Université de Montréal

Améliorer la prise en charge des patients souffrant de lombalgie : une approche fondée sur les données probantes

Par

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Programme de sciences biomédicales, Faculté de médecine

en extension à l'Université du Québec à Trois-Rivières

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Cette thèse intitulée

Améliorer la prise en charge des patients souffrant de lombalgie : une approche fondée sur les données probantes

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Résumé

Malgré l'existence de guides de bonnes pratiques reconnus internationalement, la prise en charge de la lombalgie demeure marquée par l'usage inapproprié de traitements pharmacologiques et d'examens d'imagerie, ainsi que par le recours injustifié à l'expertise de médecins spécialistes. Devant le fardeau croissant de la lombalgie, un regroupement d'expert·e·s a lancé, en 2018, un appel à l'action pressant les instances gouvernementales à repenser l'organisation des soins afin de permettre à chaque personne un accès opportun au·à la professionnel·le de la santé approprié·e, tout en évitant les interventions inutiles ou inefficaces. Dans cette perspective, l'élaboration de pratiques claires en matière d'évaluation et de référencement, ainsi que l'intégration d'expert·e·s en santé musculosquelettique dans les parcours de soins, ont été identifiées comme des leviers prometteurs pour améliorer la pertinence et l'efficience des services offerts aux patient·e·s atteint·e·s de lombalgie. Ainsi, l'objectif de cette thèse était d'identifier les pratiques actuelles d'évaluation et de référencement des patient·e·s consultant pour une lombalgie dans le système de santé public québécois, d'analyser leur adéquation avec les recommandations de bonnes pratiques basées sur les plus récentes données probantes et d'évaluer l'efficacité d'une stratégie de triage reposant sur l'expertise de professionnel·le·s en santé musculosquelettique pour optimiser les trajectoires de soins.

Le premier article de cette thèse, une revue de la portée, a mis en évidence la faible valeur diagnostique des composantes de l'évaluation clinique de la lombalgie en contexte de soins primaires. Ce constat souligne l'importance d'une interprétation intégrée des résultats de l'évaluation, les composantes prises isolément présentant une valeur limitée et étant susceptibles d'orienter inadéquatement les décisions cliniques. Cette revue de la portée a ensuite guidé le développement d'un outil d'aide à la prise de décision clinique, utilisé comme cadre de référence pour caractériser les profils cliniques et les trajectoires de soins des patient·e·s référé·e·s vers des soins spécialisés pour une lombalgie, objectif du deuxième projet de cette thèse. La deuxième étude, une analyse rétrospective de données issues de dossiers médicaux, a montré qu'une proportion significative des références effectuées pour une lombalgie au département de neurochirurgie du Centre intégré universitaire de soins de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec était sous-optimale. Les portraits cliniques des patient·e·s non

admissibles à une prise en charge chirurgicale étaient principalement caractérisés par une douleur lombaire dominante et aucun signe neurologique objectif. Ainsi, malgré des délais d'attente de plusieurs mois, ces patient·e·s ont été orienté·e·s vers des approches de soins conservatrices, suggérant qu'une optimisation de la trajectoire de soins aurait été possible dès la première consultation en soins primaires. Enfin, un essai contrôlé randomisé a permis de documenter les effets d'une évaluation de triage, réalisée par un·e expert·e en santé musculosquelettique, en l'occurrence un·e chiropraticien·ne, sur l'évolution clinique et les trajectoires de soins des personnes référées vers des soins spécialisés de neurochirurgie pour une lombalgie. Bien que cette intervention n'ait entraîné aucun effet cliniquement significatif sur l'évolution de la lombalgie et n'ait exercé qu'un impact minimal sur l'utilisation subséquente des soins et services de santé, une analyse secondaire a mis en évidence une concordance diagnostique et décisionnelle modérée à élevée entre les chiropraticien·ne·s et les neurochirurgien·ne·s. Ces résultats suggèrent que ces professionnel·le·s partagent des critères d'évaluation et de prise de décision cohérents et qu'un triage assuré par un·e expert·e en santé musculosquelettique en première ligne pourrait contribuer à l'optimisation des trajectoires de soins. Les recherches futures devraient notamment s'attarder à l'identification des barrières et des leviers favorisant l'acceptabilité et l'implantation durable de ces modèles, en particulier en soins primaires, où les décisions cliniques exercent une influence déterminante sur les trajectoires de soins.

Mots-clés : lombalgie, triage, efficience des soins, accessibilité, trajectoires de soins, pratique clinique fondée sur les données probantes, chiropratique, santé musculosquelettique, services de santé

Abstract

Despite the availability of clinical practice guidelines, the management of low back pain is characterised by inappropriate use of pharmacological treatments and imaging procedures, and by unnecessary referrals to medical specialists. In response to the growing burden of low back pain, international experts issued a call to action in 2018, urging governments to reorganize care pathways so that every individual can access the right treatment in a timely manner, while avoiding unnecessary or ineffective interventions. Developing clear assessment and referral practices and integrating musculoskeletal health experts into care pathways have been identified as key strategies to enhance the appropriateness and efficiency of patient care.

The aim of this thesis was to examine current assessment and referral practices for patients presenting with low back pain, to assess their concordance with evidence-based practice guidelines, and to examine the effectiveness of a triage strategy led by musculoskeletal health experts aimed at optimizing care trajectories.

The first article, a scoping review, demonstrated that most components of the clinical examination for low back pain have limited diagnostic accuracy in primary care settings. These findings highlight the importance of an integrated interpretation of assessment results, as individual components, when considered in isolation, have limited value and may lead to inappropriate clinical decision-making. This scoping review subsequently guided the development of a clinical decision support tool, which served as a reference framework to characterize the clinical profiles and care trajectories of patients referred for specialized care for low back pain.

The second article, a retrospective analysis of medical records, revealed that a significant proportion of referrals made to the neurosurgery department of the CIUSSS de la Mauricie-et-du-Centre-du-Québec over a three-year period were suboptimal. Patients deemed unsuitable for surgical management typically presented with dominant back pain and lacked objective neurological signs. Despite waiting for several months, these patients were ultimately managed with conservative care, indicating that care pathway optimization could have been achieved as early as the initial primary care visit. Finally, a randomised controlled trial documented the effects of a triage assessment conducted by a musculoskeletal health expert on clinical outcomes and

care trajectories among individuals referred for specialized neurosurgical care for low back pain. While the intervention did not produce any clinically meaningful effects on low back pain outcomes and had only a minimal impact on subsequent health care utilization, a secondary analysis demonstrated moderate to high diagnostic and decision-making concordance between chiropractors and neurosurgeons. These findings indicate that shared evaluative frameworks may support a primary care triage model led by a musculoskeletal health expert to optimize care pathways.

Future research should focus on identifying the factors that promote the acceptability and sustainable implementation of these models of care, particularly in primary care settings, where clinical decision-making plays a critical role in shaping care trajectories.

Keywords : low back pain, triage, efficiency of care, access to care, care pathways, evidence-based practice, chiropractic, musculoskeletal health, health services

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Liste des sigles et abréviations

ACI : Agency for Clinical Innovation

AINS : Anti-inflammatoires non-stéroïdiens

BACPAP : Low Back Pain Phenotyping Consortium

CIUSSS MCQ : Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du Centre-du-Québec

CRDS : Centre de répartition des demandes de services

EMG : Électromyographie

FABER : Flexion Abduction External Rotation

FMSQ : Fédération des médecins spécialistes du Québec

FNAH : French National Authority for Health

GBD : Global Burden of Disease, Injuries and Risk Factors

IASP : International Association for the Study of Pain

ICC : Intra-class correlation coefficient

IDMS : Indice de défavorisation matérielle et sociale

IMC : Indice de masse corporelle

INESSS : Institut national d'excellence en santé et services sociaux

IRM : Imagerie par résonance magnétique

Kg : Kilogramme

KNGF : Royal Dutch Society for Physical Therapy

LR + : Rapport de vraisemblance positif

MSSS : ministère de la Santé et des Services Sociaux

NASS : North American Spine Society

NDMG : German Disease Management Guideline

NICE : National Institute for Health and Care Excellence

NRS-11 : 11-point Numeric Rating Scale

OMS : Organisation Mondiale de la Santé

OPTIMA : Ontario Protocol for Traffic Injury Management

SBST : STarT Back Screening Tool

SDI : Indice socio-démographique

SNRI : Inhibiteur de la recapture de la sérotonine et de la noradrénaline

TENS : Stimulation électrique transcutanée des nerfs

TMS : Troubles musculosquelettiques

USD : United States Dollar

Pour Emma et Margot : Une nouvelle route tracée pour vous.

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Mise en contexte

Responsabilité populationnelle

Depuis 2005, le gouvernement du Québec a intégré le concept de *responsabilité populationnelle en santé* dans sa Loi sur les services de santé et services sociaux (Commissaire à la santé et au bien-être, 2025). Cette approche repose sur l'obligation de maintenir et d'améliorer le bien-être de l'ensemble de la population, en tenant compte de leurs besoins exprimés et non-exprimés, ainsi que des caractéristiques uniques des territoires et des communautés (Buck, Baylis, Dougall, & Robertson, 2018; Cohen et al., 2014; Trottier, 2013). Plus concrètement, la responsabilité populationnelle implique la mise en œuvre de stratégies favorisant [1] l'accès à des services sociaux et de santé pertinents et coordonnés, [2] l'accompagnement et le soutien des personnes afin de maintenir leur autonomie fonctionnelle et [3] la réduction des écarts injustes et évitables entre certains sous-groupes populationnels, notamment par des interventions tenant compte des déterminants sociaux de la santé (Commissaire à la santé et au bien-être, 2025).

Au cours des vingt dernières années, le système de santé et de services sociaux québécois a connu d'importantes restructurations, notamment marquées par l'abolition des réseaux locaux de santé (RLS) et des centres de santé et de services sociaux (CSSS), ainsi que par la création des centres intégrés de santé et de services sociaux (CISSS) et des centres intégrés universitaires de santé et de services sociaux (CIUSSS) (Gouvernement du Québec, 2015). Depuis 2015, la responsabilité populationnelle est confiée aux CISSS et aux CIUSSS, qui sont désormais responsables de plus vastes territoires, caractérisés par des profils socio-culturels et économiques variés, tout en devant composer avec des ressources limitées (Commissaire à la santé et au bien-être, 2025). Malgré ces enjeux, l'intégration de l'approche de santé populationnelle demeure au centre des préoccupations du ministère de la Santé et des Services Sociaux (MSSS) du Québec. Elle est notamment présentée comme un levier potentiel pour atténuer les nombreuses disparités exacerbées par la pandémie de COVID-19 et pour répondre à la pénurie et à l'épuisement des professionnels de la santé (Commissaire à la santé et au bien-être, 2025; Santé Québec, 2025).

Par ailleurs, la croissance démographique et le vieillissement de la population québécoise entrainent une augmentation et une transformation des besoins en matière de santé, exacerbant

les défis concernant l'organisation des soins et d'accès aux services (Institut de la statistique du Québec, 2025; Santé Québec, 2025). Cette hausse de la demande, combinée à la fragmentation des soins et services, ainsi qu'à l'absence d'un fournisseur de soins de santé pour une proportion significative de la population, contribue à surcharger les services de première ligne (Institut Canadien d'information sur la Santé, 2023; Ministère de la Santé et des Services sociaux du Québec, 2023a). En conséquence, le Québec se classe parmi les provinces canadiennes ayant les plus longs délais d'attente pour accéder à certains services, et ce, malgré la mise en œuvre du projet de loi n°15 en 2023, ayant mené à la création de Santé Québec (Gouvernement du Québec, 2025a). En s'appuyant sur le quintuple objectif en santé (Nundy, Cooper, & Mate, 2022), Santé Québec souligne dans son plus récent plan stratégique (2025-2028) que la priorisation des actions cliniques ainsi que l'adoption d'une approche de soins et services intégrés sont essentielles pour [1] améliorer la santé et le bien-être de la population, [2] offrir une expérience de soins positive, [3] favoriser l'équité entre les groupes qui composent la population, [4] soutenir un environnement de travail sain et [5] assurer la pérennité et l'efficacité du système de santé (Santé Québec, 2025).

Atteinte du quintuple objectif et santé musculosquelettique

Les troubles musculosquelettiques (TMS) constituent la principale cause d'incapacité à l'échelle mondiale, la lombalgie représentant la première cause d'incapacité dans 160 pays (R. Buchbinder et al., 2018; GBD Low Back Pain Collaborators, 2023). Au Canada, la prévalence des TMS connait une augmentation marquée, passant de 23,0 % en 1990 à 27,8 % en 2017, une évolution qui pourrait notamment être attribuée à une hausse des comportements sédentaires (GBD Disease and Injury Incidence and Prevalence Collaborators, 2018). Dans son plus récent rapport sur les coûts associés aux maladies et blessures, l'Agence de la santé publique du Canada estime que 6,7 milliards de dollars, soit 6,0 % des dépenses annuelles totales en santé, sont attribuables aux coûts directs liés aux TMS, incluant les médicaments, les soins hospitaliers et les services médicaux (Agence de la santé publique du Canada, 2018). De plus, l'analyse des bases de données administratives de la province de l'Ontario pour l'exercice financier 2013–2014 révèle que 28,5 % des adultes ont consulté un médecin en soins ambulatoires au moins une fois pour un TMS au

cours de l'année, représentant environ 5,6 millions de visites en soins primaires annuellement (Power et al., 2022).

Dans un appel à l'action publié en 2018 dans la revue scientifique *The Lancet*, un regroupement d'expert·e·s internationaux·ales interpellent les instances gouvernementales à mettre en œuvre des stratégies pour freiner le fardeau croissant de la lombalgie à l'échelle mondiale (R. Buchbinder et al., 2018). Ces auteur·e·s dénoncent notamment la fragmentation des soins et services, ainsi que le recours à des pratiques non conformes aux plus récentes données probantes, caractérisées par l'utilisation excessive d'interventions pharmacologiques et d'examens d'imagerie, et par le recours injustifié à l'expertise de médecins spécialistes (Bishop & Wing, 2003; Debono, Sabatier, Koudsie, Buffenoir, & Hamel, 2017). Conformément à l'approche de santé populationnelle et le quintuple objectif en santé, ces experts recommandent la réorganisation des trajectoires de soins afin de permettre à chaque personne d'accéder au·à la professionnel·le approprié·e, au moment opportun (R. Buchbinder et al., 2018). L'intégration de l'expert·e en santé musculosquelettique dans le parcours de soins des personnes atteintes de lombalgie est ainsi identifiée parmi les leviers potentiels pour favoriser des soins de santé intégrés, efficaces et de grande valeur (R. Buchbinder et al., 2018).

Malgré ces recommandations, l'offre de soins et services publics interdisciplinaires en santé musculosquelettique demeure considérablement limitée au Québec, alors que la majorité des professionnel·le·s œuvrant dans ce domaine d'expertise ont des interactions minimales avec les intervenant·e·s du système de santé public. Cette organisation fragmentée des soins contribue notamment à alourdir les temps d'attente, particulièrement pour l'accès aux tests diagnostiques, aux services de réadaptation post-opératoires et aux soins spécialisés (Gouvernement du Québec, 2025b). Selon des données de novembre 2025, plus de 60% des références effectuées en attente d'une consultation avec un médecin spécialiste sont hors délai sur le territoire du CIUSSS de la Mauricie-et-du-Centre-du-Québec, c'est-à-dire que leur temps d'attente excède le délai cible recommandé selon leur niveau de priorité (Gouvernement du Québec, 2025b). Toutefois, de façon informelle, l'équipe de neurochirurgie du CIUSSS-MCQ dénonce des pratiques de référencement sous-optimales, rapportant qu'une proportion significative de personnes référées pour un motif de lombalgie à leur service ne requiert pas l'expertise d'un médecin spécialiste.

Objectif de la thèse

Dans une perspective de responsabilité populationnelle et appuyé par le cadre de référence du quintuple objectif en santé, l'objectif de cette thèse était d'identifier les composantes ayant une valeur diagnostique adéquate pour l'évaluation de la lombalgie en première ligne de soins, de décrire les pratiques actuelles en matière d'évaluation et référencement pour la lombalgie et leur adéquation avec les plus récentes données probantes, et de mesurer les effets d'une stratégie de triage réalisée par un·e expert·e en santé musculosquelettique sur l'évolution des profils cliniques et l'optimisation des trajectoires de soins pour la lombalgie.

Cette thèse se divise en huit chapitres. Le premier chapitre aborde les principaux aspects théoriques de l'évolution clinique, de l'évaluation et de la prise en charge de la lombalgie.

Le deuxième chapitre décrit l'organisation des soins de santé au Québec, son impact sur l'accès et l'efficience des soins, ainsi que le rôle de l'expert·e en santé musculosquelettique dans la prise en charge de la lombalgie.

Le troisième chapitre présente le premier article de cette thèse, une revue de la portée, publiée en 2023 dans le *Journal of Clinical Medicine.* Cette étude recense les données probantes portant sur la valeur diagnostique des composantes de l'évaluation de la lombalgie. Les résultats obtenus ont servi de cadre de référence, permettant de préciser dans quelle mesure chacun des éléments de l'évaluation de la lombalgie pouvait informer la prise de décision clinique.

Le quatrième chapitre présente le deuxième article, publié dans le journal *Frontiers in Medicine* en 2024, une analyse rétrospective de dossiers médicaux de personnes référées vers un service spécialisé de neurochirurgie pour une lombalgie. Cette étude a permis de mieux caractériser les trajectoires de référencement, tout en précisant les facteurs cliniques et organisationnels susceptibles d'expliquer certaines trajectoires sous-optimales, et ce, malgré la mise en place d'un mécanisme d'accès priorisé aux services spécialisés.

Le cinquième chapitre présente le troisième article, un essai contrôlé randomisé, soumis pour publication dans *The Spine Journal* en janvier 2026. Cette étude documente les effets d'une intervention de triage, menée par un expert·e en santé musculosquelettique, sur le portrait

clinique et les trajectoires de soins de personnes référé·e·s vers des soins spécialisés pour une lombalgie.

Le sixième chapitre présente le dernier article de cette thèse, une analyse secondaire des données issues de l'essai contrôlée randomisée précédemment décrit, publiée dans le journal *Scientific Reports* en 2025. Cette étude évalue la concordance diagnostique et décisionnelle entre un·e expert·e en santé musculosquelettique et un·e neurochirurgien·ne pour la lombalgie et discute des implications cliniques et des enjeux organisationnels soulevés par ces résultats.

Enfin, le septième chapitre présente la discussion, qui situe les résultats de l'ensemble des études de cette thèse dans le contexte des connaissances actuelles. Le huitième et dernier chapitre rappelle les principales implications cliniques de ces travaux, ainsi que les perspectives de recherche qu'ils permettent d'envisager.

Chapitre 1 – La lombalgie

Classifications de la lombalgie

La lombalgie se définit par une douleur localisée entre le bord inférieur de la 12^{e} côte et le pli fessier, avec ou sans douleur au membre inférieur (Knezevic, Candido, Vlaeyen, Van Zundert, & Cohen, 2021). De nombreux systèmes de classification sont utilisés pour définir les différents types de lombalgie, dont les plus fréquents sont basés sur l'origine de la douleur ou sur le phénotype de la douleur prédominante. La compréhension de ces classifications est essentielle puisque l'identification du type de lombalgie est un élément clé pour déterminer l'intervention thérapeutique appropriée pour chaque patient·e (Krenn et al., 2020). Une revue systématique de la littérature recensant les plus récents guides de bonnes pratiques cliniques pour la lombalgie met en évidence de nombreuses similitudes, mais également certaines différences dans la manière de catégoriser la lombalgie (Oliveira et al., 2018). Néanmoins, 83,3% des guides de bonnes pratiques identifiés dans cette revue (10 sur 12) recommande la classification de la lombalgie en fonction de l'origine de la douleur, en portant une attention particulière à l'identification de conditions spécifiques sous-jacentes pouvant être à l'origine de la lombalgie (Oliveira et al., 2018). De plus, 75,0% des guides de bonnes pratiques répertoriés présentent une classification secondaire, qui propose des recommandations thérapeutiques adaptées à la durée des symptômes (Oliveira et al., 2018). La durée de la lombalgie est généralement scindée en trois sous-catégories, soit aiguë (c.-à-d. les symptômes sont présents depuis moins de 4 semaines), subaigüe (c.-à-d. les symptômes sont présents depuis 4 à 12 semaines) et chronique (c.-à-d. les symptômes persistent depuis plus de 12 semaines). Bien que la définition de la lombalgie chronique soit commune à tous les guides de bonnes pratiques identifiés, certains guides ne font pas de distinction entre la lombalgie aigüe et subaigüe et définissent donc la lombalgie aigüe comme une douleur présente depuis moins de 12 semaines (A. E. Bussières et al., 2018; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016; Stochkendahl et al., 2018; Van Tulder et al., 2006; J. J. Wong et al., 2017).

La lombalgie chronique selon les National Institutes of Health

Conscients des limites d'une définition de la douleur chronique reposant exclusivement sur la durée des symptômes, les National Institutes of Health (NIH) ont mis en place un groupe d'expert·e·s afin d'établir des critères permettant d'en standardiser la définition dans un contexte de recherche. (Deyo et al., 2015). À partir d'un processus de consensus fondé sur les plus récentes données probantes disponibles, ce groupe a proposé une définition multidimensionnelle de la douleur chronique intégrant non seulement la durée de la douleur, mais également sa fréquence et son impact fonctionnel. Selon les critères des NIH, la lombalgie chronique se définit comme une douleur lombaire présente depuis au moins trois mois et survenant au moins la moitié des jours au cours des six derniers mois (Deyo et al., 2015). Ce groupe de travail recommande également la stratification de la lombalgie chronique en fonction de son impact fonctionnel, défini par une combinaison de l'intensité de la douleur, l'interférence de cette douleur avec les activités de la vie quotidienne, ainsi que le statut fonctionnel, mesuré par 9 items du questionnaire PROMIS-29 (Deyo et al., 2015). Ainsi, selon cette stratification, la lombalgie chronique a un impact fonctionnel minime si le score obtenu se situe entre 8 et 27, modéré si le·la patient·e obtient un score entre 34-38 et sévère si le score est $\geq$ 35 (Deyo et al., 2015).

La section suivante présentera les particularités de la classification de la lombalgie en fonction de l'origine de la douleur, utilisée dans le cadre de cette thèse, et la comparera à certaines classifications plus récemment décrites dans la littérature scientifique.

Classification selon l'origine de la douleur

Tel qu'énoncé précédemment, la classification de la lombalgie selon l'origine de la douleur est la plus communément retrouvée dans les guides de bonnes pratiques cliniques. Cette classification définit la lombalgie en trois catégories distinctes, soient la lombalgie non-spécifique, le syndrome radiculaire et la lombalgie spécifique.

Lombalgie non-spécifique

La lombalgie non-spécifique est attribuée à une douleur lombaire dont l'origine nociceptive précise ne peut être identifiée (Maher, Underwood, & Buchbinder, 2017). Cette catégorie représente environ 90% des cas de lombalgie (Hartvigsen et al., 2018). La lombalgie non-

spécifique résulte d'un processus inflammatoire ou dégénératif affectant une ou plusieurs structures anatomiques, telles que les muscles de la région lombaire, les ligaments, les disques intervertébraux ou les articulations zygapophysaires (situées entre les processus articulaires de deux vertèbres adjacentes) (Knezevic et al., 2021). L'articulation sacro-iliaque, formée entre l'os iliaque et le sacrum, est également une source nociceptive potentielle. Bien que caractérisée par une douleur généralement prédominante à la fesse, une dysfonction de l'articulation sacro-iliaque peut se traduire par une douleur lombaire chez plus du deux tiers des personnes atteintes, dont près de la moitié pourront également ressentir une douleur non-dermatomale (c.-à-d. ne suivant pas le territoire d'une racine nerveuse) à la jambe, qui s'arrête au-dessus du genou (Knezevic et al., 2021).

Syndrome radiculaire

La deuxième catégorie, le syndrome radiculaire, regroupe un ensemble de symptômes liés à l'atteinte d'une racine nerveuse, se caractérisant par une douleur lombaire combinée à une douleur à la jambe (Hartvigsen et al., 2018). La douleur à la jambe est typiquement d'une intensité supérieure à la douleur lombaire et s'accompagne ou non de symptômes neurologiques. Le syndrome radiculaire se définit en trois catégories, soit la douleur radiculaire, la radiculopathie et la sténose spinale lombaire (Hartvigsen et al., 2018). Ces trois sous-catégories se distinguent entre elles principalement par la distribution de la douleur au membre inférieur et par la présence ou l'absence de symptômes neurologiques.

La douleur radiculaire relève de l'inflammation ou de l'irritation d'une racine nerveuse et se caractérise par une douleur dermatomale typiquement unilatérale, sans symptômes neurologiques (Knezevic et al., 2021). La radiculopathie, quant à elle, se définit par la présence de symptômes neurologiques objectifs (c.-à-d. une atteinte de la sensibilité, de la force motrice ou des réflexes) affectant le territoire d'une ou plusieurs racines nerveuses (Hartvigsen et al., 2018). La douleur radiculaire et la radiculopathie co-existent dans plusieurs cas, mais une personne peut présenter une radiculopathie sans douleur radiculaire, et à l'inverse, présenter une douleur radiculaire sans radiculopathie (Hartvigsen et al., 2018). Enfin, la sténose spinale lombaire se caractérise par un rétrécissement du canal rachidien lombaire, entrainant une compression progressive des structures neurovasculaires cheminant dans ce canal (A. Bussières et al., 2021).

Cette condition relève principalement d'un processus dégénératif intimement lié à l'âge, bien qu'elle peut également être la conséquence d'un trouble développemental ou d'une anomalie congénitale (Bagley et al., 2019). La sténose spinale lombaire se caractérise par des douleurs diffuses, une sensation de brûlure ou des crampes intermittentes au niveau de la région fessière, des cuisses ou des jambes (C. Cook et al., 2011). Ces symptômes peuvent être unilatéraux ou bilatéraux et être accompagnés d'une combinaison de troubles sensoriels et moteurs (ex. : douleur, paresthésie, faiblesse musculaire, perte d'équilibre) (A. Bussières et al., 2021). Les symptômes associés à la sténose spinale lombaire sont dits dynamiques puisqu'ils varient étroitement en fonction des changements posturaux. Ils sont typiquement aggravés à la marche ou lors du maintien d'une position debout statique et diminués par la flexion lombaire (Jensen & Schmidt-Olsen, 1989; Sugioka, Hayashino, Konno, Kikuchi, & Fukuhara, 2008) ou la position assise (Nadeau et al., 2013). Cette présentation clinique caractéristique de la sténose spinale lombaire est également connue sous le nom de claudication neurogène.

Lombalgie spécifique

Le diagnostic de lombalgie spécifique est attribué à une douleur lombaire dont la source nociceptive précise peut être identifiée (Hartvigsen et al., 2018). La fracture vertébrale, la tumeur maligne vertébrale, la spondyloarthropathie axiale, l'infection vertébrale et le syndrome de la queue de cheval sont des pathologies spécifiques pouvant affecter le rachis et être à l'origine d'une douleur lombaire (Hartvigsen et al., 2018). Une méta-analyse regroupant 10 études ayant évalué la prévalence de pathologies spécifiques chez les personnes consultant pour une lombalgie rapporte une prévalence combinée (c.-à.-d. considérant tous les types de pathologies et tous les contexte de soins) de 2,9 % (95% IC 1,6-5,2) (Reginato et al., 2025). Cette prévalence varie toutefois en tenant compte du niveau de soins. En effet, elle est plus faible en milieux de soins primaires (0,8 %; 95% IC 0,3-1,2%), comparativement aux milieux de soins d'urgence (2,1 %; 1,3-3,4), secondaires (4,6%; 95% IC 1,1-17,5) et tertiaires (6,9%; 95% CI 2,5-18,0) (Reginato et al., 2025). La prévalence de la lombalgie spécifique diffère également selon la nature de la pathologie identifiée, la fracture vertébrale présentant la prévalence combinée la plus élevée (2,4%; 95% CI 1,1-5,0), suivie par l'infection (0,7%; 95% CI 0,2-2,9), la tumeur maligne (0,5%; 95% CI 0,3-0,9) et le syndrome de la queue de cheval (0,3%; 95% CI 0,1-1,5) (Reginato et al., 2025).

Classification de l'International Association for the Study of Pain

Dans son plus récent guide de bonnes pratiques cliniques portant sur la prise en charge de la lombalgie chez les adultes consultant dans les milieux de soins primaires, l'Organisation Mondiale de la Santé (OMS) adopte la classification de l'International Association for the Study of Pain (IASP) pour caractériser la lombalgie chronique (World Health Organization, 2023). L'objectif de la classification de l'IASP était de proposer une caractérisation de la douleur chronique employant des termes plus positifs et clairs, fondée sur des concepts observables plutôt que sur l'absence d'éléments cliniques (R. Treede et al., 2015). Cette classification distingue deux sous-types de douleur chronique, soit la douleur chronique primaire et la douleur chronique secondaire. La douleur chronique primaire telle que définit par l'IASP se caractérise par [1] une douleur récurrente ou persistante depuis plus de 3 mois, accompagnée de [2] détresse émotionnelle significative (ex. : anxiété, colère, frustration, humeur dépressive) ou d'une incapacité fonctionnelle (c.-à-d. une diminution des capacités à accomplir les activités quotidiennes ou à remplir ses rôles sociaux) dont [3] les symptômes ne peuvent être expliqués par un autre diagnostic (Nicholas et al., 2019). Dans le plus récent guide de bonnes pratiques de l'OMS, cette définition remplace celle de la lombalgie chronique non-spécifique (World Health Organization, 2023). La douleur chronique secondaire fait, quant à elle, référence à une douleur qui relève d'une pathologie sous-jacente ou d'une lésion structurelle identifiable (Nicholas et al., 2019). Ainsi, la douleur chronique secondaire correspond au concept de lombalgie chronique spécifique, dans la mesure où elle est attribuable à une pathologie identifiable ou à une lésion structurelle sous-jacente (World Health Organization, 2023).

Classification selon le phénotype de la douleur prédominante

La lombalgie chronique peut résulter d'un ou plusieurs mécanismes physiopathologiques, incluant des composantes nociceptives, neuropathiques ou nociplastiques (Jo Nijs et al., 2024). Chacun de ces mécanismes étant associé à un phénotype de douleur prédominante, il est suggéré que le recours à une approche thérapeutique personnalisée, guidée par le phénotype de douleur, pourrait optimiser la réponse au traitement (Alev et al., 2017; J. Nijs et al., 2021; Schliessbach et al., 2018). En 2023-2024, le Low Back Pain Phenotyping Consortium (BACPAP) a été mis sur pied, regroupant 36 expert·e·s de la douleur et de la réadaptation provenant de 13 pays différents (Jo

Nijs et al., 2024). Le BACPAP avait pour mandat de rédiger des recommandations permettant de guider l'identification des phénotypes de la douleur prédominante (Jo Nijs et al., 2024). Ce consensus d'expert·e·s s'est notamment appuyé sur un ensemble de critères déjà reconnus pour l'identification de la douleur neuropathique (Finnerup et al., 2016) ainsi que sur l'algorithme de prise de décision clinique de l'IASP pour l'identification de la douleur nociplastique (Kosek et al., 2021). Ultimement, le consortium BACPAP a permis de mieux définir les différents phénotypes de la douleur et ainsi proposer un outil d'aide à la prise de décision clinique permettant l'identification du phénotype de la douleur prédominante.

Douleur nociceptive prédominante

La douleur nociceptive aigüe ou chronique relève de l'activation des terminaisons réceptrices périphériques des neurones afférents primaires en réponse à des stimuli de nature chimique, mécanique ou thermique (Keith M. Smart, Blake, Staines, & Doody, 2010). Parmi les différents types de douleur, la douleur nociceptive est la plus communément expérimentée (Kosek et al., 2016). L'identification du phénotype de la douleur nociceptive repose sur la caractérisation de la douleur et du mécanisme de blessure, ainsi que sur la reproduction proportionnée des symptômes par certains mouvements, postures ou mise en charge articulaire (Shraim et al., 2022). La douleur nociceptive est généralement localisée et reproduite de manière constante et prévisible par certaines positions ou mouvements (Shraim et al., 2022). Plusieurs structures anatomiques de la région lombaire sont susceptibles d'être à l'origine d'un influx nociceptif telles que les muscles, les fascias, les articulations zygapophysaires, les articulations sacro-iliaques, les disques intervertébraux et les ligaments (Jo Nijs et al., 2024). La lombalgie non-spécifique relève d'un mécanisme pathophysiologique nociceptif. Cependant, pour environ 90% des cas de lombalgie, la source nociceptive précise ne peut être identifiée (Knezevic et al., 2021). Un diagnostic de lombalgie spécifique ou chronique secondaire est posé lorsque la douleur est causée par une pathologie sous-jacente (ex : maladie inflammatoire, infection, cancer), identifiée par une combinaison d'éléments cliniques et les résultats de tests supplémentaires (c.-à-d. imagerie, analyses biomédicales) (Downie et al., 2013; Henschke et al., 2013; Verhagen, Downie, Popal, Maher, & Koes, 2016). La lombalgie chronique primaire peut également être attribuable à un mécanisme pathophysiologique nociceptif, dans la mesure où la personne ne présente aucun

signe d'hypersensibilité aux stimuli sensoriels (Jo Nijs et al., 2024). Enfin, la douleur nociceptive ressentie à un autre site que le stimulus nociceptif initial désigne une douleur somatique référée (Institut national d'excellence en santé et en services sociaux, 2025). La pancréatite, la pyélonéphrite et le syndrome de la charnière thoraco-lombaire sont des exemples de conditions à l'origine d'une douleur somatique référée à la région lombaire.

Douleur neuropathique prédominante

La douleur neuropathique aigüe ou chronique, telle que définit par l'IASP, relève d'une lésion ou d'une maladie du système nerveux central ou périphérique (Scholz et al., 2019). La douleur neuropathique peut être spontanée ou provoquée, se manifestant par une réponse exagérée à un stimulus douloureux (hyperalgésie) ou par une réponse douloureuse à un stimulus normalement non douloureux (allodynie) (Jo Nijs et al., 2024). Une sensation de brûlure ou de chaleur, des décharges électriques, des élancements ou des picotements, une sensation de type aiguille, une douleur provoquée par un léger contact ou par le froid, ainsi que des sensations non douloureuses comme des engourdissements et des fourmillements sont évocatrices, bien que non pathognomoniques, de la douleur neuropathique (Jo Nijs et al., 2024). Le diagnostic de la douleur neuropathique étant complexe, l'IASP Special Interest Group on Neuropathic Pain (NeuPSIG) a proposé un système de gradation du niveau de certitude avec lequel une douleur neuropathique peut être diagnostiquée chez un·e patient·e (R. D. Treede et al., 2008). Trois niveaux de certitude ont été suggérés : la douleur neuropathique « possible », « probable » et « certaine ». Le diagnostic de douleur neuropathique « possible » requiert la présence de deux critères, soient un antécédent de lésion ou de maladie du système nerveux et une distribution neuroanatomique plausible de la douleur (Finnerup et al., 2016). En d'autres termes, la localisation de la douleur correspond au territoire cutané innervé par le nerf ou la racine nerveuse affectée. La douleur radiculaire telle que décrite précédemment (pp. 32-33) répond aux critères de la douleur neuropathique possible, dans la mesure où un antécédent de lésion nerveuse est présent.

Un diagnostic de douleur neuropathique « probable » est attribué en présence de symptômes ou signes sensoriels négatifs (ex : une diminution ou une perte de la sensibilité) et positifs (ex : allodynie ou hyperalgésie) compatibles avec le territoire d'innervation de la structure nerveuse

atteinte (Finnerup et al., 2016). La radiculopathie lombaire et la sténose spinale lombaire correspondent aux critères de la douleur neuropathique « probable », se traduisant principalement par des symptômes sensoriels négatifs, accompagnés ou non de déficits moteurs (Hartvigsen et al., 2018). Enfin, la douleur neuropathique « certaine » représente le niveau de certitude le plus élevé. Ce diagnostic est attribué lorsqu'un test diagnostique objectif (ex : imagerie par résonnance magnétique (IRM), électromyographie (EMG)) confirme la lésion ou la maladie du système nerveux somatosensoriel et que cette lésion est compatible avec la présentation clinique du·de la patient·e (Finnerup et al., 2016). La douleur neuropathique et la douleur nociceptive peuvent co-exister. Par exemple, une personne ayant une hernie discale lombaire peut présenter un phénotype de douleur nociceptive dominante à la région lombaire, mais également un phénotype de douleur neuropathique dominante à la jambe (Kosek et al., 2021).

Douleur nociplastique prédominante

En 2017, un troisième phénotype de la douleur, soit celui de la douleur nociplastique, a été proposé par l'IASP (Kosek et al., 2016). La douleur nociplastique résulte d'une altération de la nociception qui ne s'explique par aucune lésion tissulaire réelle ou potentielle activant les nocicepteurs périphériques, ni par une lésion ou une maladie du système somatosensoriel (Kosek et al., 2021). Le diagnostic de la douleur nociplastique repose sur l'identification de 4 critères cliniques : (1) la douleur est présente depuis plus de 3 mois, est régionale, multifocale ou diffuse plutôt que localisée et ne peut être entièrement expliquée par les mécanismes de la douleur nociceptive ou neuropathique; (2) la personne présente des antécédents d'hypersensibilité dans la région douloureuse, se manifestant par une réponse disproportionnée et imprévisible au toucher, à la pression, au mouvement, à la chaleur ou au froid; (3) la personne présente au moins une comorbidité (ex : difficultés de sommeil, fatigue, troubles cognitifs ou de l'hypersensibilité aux bruits, à la lumière ou aux odeurs) et (4) des phénomènes d'hypersensibilité à la douleur peuvent être observés cliniquement dans la zone douloureuse. (Kosek et al., 2021). Le diagnostic de douleur nociplastique « possible » est attribué en présence des critères 1 et 4. Un diagnostic de douleur nociplastique « probable » est attribué si tous les critères sont présents (Kosek et al., 2021).

Le tableau 1 présente un regroupement des différentes classifications de la lombalgie. Les travaux réalisés dans le cadre de cette thèse ont utilisé la première classification précédemment décrite (c.-à-d. lombalgie non-spécifique, syndrome radiculaire et lombalgie spécifique). Cette classification demeure la plus communément retrouvée dans les guides de bonnes pratiques cliniques formulant des recommandations en matière d'évaluation et de prise en charge de la lombalgie.

Tableau 1. Regroupement des différentes classifications de la lombalgie

Temporalité	Origine de la douleur	Phénotype de la douleur	Terminologie
Aigüe à chronique	Généralement non-identifiée *Origines potentielles* : Muscles, fascias, ligaments, disques intervertébraux, art. zygapophysaires, art. sacro-iliaques	1. Douleur localisée 2. Reproduction proportionnée des symptômes par le mouvement ou une posture 3. Absence de symptômes neurologiques objectifs	Lombalgie non-spécifique Lombalgie mécanique Lombalgie simple Lombalgie commune Lombalgie à douleur nociceptive prédominante
Chronique			Lombalgie chronique primaire sans signes d'hypersensibilité
Aigüe à chronique	Lésion (irritation, inflammation, compression) ou maladie du système nerveux	1. Historique de lésion du système nerveux 2. Distribution de la douleur anatomiquement plausible 3. Douleur dominante au membre inférieur 4. Signes neurologiques objectifs[a] 5. Brûlure, choc électrique, picotement, engourdissement[a p.54]	Syndrome radiculaire Radiculopathie lombaire Douleur radiculaire Sténose spinale lombaire Lombalgie à douleur neuropathique prédominante
Aigüe à chronique	Maladie ou lésion sous-jacente identifiée (ex : cancer, infection, fracture, maladie inflammatoire)	1. Maladie ou lésion sous-jacente identifiée par des tests supplémentaires (imagerie, analyses biomédicales) 2. Présence de drapeaux rouges	Lombalgie spécifique Lombalgie à douleur nociceptive prédominante
Chronique			Lombalgie chronique secondaire
Chronique	Ne s'explique par aucune lésion tissulaire réelle ou potentielle, ni par une lésion ou une maladie du système somatosensoriel	1. Douleur régionale, multifocale ou diffuse 2. Antécédents ou signes cliniques d'hypersensibilité 3. Comorbidités[a]	Lombalgie à douleur nociplastique prédominante Lombalgie chronique primaire avec signes d'hypersensibilité

art: articulations; [a]Le diagnostic peut être posé même en l'absence de ce critère

Épidémiologie

Fardeau de la lombalgie

Selon la Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), il est estimé qu'en 2020, 619 millions de personnes (95% IC 554-694) ont souffert de lombalgie à travers le monde, une augmentation de 60,4% (95% IC 57.1-64.2) depuis 1990 pour tous les âges et sexes combinés. La lombalgie fut également responsable de 69 millions d'années vécues avec une incapacité (c.-à-d. les années de vie en santé perdues en raison du temps passé dans un état de santé fonctionnelle qui n'est pas optimal) (Martel & Steensma, 2012) en 2020, demeurant la principale cause d'incapacité mondialement (GBD Low Back Pain Collaborators, 2023). La prévalence mondiale de la lombalgie augmente avec l'âge, étant la plus élevée approximativement à l'âge de 85 ans (GBD Low Back Pain Collaborators, 2023). Une revue systématique regroupant 10 études de qualité méthodologique modérée à élevée rapporte une prévalence de la lombalgie chronique de 20,6% (95% CI 19,4-21,9) chez les adultes âgées de 60 ans et plus (C. K. Wong et al., 2022). Toujours selon cette revue systématique, un peu plus du tiers (36.1%; 95% CI 35,1-37,1) des adultes âgés de 60 ans et plus rapportent un épisode de lombalgie au cours d'une période de 12 mois (C. K. Wong et al., 2022). Entre 1990 et 2021, l'incidence de la lombalgie suit également une tendance croissante avec l'âge, culminant chez les personnes âgées de 50 à 54 ans (Li et al., 2024). En raison de la croissance démographique et du vieillissement de la population, il est estimé qu'en 2050, 843 millions de personnes (95% CI 759-933) rapporteront au moins un épisode de lombalgie, représentant une hausse de 36.4% (95% CI 29.9-43.2) comparativement à 2020.

Il est également important de tenir compte du fait que les données relatives à la prévalence et à l'incidence d'une condition peuvent varier en fonction des caractéristiques de la population étudiée, ainsi que des critères diagnostiques utilisés. À titre d'exemple, une revue systématique regroupant 31 études de cohorte portant sur l'incidence de la hernie discale lombaire avec radiculopathie chez l'adulte rapporte une incidence annuelle entre 0,2 et 2,5 cas pour 1000 personnes lorsque le diagnostic repose sur une confirmation par imagerie en vue d'une intervention chirurgicale (Hincapié et al., 2024). Pour cette même condition, une incidence annuelle plus élevée est observée dans les études utilisant uniquement des critères diagnostiques

cliniques, avec des taux variant entre 4,1 et 26,6 cas pour 1000 personnes, selon les caractéristiques des populations étudiées (Hincapié et al., 2024).

Données normalisées selon l'âge

Les taux de prévalence de la lombalgie, normalisés selon l'âge (c.-à-d. les taux de prévalence en tenant compte des différences existant dans la structure par âge de deux populations), sont plus élevés chez les personnes de sexe féminin (9330 cas pour 100 000 personnes; 95% CI 8370-10 500) comparativement au sexe masculin (5520 cas pour 100 000 personnes; 95% CI 4930-6190). Une analyse secondaire des données de l'étude GBD rapporte également des taux d'incidence normalisés selon l'âge plus élevés pour les personnes de sexe féminin (3879 cas pour 100 000 personnes; 95% CI 3438-4344) comparativement au sexe masculin (2450 cas pour 100 000 personnes; 95% CI 2161-2758) (Li et al., 2024). Le groupe d'âge 80-84 ans présente le plus haut nombre d'années vécues avec de l'incapacité pour 100 000 personnes, soit 2440 années (95% CI 1470-3490).

Impact du niveau de développement des pays sur le fardeau de la lombalgie

La catégorisation des pays selon leur niveau de développement économique est un moyen communément utilisé pour comparer le fardeau d'une maladie entre des régions géographiques aux profils socio-économiques distincts. La classification la plus utilisée est celle du Groupe de la Banque Mondiale, qui répartit les économies du monde en quatre catégories selon le revenu national brut par habitant: faible revenu (low-income), revenu intermédiaire de la tranche inférieure (lower-middle income), revenu intermédiaire de la tranche supérieure (upper-middle income) et revenu élevé (high income) (Metreau, Young, & Eapen, 2024). Certains indicateurs complémentaires peuvent également être utilisés, tel que l'indice sociodémographique (SDI), qui caractérise le niveau de développement d'un pays entre 0 (très faible) et 1 (très élevé) en tenant compte du revenu national brut par habitant, du niveau d'éducation chez les adultes de 15 ans et plus et du taux de fécondité chez les femmes de moins de 25 ans (Li et al., 2024). L'indice de défavorisation matérielle et sociale (IDMS) a été conçu à des fins similaires, permettant de documenter la présence d'iniquités de santé entre certains groupes de la population québécoise et canadienne (Institut national de santé publique du Québec, 2019). Cet indice prend en compte

deux dimensions, soient le manque de ressources matérielles (ex : éducation, emploi et revenu) et la fragilité du réseau social (ex : vivre seul, être monoparental, séparé, divorcé ou veuf) (Institut national de santé publique du Québec, 2019; Pampalon, Hamel, & Raymond, 2004). L'IDMS s'exprime en quintiles, représentant des ensembles de 20 % de la population. Le quintile 1 représente l'ensemble de la population le plus favorisé et le quintile 5, le plus défavorisé (Gamache, Hamel, & Pampalon, 2015).

L'analyse réalisée par le groupe de chercheur·euse·s de l'étude GBD publiée en 2021 montre que les taux d'incidence de la lombalgie standardisés selon l'âge entre 1990 et 2020 sont les plus élevés dans les pays à revenus élevés (GBD Low Back Pain Collaborators, 2023). Cependant, une analyse secondaire de ces données a révélé une corrélation négative entre le SDI et le taux d'incidence de la lombalgie normalisé selon l'âge pour les régions à SDI élevé (c.-à-d. > 0,8), traduisant une réduction du fardeau de la lombalgie dans les pays très développés (Li et al., 2024). Ce résultat diffère des constats publiés auparavant, où une corrélation positive entre l'incidence de la lombalgie et le niveau de développement d'un pays avait été notée (Chen et al., 2022). Cette tendance pourrait notamment s'expliquer par l'avancée des connaissances en matière de prise en charge de la lombalgie et par l'amélioration des conditions ergonomiques en milieu de travail liées à la modernisation industrielle, des facteurs qui semblent compenser l'augmentation de la sédentarité et de l'obésité observée dans les pays à haut développement économique (Li et al., 2024). Toutefois, ces résultats traduisent également la présence d'iniquités de santé qui persistent dans les pays sous-développés (Li et al., 2024).

Facteurs de risque de la lombalgie

La compréhension des caractéristiques et des comportements modifiables qui augmentent la probabilité de développer un problème de santé est essentielle pour optimiser les stratégies de prévention et de prise en charge d'une condition. La probabilité de développer une condition de santé diffère d'une personne à l'autre, non seulement en raison de la présence de certains facteurs de risque, mais également en raison des interactions complexes entre ces facteurs (Hincapié et al., 2024). Or, il faut noter que la plupart des études épidémiologiques rapportent des mesures d'association, telles que des rapports de cotes ou des rapports de risque, pour

chaque facteur pris individuellement, sans tenir compte de l'effet potentiel de la combinaison de ces facteurs.

Une synthèse de 15 revues systématiques de la littérature, publiée en 2018, identifie quatre catégories de facteurs de risque pour la lombalgie, soient les facteurs individuels, les facteurs relatifs à l'état de santé général, les facteurs physiques et les facteurs psychologiques (Parreira, Maher, Steffens, Hancock, & Ferreira, 2018). Parmi les facteurs individuels, être plus âgé (44-75 ans comparativement à 18-44 ans) et avoir déjà souffert d'un épisode de lombalgie augmentent la probabilité d'en souffrir à nouveau (Parreira et al., 2018). Le tabagisme, l'obésité, les troubles du sommeil, ainsi qu'être atteint d'une maladie chronique ont été identifiés comme des facteurs relatifs à l'état de santé général augmentant le risque de développer un épisode de lombalgie (Parreira et al., 2018). Plusieurs facteurs de risque physiques liés au travail ont également été identifiés, tels que l'exposition du corps à la vibration, conduire pendant plus de 2h, le soulèvement de charges lourdes (> 56 kg), l'adoption de positions contraignantes pendant plus de 15 minutes, les mouvements répétés de flexion-extension du tronc, ainsi que marcher ou maintenir une position debout statique pendant plus de 2 heures (Parreira et al., 2018). Enfin, cette synthèse de la littérature identifie également plusieurs facteurs de risque psychologiques associés à la lombalgie tels que la présence de facteurs psychosomatiques comme le stress, l'anxiété et la dépression (Parreira et al., 2018). Il est cependant important de tenir compte du fait que la majorité des facteurs de risque identifiés par cette synthèse de la littérature repose sur les données d'une seule étude. De plus, en présence de plusieurs études, les données étaient généralement insuffisantes ou trop hétérogènes pour réaliser une méta-analyse (Parreira et al., 2018). Néanmoins, ces résultats concordent avec l'analyse systématique de l'étude GBD publiée en 2019, où 38,8% des années vécues avec de l'incapacité associées à la lombalgie ont été attribuées à trois facteurs de risque modifiables, soient le tabagisme, un indice de masse corporelle (IMC) élevé (c.-à-d. supérieur à 25,0 kg/m^2) et l'exposition à des facteurs ergonomiques professionnels (c.-à-d. soulèvement répété de charges, position assise ou debout prolongée, mouvements nécessitant une force physique importante, postures contraignantes et vibration) (Ärnlöv & Collaborators, 2020). Plus précisément, pour tous les âges et sexes combinés, 22,0% (CI 95% 20,4-23,4) des années vécues avec une incapacité associées à la lombalgie ont été attribuées

aux facteurs ergonomiques professionnels, 12,5% (95% CI 3,1-21,5) au tabagisme et 11,5% (95% CI 1,4-20,9) à un IMC élevé (Ärnlöv & Collaborators, 2020).

Plus récemment, une revue systématique de la littérature regroupant 25 études de cohorte et 28 études cas-témoins s'est intéressée spécifiquement aux facteurs de risque associés au développement d'une hernie discale lombaire avec radiculopathie chez l'adulte (Hincapié et al., 2024). Les résultats suggèrent qu'un âge moyen (c.-à-d. 30–50 ans comparativement aux jeunes adultes), un IMC élevé (valeur non indiquée), la présence de facteurs de risque cardiovasculaires chez la femme (c.-à-d. le diabète, l'hypertension et l'hypercholestérolémie), le tabagisme, ainsi qu'une charge lombaire professionnelle liée aux postures en flexion et à la manutention cumulative de charges sont tous des facteurs qui augmentent le risque de développer une hernie discale lombaire (Hincapié et al., 2024).

Évolution clinique de la lombalgie

Il est difficile d'établir un consensus sur l'évolution clinique naturelle de la lombalgie en raison de l'hétérogénéité importante entre les études. Celles-ci diffèrent notamment par leur définition de la lombalgie, leurs périodes de suivi et les critères ou mesures de résultats utilisés pour évaluer le rétablissement (Itz, Geurts, Van Kleef, & Nelemans, 2013; Wallwork et al., 2024). En ce sens, diverses conceptualisations de l'évolution clinique de la lombalgie sont décrites dans la littérature. Le modèle le plus répandu repose sur une classification fondée sur la durée des symptômes (aigüe, subaiguë ou chronique), postulant que la temporalité des symptômes détermine la trajectoire clinique. En d'autres termes, ce modèle soutient que les personnes présentant une lombalgie aigüe présenteront des trajectoires de douleur et d'incapacité différentes de celles présentant une lombalgie subaigüe ou chronique (Wallwork et al., 2024). Selon cette perspective, une personne pourrait également vivre plusieurs épisodes distincts de lombalgie aigüe au cours d'une année, chacun étant considéré comme un événement isolé, ou encore connaître un ou plusieurs épisodes douloureux persistants (> 12 semaines) (Itz et al., 2013; Wallwork et al., 2024). Une méta-analyse publiée en 2013, regroupant 11 études menées en milieux de soins primaires auprès de personnes consultant pour un nouvel épisode de lombalgie avec ou sans douleur à la jambe, a montré que lorsque les symptômes persistent au-delà de trois

mois, l'évolution clinique de la lombalgie non-spécifique est généralement défavorable (Itz et al., 2013). Douze semaines après l'apparition des symptômes, environ deux tiers des participant·e·s (67%; IC 95% 50-83%) présentent encore de la douleur (Itz et al., 2013). Entre 3 et 12 mois, l'amélioration semble limitée, alors que 65 % (IC 95% 54-75%) des participant·e·s rapportent encore des douleurs un an après l'épisode initial (Itz et al., 2013). Plus récemment, une méta-analyse regroupant 95 études réalisées en milieux de soins primaires, secondaires et tertiaires a également mis en évidence une trajectoire clinique plus favorable chez les personnes présentant une lombalgie aiguë**,** avec une réduction marquée de l'intensité de la douleur et de l'incapacité au cours des six premières semaines suivant le début des symptômes (Wallwork et al., 2024). Toutefois, chez les personnes présentant des douleurs lombaires chroniques, les symptômes demeuraient élevés au cours d'une année (Wallwork et al., 2024). Les résultats de cette méta-analyse ne sont toutefois pas généralisables aux personnes âgées de 60 ans et plus, puisque celles-ci ont été exclues de l'étude.

Les travaux de Kongsted et al. (2016) proposent une caractérisation différente de l'évolution clinique de la lombalgie, suggérant l'existence d'une plus grande variété de trajectoires de douleur et remettant en question l'hypothèse selon laquelle chaque épisode de lombalgie serait indépendant les uns des autres. La définition des trajectoires proposée par Konsgted et al. (2016) repose sur une synthèse des résultats d'études ayant identifié différents profils d'évolution de la douleur chez les personnes atteintes de lombalgie. Un consensus d'expert·e·s a ensuite permis d'identifier les trajectoires les plus fréquemment observées et cliniquement pertinentes, tant pour les patient·e·s que pour les clinicien·ne·s (A. Kongsted et al., 2016). Les trajectoires identifiées par cette synthèse montrent que la lombalgie devrait plutôt être reconnue comme une affection de longue durée, dont la symptomatologie peut varier au fil du temps. Quatre principales trajectoires de douleur se dégagent de cette analyse : l'épisode douloureux unique, la douleur épisodique, la douleur fluctuante et la douleur persistante. L'épisode douloureux unique correspond à un seul épisode de douleur lombaire, d'une durée de moins de 2 semaines, sur une période de 1 an. La douleur épisodique se définit quant à elle par la survenue de plusieurs épisodes de lombalgie, séparés par des périodes sans douleur d'au moins un mois. La douleur fluctuante se manifeste par des variations d'intensité d'au moins 2 points sur une échelle

d'évaluation numérique (NRS-11), sans période asymptomatique, pour une durée minimale d'un mois. Enfin, la douleur persistante correspond à une douleur dont l'intensité demeure relativement stable (variation inférieure à 1 point au NRS-11) et ressentie plus de 4 jours par semaine. De ces profils peuvent émerger différentes trajectoires qui diffèrent entre elles par l'intensité de la douleur (ex : mineure, légère, modérée, sévère) ou par son évolution (ex : amélioration rapide, amélioration lente, aggravation progressive). Par exemple, une personne peut présenter une douleur lombaire persistante d'intensité modérée alors qu'une autre peut présenter une douleur lombaire sévère épisodique. Le tableau 2 détaille les différentes trajectoires de douleur répertoriées.

Tableau 2. Définitions des trajectoires de douleur

Profils	Intensité (NRS-11)	Variation
Persistante sévère	≥ 6	L'Intensité de la douleur varie de $\pm$ 1 de la valeur moyenne, présente au moins 4 jours/semaine
Persistante modérée	≥ 4 et < 6	
Persistante légère	≥ 2 et < 4	
Persistante mineure	< 2	$\pm$ 1 de la valeur moyenne, aucune période sans douleur de plus de 4 semaines
Fluctuante sévère	≥ 6	L'intensité varie > 1 par rapport à la moyenne, aucune période sans douleur de plus de 4 semaines
Fluctuante modérée	≥ 4 et < 6	
Fluctuante légère	≥ 2 et < 4	
Fluctuante mineure	< 2	
Épisodique sévère	≥ 6	Périodes sans douleur d'au moins 4 semaines consécutives entre les épisodes douloureux
Épisodique modérée	≥ 4 et < 6	
Épisodique légère	≥ 2 et < 4	
Épisodique mineure	< 2	
Épisode unique sévère	≥ 6	Un seul épisode douloureux au cours d'une année, d'une durée maximale de 2 semaines
Épisode unique modéré	≥ 4 et < 6	
Épisode unique léger	≥ 2 et < 4	
Épisode unique mineur	< 2	

Adapté de Kongsted et al. (2017)

Une analyse secondaire de données issues de deux cohortes de patient·e·s âgé·e·s entre 18 et 65 ans suivies sur une période de 1 an après une consultation pour une lombalgie en milieux de soins primaires (médecine générale et chiropratique), a révélé que la trajectoire de douleur «

épisodique sévère » était la plus fréquemment observée dans les deux contextes de soins, avec des proportions respectives de 28% et 24%, suivie de la trajectoire « épisodique modérée », identifiée dans 14% et 16% des cas (A. Kongsted et al., 2017). Dans ces cohortes, les trajectoires de douleurs fluctuantes étaient généralement associées à des symptômes d'intensité plus élevée et de plus longue durée, comparativement aux trajectoires de douleurs épisodiques (A. Kongsted et al., 2017). À intensité similaire, les personnes suivant une trajectoire de douleur fluctuante présentaient, au départ, un niveau de détresse psychologique significativement plus élevé, une douleur à la jambe plus intense, des limitations fonctionnelles plus importantes après 3 mois, ainsi que des attentes plus négatives quant à l'évolution de la lombalgie après 12 mois de suivi (A. Kongsted et al., 2017).

Les sous-groupes appartenant aux trajectoires « persistante mineure », « épisodique mineure », ainsi que les quatre sous-groupes caractérisés par un épisode unique de douleur présentaient des profils similaires, marqués par un très faible nombre de jours avec lombalgie. Ainsi, il a été suggéré que ces profils soient regroupés sous une même entité clinique correspondant à une forme mineure de lombalgie (A. Kongsted et al., 2017). De plus, il a été observé que près de la totalité des participant·e·s présentaient de légères fluctuations de douleur. Il est possible que ces variations soient simplement attribuables à des erreurs de mesure, questionnant la pertinence de ce critère pour distinguer les personnes présentant des douleurs fluctuantes ou persistantes. Ainsi, il a été proposé que ces deux profils soient regroupés sous une même catégorie, soit celle de la « lombalgie persistante, avec ou sans fluctuations » (A. Kongsted et al., 2017).

En résumé, bien que cette conceptualisation de l'évolution clinique de la lombalgie approfondisse la compréhension des divers profils cliniques et trajectoires, contrairement à une classification fondée uniquement sur la temporalité des symptômes, des études complémentaires sont nécessaires pour affiner la sélection des trajectoires ainsi que pour valider si une prise en charge ciblée à celles-ci favoriserait de meilleurs résultats cliniques.

Impact économique

L'impact économique d'une condition de santé peut être évalué selon différentes perspectives, notamment celles des patient·e·s, des prestataires de soins et du point de vue de la société dans

son ensemble (Fatoye, Gebrye, Ryan, Useh, & Mbada, 2023). Les coûts sociétaux associés à une condition de santé sont généralement exprimés sous la forme de coûts directs et indirects. Les coûts directs font référence à la consommation de ressources pour prévenir, diagnostiquer et traiter un problème de santé, y compris les dépenses associées aux soins médicaux, dont les hospitalisations et les soins ambulatoires (Agence de la santé publique du Canada, 2018). Les coûts indirects désignent les pertes économiques résultant d'une incapacité de la personne à utiliser certaines ressources en raison d'une maladie ou d'une blessure, incluant les impacts sur la productivité du travail, tels que l'absentéisme et le présentéisme (c.-à-d. la présence au travail sans être en mesure d'offrir un rendement optimal) (Agence de la santé publique du Canada, 2018).

Coûts directs et indirects de la lombalgie

La comparaison des coûts totaux liés à la lombalgie entre différents pays est complexe, en raison de la grande hétérogénéité des approches méthodologiques utilisées. Néanmoins, la lombalgie engendre des dépenses significatives en matière de santé, les coûts indirects étant généralement bien supérieurs aux coûts directs (Maher et al., 2017). Une revue systématique regroupant 21 études estime d'une part que les coûts directs annuels moyens liés à la lombalgie se situent entre 3,4 et 3,6 milliards de dollars américains (USD) dans les pays à revenu élevé (Fatoye, Gebrye, Ryan, et al., 2023). D'autre part, les coûts indirects annuels moyens liés à la lombalgie dans ces pays apparaissent supérieurs, mais varient considérablement (3,2 millions-13,2 milliards USD) en fonction de la région géographique considérée (Fatoye, Gebrye, Ryan, et al., 2023). Dans les pays à faible revenu et à revenu intermédiaire, les coûts indirects annuels moyens liés à la lombalgie sont estimés à 1,7 milliards USD, soit près de 80% des dépenses totales liées à la prise en charge de cette condition (Fatoye, Gebrye, Mbada, & Useh, 2023). Bien qu'en valeur absolue ces coûts soient inférieurs comparativement aux pays à revenu élevé, le fardeau économique de la lombalgie dans les pays sous-développés n'est pas moindre. En effet, la forte prévalence de l'emploi informel (c.-à-d. non-encadré par la législation du travail ou par les dispositifs de protection sociale) (ILO, 2018) accroît la vulnérabilité de ces secteurs en limitant l'accès aux soins ainsi qu'aux indemnisations en cas de maladie ou d'incapacité (Hartvigsen et al., 2018).

Évaluation de la lombalgie

Dans un souci de faciliter le partage et l'application des recommandations issues des guides de bonnes pratiques au sein des milieux cliniques, plusieurs stratégies de diffusion peuvent être mises en œuvre (Glasgow et al., 2012). Par exemple, le ministère de la Santé et des Services Sociaux (MSSS) a publié en 2015 un algorithme de prise en charge de la douleur lombaire, spécifiquement dédié aux intervenants du réseau québécois de la santé (Ministère de la Santé et des Services sociaux, 2015). Cet algorithme a été mis à jour par l'Institut national d'excellence en santé et en services sociaux du Québec au cours de la dernière année (Institut national d'excellence en santé et en services sociaux, 2025).

Entre 2015 et 2025, plus de 10 guides de bonnes pratiques cliniques portant sur l'évaluation et la prise en charge de la lombalgie (excluant ceux publiés dans une autre langue que le français ou l'anglais) ont été publiés (Apeldoorn, Swart, Conijn, Meerhoff, & Ostelo, 2024; Bailly et al., 2021; A. E. Bussières et al., 2018; Chenot et al., 2017; Côté et al., 2015; de Campos, 2017; Hussein et al., 2016; D. S. Kreiner et al., 2013; NSW Agency for Clinical Innovation, 2016; Qaseem et al., 2017; Stochkendahl et al., 2018; World Health Organization, 2023). Une revue systématique de la littérature recensant la nature des informations retrouvées dans ces guides met toutefois en lumière une hétérogénéité importante dans les recommandations portant sur l'évaluation clinique de la lombalgie (Oliveira et al., 2018). Plus récemment, les travaux de Zaina et al. (2023) ont montré que, même parmi les guides de bonnes pratiques présentant une qualité méthodologique élevée, seule une faible proportion des recommandations s'y retrouvant concernait l'évaluation de la lombalgie (entre 11 % et 25 % des recommandations totales), comparativement à une majorité portant sur la prise en charge (entre 75 % et 100 %). Le tableau 3 présente l'ensemble des recommandations en matière d'évaluation de la lombalgie répertoriées et permet d'identifier les similarités et les différences entre chacun des guides publiés.

Tableau 3. Recommandations en matière d'évaluation de la lombalgie répertoriées dans les guides de bonnes pratiques cliniques

Recommandations	Guides de bonnes pratiques
Déroulement	
Adopter une approche centrée sur la personne • Tenir compte du contexte individuel de chaque personne • Encourager la personne à exprimer ses besoins, ses croyances, ses préoccupations et ses préférences en matière de soins de santé • Considérer les contextes personnels et sociaux de la personne, qui englobent la culture, les connaissances et croyances, les attentes, l'histoire, l'environnement, le genre, l'âge et le statut socioéconomique	INESSS (2025) WHO Guidelines (2023) Canadian Chiropractic Guideline Initiative (2018) OPTIMA Collaboration (2015)
Identifier le degré de motivation/volonté de la personne à s'engager dans la prise en charge (auto-efficacité, stratégies d'auto-gestion et d'adaptation)	KNGF Guidelines (2024)
Reconnaitre la présence d'inégalités dans l'expérience de la douleur, l'accès aux soins et au soutien à l'autogestion sur la base de divers déterminants structurels et sociaux (identité de genre, orientation sexuelle, âge, origine ethnique, niveau d'éducation, situation de handicap, statut socioéconomique, ainsi qu'au lieu et au pays de résidence)	WHO Guidelines (2023)
Adopter une approche biopsychosociale	INESSS (2025) WHO Guidelines (2023)
Anamnèse	
Rechercher et exclure la présence de signes de pathologies structurelles ou systémiques graves (drapeau rouge)	INESSS (2025) KNGF Guidelines (2024) WHO Guidelines (2023) FNAH Updated Guidelines (2021) NASS Guidelines Canadian Chiropractic Guideline Initiative (2018) NDMG Guidelines (2017) NICE Guidelines (2016)

	Malaysian LBP Management Guidelines (2016) ACI Guidelines (2016) OPTIMA Collaboration (2015)
Tenir compte que, lorsque considéré seul, un drapeau rouge possède une spécificité limitée. La combinaison de drapeaux rouges doit davantage retenir l'attention.	FNAH Updated Guidelines (2021)
Considérer les drapeaux rouges avec une valeur diagnostique acceptable	Canadian Chiropractic Guideline Initiative (2018)
Considérer les facteurs suivants : âge, historique de la douleur, présence de symptômes neurologiques, présence de symptômes constitutionnels, antécédent de lombalgie, antécédent de chirurgie du rachis, conditions de santé, occupation, style de vie et les problématiques d'ordre social et psychologique	INESSS (2025) Malaysian LBP Management Guidelines (2016)
Considérer l'ensemble des caractéristiques suivantes : durée, fréquence, circonstance de survenue, progression, localisation, douleur à la fesse ou à la jambe, impact du repos, du sommeil, des mouvements et des postures sur la douleur, impact de l'augmentation de la pression intra-abdominale sur la douleur, antécédent de lombalgie	KNGF Guidelines (2024)
Évaluer les critères de la douleur nociplastique: douleur diffuse et hypersensibilité évoquée	INESSS (2025)
Questionner l'impact de la lombalgie sur le fonctionnement : AVQ, capacité à travailler ou à aller à l'école, loisirs et activité physique	INESSS (2025) KNGF Guidelines (2024)
Identifier la présence d'autres conditions de santé ou comorbidités	KNGF Guidelines (2024) Canadian Chiropractic Guideline Initiative (2018) NDMG Guidelines (2017) Malaysian LBP Management Guidelines (2016)
Identifier la présence de facteurs pronostiques pouvant affecter le rétablissement (drapeaux jaunes)	INESSS (2025) KNGF Guidelines (2024) WHO Guidelines (2023) FNAH Updated Guidelines (2021)

	NASS Guidelines (2020) Canadian Chiropractic Guideline Initiative (2018) NDMG Guidelines (2017) Malaysian LBP Management Guidelines (2016) ACI Guidelines (2016) OPTIMA Collaboration (2015)
Identifier la présence de facteurs de risque d'incapacité prolongée au travail ou les obstacles au retour à l'emploi (drapeaux bleus et noirs)	FNAH Updated Guidelines (2021) NASS Guidelines (2020) NDMG Guidelines (2017)
Considérer des facteurs externes tels que la situation du ménage (financière, statut marital), le réseau social, et la situation d'emploi	INESSS (2025) KNGF Guidelines (2024)
Examen physique	
Effectuer un examen neurologique comprenant l'examen des forces, des sensibilités et des réflexes ostéotendineux du membre inférieur	INESSS (2025) KNGF Guidelines (2024) NDMG Guidelines (2017) Malaysian LBP Management Guidelines (2016) ACI Guidelines (2016) OPTIMA Collaboration (2015)
Évaluer les critères de la douleur nociplastique: hypersensibilité objective	INESSS (2025)
Considérer les composantes suivantes : Observation, palpation musculaire et articulaire, amplitudes de mouvement de la région lombaire et des hanches, démarches et des tests spécifiques	INESSS (2025) KNGF Guidelines (2024) Malaysian LBP Management Guidelines (2016)
Évaluer l'exécution de mouvements fonctionnels (marcher, se pencher, transferts, s'habiller ou toutes autres AVQ pertinentes)	KNGF Guidelines (2024)
Tests supplémentaires	
Éviter le recours systématique à l'imagerie diagnostique chez les personnes présentant une lombalgie ou une douleur irradiant dans la jambe, quel que soit	INESSS (2025) KNGF Guidelines (2024)

le délai d'évolution des symptômes, sauf en présence d'éléments cliniques laissant suspecter une pathologie sous-jacente grave	FNAH Updated Guidelines (2021) Canadian Chiropractic Guideline Initiative (2018) Danish National Clinical Guidelines (2018) NDMG Guidelines (2017) ACI Guidelines (2016)
Considérer la prise d'imagerie avancée (IRM ou CT-Scan) en présence d'une lombalgie chronique (> 3 mois)	FNAH Updated Guidelines (2021)
Considérer la prise d'imagerie avancée en présence de douleurs sévères et réfractaires, n'ayant pas répondu aux traitements optimaux	INESSS (2025) NASS Guidelines (2020)
Réévaluer le besoin d'imagerie diagnostique après 4 à 6 semaines pour les patient·e·s dont la lombalgie continue de limiter l'activité physique ou s'est aggravée malgré un traitement conforme aux données probantes	NDMG Guidelines (2017)
Considérer la prise d'imagerie pour les personnes présentant une lombalgie avec ou sans douleur à la jambe seulement si le résultat est susceptible de modifier la prise en charge	KNGF Guidelines (2024) NICE Guidelines (2016)
Considérer la prise de radiographies du rachis lombaire en présence d'une lombalgie aigüe qui persiste plus de 2 semaines en l'absence de drapeaux rouges	Malaysian LBP Management Guidelines (2016)
Intégration des informations	
Catégoriser les patients en trois catégories : lombalgie non-spécifique, lombalgie spécifique, syndrome radiculaire	Canadian Chiropractic Guideline Initiative (2018) ACI Guidelines (2016)
Envisager l'utilisation d'un outil de stratification du risque, tel que le questionnaire STarT Back, afin de soutenir une prise de décision partagée en vue d'une prise en charge adaptée au profil de la personne	FNAH Updated Guidelines (2021) NDMG Guidelines (2017) NICE Guidelines (2016) ACI Guidelines (2016)

ACI : Agency for Clinical Innovation; FNAH : French National Authority for Health; INESSS : Institut national d'excellence en santé et services sociaux; KNGF : Royal Dutch Society for Physical Therapy; NASS : North American Spine Society; NDMG : German Disease Management Guideline; NICE : National Institute for Health and Care Excellence; OPTIMA : Ontario Protocol for Traffic Injury Management; WHO : World Health Organization

Déroulement de l'évaluation clinique

Des recommandations générales relatives au contexte et au déroulement de l'évaluation clinique de la lombalgie ont été formulées dans 4 guides de bonnes pratiques (Apeldoorn et al., 2024; A. E. Bussières et al., 2018; Côté et al., 2015; World Health Organization, 2023), ainsi que dans le plus récent algorithme de prise en charge de l'INESSS (Institut national d'excellence en santé et en services sociaux, 2025). Ces guides insistent sur l'importance d'adopter, dès l'évaluation initiale, une approche centrée sur la personne, qui tient compte des caractéristiques individuelles et du contexte social unique à chaque patient·e. Le plus récent guide de bonnes pratiques publié par l'OMS (2023) précise qu'une approche biopsychosociale est souhaitée, reconnaissant l'apport des facteurs biologiques, psychologiques et sociaux sur l'expérience de la douleur et sur l'incapacité qui y est associée. L'OMS (2023) va également plus loin en soulignant la nécessité d'adapter l'approche d'évaluation et de prise en charge pour tenir compte des inégalités de santé pouvant affecter l'expérience de la douleur, l'accès aux soins et la capacité d'auto-gestion des personnes atteintes de lombalgie. L'OMS reconnait notamment l'influence de divers déterminants sociaux de la santé tels que l'âge, l'identité de genre, l'origine ethnique, la religion, le statut socio-économique et le lieu de résidence (O'Neill et al., 2014; Solar & Irwin, 2010). Le guide de la Royal Dutch Society for Physical Therapy (2024) ajoute que l'évaluation clinique de la lombalgie devrait également comprendre une analyse du degré de motivation de la personne à s'engager activement dans sa prise en charge.

Anamnèse

Signes et symptômes de pathologies sous-jacentes

La recherche de signes et symptômes pouvant indiquer la présence d'une pathologie structurelle ou systémique grave est un élément d'évaluation commun à l'ensemble des guides de bonnes pratiques cliniques identifiés. Toutefois, la nature des signes et symptômes rapportés varie d'un guide à l'autre. La majorité des guides de bonnes pratiques partagent une liste de signes et symptômes, aussi désignés comme « drapeaux rouges » ou « signaux d'alarme » possiblement évocateurs d'une pathologie spécifique à l'origine de la lombalgie, sans toutefois préciser la nature de cette pathologie (Bailly et al., 2021; A. E. Bussières et al., 2018; Hussein et al., 2016; D.

S. Kreiner et al., 2013; NSW Agency for Clinical Innovation, 2016). Trois guides associent explicitement chacun de ces signes et symptômes à une pathologie sous-jacente potentielle (Apeldoorn et al., 2024; Chenot et al., 2017; World Health Organization, 2023). Le tableau 4 présente ces signes et symptômes ainsi que les conditions auxquelles ils sont potentiellement associés.

Tableau 4. Signes et symptômes de pathologies sous-jacentes

Origine possible	Signes et symptômes
Cancer	Antécédent de cancer, perte de poids inexpliquée, douleur nocturne, âge avancé, fatigue intense
Infection vertébrale	Fièvre, frissons, consommation de drogues par voie intraveineuse, immunosuppression, antécédent d'infection récente
Syndrome de la queue de cheval	Incontinence urinaire ou fécale, rétention urinaire, anesthésie de la région périnéale ou périanale, diminution du tonus anal, symptômes neurologiques rapidement progressifs
Fracture vertébrale	Âge avancé, utilisation prolongée de corticostéroïdes, trauma important, présence d'une contusion ou d'une abrasion sur la peau
Arthrite inflammatoire	Douleur chronique (> 3 mois) chez le jeune adulte, raideur matinale, amélioration des symptômes avec le mouvement ou avec la prise d'anti-inflammatoires non-stéroïdiens, aggravation des symptômes avec le repos, atteintes périphériques ou extra-articulaires

Deux guides de bonnes pratiques ajoutent que la présence d'un seul de ces symptômes ne permet pas toujours de poser le diagnostic d'une pathologie sous-jacente et insistent sur la nécessité de considérer la valeur diagnostique du drapeau rouge identifié (Bailly et al., 2021; A. E. Bussières et al., 2018). Le guide de la FNAH précise également que la présence concomitante de plusieurs drapeaux rouges est plus évocatrice qu'un drapeau rouge isolé (Bailly et al., 2021). Toutefois, aucun de ces deux guides ne partage d'informations sur la valeur diagnostique des drapeaux rouges énumérés, tant sur le plan quantitatif que qualitatif.

Caractéristiques de la douleur

Deux guides de bonnes pratiques recommandent l'évaluation de certaines caractéristiques cliniques du motif de consultation (ex : durée, fréquence, irradiation, antécédent de lombalgie) ainsi que de son impact fonctionnel (Apeldoorn et al., 2024; Hussein et al., 2016). Cependant, ces recommandations demeurent imprécises quant à la façon dont ces éléments devraient orienter la prise de décision clinique et contribuer à l'identification du type de lombalgie. Enfin, seul l'algorithme de prise en charge de la douleur lombaire de l'INESSS recommande d'inclure dans l'évaluation de la lombalgie, la recherche d'éléments cliniques qui caractérisent la douleur nociplastique (Institut national d'excellence en santé et en services sociaux, 2025).

Facteurs externes

Les guides de bonnes pratiques identifiés reconnaissent l'influence de facteurs externes sur l'évolution clinique de la lombalgie. Les recommandations les plus communément recensées en cette matière concernent l'identification de facteurs pronostiques pouvant affecter le rétablissement, aussi appelés « drapeaux jaunes ». La présence de problématiques d'ordre psychologique (c.-à-d. comportements de peur-évitement, catastrophisation, kinésiophobie, sentiments dépressifs, dépression, anxiété), un niveau d'incapacité élevé, le retrait des interactions sociales et des attentes ou des comportements passifs en regard du rétablissement sont cités dans cette catégorie. Cinq guides de bonnes pratiques cliniques recommandent que l'évaluation de la lombalgie comprenne la recherche de facteurs de risque d'incapacité prolongée au travail ou pouvant retarder le retour à l'emploi (Apeldoorn et al., 2024; Bailly et al., 2021; Chenot et al., 2017; Hussein et al., 2016; D Scott Kreiner et al., 2020; Nonclercq & Berquin, 2012). Les facteurs liés à l'environnement de travail les plus fréquemment mentionnés comprennent les conflits professionnels, l'insatisfaction au travail, une charge de travail physique élevée, un faible pouvoir décisionnel ainsi que la présence de litiges en regard des systèmes de rémunération. Enfin, le guide de la Royal Dutch Society for Physical Therapy ajoute que l'évaluation de la lombalgie devrait également tenir compte du contexte social de la personne, incluant son environnement familial, sa situation socio-économique, son contexte culturel et son niveau d'éducation (Apeldoorn et al., 2024; Hussein et al., 2016). Cette recommandation est reprise dans le plus récent algorithme de prise en charge de l'INESSS (Institut national d'excellence en santé

et en services sociaux, 2025). Plusieurs outils ont été développés pour accompagner les professionnel·le·s de la santé dans l'identification de facteurs externes pouvant avoir un impact sur l'évolution de la lombalgie. Les questionnaires STarT Back et Orëbro sont les outils les plus communément recommandés par les guides de bonnes pratiques cliniques identifiés. Le questionnaire StarT Back est un outil fidèle et valide comprenant 9 affirmations pour lesquelles la personne atteinte de lombalgie doit noter son niveau d'accord en se rapportant à la douleur lombaire ressentie au cours des deux dernières semaines (Bruyère et al., 2014). Le résultat obtenu à ce questionnaire permet de préciser le risque de chronicisation de la condition en catégorisant chaque personne selon trois niveaux de risque (faible, modéré et élevé). En plus d'estimer le risque de chronicisation, ce questionnaire a également été conçu pour guider la prise de décisions cliniques, notamment le choix de la stratégie de prise en charge (Croft, Hill, Foster, Dunn, & van der Windt, 2024). Des études montrent que l'utilisation d'une approche de soins stratifiés basée sur le résultat obtenu au questionnaire STarT Back permet d'obtenir de meilleurs résultats cliniques que les soins usuels pour les personnes atteintes de lombalgie (Choudhry et al., 2022; Hill et al., 2011).

Le questionnaire Orëbro est un outil permettant de prédire l'invalidité à long terme et l'absentéisme au travail chez les personnes atteintes de douleurs musculosquelettiques aiguës et chroniques (Linton & Halldén, 1998). Cet outil comporte 25 items questionnant un ensemble de facteurs psychosociaux, reconnus comme des facteurs de risque de chronicité, tels que la dépression, les croyances d'évitement face à la douleur, les stratégies d'adaptation, la douleur et l'incapacité, le stress, la satisfaction au travail et la perception personnelle du risque de chronicité (Linton & Halldén, 1998). La version francophone du questionnaire Orëbro présente une bonne validité prédictive pour l'incapacité et le retour au travail, particulièrement en contexte de soins secondaires (Nonclercq & Berquin, 2012). L'outil montre également une excellente fidélité test-retest (ICC = 0,89) (Opsommer, Hilfiker, Raval-Roland, Crombez, & Rivier, 2013) et une validité de construit adéquate, se traduisant par une corrélation modérée à élevée avec des questionnaires validés mesurant des construits similaires (ex : Oswestry Disability Index, Hospital Anxiety and Depression Scale et Coping Strategies Questionnaire) (Hilfiker et al., 2016).

Enfin, le questionnaire Oswestry Disability Index est un outil proposé pour l'évaluation des capacités fonctionnelles de la personne atteinte de lombalgie (Côté et al., 2015; Institut national d'excellence en santé et en services sociaux, 2025). Ce questionnaire comporte dix questions portant sur différents domaines, incluant l'intensité de la douleur, les soins personnels, le soulèvement de charges, la marche, la position assise, la position debout, le sommeil, la vie sexuelle, la vie sociale et la capacité à se déplacer (Vianin, 2008). Chaque question est cotée sur une échelle de 0 à 5 points, pour un score maximal de 50. Des scores plus élevés indiquent un niveau d'incapacité plus important. La version française de l'Oswestry Disability Index est un outil d'évaluation fidèle, présentant une bonne cohérence interne et une excellente fidélité test-retest (ICC 0,92) (Denis & Fortin, 2012). Il présente également une validité de construit adéquate, se traduisant par une corrélation élevée avec le Quebec Back Pain Disability Scale (r=0,90) ainsi qu'avec le Roland-Morris Disability Questionnaire (r=0,84) (Denis & Fortin, 2012).

Examen physique

L'examen neurologique du membre inférieur

Seuls cinq guides de bonnes pratiques cliniques parmi ceux identifiés présentent des recommandations relatives à l'examen physique d'une personne atteinte de lombalgie (Apeldoorn et al., 2024; Chenot et al., 2017; Côté et al., 2015; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016). L'examen neurologique du membre inférieur est le seul élément commun à l'ensemble de ces guides. Celui-ci comprend l'évaluation de la force motrice, de la sensibilité et des réflexes ostéotendineux du membre inférieur. Aucun de ces guides ne partage d'informations en regard de la valeur diagnostique de ces éléments d'examen ou ne précise dans quelle mesure les résultats de ceux-ci devraient informer la prise de décisions cliniques.

Autres composantes de l'examen physique

Seuls deux guides de bonnes pratiques cliniques partagent des recommandations complémentaires à l'examen neurologique (Apeldoorn et al., 2024; Hussein et al., 2016). Ceux-ci intègrent à l'évaluation de la lombalgie l'observation, la palpation musculaire et articulaire, les amplitudes de mouvement de la région lombaire et des hanches, l'évaluation des démarches, ainsi que certains tests spécifiques (c.-à-d. élévation de la jambe tendue, élévation de la jambe

tendue croisée, étirement du nerf fémoral, FABER). À nouveau, aucun de ces guides ne partage d'informations en regard de la valeur diagnostique de ces éléments d'examen ou ne précise dans quelle mesure les résultats de ceux-ci devraient informer la prise de décisions cliniques.

Tests supplémentaires

La majorité des guides de bonnes pratiques identifiés partagent des recommandations quant à l'utilisation de tests supplémentaires pour l'évaluation de la lombalgie (Apeldoorn et al., 2024; Bailly et al., 2021; A. Bussières et al., 2021; Chenot et al., 2017; de Campos, 2017; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016; Stochkendahl et al., 2018). Ceux-ci s'entendent sur le fait que le recours à l'imagerie diagnostique de routine devrait être évité pour les personnes présentant une lombalgie sans drapeau rouge, et ce, peu importe la durée d'évolution des symptômes (Apeldoorn et al., 2024; Bailly et al., 2021; A. Bussières et al., 2021; NSW Agency for Clinical Innovation, 2016; Stochkendahl et al., 2018). Deux guides de bonnes pratiques suggèrent plutôt la prise d'imagerie en présence d'une lombalgie sans drapeau rouge qui persiste au-delà de 2 semaines (Hussein et al., 2016) ou en présence d'une lombalgie chronique (Bailly et al., 2021). L'échec des traitements conservateurs et la probabilité que le résultat d'imagerie influence la prise en charge sont également cités comme des critères justifiant la prise d'imagerie (Apeldoorn et al., 2024; Chenot et al., 2017; D Scott Kreiner et al., 2020) .

Prise en charge de la lombalgie

Les guides de bonnes pratiques cliniques identifiés contiennent majoritairement des recommandations permettant de guider les professionnel·le·s de la santé dans la prise en charge de la lombalgie. Ces recommandations sont pour la plupart adaptées à la durée des symptômes ainsi qu'en fonction du type de lombalgie identifié. À l'inverse des recommandations portant sur l'évaluation, qui montrent une certaine variabilité, les recommandations en matière de prise en charge de la lombalgie se révèlent relativement cohérentes d'un guide à l'autre. Trois axes principaux sont mis de l'avant: l'éducation, les interventions non pharmacologiques, incluant des approches physiques et psychologiques, et les traitements pharmacologiques. Le tableau 5 présente un résumé des recommandations identifiées, chaque point correspondant à un guide de bonnes pratiques distinct.

Tableau 5. Recommandations de prise en charge de la lombalgie contenues dans les guides de bonnes pratiques cliniques

	Temporalité des symptômes	
Recommandations	**Aigüe-Subaigüe (<12 semaines)**	**Chronique (≥ 12 semaines)**
Éducation		
Réassurance (pronostic favorable, condition bénigne)	🟢🟢🟢🟢🟢🟢🟢	🟢🟢🟢🟢🟢🟢
Maintenir ou reprendre les activités sociales et quotidiennes	🟢🟢🟢🟢🟢	🟢🟢🟢🟢🟢🟢
Demeurer physiquement actif-active	🟢🟢🟢🟢🟢🟢🟢🟢	🟢🟢🟢🟢🟢🟢🟢
Éviter le repos au lit prolongé	🟢🟢🟢	🟢🟢
Encourager le retour au travail	🟢🟢🟢🟢🟢	🟢🟢🟢🟢
Stratégies d'auto-gestion	🟢🟢🟢🟢	🟢🟢🟢
Interventions physiques		
Exercices	🟢🟢🟡🟢🟢🟢	🟢🟢🟢🟢🟢🟢🟢🟢🟢🟢
Thérapies manuelles vertébrales (manipulation, mobilisation)	🟢🟢🟢🟢🟢🟢🟢	🟢🟢🟡🟢🟢🟢🟡🟢🟢🟢🟢
Massage et thérapies des tissus mous	🔴🟢	🟢🟡🔴🟢🟢🟢
Thérapies par aiguilles (acupuncture, aiguilles sèches)	🔴🔴🔴🔴🟢🔴	🔴🔴🔴🔴🟢🟢🔴
Traction	🔴🔴🔴	🔴🔴🔴🔴🔴
Thérapies complémentaires (ultrasons, TENS)	🔴🔴🔴🔴🔴	🔴🔴🔴🔴🔴🔴🔴🔴
Thérapies par le mouvement (yoga, Tai Chi, Pilates)		🟢🟢
Interventions psychologiques		
Thérapie d'activation comportementale		🟡🟢
Thérapie de relaxation		🟡🟡🔴🟢
Thérapie de pleine conscience		🟡🟡🟢
Thérapie cognitivo-comportementale		🟡🟡🟡🟡🟢🟡🟢
Interventions pharmacologiques		
AINS	🟢🟢🟢🟢🟢🟡	🟢🟢🟢🟢🟡
Acétaminophène	🟢🟢🟢🔴🔴🔴	🔴

Relaxants musculaires	🟢🟡🟢	
Antidépresseurs (tricycliques ou SNRI)	🟡🟡🟡	🟡🟡🟡🟡🔴🟡
Anticonvulsivants	🟡🟡🟡	🟡🟡🟡🔴
Analgésiques opioïdes	🟡🟡🟡🟡🟡	🔴🟡🟡🟡🟢🟡
Injection spinale (épidurale ou foraminale)	🔴🟡🟡	🟡🔴🟡
Autre		
Aides techniques (ceintures lombaires, orthèses, aides à la mobilité)	🔴🔴🟡🔴	🔴🟡🔴🔴🔴
Programme de perte de poids		🟢🟡
Application de chaleur	🟢🟢	
Cessation tabagique		🟢
Référence		
Référence médecin généraliste ou spécialiste	🟡🟡	🟡🟡🟡🟡

AINS : Anti-inflammatoire non-stéroïdien; SNRI : Inhibiteur de la recapture de la sérotonine et de la noradrénaline; TENS : Stimulation électrique transcutanée des nerfs

🟢 Recommandé 🟡 Recommandation conditionnelle 🔴 Non recommandé

Principes généraux

Les guides de bonnes pratiques recensés présentent des principes communs en matière de prise en charge de la lombalgie. Ceux-ci soulignent que la prise en charge de cette condition devrait être centrée sur la collaboration entre le.la patient·e et le.la professionnel·le de la santé, en favorisant une prise de décision partagée. Dès la première consultation et tout au long du parcours de soins, les interventions non pharmacologiques, en particulier l'éducation, devraient être privilégiées. L'approche clinique devrait également être adaptée selon le risque de chronicisation de la condition, déterminé par la présence de facteurs pronostiques défavorables. Ainsi, chez les personnes présentant une lombalgie aiguë peu sévère et un faible risque de chronicité, les stratégies de prise en charge devraient prioriser l'éducation, la réassurance, et le soutien à l'autogestion. En revanche, pour les personnes dont la douleur persiste et présentant un risque élevé de chronicisation, une approche multimodale et interdisciplinaire devrait être proposée. Enfin, les traitements pharmacologiques peuvent être envisagés, mais uniquement en complément aux interventions non-pharmacologiques.

Éducation au patient

L'ensemble des guides de bonnes pratiques identifiés partagent des recommandations en matière d'éducation (McKenzie et al., 2025). Ces recommandations insistent sur l'importance d'informer et d'éduquer les patient·e·s, de sorte à promouvoir le maintien ou la reprise des activités quotidiennes, sociales et physiques, tant en phase de douleur aiguë que chronique (Alice Kongsted et al., 2026). Des stratégies d'autogestion devraient également être proposées, afin d'encourager la personne à s'impliquer activement dans son processus de rétablissement. Réassurer sur la nature bénigne de la lombalgie et sur son pronostic favorable est également recommandé (Alice Kongsted et al., 2026).

Interventions non-pharmacologiques

Interventions physiques

Les interventions non-pharmacologiques occupent une place centrale dans les recommandations cliniques pour la prise en charge de la lombalgie. L'exercice physique est unanimement

recommandé, à l'exception d'un guide qui en déconseille l'usage en présence d'une douleur aiguë (NSW Agency for Clinical Innovation, 2016). De manière générale, les guides suggèrent la mise en œuvre d'un programme d'exercices, qu'il soit supervisé ou réalisé à domicile, pour tout type de lombalgie en l'absence de drapeaux rouges. Aucun type d'exercice n'est systématiquement privilégié. Le choix du type d'exercice devrait plutôt être individualisé, en fonction des préférences de la personne et des objectifs thérapeutiques visés. La thérapie manuelle, incluant les mobilisations et les manipulations vertébrales, est également recommandée, en complément à l'exercice. Un guide suggère toutefois de limiter cette approche aux personnes présentant un risque modéré ou élevé de chronicisation, et de l'éviter chez celles atteintes d'un syndrome radiculaire (Apeldoorn et al., 2024). La majorité des guides recommandent également d'éviter le recours à des approches thérapeutiques passives telles que l'ultrason thérapeutique, l'électrothérapie, la traction (manuelle ou assistée d'un appareil) ainsi que l'utilisation d'aides techniques (ex : ceinture lombaire, corset, orthèses). Les thérapies par aiguilles, telles que l'acupuncture, ne sont généralement pas recommandées pour la prise en charge de la lombalgie aiguë ou chronique. Néanmoins, trois guides de bonnes pratiques suggèrent qu'elles pourraient être bénéfiques pour le traitement de la lombalgie chronique, lorsqu'elles sont combinées à un programme d'exercice (Côté et al., 2015; NSW Agency for Clinical Innovation, 2016; World Health Organization, 2023). Un seul guide appuie spécifiquement l'utilisation de l'acupuncture pour le traitement de la lombalgie aiguë (NSW Agency for Clinical Innovation, 2016).

Interventions psychologiques

La majorité des guides de bonnes pratiques recommandent une approche thérapeutique multimodale pour la prise en charge de la lombalgie chronique, incluant une composante ciblant les facteurs pronostiques défavorables d'ordre psychologique. Parmi les interventions psychologiques proposées, la thérapie cognitivo-comportementale est la plus fréquemment mentionnée. La thérapie cognitivo-comportementale, combinée aux interventions physiques, n'est indiquée que chez les personnes présentant des facteurs pronostiques défavorables (Apeldoorn et al., 2024; NSW Agency for Clinical Innovation, 2016; UK National Guideline Centre, 2016; World Health Organization, 2023), tels qu'un niveau élevé d'incapacité, une détresse

psychologique importante (Côté et al., 2015), ou encore lorsque les traitements conservateurs optimaux se sont révélés inefficaces (Bailly et al., 2021; UK National Guideline Centre, 2016).

Interventions pharmacologiques

Contrairement aux interventions physiques et psychologiques, la nature des interventions pharmacologiques proposées présente une variabilité notable entre les guides de bonnes pratiques identifiés. Une revue systématique ayant analysé la concordance des recommandations en matière de prise en charge de la lombalgie issues de 22 guides de bonnes pratiques de qualité méthodologique élevée a révélé des divergences concernant 42 approches ou combinaisons thérapeutiques proposées dans ces guides, dont la plupart concernaient des interventions pharmacologiques (McKenzie et al., 2025).

Néanmoins, la majorité des guides propose un traitement pharmacologique adapté au type de lombalgie identifié ainsi qu'en fonction de la durée des symptômes. De plus, tous soulignent que les traitements pharmacologiques devraient être proposés uniquement en complément à des interventions non-pharmacologiques. De façon générale, les recommandations en matière de prise en charge de la lombalgie non-spécifique suggèrent le recours aux anti-inflammatoires non-stéroïdiens (AINS) en première intention, seuls (Chenot et al., 2017; D Scott Kreiner et al., 2020; Qaseem et al., 2017; Stochkendahl et al., 2018; UK National Guideline Centre, 2016; World Health Organization, 2023) ou combinés à l'acétaminophène (Bailly et al., 2021; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016). Le recours aux analgésiques opioïdes est généralement réservé aux situations où les AINS sont contre-indiqués ou se sont révélés inefficaces (Bailly et al., 2021; Chenot et al., 2017; Hussein et al., 2016; D Scott Kreiner et al., 2020; Qaseem et al., 2017; Stochkendahl et al., 2018; UK National Guideline Centre, 2016). Malgré des résultats cliniques contradictoires et un faible niveau de preuves, les relaxants musculaires sont recommandés par trois guides de bonnes pratiques pour le traitement de la lombalgie aigüe non-spécifique (Côté et al., 2015; Hussein et al., 2016; Qaseem et al., 2017). Quatre guides de bonnes pratiques partagent également des recommandations spécifiques à la prise en charge du syndrome radiculaire. Les antidépresseurs tricycliques, les inhibiteurs de la recapture de la sérotonine et de la noradrénaline, ainsi que les anticonvulsivants, peuvent être

envisagés chez les personnes présentant une douleur radiculaire persistante, sévère, et réfractaire aux interventions non-pharmacologiques ou aux traitements pharmacologiques de première intention (Bailly et al., 2021; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016; UK National Guideline Centre, 2016).

Injections spinales

Quatre guides de bonnes pratiques abordent l'utilisation des injections spinales dans la prise en charge de la lombalgie (Bailly et al., 2021; NSW Agency for Clinical Innovation, 2016; Stochkendahl et al., 2018; UK National Guideline Centre, 2016). Trois d'entre eux suggèrent le recours à l'injection spinale en présence d'une douleur radiculaire sévère et persistante (Bailly et al., 2021; NSW Agency for Clinical Innovation, 2016; UK National Guideline Centre, 2016). En revanche, un guide recommande plutôt d'éviter cette modalité en raison de son efficacité clinique limitée et de courte durée (Stochkendahl et al., 2018). Enfin, deux guides précisent que l'injection spinale ne devrait pas être utilisée pour le traitement de la sténose spinale et de la claudication neurogène (NSW Agency for Clinical Innovation, 2016; UK National Guideline Centre, 2016).

Référence vers un autre professionnel de la santé

Sept guides de bonnes pratiques précisent les situations cliniques qui justifient qu'une personne atteinte de lombalgie soit référée vers un·e autre professionnel·le de la santé pour une évaluation spécialisée. Deux guides recommandent une référence immédiate en présence de drapeaux rouges évocateurs d'une compression spinale potentielle, tels qu'une diminution progressive de la force au membre inférieur, une anesthésie en selle, une incontinence urinaire ou fécale, ou encore une rétention urinaire (Apeldoorn et al., 2024; Hussein et al., 2016). La présence de symptômes neurologiques persistants et de douleurs sévères entrainant une incapacité fonctionnelle est également énoncée comme un critère justifiant une référence (Apeldoorn et al., 2024; Côté et al., 2015; Hussein et al., 2016; UK National Guideline Centre, 2016). Enfin, cinq guides de bonnes pratiques ajoutent qu'une approche chirurgicale peut être envisagée en présence d'une douleur radiculaire sévère, réfractaire aux traitements conservateurs et accompagnée de signes cliniques concordant avec les résultats d'imagerie spécialisée (Bailly et

al., 2021; Hussein et al., 2016; NSW Agency for Clinical Innovation, 2016; Stochkendahl et al., 2018; UK National Guideline Centre, 2016).

Application des recommandations de bonnes pratiques

Malgré l'existence de guides de bonnes pratiques cliniques, des écarts persistent entre les recommandations issues des plus récentes données probantes et les pratiques actuelles en matière de prise en charge de la lombalgie (Bishop & Wing, 2003; S. J. Kamper et al., 2020; Williams et al., 2010). Ces écarts se traduisent notamment par le recours inopportun à des approches diagnostiques et thérapeutiques, dont une utilisation injustifiée de l'imagerie médicale, de prescriptions d'analgésiques opioïdes, ainsi qu'à un nombre croissant de références jugées inappropriées vers les médecins spécialistes (Debono et al., 2017; S. J. Kamper et al., 2020). Dans un appel à l'action publié dans la revue scientifique The Lancet (R. Buchbinder et al., 2018), des expert·e·s internationaux·ales dénoncent le recours à des approches diagnostiques et thérapeutiques de faible valeur (c.-à-d. des interventions dont les bénéfices sont limités au regard des risques et des coûts) (Oakes & Radomski, 2021), soulignant qu'elles contribuent à accroître le fardeau individuel de la lombalgie et à mobiliser de façon inefficace des ressources de santé limitées (R. Buchbinder et al., 2018).

Parmi les stratégies proposées pour répondre à cette problématique, une réorganisation des trajectoires de soins et l'élaboration de pratiques claires en matière de référencement sont suggérées, de sorte que les patient·e·s puissent rencontrer le·la professionnel·le de la santé approprié·e pour bénéficier du bon traitement au bon moment, tout en évitant le recours à des trajectoires alternatives sous-optimales (R. Buchbinder et al., 2018). Malgré des solutions concrètes et une vaste campagne médiatique, un compte-rendu des retombées de cet appel à l'action, deux ans après sa publication, (Rachelle Buchbinder, Underwood, Hartvigsen, & Maher, 2020) révèle que plusieurs initiatives mises en place n'ont eu qu'un impact minimal sur la réduction du recours à des soins de faible valeur et sur l'amélioration des résultats cliniques pour les patient·e·s (Darlow et al., 2019; François Desmeules et al., 2012; Hong, Ross-Degnan, Zhang, & Wharam, 2017; Oakley & Shacklady, 2015), ou n'ont simplement pas réussi à s'ancrer de manière durable dans les pratiques (Fischer, Lange, Klose, Greiner, & Kraemer, 2016; Slade, Kent,

Patel, Bucknall, & Buchbinder, 2016). Des efforts supplémentaires sont donc nécessaires pour mieux comprendre les trajectoires de soins et les pratiques en matière de référencement pour la lombalgie, afin de proposer des stratégies ancrées dans les réalités du terrain et répondant aux besoins des patient·e·s.

Chapitre 2 – Trajectoires de soins

Organisation du système de santé publique au Canada

Les soins de première ligne

Les services de soins de santé primaires, dits « de proximité » constituent le point d'entrée dans le système de soins de santé (Gouvernement du Canada, 2019). Ils relèvent d'une infrastructure légère, de compétences professionnelles générales et diversifiées ainsi que de techniques courantes d'interventions, permettant d'offrir une variété de services, allant de la prévention aux traitements des maladies (Gouvernement du Canada, 2019). Les professionnel·le·s en soins primaires ont également pour mandat de coordonner les services de soins de santé pour assurer la continuité des soins et favoriser un parcours de soins efficace (Gouvernement du Canada, 2019). Les priorités en santé partagées par les gouvernements fédéral et provinciaux au Canada indiquent qu'un système de soins de première ligne efficient est caractérisé par un accès rapide aux soins appropriés, tout en minimisant le recours à des services d'urgence pour des conditions propices à des soins ambulatoires (Institut Canadien d'information sur la Santé, 2024).

Les soins de deuxième ligne

Les services de soins de santé secondaires, dits « spécialisés », sont complémentaires aux soins prodigués en première ligne et relèvent de ressources et technologies avancées, permettant le traitement de problématiques de santé complexes, mais relativement fréquentes (Gouvernement du Canada, 2019). Ces services visent la récupération de l'autonomie, l'intégration et la participation sociale, notamment par des programmes spécialisés de réadaptation (Gouvernement du Canada, 2019). L'imagerie diagnostique est également considérée comme un service de deuxième ligne, requérant une référence et des compétences maîtrisées par un nombre restreint de professionnel·le·s.

Les soins de troisième ligne

Sous la référence d'un médecin généraliste ou d'un médecin spécialiste, une personne peut accéder à des services de soins tertiaires, dits « surspécialisés ». Ces services relèvent

d'équipements, de technologies et d'expertises sophistiqués et rares, permettant la prise en charge de populations aux prises avec des problèmes de santé et des problèmes sociaux très complexes (Gouvernement du Canada, 2019). L'accès à ces services est considérablement restreint, puisque ceux-ci sont concentrés dans un nombre limité d'établissements de santé, généralement localisés dans les grands centres urbains (Gouvernement du Canada, 2019).

Défi d'accessibilité et d'efficience des soins de santé

Une enquête menée dans 10 pays à revenu élevé a dévoilé que le Canada accuse un retard au chapitre de l'accès aux soins de première ligne, affichant le pourcentage le plus bas d'adultes de 18 ans et plus ayant accès à un·e professionnel·le de soins de santé de première ligne, passant de 93% en 2016 à 86% en 2023 (Fonds du Commonwealth, 2023). Cela signifie qu'environ 4 millions d'adultes canadiens n'avaient pas de dispensateur de soins de première ligne en 2023. Les Canadiens ont également plus de difficulté que les personnes des autres pays sondés à obtenir un rendez-vous rapidement. En 2023, moins du quart des Canadiens (26%) ont estimé qu'il était facile d'obtenir un rendez-vous dans des délais opportuns, contre 46% en 2016 (Fonds du Commonwealth, 2023). Le Québec est confronté à des constats similaires. En effet, le rapport de performance du réseau de la santé et des services sociaux d'octobre 2025 indiquait que 83,3% de la population québécoise était attitrée à un·e professionnel·e de soins de première ligne en 2025, signifiant donc que près de 650 000 personnes étaient toujours en attente d'un médecin de famille, dont près de 10 000 personnes présentaient des besoins urgents et se trouvaient dans une situation de grande vulnérabilité (Gouvernement du Québec, 2025b). Les services médicaux spécialisés ne sont pas épargnés par ce manque d'efficience. En juin 2025, 913 987 personnes étaient en attente d'une consultation avec un médecin spécialiste au Québec, dont près de 65% de ces consultations excédaient les délais recommandés par la condition médicale (Gouvernement du Québec, 2025b).

Centre de répartition des demandes de services

En 2016, le MSSS du Québec a lancé le programme d'Accès priorisé aux services spécialisés (Gouvernement du Québec, 2022), caractérisé par un ensemble de stratégies visant à améliorer l'accès aux soins spécialisés en gérant l'asymétrie entre l'offre et la demande (Breton et al., 2020).

Parmi ces stratégies, des listes d'attente centralisées ont été mises en place afin de regrouper les listes d'attente de plusieurs fournisseurs de services et organisations en une seule liste pour un service spécialisé donné. Une liste d'attente centralisée fonctionne selon un modèle de priorisation : les patient·e·s y sont inscrit·e·s par un guichet central et assigné·e·s à des prestataires médicaux en fonction de leur niveau de besoin (Breton et al., 2020). Les besoins de la personne, et donc sa priorité médicale, sont déterminés selon des critères cliniques et administratifs précis, élaborés non seulement pour établir l'ordre de priorisation, mais également pour aider les professionnel·le·s référents à juger de la pertinence des demandes de consultation. Le Centre de répartition des demandes de services (CRDS) correspond à la définition d'une liste d'attente centralisée, puisqu'il gère toutes les nouvelles demandes de consultation transmises par les prestataires de soins de première ligne vers les services spécialisés. La province de Québec compte 15 CRDS répartis sur son territoire (Gouvernement du Québec, 2022). Bien que prometteur, le plus récent rapport du MSSS suggère que l'implantation des CRDS et de ses critères de priorisation ne permet pas de résoudre la problématique d'efficience des soins (Gouvernement du Québec, 2025b).

Rôle de l'expert en santé musculosquelettique

Dans un contexte où le système de santé fait face à des ressources limitées, les professionnel·le·s de premier contact jouent un rôle clé dans l'optimisation de la trajectoire de soins des patient·e·s, permettant d'assurer une utilisation justifiée et efficace des ressources de santé. Leur efficacité dépend toutefois de plusieurs facteurs, dont de leur capacité à évaluer correctement les patient·e·s et à les diriger vers les services appropriés. Pour les cas de lombalgie, les expert·e·s en santé musculosquelettique disposent des compétences nécessaires, mais leur faible intégration au système de santé public restreint leur impact sur l'optimisation des trajectoires de soins.

L'amélioration de l'accessibilité et de la qualité des soins de première ligne et des services spécialisés s'inscrit dans les orientations stratégiques du ministère de la Santé et des Services sociaux du Québec depuis plus d'une décennie (Ministère de la Santé et des Services sociaux du Québec, 2017, 2021, 2023b). La mise en œuvre progressive des Centres de répartition des

demandes de services en 2016 avait pour but d'optimiser les trajectoires des soins primaires aux soins spécialisés, en promouvant un accès opportun et prioritaire aux personnes répondant à des critères cliniques et administratifs précis (Breton et al., 2020; Gouvernement du Québec, 2022). Cette démarche devait, en principe, contribuer à l'efficience et à la qualité des soins, notamment en diminuant les temps d'attente et les pratiques de référencement sous-optimales. Cependant, les données disponibles au 20 septembre 2025 indiquent que 65% des personnes en attente de services spécialisés sont hors-délais (c.à.d., le délai maximal recommandé pour la prise en charge de la condition n'est pas respecté), un écart important par rapport à l'objectif de 35% établi par le MSSS en mars 2025 (Gouvernement du Québec, 2025b).

Les travaux de cette thèse, débutés en 2021, s'inscrivent également dans un contexte de pandémie mondiale, qui a accentué le besoin de revoir l'organisation des trajectoires de soins. Une meilleure intégration des autres professionnel·le·s en soins primaires, notamment pour la prise en charge des conditions musculosquelettiques ne nécessitant pas de consultation médicale, apparaissait comme une stratégie susceptible d'alléger le fardeau pesant sur le système de santé public. Certaines études menées au Québec mesurant l'efficacité d'interventions de triage ou de modèles de soins alternatifs concluent, pour la plupart, que l'expert·e en santé musculosquelettique peut orienter efficacement les patient·e·s consultant pour un problème musculosquelettique périphérique (hanche, genou, épaule) (Décary et al., 2017; F. Desmeules et al., 2013; Gagnon et al., 2020; Lafrance et al., 2024; Lowry et al., 2020; Matifat et al., 2019). Bien que certains travaux à l'échelle nationale et internationale se soient également intéressés à de telles initiatives pour la prise en charge de la lombalgie, les effets cliniques ainsi que l'impact des modèles de soins alternatifs sur l'utilisation des ressources de santé demeurent peu documentés (Cherkin et al., 2018; Hill et al., 2011; Konstantinou et al., 2020; Schröder et al., 2021). Dans ce contexte, les articles 1 et 2 de cette thèse ont d'abord permis de documenter les pratiques en matière d'évaluation et de référencement pour la lombalgie, ainsi que d'évaluer leur adéquation avec les plus récentes données probantes. Ces connaissances ont informé le développement d'une intervention de triage, menée par un·e expert·e en santé musculosquelettique, dont les effets cliniques et l'impact sur les trajectoires de soins sont documentés dans les articles 3 et 4 de cette thèse.

Chapitre 3 – Article I: Diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of low back pain: a scoping review of systematic reviews

Ce chapitre inclut le premier article de cette thèse qui a été publié dans la revue *Journal of Clinical Medicine* en 2023.

Mathieu, J[1]., Pasquier, M[2]., Descarreaux, M[3]., & Marchand, A.A[4]. (2023). Diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of low back pain: A scoping review of systematic reviews. Journal of Clinical Medicine, 12(10), 3581.

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Résumé

Contexte : La lombalgie est la principale cause d'incapacité à l'échelle mondiale. Les plus récents guides de bonnes pratiques recommandent une évaluation clinique approfondie des personnes atteintes de lombalgie, incluant une anamnèse et un examen physique ciblé. Toutefois, les données probantes concernant la valeur diagnostique des différents éléments d'évaluation demeurent fragmentées et hétérogènes. Ainsi, une incertitude persiste quant à la manière dont ces composantes peuvent informer les décisions cliniques en première ligne de soins.

Objectif : Cette étude avait pour but de recenser les données issues de revues systématiques portant sur la valeur diagnostique des composantes de l'anamnèse et de l'examen physique pouvant être utilisées lors de l'évaluation clinique de la lombalgie en première ligne de soins.

Méthodes : Une revue de la portée a été menée pour répondre à cet objectif. Les auteurs ont recherché, dans les bases MEDLINE, CINAHL, PsycINFO et Cochrane, les revues systématiques publiées entre le 1er janvier 2000 et le 10 avril 2023. Deux évaluateurs indépendants ont sélectionné les articles éligibles et procédé à l'extraction des données. Sur un total de 2 077 articles identifiés, 27 répondaient aux critères d'inclusion (données sur la valeur diagnostique, population adulte, lombalgie de type non-spécifique, radiculaire ou spécifique).

Résultats : La majorité des études identifiées ont été menées dans des milieux de soins secondaires ou tertiaires, tandis que seulement 16 études ont été réalisées en première ligne de soins. Dans l'ensemble, les résultats de cette étude révèlent que les composantes de l'anamnèse et de l'examen physique pour la lombalgie, si considérées isolément, présentent une valeur diagnostique limitée. De plus, les données appuyant l'utilisation de ces éléments cliniques sont hétérogènes et difficilement applicables aux soins primaires.

Conclusions : Des études supplémentaires sont nécessaires pour soutenir le développement de procédures d'évaluation de la lombalgie, standardisées et basées sur les plus récentes données probantes. Il est essentiel que cette démarche soit adaptée aux réalités et aux besoins des soins primaires.

Mots clés : lombalgie; validité diagnostique; anamnèse; examen physique; soins primaires

Abstract

Background: Low back pain ranks as the leading cause of years lived with disability worldwide. Although best practice guidelines share a consistent diagnostic approach for the evaluation of patients with low back pain, confusion remains as to what extent patient history and physical examination findings can inform management strategies.

Objective: The aim of this study was to summarize evidence investigating the diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of low back pain.

Methods: To this end, peer-reviewed systematic reviews were searched in MEDLINE, CINAHL, PsycINFO and Cochrane databases from January 1, 2000, to April 10, 2023. Paired reviewers independently reviewed all citations and articles using a two-phase screening process and independently extracted the data.

Results: Of the 2077 articles identified, 27 met the inclusion criteria, focusing on the diagnosis of lumbar spinal stenosis, radicular syndrome, non- specific low back pain and specific low back pain. Most patient evaluation components lack diagnostic accuracy for the diagnosis of low back pain when considered in isolation.

Conclusion: Further research is needed to develop evidence-based and standardized evaluation procedures, especially for primary care settings where evidence is still scarce.

Keywords: low back pain; diagnostic accuracy; history taking; physical examination; primary care

Introduction

Canada's overall health expenditure is expected to account for 12.2% of its gross domestic product (GDP) in 2022 (Institut canadien d'information sur la santé, 2022). Increase use of health care services and compensation of health care providers are listed as the two main health care cost drivers, accounting for almost half of estimated Canada's total health spending (Institut canadien d'information sur la santé, 2022). A cross-sectional analysis of administrative health data of the province of Ontario, Canada revealed that 1.6 million outpatient physician visits for spinal conditions, of which 86% occurred in primary care settings, were made in 2013-2014 (Rampersaud et al., 2020). Given its high prevalence, low back pain (LBP) accounts for a significant share of Canada's health care spending. Compared to adults without back problems, patients with LPB present higher rates of health care utilization and costs, resulting approximately in 1.95 billion$ CAD in costs in 2019 (Wong, Côté, Tricco, Watson, & Rosella, 2021).

Low back pain ranks as the leading cause of years lived with disability (YLDs) worldwide ("Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017," 2018). Although several global initiatives have been implemented to address the burden of LBP, YLDs attributable to this condition raised by 17.8% between 2007 and 2017 ("Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017," 2018), reflecting its continuous burden increase as the population grows and ages. In the 2018 Lancet Low Back Pain Series, experts highlighted several potential measures to support healthcare systems in the prevention and management of disabling LBP (Buchbinder et al., 2018). Clinical and referral pathways redesign, and the integration of consistent evidence-based clinical care standards across healthcare systems and settings were proposed to promote timely access to effective healthcare, while preventing the use of low-value care approaches (Buchbinder et al., 2018).

Several evidence-based clinical guidelines (Bernstein, Malik, Carville, & Ward, 2017; A. Bussières et al., 2021; A. E. Bussières et al., 2018; Chou et al., 2007; Kreiner et al., 2013; Qaseem et al., 2017; Wong et al., 2017) have been published over the years to provide healthcare providers with the best practice recommendations for the evaluation and management of patients with LBP. These guidelines share a consistent diagnostic approach based on a focused patient history and physical examination, which should assess level of concern for major structural or other pathologies, and the presence of co-morbidities and neurological signs. This approach should enable clinicians to identify the type of LBP (i.e., non-specific LBP, radicular syndrome, specific LBP), and help them determine whether the patient's condition warrants further investigation or a referral to the appropriate healthcare provider. However, clinicians agree that such guideline recommendations may lack clarity and lead to confusion as the rationale for diagnostic decisions and the diagnostic accuracy of endorsed clinical indicators are typically not provided (Finucane et al., 2020; Verhagen, Downie, Maher, & Koes, 2017). This contributes to a widening gap between evidence and clinical practices (Bishop & Wing, 2003; Kamper et al., 2020; Williams et al., 2010) and leads to the use of inappropriate diagnostic and therapeutic approaches, including overuse of imaging and opioid prescriptions, as well as an increasing number of unnecessary referrals to medical specialists (Debono, Sabatier, Koudsie, Buffenoir, & Hamel, 2017; Kamper et al., 2020).

As the public health care system struggles with limited healthcare resources in the face of increasing demands for services, initial diagnostic accuracy is deemed crucial to enable patients to see the right professional at the right time, while precluding use of ineffective and costly therapeutic approaches (Buchbinder et al., 2018). Thus, to assist healthcare providers in evidence-based decision making, there is a need to clearly define evaluation components and clinical indicators endorsed by practice guidelines for the diagnosis of LBP, and to clarify to what extent these should inform clinical decisions. Therefore, the aim of this study was to summarize evidence investigating the diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of LBP.

Methods

Study design

To address our research question, a scoping review was conducted based on the frameworks proposed by Arksey & O'Malley (Arksey & O'Malley, 2005) and Levac et al (Levac, Colquhoun, & O'Brien, 2010). This type of study allows us to report on the current state of knowledge in a research field and captures the breadth of information on a topic that has been widely studied and for which the available data are numerous and heterogeneous (Peters et al., 2015). Consistent with this framework, we did not appraise the methodological quality of the included studies.

Search strategy

Our search strategy was developed by one of the authors (J.M.) and two coauthors (A.A.M., M.D.) subsequently cross-validated the search to ensure completeness of results. The search strategy was developed in MEDLINE (see Appendix A) and then adapted to other bibliographic databases. Search terms included controlled vocabulary for each database and free text words for the key concepts of low back pain, diagnostic validity, patient evaluation, and systematic review. In addition, reference lists from relevant articles and previously published systematic reviews were hand searched for additional potentially relevant reviews. We initially searched MEDLINE, CINAHL, PsycINFO and Cochrane databases from January 1, 2000 to April 30, 2022, and updated the search on April 10, 2023. EndNote was used to de-duplicate references electronically across all databases, record number of duplicates identified and manage the search results.

Study selection

Inclusion criteria

To be included, studies had to meet the following criteria: 1) be written in English or French language; 2) were systematic reviews of diagnostic studies that included comparative or exploratory studies, cross-sectional, cohort or case-control studies, or secondary analyses of randomized controlled trials; 3) focused on adults (aged > 18 years) suffering from any type of

LBP with or without radiating pain; 4) investigated at least one index test (e.g., demographics, patient history and clinical examination findings) for the diagnosis of LBP, applicable in primary care settings; and 5) provided data on the diagnostic value of index tests. Studies exclusion criteria included: primary studies, unpublished manuscripts, books and book chapters, conference proceedings, meeting and conference abstracts, thesis and dissertations, non-systematic reviews, laboratory studies, study not reporting on methodology and cadaveric or animal studies.

Screening and agreement

A two-phase (titles and abstracts; full-text articles) screening process was used to select eligible studies. In phase I screening, pairs of independent reviewers (J.M., M.P.) screened citation titles and abstracts to determine the eligibility of studies (categorizing studies as possibly relevant or irrelevant). In instances where eligibility could not be ascertained due to limited information in the title/abstract, the citation was considered ‘’possibly relevant” until a final decision was made upon full text review. Pairs of independent reviewers (J.M., M.P.) screened the full text of possibly relevant during phase II screening to determine eligibility and reasons for exclusion were documented. Reviewers met to discuss disagreements and to reach consensus in both phases. An additional reviewer (A.A.M.) was involved if consensus could not be reached.

Data extraction

Data extraction forms were drafted, and pilot tested. Two reviewers (J.M., M.P.) independently extracted data and discussed to reconcile differences. A third reviewer (A.A.M.) verified the extracted data to minimize error. Data extraction items included: first author’s name, publication year, country, number of included primary studies, details of search strategy, sample characteristics (e.g., size, mean age, LBP type, LBP duration), index tests and reference standards’ description, and diagnostic accuracy values (e.g., sensitivity and specificity) or measures (e.g., predictive values (PPV or NPV), likelihood ratios (LR), estimates of the summary receiver operating characteristic (ROC) curve, posttest probability (PPT), diagnostic odds ratios (DOR)). If a meta-analysis was conducted, reviewers extracted the meta-analytic summary of accuracy estimates across studies and its associated statistical uncertainty (e.g., 95% confidence intervals).

Likelihood ratios were considered as the main clinical outcome measure for the purposes of this review and were clinically interpreted as outlined in Table 6.

Table 6. Likelihood ratios interpretation

Likelihood ratios	Interpretation
+LR > 10 or -LR < 0.1	Large
+LR 5-10 or -LR 0.1-0.2	Moderate
+LR 2-5 or -LR 0.2-0.5	Small
+LR 1-2 or -LR 0.5-1	Very small

Data synthesis and analysis

A descriptive synthesis was conducted to provide details regarding the total number of studies kept for analysis, first author's name and country, year of publication, settings of data collection, the number of primary studies included, and study populations' characteristics (see Table 7).

To answer our research question, our review findings were sorted by LBP type (i.e., non-specific LBP, radicular syndrome, lumbar spinal stenosis, and specific LBP), and by evaluation component (i.e., demographics, patient history, and physical examination). This classification was chosen to facilitate the reporting of study results as it reflected the LBP categories used in the eligible systematic reviews, and in previously published practice guidelines.

Table 7. Systematic reviews characteristics

LUMBAR SPINAL STENOSIS									
First author	**Year of publication**	**End of search**	**Country**	**Settings of data collection**	**Study design(s)**	**Number of primary studies**	**Number of participants**	**Population**	**Meta-analysis**
Cook	2020	Nov 2018	USA	Mixed	Prospective (7); Multicenter cross-sectional (1); Retrospective cohort (1)	n=9	N=36 228	Adult (>18 yrs) patients with LBP of any duration with a suspicion of LSS	No
De Schepper	2013	March 2011	NLD	Mixed	Prospective	n=15	N=2909	Adult patients with LSS	No
RADICULAR SYNDROME *(Lumbar radiculopathy, LDH)*									
First author	**Year of publication**	**End of search**	**Country**	**Settings of data collection**	**Study design(s)**	**Number of primary studies**	**Number of participants**	**Population**	**Meta-analysis**
Mistry	2020	July 2019	UK	Mixed	Cross-sectional observational study (11)	n=11	N=3908	Adult participants with LBLP	No
Tawa	2017	July 2016	Kenya	Mixed	Cohort study (11); case control (1)	n=12	N=1026	Subjects with clinical signs and symptoms consistent with lumbo-sacral radiculopathy.	No
Al Nezari	2013	March 2011	NZ	Mixed	Prospective cohort (12); Case-control (2)	n=14	N=7200	Patients with LBP of any duration with suspicion of radiculopathy caused by a potential LDH	Yes

Scaia	2012	Dec 2011	USA	Mixed	Case control, case-based case control, and cohort studies	n=7	N=4311	Patients with suspected LDH, lumbar radiculopathy or sciatica	No
Van der Windt	2010	April 2008	UK	Mixed	Case-control study (3); prospective cohort (11); retrospective cohort (5)	n=19	Cohort: median N = 126, range 71-2504 Case control: 38- 100 cases	Patients with low-back pain with pain radiating into the leg, who were suspected of having radiculopathy due to LDH	Yes
Devillé	2000	1997	NLD	Mixed	Unclear	n=15	NA	Unclear	Yes
NON-SPECIFIC LOW BACK PAIN									
First author	**Year of publication**	**End of search**	**Country**	**Settings of data collection**	**Study design(s)**	**Number of primary studies**	**Number of participants**	**Population**	**Meta-analysis**
Han	2023	Jan 2023	Australia	Mixed (secondary and tertiary care)	NA	n=62	Ranged from 15 to 736	Patients with LBP without serious pathology	Yes
Nolet	2021	July 2019	Canada	NA	NA	n=7	N=777	Adult patients with LBP with or without radiculopathy of any duration	No
Stolz	2020	Sept 2019	Germany	Mixed	NA	n=13 (3 validy studies)	N=235	Included at least one group of adult participants that had suffered from LBP	No

Maas	2017	June 2016	NLD	Mixed	Cross-sectional (10); case-control (1); Retrospective cohort (1)	n=12	N=1504	Adult patients, of either gender, suffering from CLBP	No
Grodahl	2016	Nov 2015	Norway	Mixed	Prospective (3); Retrospective (2); Cross-sectional (1); Non-experimental (1); Case series (1)	n=8	N=654	Population with LBP with/without radiculopathy presenting with suspected spondylolysis and/or spondylolisthesis	No
Ferrari	2015	Dec 2013	Italy	Mixed	NA	n=6	N=333	Adult population with sub-acute or chronic LBP	No
Sivayogam	2011	Feb 2011	Singapore	NA	NA	n=6	N=409	Adult patients with non-specific, non-pregnancy related LBP and/or buttock pain, with or without lower extremity symptoms	No
Alqarni	2011	March 2010	NZ	Mixed	Prospective (3); Cross-sectional (1)	n=4	N=351	Patient with CLBP or with mixed lumbar pathology	No
Hancock	2007	Feb 2006	Australia	NA	NA	n=41	NA	Patients with low back pain and no known or suspected serious pathology	No
Simpson	2006	Dec 2005	UK	NA	NA	n=11	NA	Adult patients with LBP	No

SPECIFIC LOW BACK PAIN									
First author	**Year of publication**	**End of search**	**Country**	**Settings of data collection**	**Study design(s)**	**Number of primary studies**	**Number of participants**	**Population**	**Meta-analysis**
Tabrah	2022	Oct 2020	UK	Mixed	Retrospective cohort (5); Prospective cohort (1)	n=6	N=679	People presenting with acute CES	Yes
Galliker	2020	Jan 2019	Switzerland	Mixed	Prospective cohort (3); Retrospective cohort (15); Cross-sectional (3); Mixed (1)	n=22 (10 on DA of RF)	N=41 320	Adult patients presenting with LBP of any duration to an ED	No
Maselli	2020	June 2020	Italy	Mixed	Retrospective (19); Prospective (1); Cross-sectional (3); Observational (6); Cohort (1)	n=40 (21 focused on LBP patients)	N=49 422	Patients consulting healthcare professionals for LBP	No
Dionne	2019	Jan 2018	Canada	Mixed	Retrospective cohort (6); Prospective cohort (1)	n=7	N=869	Adults who presented with suspected CES from an insidious onset or herniated disc prolapse	Yes
Williams	2013	March 2012	Australia	Mixed (primary and secondary)	Prospective cohort (6); Retrospective cohort (2)	n=8	N=7378	Patients presenting with LBP or for lumbar spine examination	No

Henschke	2013	April 2012	Germany	Mixed	Prospective cohort (6); Retrospective cohort (2)	n=8	N=8905	Patients with LBP or requiring examination of the lumbar spine	No
Henschke	2008	Feb 2007	Australia	Mixed	Prospective (8); Retrospective (4)	n=12	N=7147	Patients with back pain presenting to the ED	No
MIXED									
First author	**Year of publication**	**End of search**	**Country**	**Settings of data collection**	**Study design(s)**	**Number of primary studies**	**Number of participants**	**Population**	**Meta-analysis**
Haskins	2015	July 2013	Australia	Mixed	Prospective (n=9); Retrospective (n=2); NA (n=4)	n=15	NA	Mixed	No
Shultz	2015	Nov 2013	USA	Mixed	Prospective (n=9); Retrospective (n=1); Cross-sectional (n=1)	n=11	N=2899	Patients with low back pain (LBP) and related lower extremity pain condition	No

CES: Cauda equina syndrome; CLBP: Chronic low back pain; DA: Diagnostic accuracy; ED: Emergency department; LBLP: Low back-related leg pain; LBP: Low back pain; LDH: Lumbar disc herniation; LSS: Lumbar spinal stenosis; NA: Not available; RF: Red Flags

Results

Descriptive synthesis

The PRISMA flow diagram describing the process of review selection is presented in Figure 1. A total of 2077 articles were identified from the literature search. After duplicates were removed (n= 653), 1424 were screened by titles and abstracts and 1289 were deemed irrelevant. We reviewed full-text reports for the 96 systematic reviews of potential relevance, and of these, 69 were subsequently excluded, bringing the total count to 27 systematic reviews that were included in our analysis.

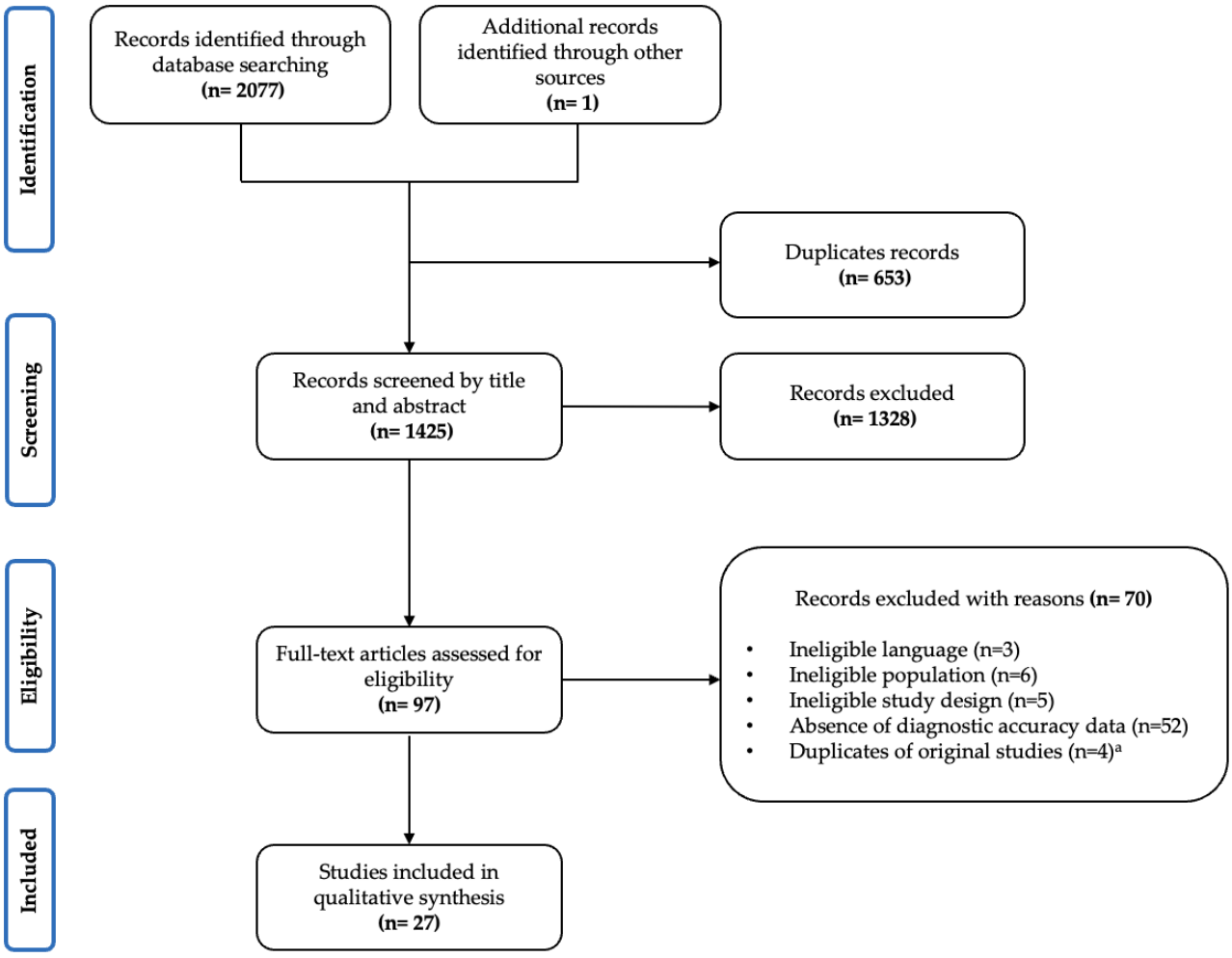


Figure 1. Flowchart diagram

Characteristics of included reviews

Included systematic reviews characteristics are presented in Table 7. The systematic reviews were published between 2000 and 2023, with 44.4% (12 of 27) of studies published between 2016 and 2023 and 40.7% (11 of 27) between 2010 and 2015. The total number of studies included in the reviews ranged from 6 to 62. Six systematic reviews performed meta-analyses. Overall, 5 systematic reviews were performed by researchers in Australia, 4 in United Kingdom, 3 in the United-States, 3 in New Zealand, and the remaining were conducted in Canada (2), Germany (2), Italy (2), Singapore (1), Switzerland (1), Norway (1), and Kenya (1). Most reviews included various study designs such as prospective and retrospective cohort studies, case-control, and cross-sectional studies, and combined data obtained from various health care settings. Two reviews focused solely on the diagnostic accuracy of demographic, history or physical examination findings for the assessment of [1] lumbar spinal stenosis, 6 focused on [2] the radicular syndrome, 10 on [3] non- specific low back pain and 7 on [4] specific low back pain. Two reviews (Haskins, Osmotherly, & Rivett, 2015; Shultz, Averell, Eickelman, Sanker, & Donaldson, 2015) presented diagnostic accuracy data from each of the four categories. Figure 2 illustrates the distribution of accuracy data from each of the four categories.

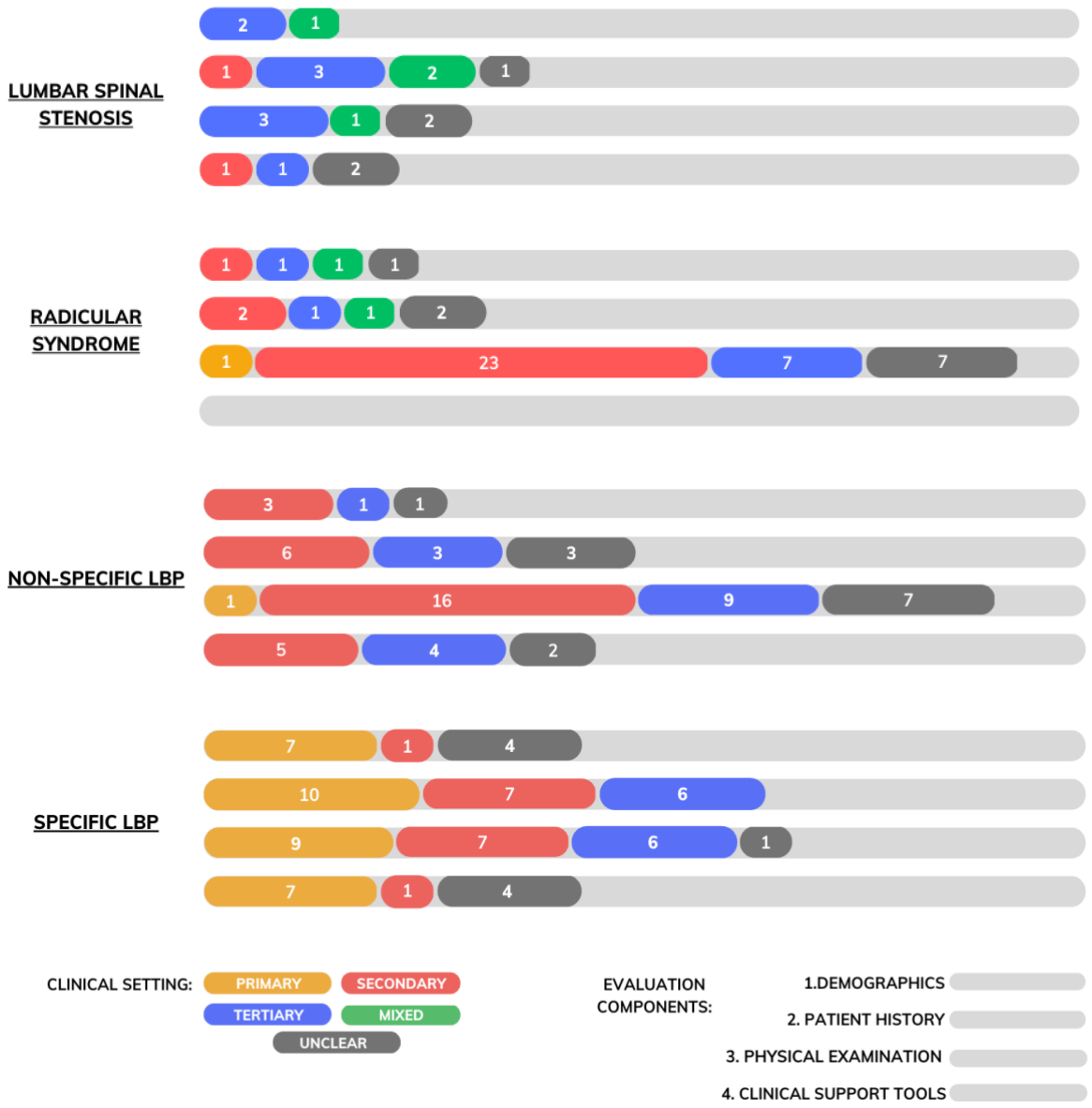


Figure 2. Distribution of studies by LBP type, evaluation component and care setting

Lumbar spinal stenosis

Three systematic reviews (C. J. Cook et al., 2020; de Schepper et al., 2013; Shultz et al., 2015) investigated the diagnostic accuracy of demographic, patient history or physical examination findings used to diagnose lumbar spinal stenosis (Stochkendahl et al.). A total of 12 primary studies were included in the systematic reviews, including 8 (66.7%) prospective studies, 3 (25.0%) cross-sectional studies and 1 (8.3%) retrospective cohort study. Primary studies were

mostly conducted in tertiary (33.3%) or secondary (25.0%) care settings. Two studies provided data from both primary and secondary health care settings. The studies' sample size varied from 23 to 32 086 participants, with participants mean age ranging from 46.39 to 68.2 years old. Study populations differed, although participants were mostly described as adults with low back pain of any duration, with or without lower extremity symptoms and with a suspicion of LSS. Of all primary studies, 7 (58.3%) used a clinical reference standard (i.e., expert opinion based on clinical findings and imaging and/or surgery), whereas 5 studies relied solely on imaging and/or surgery findings to diagnose LSS. Imaging procedures included magnetic resonance imaging (MRI), computed tomography (CT) and radiograph.

Demographics

Appendix B (Supplementary Table S1) presents data on the 2 systematic reviews (C. J. Cook et al., 2020; de Schepper et al., 2013) that examined the diagnostic accuracy of demographic findings used to diagnose LSS. Neither of these systematic reviews conducted a meta-analysis. Of the three primary studies included in these reviews, two were conducted in a tertiary care setting (C. Cook et al., 2011; Katz et al., 1995), while one included data from both primary and secondary care settings (Konno et al., 2007). All three primary studies only assessed the diagnostic value of patient age for the diagnosis of LSS but used a different age threshold. Overall, the criterion of being older (i.e., > 48 years, > 65 years or > 70 years) seemed more sensitive than specific, with sensitivity values ranging from 0.64-0.88. Cook et al. (C. Cook et al., 2011) identified a 26% decrease in posttest probability when patient age was 48 years or younger. These findings are consistent with the pathophysiology of acquired LSS, which is known to be a degenerative process whose prevalence increases with age.

Patient history

Three systematic reviews (C. J. Cook et al., 2020; de Schepper et al., 2013; Shultz et al., 2015), including 8 primary studies, provided data on the diagnostic value of patient history findings for the diagnosis of LSS (see Appendix B - Table S2). Neither of these systematic reviews pooled data statistically. Index tests identified were consistent with pain location characteristics (n=15), relieving factors (n=12), exacerbating factors (n=11), subjective neurological symptoms (n=7),

pain character (n=2), pain duration (n=1) and functional limitations (n=1). The absence of pain when seated (LR+ 7.21 [1.82, 28.61]; +PTP absolute difference 33.31%)(Katz et al., 1995) and the improvement of symptoms when bending forward (LR+ 1.41-6.4; +PTP absolute difference: 25.12%)(Fritz, Erhard, Delitto, Welch, & Nowakowski, 1997; Katz et al., 1995; Konno et al., 2007) consistently presented the highest diagnostic utility for ruling in the diagnosis of LSS, generally reflected by higher positive likelihood ratios or posttest probability increases. Larger magnitude negative likelihood ratios and posttest probability decreases were attributed to the absence of lower extremity symptoms (LR- 0.34 [0.13, 0.88] – 0.71 [0.46, 1.09]; -PTP absolute difference: 11.48- 25.98%) (C. Cook et al., 2011; Katz et al., 1995) and to the absence of pain exacerbation when standing up or walking (LR- 0.33- 0.97; -PTP absolute difference: 16.05%)(C. Cook et al., 2011; Fritz et al., 1997; Katz et al., 1995; Konno et al., 2007; Sugioka, Hayashino, Konno, Kikuchi, & Fukuhara, 2008), indicating that these index tests were generally the most clinically useful to rule out LSS. Although promising, none of these clinical tests seemed to perform strong enough to justify using them as stands-alone for the diagnosis of LSS. Discrepancies in LSS definitions, reference standards and in primary studies' methodology may limit the generalizability of study findings.

Physical examination

Two systematic reviews (C. J. Cook et al., 2020; de Schepper et al., 2013), including 6 primary studies, investigated the diagnostic accuracy of physical examination findings for the diagnosis of LSS (see Appendix B -Table S3). Neither of these systematic reviews performed a meta-analysis. Functional and neurological symptoms change after level walking, and neurological examination findings were the most frequently investigated index tests. The absence of any functional neurological changes and no prolonged recovery after a two-level treadmill test (Fritz et al., 1997; Jensen & Schmidt-Olsen, 1989) were consistently both associated with higher posttest probability decreases, ranging from 7.26 to 35%, reflective of better utility to rule out LSS. Neurological examination findings (i.e., absent Achilles reflex, sensory deficit, muscle weakness, abnormal Romberg and poor balance) (Katz et al., 1995) showed very small magnitude positive likelihood ratios (1.49 CI 95% [0.98, 2.26] – 4.06 CI 95% [1.29, 12.76]) and moderate to large positive posttest probability differences (9.35 – 27.17 %). This suggest the presence of neurological deficits might

be used for ruling in the diagnosis of LSS. There is limited and highly inconsistent evidence to support the use of the Lumbar Extension Test and of the Straight Leg Raising Test for the diagnosis of LSS (Dobbs, May, & Hope, 2016; Katz et al., 1995; Konno et al., 2007).

Diagnostic support tools

Two systematic reviews (de Schepper et al., 2013; Haskins et al., 2015), including 4 primary studies, provided data on the diagnostic value of diagnostic support tools for the diagnosis of LSS (see Appendix B- Table S4). Three diagnostic support tools were identified. Cook et al. (C. Cook et al., 2011) provided data on a 5-item support tool, which improved posttest probabilities to 63-76% when 3-5 of 5 conditions were met (i.e., [1] bilateral symptoms, [2] leg pain worse than back pain, [3] pain during walking/standing, [4] pain relief upon sitting, and [5] age > 48 years). Two studies (Kato et al., 2009; Konno et al., 2007) assessed the diagnostic value of a scoring system that involved age, self-reported symptoms and physical examination findings. Scores ≥ 7 were associated with very small magnitude positive likelihood ratios (LR+ 1.6). Finally, Sugokia et al. (Sugioka et al., 2008) investigated the diagnostic performance of a clinical prediction rule that combined 7 clinical findings (i.e., older age, duration of symptoms > 6 months, improvement of symptoms when bending forward, no improvement of symptoms when bending backward, occurrence of symptoms when standing up, symptoms occurring when walking are improved by resting, and urinary incontinence). Scores ≥ 5 were associated with very small magnitude positive likelihood ratios (LR+ 1.5 [1.1, 2.1]).

Radicular syndrome

Seven systematic reviews (Al Nezari, Schneiders, & Hendrick, 2013; Devillé, van der Windt, Dzaferagić, Bezemer, & Bouter, 2000; Mistry, Heneghan, Noblet, Falla, & Rushton, 2020; Scaia, Baxter, & Cook, 2012; Shultz et al., 2015; Tawa, Rhoda, & Diener, 2017; van der Windt et al., 2010) investigated the diagnostic accuracy of demographic, patient history or physical examination findings used to diagnose radicular syndromes. Three of the 7 systematic reviews performed a meta-analysis (Al Nezari et al., 2013; Devillé et al., 2000; van der Windt et al., 2010). Four systematic reviews presented data from both primary and secondary care settings, while 3 reviews included only studies from secondary or tertiary care environments. A total of 74 primary

studies were included in these systematic reviews. The studies' sample size varied from 16 to 2504 participants, with participants mean age ranging from 38.0 to 60.0 years old. Study populations were generally consistent, most of which included adults with clinical signs and symptoms of any duration, suggestive of lumbar radiculopathy. Imaging procedures (i.e., MRI, CT, electromyography, radiograph or myelography) and surgical findings were used as reference standards.

Demographics

Two systematic reviews (Mistry et al., 2020; Shultz et al., 2015) examined the diagnostic accuracy of demographic findings used to diagnose radicular syndromes (see Appendix B -Table S5). Given the heterogeneity of the 4 included primary studies (Coster, de Bruijn, & Tavy, 2010; Verwoerd et al., 2014; Vroomen, de Krom, Wilmink, Kester, & Knottnerus, 2002; Vucetic, de Bri, & Svensson, 1997), meta-analyses were not performed. Demographic index tests included age, sex, living situation, education level and job type. None of these index tests significantly alter the likelihood of the condition (i.e., +LR $\geq$ 2; -LR $\leq$ 0.5), all reporting diagnostic odds ratios of less than 4.

Patient history

Two systematic reviews (Mistry et al., 2020; Shultz et al., 2015), including 6 primary studies (Beattie, Meyers, Stratford, Millard, & Hollenberg, 2000; Coster et al., 2010; Smart, Blake, Staines, Thacker, & Doody, 2012; Verwoerd et al., 2014; Vroomen et al., 2002; Vucetic et al., 1997) investigated the diagnostic accuracy of patient history findings for the diagnosis of radicular syndromes (Appendix B - see Table S6). Mistry et al. provided data on the diagnostic utility of patient history findings to identify neuropathic pain in patients with low back-related leg pain. As stand-alone findings, duration and location of pain, pain history, subjective neurological symptoms and aggravating factors (i.e., coughing, sneezing, straining, sitting) appeared uninformative. Shultz et al. (Shultz et al., 2015) provided data on the diagnostic accuracy of history taking findings used to identify spinal conditions that cause low back-related leg pain. The diagnostic accuracy of 28 patient history items was reported, the most common categories corresponding to comorbidities and health history findings (n=10; 35.7%), pain location characteristics (n=4; 14.3%), pain duration (n=4; 14.3%) and subjective neurological symptoms

(n=4; 14.3). For the diagnosis of lumbar radiculopathy, dermatomal distribution of pain presented the highest diagnostic performance (Coster et al., 2010; Smart et al., 2012), reflected by large magnitude diagnostic odds ratios [DOR 24.29 (CI 95% 6.33, 93.19); 4.1 (CI 95% 2.20, 7.80)], followed by history of nerve injury [DOR 12.64 (CI 95% 3.59, 44.49)] (Smart et al., 2012). When considered independently, other history taking items did not significantly alter the probability of the condition (DOR <4).

Physical examination

Six systematic reviews (Al Nezari et al., 2013; Devillé et al., 2000; Mistry et al., 2020; Scaia et al., 2012; Tawa et al., 2017; van der Windt et al., 2010), 3 of which conducted a meta-analysis (Al Nezari et al., 2013; Devillé et al., 2000; van der Windt et al., 2010), provided data on the diagnostic accuracy of physical examination findings for the diagnosis of lumbar radiculopathy (see Appendix B - Table S7). Neurological examination findings (i.e., sensory deficits, motor deficits, impaired reflexes) and neurodynamic tests (i.e., Straight Leg raise (SLR), Crossed SLR, Slump test) were the most frequently investigated index tests. The overall findings revealed limited diagnostic accuracy of all components of the neurological examination when used in isolation to detect a nerve root compression or a disc herniation in patients with suspected radiculopathy, expressed by poor-to-moderate positive likelihood ratios. The highest specificity values attributed to neurological examination components however indicate these tests might be useful to rule in the diagnosis of lumbar radiculopathy when used in combination. Based upon the current evidence, the SLR and Crossed SLR neurodynamic tests lack diagnostic utility as stand-alone findings, as suggested by variable diagnostic accuracy values. In surgical populations, the SLR and Crossed SLR tests respectively showed high sensitivity and moderate-to-high specificity but demonstrated poor diagnostic performance when imaging findings were used as a reference standard (Devillé et al., 2000; van der Windt et al., 2010).

Non-specific low back pain

Ten systematic reviews (Alqarni, Schneiders, & Hendrick, 2011; Ferrari, Manni, Bonetti, Hugo Villafañe, & Vanti, 2015; Grødahl et al., 2016; Han et al., 2023; Hancock et al., 2007; Maas et al., 2017; Nolet et al., 2021; Simpson & Gemmell, 2006; Sivayogam & Banerjee, 2011; Stolz, von

Piekartz, Hall, Schindler, & Ballenberger, 2020), including 32 primary studies, investigated the diagnostic accuracy of demographic, patient history and physical examination findings commonly used in the diagnosis of non-specific low back pain. Only one systematic review performed a meta-analysis (Han et al., 2023). All systematic reviews presented data from mixed care settings, the majority (17 of 30 primary studies) being from secondary care environments. The studies' sample size varied from 21 to 337 participants, with participants mean age ranging from 38.4 to 62.04 years old. Study populations varied but mostly included adult patients with chronic LBP, without leg symptoms and neurological deficits. Three systematic reviews (Alqarni et al., 2011; Ferrari et al., 2015; Grødahl et al., 2016) focused specifically on populations with LBP presenting with suspected spondylolysis or spondylolisthesis, also referred to as lumbar instability.

Demographics

Three systematic reviews (Grødahl et al., 2016; Hancock et al., 2007; Maas et al., 2017), including 5 primary studies (Gregg, Dean, & Schneiders, 2009; Laslett, McDonald, Aprill, Tropp, & Oberg, 2006; Manchikanti, Pampati, Fellows, & Baha, 2000; Manchikanti, Pampati, Fellows, & Bakhit, 1999; M. Revel et al., 1998) provided data on the diagnostic accuracy of demographics for the diagnosis of non-specific LBP (see Appendix B Table S8). All data were derived from secondary or tertiary care settings. Demographics investigated included older age (> 65 or > 50 years old), male gender, work status and the body mass index (BMI). As stand-alone findings, all demographic variables presented low-to-moderate sensitivity (Se range: 0.19 CI 95% [0.10, 0.31] – 0.39 CI 95% [0.27, 0.52]) and moderate-to-high specificity values (Sp range: 0.56 CI 95% [0.44, 0.67] – 0.85 CI 95% [0.78, 0.91]). The criterion of being older did not meet the threshold to alter the likelihood of the condition (+LR range: 0.6 CI 95% [0.3-1.1] - 1.8 CI 95% [0.7, 4.7]); (-LR range: 0.78 CI 95% [0.49, 1.23] - 1.21 CI 95% [0.98, 1.51]), with all studies reporting diagnostic odds ratios of less than 4. Overall, the study findings revealed that demographics had no value in diagnosing non-specific low back pain.

Patient history

Five systematic reviews (Grødahl et al., 2016; Han et al., 2023; Hancock et al., 2007; Maas et al., 2017; Sivayogam & Banerjee, 2011), including 12 primary studies (Depalma, Ketchum, Trussell,

Saullo, & Slipman, 2011; Dreyfuss, Michaelsen, Pauza, McLarty, & Bogduk, 1996; Gregg et al., 2009; Jung et al., 2007; Kalpakcioglu, Altinbilek, & Senel, 2009; Laslett et al., 2006; Lewinnek & Warfield, 1986; Manchikanti et al., 2000; Manchikanti et al., 1999; M. Revel et al., 1998; M. E. Revel et al., 1992; Schwarzer et al., 1994), examined the diagnostic value of patient history findings for the diagnosis of non-specific LBP (see Appendix B - Table S9). Three systematic reviews (Han et al., 2023; Hancock et al., 2007; Maas et al., 2017) provided data on the diagnostic accuracy of patient history findings used to diagnose LBP originating from the facet joints, using single or double zygapophyseal diagnostic nerve blocks as reference standards. Most investigated index tests for this category were pain in the paraspinal area with or without leg pain, pain reduced with recumbency, and pain not increased with cough. The review by Sivayogam et al. (Sivayogam & Banerjee, 2011) focused on the diagnostic performance of pain location characteristics (i.e., pain over groin, buttock, posterior superior iliac crest) to identify the sacroiliac joint (SIJ) as the source of pain, using SIJ blocks as reference standards. Finally, Grodahl et al. (Grødahl et al., 2016) provided data on the utility of patient history findings (i.e, age, male gender) to detect lumbar instability in patients with LBP. All these systematic reviews presented considerable heterogeneity in study populations, index tests' descriptions and diagnostic accuracy data. Furthermore, most primary studies only reported sensitivity and specificity values of index tests, limiting the interpretability of study findings. Overall, evidence regarding the diagnostic accuracy of patient history components as stand-alone findings for the diagnosis of non-specific LBP was poor.

Physical examination

Ten systematic reviews (Alqarni et al., 2011; Ferrari et al., 2015; Grødahl et al., 2016; Han et al., 2023; Hancock et al., 2007; Maas et al., 2017; Nolet et al., 2021; Simpson & Gemmell, 2006; Sivayogam & Banerjee, 2011; Stolz et al., 2020), including 31 primary studies, provided data on the diagnostic accuracy of physical examination findings used for the diagnosis of non-specific LBP (see Appendix B -Table S10). Most of the systematic reviews investigated physical examination components including manual palpation, segmental motion testing, lumbar spine range of motion, and spinal orthopaedic testing. The meta-analysis performed by Han et al. (Han et al., 2023) demonstrated informative LR+ for the distraction test (2.18; 95% CI [1.08–4.38]) to

detect LBP originating from the SIJ, but uninformative LR- (0.73; 95% CI [0.54–0.99]). Absence of midline low back pain also demonstrated informative LR+ (2.41 95% CI [1.89–3.07]) and −LR 0.35 (95% CI [0.12–1.01]). Three studies (Adelmanesh et al., 2016; Koppenhaver et al., 2014; Walsh & Hall, 2009), providing diagnostic accuracy data on static joint, joint motion and soft tissue palpation, were identified by Nolet et al. (Nolet et al., 2021). Only little and inconsistent evidence was available to support the clinical usefulness of manual palpation when examining patients with LBP. When considered separately, Revel's criteria (i.e., [1] age over 65 years, [2] pain well relieved by recumbency, and pain not exacerbated by [3] coughing, [4] forward flexion, [5] extension, [6] rising from flexion and [7] extension-rotation) also presented highly inconsistent performance in diagnosing LBP of facet joint origin, with sensitivity values ranging from 0.15 (95% CI 0.09–0.25) to 1.00 (95% CI 0.77–1.00) and specificity values ranging from 0.13 (95% CI 0.08–0.20) to 0.86 (95% CI 0.79–0.91) (Maas et al., 2017). Overall, clinical provocation tests exhibited poor diagnostic value to identify LBP originating from the facet joints or the SIJ when used in isolation (Simpson & Gemmell, 2006; Sivayogam & Banerjee, 2011).

As for detecting lumbar spine instability, similar conclusions were drawn from four systematic reviews (Alqarni et al., 2011; Ferrari et al., 2015; Grødahl et al., 2016; Stolz et al., 2020) examining the validity of passive segmental motion testing, manual palpation (e.g., hamstring muscle spasm, paravertebral tenderness, lumbar spinous process palpation) aberrant movements, spinal orthopaedic tests (e.g., one leg hyperextension test, prone instability test, instability catch sign, apprehension sign, sit-to-stand test) and neurodynamic tests (e.g., SLR, Active SLR, femoral stretch test), using flexion-extension radiographs as a reference standard. Almost all clinical tests were found to have poor diagnostic accuracy. Step deformity palpation, investigated in 3 studies (Ahn & Jhun, 2015; Collaer, McKeough, & Boissonnault, 2006; Kalpakcioglu et al., 2009), was the only test that showed promising diagnostic value to detect spondylolisthesis, with moderate-high sensitivity (Se range: 81-88) and high specificity values (Sp range: 87-100). Conclusions are however limited by studies' risk of bias.

Diagnostic support tools

Four systematic reviews (Han et al., 2023; Hancock et al., 2007; Maas et al., 2017; Sivayogam & Banerjee, 2011), including 10 primary studies (Laslett et al., 2006; Laslett, McDonald, Tropp,

Aprill, & Oberg, 2005; Laslett, Oberg, Aprill, & McDonald, 2004; Laslett, Young, Aprill, & McDonald, 2003; Manchikanti et al., 2000; M. Revel et al., 1998; M. E. Revel et al., 1992; Stanford & Burnham, 2010; van der Wurff, Buijs, & Groen, 2006; Young, Aprill, & Laslett, 2003), provided data on the value of diagnostic support tools for the diagnosis of non-specific LBP (Appendix B - Table S11). Four primary diagnostic studies (Laslett et al., 2004; Manchikanti et al., 2000; M. Revel et al., 1998; M. E. Revel et al., 1992) evaluated the diagnostic performance of combined Revels' criteria (positive with five or more clinical characteristics) to identify facet joints as the source of LBP. Due to clinical heterogeneity, the evidence for the diagnostic accuracy of combined Revels' criteria was inconclusive, with sensitivity values ranging from 0.11 (95% CI 0.02–0.29) to 1.00 (95% CI 0.75–1.00), and the specificity values ranging from 0.66 (95% CI 0.46–0.82) to 0.91 (95% CI 0.83–0.96). Systematic reviews by Han et al. (Han et al., 2023), Sivayogam et al. (Sivayogam & Banerjee, 2011) and Hancock et al. (Hancock et al., 2007) investigated the performance of various composites of pain provocation tests to diagnose LBP originating from the SIJ. Most studies suggested that a cutoff point of three or more positive responses from six provocation tests (i.e., distraction, compression, thigh thrust, sacral thrust and Gaenslen's test) should be considered for clinical diagnosis of SIJ pain. Data pooling from six primary studies demonstrated informative LR+s (2.44 CI 95% [1.50, 3.98]) and LRs- (0.31 CI 95% [0.21, 0.47]) (Han et al., 2023). Heterogeneity in populations, reference standards and care settings may however limit the generalizability of study findings.

Specific low back pain

Seven systematic reviews (Dionne et al., 2019; Galliker et al., 2020; N. Henschke et al., 2013; Nicholas Henschke, Christopher G. Maher, & Kathryn M. Refshauge, 2008a; Maselli et al., 2020; Tabrah, Wilson, Phillips, & Böhning, 2022; Williams et al., 2013), of which 2 conducted a meta-analysis (Dionne et al., 2019; Tabrah et al., 2022), investigated the diagnostic accuracy of demographic, patient history or physical examination findings used to diagnose specific LBP. Two systematic reviews (Dionne et al., 2019; Tabrah et al., 2022) specifically focused on the diagnostic performance of clinical characteristics to screen for cauda equina syndrome (CES), two reviews focused on spinal fractures (Nicholas Henschke, Christopher G Maher, & Kathryn M Refshauge, 2008b; Williams et al., 2013), and one review focused on spinal malignancy (N. Henschke et al.,

2013). The systematic reviews by Maselli et al. (Maselli et al., 2020) and Galliker et al. (Galliker et al., 2020) evaluated the diagnostic accuracy of red flags for the diagnosis of any serious pathologies. A total of 72 primary studies were included in systematic reviews. The studies' sample size varied from 31 to 2975 participants, with participants mean age ranging from 40.5 to 56.0 years old.

Demographics

Cauda equina syndrome

One primary study (van den Bosch, Hollingworth, Kinmonth, & Dixon, 2004) provided data on the diagnostic value of demographics used to diagnose CES (see Appendix B- Table S12). Being older than 55 years of age was identified as a potential valuable red flag to detect CES but presented highly inconsistent positive likelihood ratios values (+LR 1.5-8), thereby calling into question its diagnostic utility.

Spinal fracture

Two systematic reviews (Maselli et al., 2020; Williams et al., 2013), including 6 primary studies (Deyo & Diehl, 1986; Enthoven et al., 2016; N. Henschke et al., 2009; Premkumar, Godfrey, Gottschalk, & Boden, 2018; Roman et al., 2010; van den Bosch et al., 2004) investigated the diagnostic performance of demographic characteristics for the diagnosis of spinal fracture (see Table Appendix B - S13). Demographics investigated included age, gender and BMI. "Older age" at five different cut-offs was reported in 4 primary studies conducted in primary care (Deyo & Diehl, 1986; Enthoven et al., 2016; N. Henschke et al., 2009; van den Bosch et al., 2004). Comparing the positive likelihood ratios at different cut-offs, "age greater than 70 years" (LR+ range: 3.1 95% CI [2.0, 4.7] – 11.19 95% CI [5.33, 23.51]) and "age greater than 74 years" (LR+ range: 3.69 95% CI [3.00, 4.53] – 9.39 95% CI [2.69, 32.75]) were identified as clinically informative, both resulting in a small-to-large increase in the likelihood of spinal fracture. Combining age and female gender revealed larger increases in positive likelihood ratios (LR+ range 14.59 95% CI [8.00, 26.61] - 16.17 95% CI [4.47, 58.43]) indicating higher suspicion of spinal fracture. One study (Roman et al., 2010) conducted in a secondary care setting investigated the

diagnostic accuracy of “BMI < 23”, which revealed a small increase (LR+ 2.3 95% CI [1.4, 3.4]) in the likelihood of fracture.

Malignancy

Two systematic reviews (N. Henschke et al., 2013; Maselli et al., 2020), including 6 primary studies (Deyo & Diehl, 1986, 1988; Frazier, Carey, Lyles, Khayrallah, & McGaghie, 1989; N. Henschke et al., 2009; Jacobson, 1997; Premkumar et al., 2018) provided data on the diagnostic value of demographics for the diagnosis of spinal malignancy (see Appendix B -Table S14). The most reported index test was “Age greater than 50 years”, being investigated by five primary studies. Within the four primary care studies (Deyo & Diehl, 1986, 1988; Frazier et al., 1989; N. Henschke et al., 2009), the specificity of this index test ranged from 0.66 95% CI (0.63, 0.69) to 0.74 95% CI (0.70, 0.78), and the post-test probability for spinal malignancy following a positive screening test result was 0.8%.

Any serious pathologies

One primary study (Shaw, Kinsella, Henschke, Walby, & Cowan, 2020) provided data on the diagnostic accuracy of demographics used to diagnose any serious spinal pathologies (see Appendix B - Table S15). Being older than 70 years was the only index test investigated, presenting very small magnitude likelihood ratio (1.9 CI 95% [1.3, 2.8]).

Patient history

Cauda equina syndrome

Two systematic reviews (Dionne et al., 2019; Maselli et al., 2020), including 8 primary studies (Balasubramanian, Kalsi, Greenough, & Kuskoor Seetharam, 2010; Bell, Collie, & Statham, 2007; Domen, Hofman, van Santbrink, & Weber, 2009; Gooding, Higgins, & Calthorpe, 2013; Premkumar et al., 2018; Roman et al., 2010; Rooney, Statham, & Stone, 2009; Tsiang et al., 2019) investigated the diagnostic performance of patient history findings for the diagnosis of CES (see Appendix B -Table S16). Most studies (7 out of 8) were conducted in secondary and tertiary care settings. Bowel incontinence, urinary retention, urinary incontinence, leg pain and back pain were the most common signs and symptoms evaluated for their diagnostic accuracy predicting CES

against MRI. Dionne et al. (Dionne et al., 2019) showed that all 5 clinical findings presented high pooled specificity values, ranging from 0.30 95% CI (0.23, 0.37) for back pain to 0.86 CI 95% (0.80, 0.91) for bowel incontinence, meaning these tests could be clinically useful for ruling in CES. However, pooled positive likelihood ratios, ranging from 0.80 95% CI (0.56, 1.14) for urinary incontinence to 1.60 95% CI (0.65, 3.94) for bowel incontinence suggested that a positive result on either of these tests leads to a very small shift in likelihood of CES when used in isolation.

Spinal fracture

Three systematic reviews (Nicholas Henschke et al., 2008b; Maselli et al., 2020; Williams et al., 2013), including 11 primary studies (Deyo & Diehl, 1986; Enthoven et al., 2016; Gibson & Zoltie, 1992; N. Henschke et al., 2009; Holmes, Panacek, Miller, Lapidis, & Mower, 2003; Patrick, Doris, Mills, Friedman, & Johnston, 1983; Premkumar et al., 2018; Reinus, Strome, & Zwemer, 1998; Roman et al., 2010; Scavone, Latshaw, & Rohrer, 1981; Tsiang et al., 2019) provided data on the diagnostic accuracy of patient history findings for the diagnosis of spinal fracture (see Appendix B - Table S17). In primary care studies (Deyo & Diehl, 1986; Enthoven et al., 2016; N. Henschke et al., 2009; Scavone et al., 1981), "history of trauma" was the most common red flag reported, presenting positive likelihood ratios ranging from 3.97 CI 95% (0.20, 79.15) to 12.85 CI 95% (8.58, 19.24), resulting in a small-to-large increase in the likelihood of spinal fracture. Three primary care studies (Deyo & Diehl, 1986; Enthoven et al., 2016; N. Henschke et al., 2009) investigated the diagnostic value of prolonged corticosteroid use. This clinical finding was found to be highly specific (0.93 CI 95% [0.91, 0.95] – 1.00), but yielded imprecise positive likelihood ratios between studies (2.5 CI 95% [1.1, 5.3] – 48.5 CI 95% [11.62, 165.22]. When used in isolation, other history taking items were not clinically informative for the diagnosis of spinal fracture.

Malignancy

Two systematic reviews (N. Henschke et al., 2013; Maselli et al., 2020), including 8 primary studies (C. Cook et al., 2011; Deyo & Diehl, 1986, 1988; Donner-Banzhoff et al., 2006; N. Henschke et al., 2009; Premkumar et al., 2018; Reinus et al., 1998; Tsiang et al., 2019) investigated the diagnostic accuracy of patient history findings for the diagnosis of spinal malignancy (see Appendix B -Table S18). The most common index tests evaluated were "previous history of cancer", "no

improvement in pain after one month", "unexplained weight loss" and "insidious onset". All clinical findings appeared more specific than sensitive across studies, resulting in very small-to-moderate increases in the likelihood of spinal malignancy. When used in isolation, only a "previous history of malignancy" significantly increased the post-test probability of spinal malignancy (LR+ 7.25 CI 95% 5.65, 9.3) in patients presenting with LBP (Premkumar et al., 2018).

Spinal infection

Two systematic reviews (Galliker et al., 2020; Maselli et al., 2020), including two primary studies (Davis, Salazar, Chan, & Vilke, 2011; Premkumar et al., 2018) provided data on the diagnostic accuracy of patient history findings for the diagnosis of spinal infection (see Appendix B - Table S19). According to one primary study conducted in a secondary care setting (Premkumar et al., 2018), a recent history of infection represented the most valuable red flag to detect spinal infection in patients presenting with LBP (LR+ 9.31 CI 95% 6.63, 13.07). When considered in isolation, the presence of night sweats and chills did not significantly increase the post-test probability of spinal infection, reflected by LR+ of less than 2. For the diagnosis of epidural abscess, Maselli et al. (Maselli et al., 2020) found a moderate-to-large LR+ for intravenous drug use (13.7 CI 95% [11.4, 16.5]), patient who was immunocompromised (5.1 CI 95% [3.2, 8.0]), indwelling vascular catheter (15.7 CI 95% [7.9, 31.0]) and other infection site (13.7 CI 95% [9.4, 19.8]).

Any serious pathologies

Two systematic reviews (Galliker et al., 2020; Maselli et al., 2020), including 2 primary studies (Shaw et al., 2020; Thiruganasambandamoorthy et al., 2014), investigated the diagnostic accuracy of patient history findings for the diagnosis of serious spinal pathology (see Appendix B - Table S20). Overall, Maselli et al. (Maselli et al., 2020) reported the diagnostic accuracy of 36 red flags, while Galliker et al. (Galliker et al., 2020) provided data on 84 red flags for 12 serious spinal pathologies based on 10 primary studies. Current anticoagulants use (LR+ 6.4 CI 95% [2.6, 15.7] – 7.0 CI 95% [1.9, 26.0]) and acute urinary retention (LR+ 2.0 CI 95% [0.6, 6.0] – 8.7 CI 95% [3.1, 24.4]) were identified as clinically informative for the diagnosis of serious spinal pathology in both

reviews. Other clinical findings did not significantly alter the post-test probability of serious spinal pathology when used in isolation.

Physical examination

Cauda equina syndrome

Three systematic reviews (Dionne et al., 2019; Maselli et al., 2020; Tabrah et al., 2022), including 7 primary studies (Angus et al., 2020; Balasubramanian et al., 2010; Domen et al., 2009; Gooding et al., 2013; Raison, Alwan, Abbot, Farook, & Khaleel, 2014; Rooney et al., 2009; Venkatesan, Nasto, Tsegaye, & Grevitt, 2019) provided data on the diagnostic accuracy of physical examination findings for the diagnosis of CES (see Appendix B - Table S21). All studies included adult patients presenting to secondary or tertiary care settings with acute CES, in which digital rectal examination (DRE) was the index test and lumbar MRI was the reference standard. Five studies provided data on the evaluation of anal tone that could be combined in meta-analysis. Tabrah et al. (Tabrah et al., 2022) found a very small pooled LR+ of 1.32 CI 95% (0.94, 1.66) and a high LR- ratio of 1.09 CI 95% (0.94, 1.26), both reflecting low diagnostic accuracy of DRE of anal tone in diagnosing CES. Based on four primary studies, Dionne et al. (Dionne et al., 2019) found a very small pooled LR+ of 1.73 CI 95% (0.98, 3.08) for the presence of saddle anesthesia when used in isolation. Likelihood ratios attributed to the examination of internal anal sensation, anal squeeze and anal reflexes were not presented, although these clinical tests showed generally higher specificity than sensitivity values, suggesting these would be more clinically useful to rule in CES (Maselli et al., 2020; Tabrah et al., 2022).

Spinal fracture

Three systematic reviews (Nicholas Henschke et al., 2008b; Maselli et al., 2020; Williams et al., 2013), including 11 primary studies (Enthoven et al., 2016; Gestring et al., 2002; Gibson & Zoltie, 1992; N. Henschke et al., 2009; Holmes et al., 2003; Hsu, Joseph, & Ellis, 2003; Patrick et al., 1983; Reinus et al., 1998; Roman et al., 2010; Scavone et al., 1981; Terregino, Ross, Lipinski, Foreman, & Hughes, 1995) investigated the diagnostic accuracy of physical examination findings for the diagnosis of spinal fracture (see Appendix B -Table S22). Most primary studies (8 out of 11) were conducted in secondary or tertiary care settings. Neither of the systematic reviews pooled data

statistically. Tenderness of the spine, the presence of neurological deficits and the presence of back bruising were the most common index tests investigated. All clinical tests showed very small-to-small LR+ when considered independently, LR+ ranging from 0.69 CI 95% (0.22, 2.17) to 3.32 CI 95% (0.22, 50.86). Only one study (Patrick et al., 1983) conducted in a tertiary care setting found that the presence of back bruising was superior to other tests, reporting large magnitude LR+ (31.09 CI 95% [18.25, 52.96]).

Malignancy

One systematic review (N. Henschke et al., 2013), including 3 primary studies (Deyo & Diehl, 1988; N. Henschke et al., 2009; Khoo et al., 2003) conducted in primary care investigated the diagnostic accuracy of physical examination findings for the diagnosis of spinal malignancy (see Appendix B -Table S23). The presence of neurological symptoms, fever (>100°F), muscle spasm and spinal tenderness were the index tests evaluated. When used in isolation, all these clinical tests showed poor sensitivity values, ranging from 0 to 0.15 CI 95% (0.02, 0.45), while the specificity ranged from 0.60 CI 95% (0.58, 0.62) to 0.97 CI 95% (0.95, 0.96). No further diagnostic accuracy data were provided.

Spinal infection

Two systematic reviews (Galliker et al., 2020; Maselli et al., 2020), including 2 primary studies (Davis et al., 2011; Premkumar et al., 2018) evaluated the diagnostic accuracy of physical examination findings for the diagnosis of spinal infection in patients with LBP presenting to the ED (see Appendix B - Table S24). Based on one retrospective study of medical files (Premkumar et al., 2018), having fever, if present alone, did not significantly alter the post-test probability of spinal infection, reflected by LR+ of 1.71 CI 95% (1.04, 2.81). Based on one primary study conducted in emergency department (ED), a moderate magnitude LR + (9.0 CI 95% [0.89, 1.01]) was found for a systolic blood pressure < 90 mmHg in diagnosing epidural abscess.

Any serious pathologies

Two systematic reviews (Galliker et al., 2020; Maselli et al., 2020), including 2 primary studies (Shaw et al., 2020; Thiruganasambandamoorthy et al., 2014) conducted in the ED, provided data on the diagnostic accuracy of physical examination findings for the diagnosis of serious spinal

pathology (see Appendix B - Table S25). Anal tone loss or faecal incontinence, spine tenderness, fever, saddle anesthesia, bladder/suprapubic fullness and sensory deficits were investigated. Of the six index tests, only anal tone loss (LR+ 6.3 CI 95% [1.9, 20.8]), saddle anesthesia (LR+ 7.0 CI 95% [1.4, 36.0] – 11 CI 95% [3.1, 39.6]) and bladder/suprapubic fullness (LR+ 40.2 CI 95% [1.6, 979.1]) significantly altered the post-test probability of serious spinal pathology. No clear association between each index test and the concomitant pathology was established.

Diagnostic support tools

Cauda equina syndrome

One systematic review (Maselli et al., 2020), including 2 primary studies (Premkumar et al., 2018; Raison et al., 2014) investigated the diagnostic accuracy of index tests' combinations in diagnosing CES (Appendix B- Table S26) The combination of [1] a recent loss of bladder control and [2] a recent loss of bowel control, with (LR+ 3.46) or without saddle anesthesia (LR+ 3 CI 95% [1.01, 8.92]) improved post-test probability of CES in patients presenting with LBP.

Spinal fracture

One systematic review (Maselli et al., 2020), including 4 primary studies (Enthoven et al., 2016; N. Henschke et al., 2009; Premkumar et al., 2018; Roman et al., 2010) provided data on the diagnostic accuracy of clinical support tools for the diagnostic of spinal fracture (Appendix B - Table S27). According to Premkumar et al. (Premkumar et al., 2018), diagnostic accuracy was increased by respectively, 13.1% and 20.5%, when combining [1] a history of recent trauma to [2] age > 50 years (LR+ 2.54 CI 95% [2.05, 3.16]) or age > 70 years (LR+ 4.35 CI 95% [2.92, 6.48]). Enthoven et al. (Enthoven et al., 2016) identified a diagnostic prediction model combining multiple index tests (i.e., osteoporosis, age $\geq$ 75 years, trauma, back pain intensity score $\geq$ 7/10 and thoracic pain). Small-to-moderate LR+ were attributed to the presence of 2 or more (3.6 CI 95% [2.8, 4.8]) and 3 or more positive features (5.8 CI 95% [3.2, 10.8]). Henschke et al. (N. Henschke et al., 2009) also investigated the combination of four clinical features (i.e., history of trauma, advanced age, prolonged use of corticosteroids and female gender) in detecting osteoporotic spinal fracture in patients presenting with LBP in a primary care setting. Post-test probability of spinal fracture increased up to 52% in presence of three or more positive signs (LR+

906.11 CI 95% [50.37, 16299.11]). Finally, Roman et al. (Roman et al., 2010) evaluated the combination of [1] age > 52 years; [2] absence of leg pain; [3] BMI ≤ 22; [4] does not exercise regularly; and [5] female gender. Four positive tests yielded to a moderate increase in the likelihood of spinal fracture (LR+ 9.6 CI 95% [3.7, 14.9]).

Malignancy

Two systematic reviews (N. Henschke et al., 2013; Maselli et al., 2020), including 2 primary studies (Deyo & Diehl, 1988; Premkumar et al., 2018) provided data on combinations of index tests for the diagnosis of spinal malignancy (Appendix B -Table S28). Premkumar et al. (Premkumar et al., 2018) evaluated the combination of [1] unexplained weight loss; and [2] history of spinal malignancy, which increased the probability of a spinal malignancy up to 14.3% (LR+ 10.25 CI 95% [3.6, 29.21]). Deyo et al. (Deyo & Diehl, 1988) also discussed the diagnostic accuracy of a combination of index tests (i.e., age greater than 50 years, history of malignancy, unexplained weight loss and failure to improve with conservative therapy), reporting a sensitivity of 100% when all 4 index tests were positive. No further data on this combination of tests were provided.

Spinal infection

Two systematic reviews (Galliker et al., 2020; Maselli et al., 2020), including 3 primary studies (Davis et al., 2011; Davis et al., 2004; Premkumar et al., 2018) investigated the diagnostic accuracy of clinical support tools for the diagnosis of spinal infection (Appendix B -Table S29). Premkumar et al. (Premkumar et al., 2018) found that combination of [1] fever; [2] chills or sweating, associated with [3] a recent infection, increased the post-test probability of spinal infection up to 13.8% (LR+ 13.15 CI 95% [6.66, 25.97]). Two primary studies (Davis et al., 2011; Davis et al., 2004) evaluated the diagnostic accuracy of the combination of [1] fever ≥ 38°C; [2] spinal pain; and [3] neurological deficits in detecting spinal infection in patients with LBP presenting to the ED. Also known as the “classic triad”, this combination yielded to a moderate increase in the likelihood of spinal infection (LR+ 5.7 CI 95% [1.4, 23.2] – 10.0).

Inflammatory back pain

One systematic review (Haskins et al., 2015), including 4 primary studies (Braun, Saracbasi, Grifka, Schnitker, & Braun, 2011; Chan, Inrig, Molloy, Stone, & Derzko-Dzulynsky, 2012; Rudwaleit,

Metter, Listing, Sieper, & Braun, 2006; Sieper et al., 2009) investigated the diagnostic accuracy of clinical support tools for the diagnosis of IBP (Appendix B -Table S30). Three studies (Chan et al., 2012; Rudwaleit et al., 2006; Sieper et al., 2009) provided evidence on the diagnostic value of the Berlin criteria (i.e., morning stiffness, improvement in back pain with exercise but not with rest, awakening because of pain in the second half on the night, and alternating buttock pain) for the diagnosis of IBP. Positive likelihood ratios for the cutoff point of 2 or more predictors being present ranged from 2.8 CI 95% (1.2, 6.3) to 3.8 CI 95% (2.8, 5.0), indicating this prediction rule may have a small influence on the likelihood of IBP. Two studies (Braun et al., 2011; Sieper et al., 2009) investigated the diagnosis performance of a 5-item prediction rule for identifying patients with IBP. Using a cutoff point of 4 or more predictors being present, this prediction rule was identified to be more sensitive and less specific than the Berlin criteria, but presented similar positive likelihood ratios, ranging from 2.9 to 3.4. None of these studies were conducted in primary care settings and all used expert rheumatologists' opinions as a reference standard.

Discussion

Most clinical practice guidelines recommend diagnostic triage to classify patients into one of three categories of LBP (i.e., non-specific LBP, radicular syndrome and specific LBP). Diagnostic recommendations also emphasize that triaging of patients should be achieved by performing a focused history taking that enables the identification of patients with specific conditions as the underlying cause of LBP, and a physical examination that assesses the presence of neurological signs. Aside from these recommendations, few guidance is provided as to which clinical features are of appropriate diagnostic value and therefore should be questioned or assessed when triaging LBP patients. As the burden of disabling LBP continues to grow, actions are needed to develop evidence-based and standardized evaluation procedures that will promote diagnostic accuracy, and therefore the appropriate use of health resources. This can only be achieved with a clear understanding of the relevant clinical features that should be used in clinical practice.

To this end, our scoping review aimed to summarize evidence investigating the diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of LBP and

to clarify to what extent patient history and physical examination findings can inform clinical decisions.

Most of the eligible systematic reviews provided data obtained from various healthcare settings (i.e., primary, secondary, and tertiary) but did not specifically examine the impact of the clinical context on diagnostic test performance. Diagnostic accuracy data were predominantly derived from secondary and tertiary care settings, with only 16 individual studies having been conducted exclusively in primary care. Of these, 15 studies focused on the diagnostic value of potential indicators of underlying spinal pathology (i.e., CES, spinal fracture, malignancy, infection and spondyloarthritis). Although it is crucial to ensure that these conditions are not overlooked, their prevalence is quite low in primary care. Interestingly, 62.5% of these studies were published before 2010, most of which presenting heterogenous findings, highlighting the need for further research that investigate the diagnostic value of each component of patient evaluation. Due to clinical heterogeneity, only 6 (22.2%) systematic reviews performed a meta-analysis. Therefore, diagnostic value of demographic, patient history and physical examination findings in identifying patients with LSS, radicular syndrome, non-specific LBP, and specific LBP were descriptively reported in the original reviews.

The following sections outlines the patient evaluation components that have demonstrated appropriate diagnostic value, and that could be potentially useful for the diagnostic triage of patients with LBP.

Demographics

Twenty-two primary studies investigated the diagnostic value of demographic variables, including age, gender, BMI, job type, smoking status, living situation, and education level for the diagnosis of patients with LBP. Overall, only age and BMI appeared clinically informative as stand-alone findings. Older age at different cutoffs (i.e., > 65 years, > 70 years, and >75 years) consistently increased the likelihood of LSS and spinal fracture. One secondary care study identified “BMI < 22” as a valuable clinical finding for the diagnosis of osteoporotic spinal fracture. When combined with other clinical findings, female gender and “age > 50 years” were also identified as clinically informative for the diagnosis of spinal fracture and spinal malignancy, respectively. As such, age,

BMI and gender should be considered as potentially valuable demographic variables for the diagnostic triage of patients with LBP.

Patient history

Twenty-two primary studies provided data on the diagnostic accuracy of patient history findings for the diagnosis of LBP. Most studies (17 of 22) investigated the diagnostic value of clinical findings used to diagnose LSS or specific LBP. Bilateral lower extremity symptoms and "leg pain worse than back pain" significantly increased the likelihood of LSS when used in isolation. Pain relief upon sitting, improvement of symptoms with lumbar flexion, and pain exacerbation while standing up or walking showed inconsistent diagnostic accuracy as stand-alone findings but appeared to increase the likelihood of LSS when used in combination. For the diagnosis of specific LBP, bladder/bowel/saddle dysfunction, a previous history of trauma, prolonged corticosteroid use, a recent infection, and immunosuppression were identified as clinically informative when used in isolation. Dermatomal distribution of pain was the only index test identified as clinically informative in at least 2 primary studies for the diagnosis of radicular syndrome. All other index tests investigated yielded imprecise or poor diagnostic accuracy data. Overall, dominant site of pain (back or leg), pain distribution (dermatomal or non-dermatomal; unilateral or bilateral), aggravating or relieving factors and indicators of underlying spinal pathology should all be questioned when triaging patients with LBP.

Physical examination

One hundred primary studies investigated the diagnostic accuracy of physical examination findings for the diagnosis of LBP. Inconsistent evidence supports the use of neurological examination components (i.e., sensory deficits, motor deficits, impaired reflexes) as stand-alone findings for the diagnosis of LSS and radicular syndrome. There is promising, yet imprecise evidence supporting the use of the treadmill walking test (i.e., neurological changes induced by level walking) and of lumbar ranges of motion (i.e., symptoms induced by having patient bend backward) in identifying patients with LSS. Neurodynamic tests (i.e., Slump test and SLR) exhibited variable diagnostic value in diagnosing patients with radicular syndrome in secondary and tertiary care settings and were identified as not clinically informative in primary care populations. Based

on the current literature, there is insufficient evidence to recommend the use of other physical examination findings in isolation when triaging patients with LBP.

Clinical support tools

After reviewing several studies that investigated the diagnostic performance of clinical support tools for the diagnosis of LBP, our analysis revealed that some clinical elements, deemed uninformative when used alone, should still be considered when evaluating patients with LBP. For the diagnosis of non-specific LBP, the presence of three or more positive provocation tests (i.e., distraction, compression, thigh thrust, sacral thrust and Gaenslen's test) appears potentially useful to diagnose LBP originating from the SIJ. For the diagnosis of spinal malignancy, a previous history of malignancy, unexplained weight loss, and failure to improve with conservative care should be questioned, as well as the presence of fever, spinal pain, and neurological deficits for the diagnosis of spinal fracture. Finally, the presence of morning stiffness, improvement in back pain with exercise but not rest, awakening because of pain in the second half of the night, and alternating buttock pain were identified as clinically informative when used in combination for the diagnosis of IBP.

Factors affecting interpretation

Interpretation of our review findings may be influenced by several factors. First, most primary studies were conducted in secondary or tertiary care settings, predominantly including surgical populations. These studies generally selected patients based on a specific set of positive clinical and imaging findings, which may not be representative of patients presenting in primary settings. This could result in an overestimation of diagnostic performance. Our review also highlighted that despite a substantial increase in available evidence on patient evaluation components used for the diagnosis of LBP in the past 20 years, several index tests have been investigated by a small number of studies, still lack adequate evidence, and demonstrate imprecise diagnostic accuracy values. Moreover, many clinical features endorsed by clinical practice guidelines were not investigated in primary care settings. For instance, guidelines from 7 different countries recommend using "disturbance of urinary and bowel sphincters", and "saddle anesthesia" for the diagnosis of CES (Verhagen, Downie, Popal, Maher, & Koes, 2016). However, only one primary

care study investigated these characteristics and found that they resulted into only a small increase in the posttest probability of CES (Raison et al., 2014).

Additionally, it is important to note that most studies poorly described index tests' procedures and did not provide cutoff values for positivity. Further, most studies provided diagnostic accuracy values for index tests used in isolation, rather than in combination with other clinical findings. This limits the applicability of the study results in clinical practice as patient evaluation components are usually considered in combination to estimate the likelihood of a condition. To address these limitations, Finucane et al. (Finucane et al., 2020), proposed an international framework that is intended to assist healthcare providers in identifying patients with underlying spinal conditions who may require further investigation or referral to a medical specialist. The authors emphasized the importance of not just considering the presence or absence of red flags when deciding whether to refer a patient or not, but also the clinical setting in which a patient presents, the quality of evidence supporting the use of each clinical finding, and the potential impact on patient outcomes.

Limitations and Future Research Directions

Our scoping review has some limitations. Despite conducting robust systematic searches in multiple relevant databases, studies not published in English or French (authors' native language) were excluded, which may have resulted in relevant studies being missed. However, it has been reported that excluding non-English publications from evidence-syntheses does not lead to bias as it would have a minimal effect on overall conclusions (Morrison et al., 2012; Nussbaumer-Streit et al., 2020). It is important to note that the existing literature is considerably limited in providing recommendations for the assessment of LBP patients with more complex clinical profiles, for example, those presenting characteristics that may fall into more than one category of LBP. Therefore, our review findings may not be fully applicable to this subgroup of patients. The results of this scoping review must also be interpreted with caution as a comprehensive evaluation of systematic reviews' quality was not conducted.

Conclusions

This review provides a summary of the current evidence investigating the diagnostic value of patient evaluation components applicable in primary care settings for the diagnosis of LBP. Overall, most demographic, patient history and physical examination findings used for the diagnosis of LBP lack diagnostic accuracy when considered in isolation. Based on the available evidence, demographics (i.e., age, gender, and BMI), primary site of pain, pain distribution, aggravating and relieving factors, and indicators of underlying spinal pathology should all be questioned when triaging patients with LBP. A standardized physical examination should at least include a thorough neurological examination, combining the assessment of sensory, motor, and reflex deficits. Although several diagnostic studies have been published in recent years, our review highlights the need for evidence-based and standardized evaluation procedures, especially for primary care settings where evidence is still scarce. This is of high importance to promote the appropriate use of healthcare resources and to enable LBP patients to get a timely access to appropriate healthcare providers.

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Chapitre 4 – Article II: Appropriateness of Specialized Care Referrals for LBP: A Cross-Sectional Analysis

Ce chapitre inclut le deuxième article de cette thèse qui a été publié dans la revue *Frontiers in Medicine* en 2024.

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Résumé

Contexte : La lombalgie représente une part importante des consultations en soins primaires. Malgré le développement de guides de bonnes pratiques fondés sur les plus récentes données probantes, des études soulignent l'utilisation inefficace des ressources de santé, dont le recours inopportun à l'expertise de médecins spécialistes pour le traitement des lombalgies. Au Québec, des listes d'attente centralisées ont été mises en place pour améliorer l'accès aux soins spécialisés, assignant les patients à des prestataires de soins en fonction de leur priorité médicale. À ce jour, aucune étude n'a fourni de données objectives sur les profils cliniques des patients et les motifs de référencement vers des spécialistes médicaux pour une lombalgie dans le contexte d'un système de santé public opérant une liste d'attente centralisée.

Objectif : L'objectif de cette étude était d'évaluer la pertinence des références effectuées vers des soins spécialisés de neurochirurgie pour une lombalgie, après la mise en place d'une stratégie d'accès priorisé aux services spécialisés.

Méthodes: Une analyse transversale de 500 dossiers médicaux sélectionnés aléatoirement parmi les patients ayant consulté à la clinique externe de neurochirurgie de la région administrative de la Mauricie-et-Centre-du-Québec entre le 1er septembre 2018 et le 1er septembre 2021 a été réalisée. Les dossiers médicaux éligibles devaient correspondre à la consultation initiale en neurochirurgie d'un adulte (≥18 ans) souffrant de lombalgie, avec ou sans douleur à la jambe. Les données pertinentes permettant de décrire les profils cliniques des patients référés au service de neurochirurgie et d'évaluer la pertinence des références effectuées ont été extraites manuellement et analysées par deux réviseurs indépendants.

Résultats : Sur les 500 dossiers analysés, seuls 112 (22,4 %) patients référés étaient des candidats à la chirurgie, tandis que 221 (44,2 %) ont obtenu leur congé du service de neurochirurgie à l'issue de l'évaluation initiale. L'absence d'informations cliniques clés documentées dans les dossiers médicaux n'ont pu permettre d'établir un portrait complet des patients référés au service de neurochirurgie pour une lombalgie. Néanmoins, plus de 80,0 % des références effectuées pendant la période à l'étude ont été considérées inappropriées. Les références inappropriées étaient caractérisées par une proportion plus élevée de patients présentant une amélioration

notable de leurs symptômes, souffrant d'une douleur dominante à la région lombaire plutôt qu'à la jambe, ne présentant aucun symptôme neurologique objectif et ayant été diagnostiqués d'une lombalgie non spécifique.

Conclusion : Cette étude révèle une proportion significative de références inappropriées effectuées vers des soins spécialisés pour une lombalgie, et ce, malgré l'existence d'une liste d'attente centralisée. Des recherches supplémentaires sont nécessaires pour mieux comprendre les facteurs qui justifient le référencement à des spécialistes médicaux pour une lombalgie, ainsi que les critères pris en compte par les neurochirurgiens lors de la sélection de la stratégie de prise en charge appropriée. Des études récentes suggèrent que des approches de triage des patients menées par des experts en santé musculosquelettique sont susceptibles d'améliorer la pertinence des références effectuées vers les soins spécialisés.

Mots clés : lombalgie, pertinence des références, services spécialisés, temps d'attente, étude transversale

Abstract

Background: Low back pain (LBP) accounts for a significant proportion of primary care visits. Despite the development of evidence-based guidelines, studies point to the inefficient use of healthcare resources, resulting in over 60.0% of patients with LBP being referred to spine surgeons without any surgical indication. Centralized waiting lists (CWLs) have been implemented to improve access to specialized care by managing asymmetry between supply and demands. To date, no study has provided data on patients' clinical profiles and referral patterns to medical specialists for LBP in the context of a publicly funded healthcare system operating a prioritization model. The objective of this study was to evaluate the appropriateness of specialized care referrals for LBP after the implementation of a CWL.

Methods: A retrospective cross-sectional analysis of 500 randomly selected electronic health records of patients who attended the outpatient neurosurgery clinic of the administrative Mauricie-et-Centre-du-Québec region was performed. Inclusion criteria were neurosurgery consultation referrals for adults $\geq$ 18 years suffering from a primary complaint of LBP, and performed between September 1st, 2018, and September 1st, 2021. Data relevant for drawing a comprehensive portrait of patients referred to the neurosurgery service and for judging referrals appropriateness were manually extracted.

Results: Of the 500 cases analyzed, only 112 (22.4%) were surgical candidates, while 221 (44.2%) were discharge from the neurosurgery service upon initial assessment. Key information was inconsistently documented in medical files, thus preventing the establishment of a comprehensive portrait of patients referred to the neurosurgery service for LBP. Nevertheless, over 80.0% of referrals made during the study period were deemed inappropriate. Inappropriate referrals were characterized by higher proportion of patients symptomatically improved, presenting a back-dominant chief complaint, exhibiting no objective neurological symptoms, and diagnosed with non-specific LBP.

Conclusion: This study reveals a significant proportion of inappropriate referrals to specialized care for LBP. Further research is needed to better understand the factors that prompt referrals to medical specialists for LBP, and the criteria considered by neurosurgeons when selecting the

appropriate management strategy. Recent studies suggest that triaging approaches led by musculoskeletal experts may improve referral appropriateness to specialized care.

Keywords: low back pain, referral appropriateness, specialized services, wait time, cross-sectional study

Introduction

Canada's publicly funded health care system is organized around a 3-level of care delivery model, providing access to a broad range of health services (Gouvernement du Canada, 2019). Primary health care serves a dual function, being the first point of contact with health care services, while ensuring continuity of care and coordination with secondary and tertiary care providers when specialized services are needed (Gouvernement du Canada, 2019). Access to specialized care poses a challenge, as it relies on highly qualified personnel and equipment that may not be readily available, particularly in remote areas, and in underserved communities (Gouvernement du Canada, 2023).

In 2016, Quebec's Ministry of Health and Social Services (MSSS) launched the Prioritized Access to Specialized Services (PASS) program (Gouvernement du Québec, 2022), characterized by a set of strategies designed to improve access to specialized care by managing asymmetry between supply and demands (Breton et al., 2020). Among those strategies, centralized waiting lists (CWLs) have been implemented and consolidate multiple service providers' and organizations' waiting lists into a single waiting list for a given specialized service. A CWL operates under a prioritization model, where patients are placed into a queue, through a central intake point, and assigned to medical providers according to their level of need (Breton et al., 2020). The Service Request Management Center (Centre de répartition des demandes de services-CRDS) falls into CWLs' definition, managing all new referrals sent from primary health care providers to specialized services. The province of Quebec counts 15 CRDSs, distributed across its territory (Gouvernement du Québec, 2022). Although promising, the latest MSSS report for the year 2021-2022 indicated that 33.0 % of specialist consultations, after referral from a family physician, were not carried out within the expected delay (Gouvernement du Québec, 2019). As the public health care system struggles with limited health care resources, this reinforces the importance of the quality of referrals (i.e., referring the right patient, at the right time, to the right service, with the right information) (Imison & Naylor, 2010) in enabling patients to get a timely access to medical specialists.

As the leading cause of years lived with disability worldwide (GBD Study, 2018), low back pain (LBP) accounts for a significant proportion of outpatient physician visits (Rampersaud et al., 2020), and for a significant share of Canada's health care spending (Wong, Côté, Tricco, Watson, & Rosella, 2021). Although several evidence-based clinical guidelines have been published over the years to assist primary care providers with the prevention, evaluation and management of LBP, preventing the use of practices that are harmful or wasteful, while ensuring equitable access to effective and affordable health care for patients with LBP remains a national challenge (Buchbinder et al., 2018). In most healthcare systems from developed countries, general practitioners are the primary contacts responsible for referring patients with MSK conditions to secondary and tertiary care services, and sometimes to other healthcare professionals (Bury & Stokes, 2013). However, evidence suggests that usual care for patients with LBP often does not match care endorsed in evidence-based guidelines, leading to overuse of imaging and opioids prescriptions at the expense of self-management strategies and patient education (Bishop & Wing, 2003; Kamper et al., 2020; Williams et al., 2010). Several studies (Coyle, O'Neil, & Johnson, 2008; Fourney, 2010; Kindrachuk & Fourney, 2014; Mayman & Yen, 1999; Wilgenbusch, Wu, & Fourney, 2014) also suggest an overreliance on the expertise of medical specialists, indicating that between 62.0% to 85.0% of patients referred to spine surgeons for LBP are not surgical candidates, thus delaying access for patients in need of surgical consultation.

In Mauricie-et-Centre-du-Québec, a CRDS has been implemented in 2018 to manage demands for specialized services within the area served by the Centre intégré universitaire de soins de santé et de services sociaux de la Mauricie-et-du-Centre-du Québec (CIUSSS-MCQ). This CRDS is the only CWL within the province of Quebec to manage all referrals from primary care to specialized services, irrespective of referrals source. The CIUSSS-MCQ's neurosurgery department also distinguishes itself by managing all surgical consultations for LBP, except for traumas, whereas patients with LBP are distributed between specialists in other institutions. Such particularities offer a unique opportunity to capture relevant information regarding patients referred to specialized care services for LBP. To date, no study has yielded objective data that provide a clear understanding of patients' clinical profiles and referral patterns to specialized care for LBP following the implementation of a CWL. These data could prove to be an invaluable asset in the

development of strategies aimed at improving patients' care trajectories, while promoting optimal use of health care resources and timely access to medical specialists.

Therefore, our objective was to determine the appropriateness of referrals made to the CIUSSS-MCQ's neurosurgery service for LBP. This objective was broken down into 3 specific objectives: [1] quantify and describe patients referred for an initial consultation to the neurosurgery department for a primary complaint of LBP; [2] determine the proportion of referrals made to the neurosurgery department for a primary complaint of LBP that is deemed inappropriate; and [3] identify the characteristics that differentiate inappropriate from appropriate referrals.

Methods

The reporting of this study followed the REporting of studies Conducted using Observational Routinely collected Data (RECORD) checklist (Benchimol et al., 2015).

Ethics approval

The Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec (CER-2022-600-838) and the Université du Québec à Trois-Rivières (CER-22-288-10.04) Research Ethics Boards have reviewed and approved this study.

Study design and setting

A retrospective cross-sectional analysis of medical files data was performed, using electronic health records of patients who attended for the first time the CIUSSS-MCQ's outpatient neurosurgery clinic for a primary complaint of LBP between September 1st, 2018 (CRDS implementation date), and September 1st, 2021. The CIUSSS-MCQ was created following the fusion of regional public health and social establishments, including hospitals, community services and long-term facilities, and serves a population of more than 530,000 people, including 82.5% over the age of 18 (Centre intégré universitaire de soins de santé et de services sociaux de La Mauricie et le Centre-du-Québec, 2023). During the study period, the neurosurgery department was staffed by 5 neurosurgeons. CRDS's referral form for neurosurgery services (see Appendix C) assigns each patient a clinical priority code from A to E based on their clinical profile. Each priority code is associated with a specific delay to be observed between the referral being sent and the

neurosurgery consultation (i.e., code A: ≤ 3 days, code B: ≤ 10 days, code C: ≤ 28 days, code D: ≤ 3 months, and code E: ≤ 12 months). As a prerequisite for the neurosurgery service, patients with LBP must also provide an imaging report dated less than 3 months prior to their surgical consultation.

Study population and patient selection

An administrative agent proceeded to the identification of potentially eligible medical files by searching the CRDS database based on listed reasons for referral. Inclusion criteria for eligible chart review included: [1] a documented reference to the CIUSSS-MCQ neurosurgery outpatient clinic; [2] a primary chief complaint that prompted consultation consistent with LBP; [3] an initial consult that took place between September 1st, 2018, and September 1st, 2021; and [4] included a patient that was 18 years or older at the time of the initial consult. Exclusion criteria were charts documenting follow-up visits only, and a primary chief complaint of unspecified spinal pain region. Two independent reviewers screened all potentially eligible medical files to confirm eligibility. A third reviewer was involved if consensus could not be reached. From the medical records meeting the inclusion criteria, a random selection of 500 files was made using block stratification to ensure representativeness of time periods (years), sexes and ages in the planned analyses. Those medical records were then subjected to data extraction. The sample size was based on existing literature which generally holds 10 charts per variable as an accepted norm to obtain results that are likely to be clinically useful (Clinical epidemiology: a basic science for clinical medicine, 1985).

Data collection

The medical record of each randomly selected patient was reviewed, and data were extracted from the neurosurgery outpatient consult request form, and from the consultation note. If more than one neurosurgery consult request form and consultation note were present in the medical, only data related to the initial consultation were extracted. Data collection was performed using a standardized form with pre-set drop-down fields and free-texts boxes. Five patients meeting inclusion criteria were randomly selected and subsequently contacted by the neurosurgeon research team member (C.É.C) to obtain their consent for their records to be analyzed. This

exploratory analysis has allowed to refine the form and confirm the data sets to be extracted. Four medical students were recruited and trained for data extraction. They were advised to extract only information related to the current episode of LBP. Accordingly, dates of clinical examinations performed were retrieved to ensure that they were related to the current episode. Whenever possible, the medical residents were asked to transcribe textually the written referral form and consultation note to avoid any interpretation of the data.

Data coding and outcomes

Table 8 presents the types and definitions of variables that were extracted to allow the drawing of a comprehensive portrait of patients being referred to the neurosurgery outpatient clinic. The extracted data were coded by four research assistants, using a codebook to ensure consistency. A training exercise was conducted with 15 medical files. Random verifications were subsequently performed by the main author (J.M.) throughout the extraction process to ensure reliability of the extracted data. To minimize subjectivity in codification in relation to personal theories about the study's aims, data extractors were kept blinded to the study hypothesis (Gearing, Mian, Barber, & Ickowicz, 2006; Worster & Haines, 2004). When necessary, the neurosurgeon research team member (C.É.C) was consulted to provide information on standards of practice, and to clarify some medical terms and abbreviations. The Material and Social Deprivation Index (MSDI) was used as a proxy for lacking information on patients' socioeconomic status in the CRDS database. The MSDI allows for a comprehensive assessment of social inequalities (Institut national de santé publique du Québec, 2019), by connecting area-based socioeconomic data to postal codes. The MSDI was carefully chosen due to its well-established associations with health status and deprivation, encompassing both material and social dimensions (Pampalon, Hamel, & Raymond, 2004). The material dimension involves deprivation of the goods and conveniences that are part of modern life and marks the consequences of lack of material resources associated to low education, insecure job situation, and insufficient income. The social component refers to the composition and fragility of the social network (Hamel, 2011; Pampalon et al., 2004). For both dimensions, areas were ranked in quintiles, with quintile 1 being the most privileged and quintile 5 the most disadvantaged (Institut national de santé publique du Québec, 2019)

Table 8. Variables and outcomes

Category	Extracted variable	Outcome
Sociodemographic data	**1**. Date of birth	**1.1** Age
	2. Biological sex	**2.1** Male or Female
	3. City of residence, postal code, administrative region	**3.1** Material and Social Deprivation Index
Administrative data	**4.** Involvement of workers' compensation board (CNESST)	**4.1** Yes or No
	5. Involvement of public automobile compensation board (SAAQ)	**5.1** Yes or No
	6. Date of referral Date of consult Priority code	**6.1** Delay to neurosurgery consult **6.2** Pre-pandemic or pandemic period **6.3** A-B-C-D-E **6.4** Compliance with the priority code
	7. Referring clinicians	**7.1** Primary care referral, medical specialist, emergency unit
Clinical data	**8.** Medical history	**8.1** Type and number of comorbidities **8.2** Pain medication **8.3** History of spinal surgery **8.4** Smoking status
	9. Presence of red flags	**9.1** i.e., bladder and bowel dysfunction, saddle anesthesia, fever, chills, history of trauma

	10. Pain localization and dominance	**10.1** Back, leg(s) or both
	11. Pain status	**11.1** Intermittent, constant
	12. Pain duration	**12.1** Acute (< 4 w), Subacute (4-12w) or chronic (> 12 w)
	13. Symptoms progression	**13.1** Stable, aggravation, improvement
	14. Presence of neurological deficits	**14.1** Sensory, motor, reflex deficits **14.2** Presence of pathological reflexes (i.e., clonus, Babinski sign)
	15. Diagnosis from the neurosurgeons	**15.1** Type of LBP (i.e., non-specific LBP, radicular syndrome, specific LBP)
Care trajectories data	**16**. Use of advance imaging and diagnostic testing for LBP prior to the neurosurgery consult	**16.1** Type of diagnostic test
	17. Use of conservative care prior to the neurosurgery consult	**17.1** Type of health professional seen
Consultation outcomes	**18.**Recommended management strategy	**18.1** Proportion of discharges from the neurosurgery service **18.2** Recommendations upon discharge **18.3** Proportion of referrals made to another service **18.4** FUP interventions **18.5** Surgical indication

FUP: Follow-up; LBP: Low back pain; w: weeks

Data analysis

The Shapiro-Wilk normality test was performed for all continuous variables to determine data distribution. Patient characteristics, care trajectories and consultation outcomes were summarized using frequency distributions for categorical variables, and means, medians and standard deviations for continuous variables. For between groups comparisons (i.e., appropriate vs inappropriate referrals; pre-pandemic vs pandemic period), Mann-Whitney test and independent Student t test were used for continuous variables and the chi-square test with pairwise Z-tests were used for categorical variables. After comparing the characteristics of appropriate and inappropriate referrals, variables that differed significantly between groups were introduced in the binomial logistic regression model using the enter method (i.e., all variables were entered in the model in a single step) to determine whether they predicted the appropriateness of referrals made to the neurosurgery service. Odds ratios (OR) and 95% confidence intervals (95% CI) were calculated and reported for each included variable. Variables that were missing in more than 20.0% of our sample were not included in logistic regression analyses. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 18.0.0 (Armonk, NY: IBM Corp.) and considered p values < 0.05 statistically significant.

Results

Availability of the data

A total of 2965 medical records met the inclusion criteria, of which 500 were randomly selected. Following a preliminary analysis of our random sample, 118 files had to be replaced by a random selection, since at least one of the three components used to judge the appropriateness of referrals lacked information. Socio-demographic data were available in 100% of selected files. For the MSDI, 10.0% of patients had zip codes for which no corresponding deprivation index value was available. As for administrative data, the clinical priority code was not documented for 16.6% of patients. Several data pertaining to patients' clinical profiles were missing. Pain dominance and pain status were reported for 31.6% and 9.0% of the study sample, respectively, while back or leg pain intensity was only reported for 2.0 % of cases. The presence or absence of red flags were not documented for 45.6% of patients. For 13.6% of the sample, none of the neurological examination

components were described. The progression of symptoms and patients' medical history were not documented in 45.8% and 41.6%, respectively. While diagnostic tests performed prior to the neurosurgery consultation were reported for almost all patients, conservative treatments received were not documented for 38.2% of the sample.

Specific objective 1

The following sections outline the characteristics documented in medical files of patients referred to the CIUSSS-MCQ's neurosurgery service for a primary complaint of LBP. Proportions for each characteristic have been computed based on the total number of selected files (N=500). The percentage of missing values for each variable is detailed in corresponding Tables 9-12

Sociodemographic data

Table 9 presents the sociodemographic characteristics of the 500 patients included in the study. The mean age was 60.06 ± 15.28 years at the time of the initial neurosurgery consultation, and 52.4% of patients were male. More than half (55.8%) of patients were living in the administrative region of Mauricie, and 30.8% in the Centre-du-Québec, while 13.4% of patients originated from regions beyond the territory served by the CIUSSS-MCQ. More than half of our study sample (52.6%) was classified in the 4th and 5th quintiles for material deprivation (i.e., most disadvantaged categories), while 8.6% of patients fell into the first quintile (i.e., most privileged category) for this component. As for social deprivation, 31.8% of patients were ranked in the 4th and 5th quintiles, while only 14.6% fell into the most privileged category.

Table 9. Sociodemographic characteristics

Characteristics	N (%) or mean ± SD	Missing value, n (%)
Age (years)	60.06 ± 15.28	-
Biological sex		
Male	262 (52.4)	-
Female	238 (47.6)	

Administrative region		
Mauricie	279 (55.8)	-
Centre-du-Québec	154 (30.8)	
Lanaudière	44 (8.8)	
Other	23 (4.6)	
Material Deprivation Index		
5	141 (28.2)	50 (10.0)
4	122 (24.4)	
3	91 (18.2)	
2	53 (10.6)	
1	43 (8.6)	
Social Deprivation Index		
5	97 (19.4)	50 (10.0)
4	62 (12.4)	
3	98 (19.6)	
2	120 (24.0)	
1	73 (14.6)	

SD: Standard deviation

Administrative data

Administrative data extracted from patients' medical records are presented in Table 10. In the study sample, 61.2% of initial consultation took place before the COVID-19 pandemic outbreak in Canada. A 63.4% decrease in neurosurgery referrals for LBP was observed between the pre-pandemic and the pandemic period. Most of the neurosurgery outpatient consultation requests came from primary care physicians (88.4%), followed by medical specialists such as orthopedists (3.6%), physiatrists (2.6%), and neurologists (1.0%). The clinical priority code "D" (i.e., ≤ 3 months) was attributed to over half (56.8%) of referred patients, while the priority code "E" (i.e., ≤ 12 months) was attributed to 14.2% of the sample, and "C" (i.e., ≤ 28 days) to 9.4%. Slightly more than a quarter (25.6%) of reviewed consultations were not carried out within the timeframe

prescribed by the priority code. The percentage of consultations that failed to take place within the recommended timeframe was significantly higher during the pandemic period (35.1%) than during the pre-pandemic period (19.6%). Only 7.6% of patients were entitled to compensation from the Commission des normes, de l'équité, de la santé et de la sécurité au travail (workers' compensation board) and the Société de l'assurance automobile du Québec (public automobile compensation board) in relation to their LBP.

Table 10. Administrative data

Characteristics	N (%)	Missing value, n (%)
Involvement of compensation boards		
CNESST (yes)	34 (6.8)	-
SAAQ (yes)	4 (0.8)	
Consultation period		
Pre-pandemic (< 2020-03-13)	306 (61.2)	-
Pandemic (≥ 2020-03-13)	194 (38.8)	
Delay to the neurosurgery consult (days)	Median: 50.50 IQR: 75.75	-
Priority code		
A (≤ 3 days)	5 (1.0)	83 (16.6)
B (≤ 10 days)	10 (2.0)	
C (≤ 28 days)	47 (9.4)	
D (≤ 3 months)	284 (56.8)	
E (≤ 12 months)	71 (14.2)	
Compliance with priority code		
Yes	289 (57.8)	83 (16.6)
No	128 (25.6)	
Referring clinicians		
General physician	442 (88.4)	-
Physiatrist	13 (2.6)	
Orthopedist	8 (3.6)	
Neurologist	5 (1.0)	
Other	32 (6.4)	

CNESST : Commission des normes de l'équité, de la santé et de la sécurité du travail; IQR : Interquartile range; SAAQ : Société de l'assurance automobile du Québec

Clinical profiles

Patients' clinical characteristics are detailed in Table 11. In 19.4% of medical records, patients suffered from dominant back pain, and 6.6% exhibited intermittent symptoms. Red flags were identified in 7.8% of patients. Most patients (84.6%) were experiencing chronic pain (> 12 weeks) at the time of their initial neurosurgery consultation, 28.8% had objective sensory deficits, 21.8% showed asymmetrically diminished tendon reflexes, and 18.4% had objective motor deficits. Over a quarter (25.8%) of patients presented to the neurosurgery service with deteriorating symptoms, with 21.6% of patients experiencing improvement in symptoms since the neurosurgery referral. A review of patients' medical history revealed that 17.4% had a previous history of lumbar surgery, 49.4% were using pain medication, and 11.8% were smokers. In 35.4 % of cases, patients were classified as multimorbid, presenting two or more comorbidities (Belche et al., 2015), the most frequent being cardiovascular diseases (31.0%), endocrine diseases (19.4%) and urogenital disorders (10.0%) As for neurosurgeons' diagnoses, 60.8% of patients were diagnosed with a radicular syndrome, which included pain patterns consistent with lumbar radiculopathy, lumbar spinal stenosis, and neurogenic claudication. The diagnosis of non-specific LBP was attributed to 35.8% of patients included in the analysis, with the remaining suffering from specific LBP (1.8%) or experiencing symptoms unrelated to a lumbar spine disorder (1.6%) (e.g., cervical myelopathy, peripheral joints disorders, vascular disorders).

Table 11. Clinical profiles

Characteristics	N (%) or mean ± SD	Missing value, n (%)
Presence of red flags		
Yes	39 (7.8)	228 (45.6)
No	233 (46.6)	
Neurological status		
Motor deficits	92 (18.4)	100 (20.0)
Sensory deficits	144 (28.8)	157 (31.4)
Reflexes deficits	109 (21.8)	215 (43.0)
Pathological reflexes	10 (2.0)	391 (78.2)
Pain location		
Back (yes)	403 (80.6)	78 (15.6)
Leg(s) (yes)	407 (81.4)	35 (7.0)
Pain dominance		
Back	97 (19.4)	342 (68.4)
Leg(s)	61 (12.2)	
Pain status		
Intermittent	33 (6.6)	455 (91.0)
Constant	12 (2.4)	
Pain intensity		
Back pain	7.0 ± 2.7	491 (98.2)
Leg(s) pain	5.4 ± 3.6	495 (99.0)
Pain duration		
Acute (< 4 weeks)	4 (0.8)	33 (6.6)
Subacute (4-12 weeks)	40 (8.0)	
Chronic (> 12 weeks)	423 (84.6)	

Progression of symptoms		
Stable	34 (6.8)	229 (45.8)
Aggravation	129 (25.8)	
Improvement	108 (21.6)	
Smoking status		
Smoker	59 (11.8)	353 (70.6)
Previous history of spinal surgery		
Yes	87 (17.4)	205 (41.0)
Usage of pain medication		
Yes	247 (49.4)	205 (41.0)
Comorbidities (number)		
0-1	115 (23.0)	208 (41.6)
Multimorbidity (≥2)	177 (35.4)	
Comorbidities (type)		
Cardiovascular (e.g., HTA)	155 (31.0)	208 (41.6)
Endocrine (e.g., DB, Hypo/Hyperthyroidism)	97 (19.4)	
Urogenital (e.g., renal failure)	50 (10.0)	
Pulmonary (e.g., COPD)	47 (9.4)	
Gastrointestinal (e.g., IBS)	46 (9.2)	
Other	145 (29.0)	
Neurosurgeons' diagnoses		
Non-specific LBP	179 (35.8)	-
Radicular syndrome	304 (60.8)	
Specific LBP	9 (1.8)	
Other causes	8 (1.6)	

COPD: Chronic obstructive pulmonary disease; DB: Diabetes; HTA: Hypertension; IBS: Irritable bowel syndrome

Care trajectories data

Detailed information regarding patients' care trajectories is provided in Table 12. Nearly all (97.0%) patients were referred for further diagnostic testing prior to their initial neurosurgery consultation, with MRI (77.4%) and CT-scan (32.6%), being the most frequently prescribed imaging procedures. Over half (56.4%) of patients received conservative treatments prior to the neurosurgery consultation, including 41.8% who received anesthetic injections, 25.6% who underwent physiotherapy treatments, and 3.4% who had seen a chiropractor.

Table 12. History of diagnostic testing and conservative treatment

Characteristics	N (%)	Missing value, n (%)
Diagnostic tests prior to the neurosurgery consult		
Yes	487 (97.4)	13 (2.6)
Diagnostic tests (type)		
MRI	387 (77.4)	13 (2.6)
CT-scan	163 (32.6)	
X-rays	45 (9.0)	
EMG	28 (5.6)	
Other	3 (0.6)	
Conservative care prior to the neurosurgery consult		
Yes	282 (56.4)	191 (38.2)
No	32 (6.4)	
Type of treatment		
Anesthetic injections	209 (41.8)	235 (47.0)
Physiotherapy	128 (25.6)	321 (64.2)
Chiropractic	17 (3.4)	483 (96.6)
Massage therapy	8 (1.6)	492 (98.4)
Occupational therapy	6 (1.2)	-

CT-scan: Tomodensitometry; EMG: Electromyography; MRI: Magnetic resonance imaging; X-rays: Radiographs

Consultation outcomes

Neurosurgery consultations' outcomes are provided in Table 13. Upon initial assessment, a clear or relative (i.e., potential surgical indication if symptoms persist or worsen after conservative treatment or for clinically stable patients with persistent disabilities) spinal surgery indication was documented in 22.4% of patients. Forty-four percent of patients were discharged from the neurosurgery service, including 18.4% for whom no recommendations were documented, 11.2% who were referred for anesthetic injections, 5.4% for conservative treatments, and 3.2% to another health care professional. For patients non-surgically managed by neurosurgeons (39.8%), 13.4% were also referred for anesthetic injections, 10.6% for advanced imaging, and 7.2% for a combination of conservative treatments, advanced imaging, and anesthetic injections.

Table 13. Outcomes of neurosurgery consultations

Characteristics	**N (%)**	**Missing value, n (%)**
Recommended management strategy		
A. Discharge from the neurosurgery service (total)	221 (44.2)	3 (0.6)
B. Non-surgically managed by neurosurgeons	199 (39.8)	-
C. Received a clear or relative surgical indication	112 (22.4)	25 (5.0)
A. Recommendations upon discharge (N=221)		
No recommendations	92 (18.4)	-
Anesthetic injections	56 (11.2)	-
Conservative care	27 (5.4)	-
Combination	33 (6.6)	-
Referral to another health professional	16 (3.2)	-
B. FUP interventions (N=199)		

Imaging referral with FUP	53 (10.6)	-
Referral for anesthetic injections with FUP	67 (13.4)	-
Referral for conservative care with FUP	13 (2.6)	-
Referral for treatment combination with FUP	36 (7.2)	-
Referral to another specialist with FUP	5 (1.0)	-
Wait and see	25 (5.0)	-
C. Surgical indication (N=112)		
Clear indication	62 (12.4)	25 (5.0)
Relative indication[a]	50 (10.0)	
Reluctant or refused to undergo surgery despite surgical indication	21(18.8)	-

FUP: Follow-up; LBP: Low back pain

[a]Relative surgical indication: Potential surgical indication if symptoms persist or worsen after conservative treatment or for clinically stable patients with persistent disabilities

Specific objective 2

Referral appropriateness

In 80.4% of cases, referrals made to the neurosurgery department for a primary complaint of LBP during the study period were deemed inappropriate. The proportion of inappropriate referrals was similar during the pandemic period when compared to the pre-pandemic period (p = 0.467). Table 14 details the number of cases that failed to meet the CRDS, clinical and care trajectories criteria for a neurosurgery consultation. Regarding the CRDS criteria, 6.2 % of patients presented to their initial neurosurgery consultation without the appropriate imaging (i.e., MRI or CT) or with imaging performed over 3 months prior to the consultation. For 9,7% of the study sample,

patients were deemed inappropriately referred as they exhibited symptoms of acute or subacute duration. From a clinical perspective, 43.0% of patients presented pain patterns consistent with non-specific LBP, and the absence of objective neurological symptoms was reported in 28.1% of cases. Stable or improving symptoms were documented in 32.6 % of patients. As for patients' care trajectories, the absence of a conservative care trial prior to the neurosurgery consultation was documented for 7.0% of patients.

Table 14. Referral appropriateness

Characteristics	N (%)	Missing value, n (%)
Appropriateness		
Inappropriate	402 (80.4)	2 (0.4)
Non-compliance with CRDS referral form criteria		
Absence of appropriate or up to date (< 3 months) imaging	25 (6.2)	13 (2.6)
Acute (< 4 weeks) or subacute (4-12 weeks) pain episode	39 (9.7)	33 (6.6)
Non-compliance with clinical criteria		
Pain pattern consistent with non-specific LBP	173 (43.0)	-
Stable or improving symptoms	131 (32.6)	229 (45.8)
Absence of objective neurological symptoms	113 (28.1)	68 (13.6)
Non-compliance with care trajectories criteria		
No conservative care trial prior to the neurosurgery referral	28 (7.0)	191 (38.2)
Conservative treatment options have not been exhausted when indicated	219 (56.2)	

LBP: Low back pain

Specific objective 3

Comparison of appropriate and inappropriate referrals

Socio-demographic profiles and the median delay to the neurosurgery consultation were comparable between inappropriately and appropriately referred patients ($p > 0.05$), except for the social deprivation index, for which a higher proportion of patients ranked in the most privileged quintile was found in the appropriate referrals group compared to the inappropriate referrals group (23.5% vs 14.5%). As for patients' clinical profiles, we found a significantly higher proportion of patients suffering from dominant back pain in the inappropriate referrals group (22.9%) compared to the appropriate referrals group (4.2%). Progression of symptoms differed significantly between groups as the inappropriate referrals group had significantly higher proportion of patients symptomatically improved (24.9% vs 8.4%), while the appropriate referrals group included a higher proportion of patients with deteriorating symptoms (33.7% vs 23.6%). Inappropriate referrals group presented significantly higher proportions of patients with no objective sensory deficits (42.5% vs 28.4%) and no objective motor deficits (64.7% vs 47.4%). A pain pattern consistent with non-specific LBP has been described in 43.0% of patients deemed inappropriately referred, while only 5.3% of patients diagnosed with non-specific LBP were deemed appropriately referred (i.e., patients for whom the predominant clinical profile was consistent with non-specific LBP but who presented intermittent neurological symptoms requiring follow-up). In regression analysis, only two variables could be investigated for inappropriate referencing since the other independent variables with a p value < 0.05 exceeded the pre-established 20.0% cut-off for missing values. The absence of motor deficits ($p < 0.001$; OR 2.91; 95% CI 1.62-5.2) and being ranked in the third quintile for social deprivation ($p < 0.039$; OR 2.75; 95% CI 1.05-7.18) both appeared as predictors of inappropriate referencing to the neurosurgery service for LBP. Results of regression analyses are detailed in Appendix D

Discussion

This study aimed to draw a comprehensive portrait of patients referred to specialized care for LBP, to evaluate the appropriateness of referrals, and to identify the characteristics that differentiated inappropriate from appropriate referrals.

The study sample comprised a random selection of 500 patients, with a mean age of 60 years old, reflecting the age-related increase in prevalence of degenerative lumbar conditions, which account for a significant proportion of cases deemed likely to require surgical consultation (Deyo, 2010). Our sample included similar proportions of males and females, although the overall mean prevalence of LBP is known to be higher among females than males across all age groups (Hoy et al., 2012). Referrals for LBP decreased significantly between the pre-pandemic and the pandemic period, which might suggest that patients were avoiding healthcare services unless they had critical symptoms (Brembilla et al., 2020; Jayakumar, Kennion, Villabona, Paranathala, & Holliman, 2020). Most referrals (88.4%) made during the study period came from general physicians, which is consistent with Canada's healthcare delivery model, whereby patients must first be seen by a primary care provider before they can access specialized care (Gouvernement du Canada, 2019). The small but noteworthy proportion (13.4%) of referrals received from administrative regions not served by the CIUSSS-MCQ may be explained, though not exclusively, by long waiting lists affecting surrounding neurosurgery services, which may prompt physicians to send multiple referrals to maximize the patient's likelihood of a timely consultation (Slade et al., 2015). Nonetheless, more than 25.0% of CIUSSS-MCQ's neurosurgery consultations for LBP during the study period were not carried out within the expected delay. This percentage is, however, lower than the provincial average which was reported at 33.0% for the year 2021-2022 (Gouvernement du Québec, 2019).

Evidence-based guidelines recommend diagnostic triage to classify patients into one of three type of LBP (i.e., non-specific LBP, radicular syndrome, or specific LBP) and suggest management strategies tailored to each of these categories (Bussières et al., 2021; Roger Chou et al., 2007; Qaseem et al., 2017; Stochkendahl et al., 2018; Wong et al., 2017). As an example, patients diagnosed with persistent (> 4-6 months) non-specific LBP should be provided with structured

patient education and multimodal conservative care, whereas a diagnosis of persistent lumbar radiculopathy usually calls for referral for further investigation (Wong et al., 2017). Diagnostic accuracy is therefore considered crucial to determine whether the patient's condition warrants further investigation or a specialist referral. A recent scoping review of systematic reviews (Mathieu, Pasquier, Descarreaux, & Marchand, 2023) identified several clinical features with appropriate diagnostic value, and therefore, suitable for use in primary care settings for the diagnosis of LBP. Overall, dominant site of pain, pain distribution, aggravating and relieving factors, indicators of underlying spinal pathology and the presence of neurological signs should all be assessed or questioned when evaluating LBP patients (Mathieu et al., 2023). Various clinical characteristics are also known to predict response to surgical treatment for LBP, such as the level of disability, baseline leg pain intensity, smoking status, psychological complaints, frailty status and comorbidities, previous spinal surgeries, and patient expectations of treatment outcomes (Chan et al., 2021; Halicka et al., 2023; van Hooff et al., 2018; Wilson et al., 2016). Surprisingly, many of these variables were inconsistently documented in the CRDS referral form or in the consultation note, thus preventing the establishment of a comprehensive portrait of patients referred to the neurosurgery service for LBP. It remains to be determined whether this reflects a lack of documentation, or if these variables are being overlooked in clinical decision-making in favor of other clinical characteristics that would further inform clinical decisions. These findings are however consistent with a previous review of Canadian spine surgeons referrals (Coyle et al., 2008), which demonstrated that many factors used in surgical decision-making were not routinely documented, and that most referrals to spine surgeons lacked adequate clinical information for triage. Nevertheless, we were able to determine that most of the sample suffered from chronic pain (84.6 %), had undergone diagnostic testing prior to their neurosurgery consultation (97.4%), and had been diagnosed with a radicular syndrome (60.8 %). Interestingly, of the 271 patients for whom progression of symptoms was documented, 60.1% exhibited stable or improving symptoms at the time of their initial neurosurgery consultation, potentially reflecting the fluctuating and self-limiting nature of LBP (Dunn, Hestbaek, & Cassidy, 2013; Harrisson, Ogollah, Dunn, Foster, & Konstantinou, 2020; Hartvigsen et al., 2018; Minamide, Yoshida, & Maio, 2013). These findings also support evidence-based guidelines recommendations, which advocate that

patients with LBP should undergo a reasonable conservative care trial before contemplating referral to a medical specialist. Although considered a prerequisite for surgical consultation for LBP, it could not be determined for almost 40,0% of patients whether they had received appropriate conservative treatments before seeking neurosurgery services.

Our analysis revealed that 80.4% of referrals made to the CIUSSS-MCQ's outpatient neurosurgery clinic for LBP during the study period were deemed inappropriate. Our study findings are in line with other Canadian studies, which have previously reported that between 62.0%-85% of referrals to spine surgeons for LBP were inappropriate (Deis & Findlay, 2010; Fourney, 2010; Kindrachuk & Fourney, 2014; Mayman & Yen, 1999; Wilgenbusch et al., 2014). Of the 500 medical files reviewed, only 20.4% of patients were identified as surgical candidates, and of these, 18.8% were reluctant or explicitly refused any surgical options. Interestingly, a study by Mayman et al. (Mayman & Yen, 1999) also reported a small but significant proportion (13.0%) of referred LBP patients who expressed reluctance to undergo surgery regardless of its indication. This reinforces the importance of promoting shared-decision making, in which patients and providers work together to find a mutually agreed-upon treatment plan, as this approach is known to improve quality of care delivery, and to reduce the overuse of surgical procedures (Boss et al., 2016; Sepucha et al., 2017). Over 40.0% of LBP patients referred to the neurosurgery service during the study period were discharged upon initial assessment, most of them after being advised to initiate or pursue conservative treatments or after being referred for anesthetic injections. Of the 199 patients non-surgically managed by the neurosurgeons, 87.4% were referred for further diagnostic or therapeutic interventions before undergoing further neurosurgical follow-up, suggesting that non-surgical options had not been fully exhausted for these patients. The high proportion of patients referred for anesthetic injections, commonly seen as a therapeutic modality, could also be explained by evidence supporting the ability of spinal injections to predict surgical outcomes (Benedetti & Siriwetchadarak, 2011; Cohen & Hurley, 2007). In a retrospective analysis of medical files data from patients with LBP referred to the neurosurgery service of 3 European hospitals, Debono et al. (Debono, Sabatier, Koudsie, Buffenoir, & Hamel, 2017) raised a similar issue, identifying a significant proportion of patients inappropriately referred who had

not properly been treated before being referred to the neurosurgery service or whose imaging tests were incomplete.

Inappropriate referrals were characterized by higher proportion of patients symptomatically improved, presenting a back-dominant chief complaint, exhibiting no objective neurological symptoms, and diagnosed with non-specific LBP. The multivariate analysis also suggested that the absence of motor deficits was associated with a nearly three-fold increase in the odds of being inappropriately referred. In a retrospective review of spine referrals sent to a group of ten neurosurgeons in Edmonton, Canada, over a 3-year period (2007-2009), Deis and Findlay (Deis & Findlay, 2010) reached similar conclusions, finding that most inappropriate referrals were based on no mention of leg symptoms or signs of neurological deficits rather than on the lack of concordance between lumbar spine imaging findings and the patient's clinical profile. Debono et al. (Debono et al., 2017) reported similar results, noting that only 5.1% of inappropriate referrals to the neurosurgery service for LBP were attributed to radioclinical discordance. Additionally, a retrospective study of new referrals for LBP to the neurosurgery service of an Australian public hospital found that there was no significant association between MRI findings and the likelihood of undergoing surgery (Huang, Huang, & Teddy, 2008). This is of particular interest as it calls into question the value of imaging findings as a component that can serve to justify a referral to the neurosurgery service. In the present study, imaging results were more frequently reported by referring clinicians than any other type of clinical information, while documentation of pain predominance, level of disability, and neurological findings was often overlooked. However, it is known that up to 90.0% of patients over the age of 50 will have evidence of age-related degenerative changes without definite nerve root compression (Hicks, Morone, & Weiner, 2009) on their lumbar spine MRI or CT reports, and that these imaging findings may even be seen in asymptomatic individuals (Brinjikji et al., 2015). Overreliance on imaging procedures could, however, be explained by the constraints imposed by the CRDS's referral form, which explicitly requires that patients seeking referral for the neurosurgery service provide an imaging report dated less than 3 months. In addition to potentially increasing the importance placed on imaging results, this requirement also raises a potential issue in the referral process. Indeed, given the extended wait times associated with priority codes D and E, it appears likely that patients assigned

to theses codes may struggle to comply with this criterion, thus questioning its relevance. This reinforces evidence-based recommendations according to which decision-making should be informed first and foremost by the patients' clinical profile, and that routine imaging should be avoided and used only in the presence of potential indication for surgical consultation. Furthermore, this also underlines the need to reinforce continuing medical education for primary care providers, focusing on the clinical criteria justifying spinal imaging or referral to a spine surgeon.

Several strategies to improve the appropriateness of referrals to spine surgeons for LBP have been studied. Though currently not implemented on Quebec's territory, triage interventions have shown promising results in managing LBP patients. Two retrospective analyzes of new outpatient referrals for LBP (Kindrachuk & Fourney, 2014; Wilgenbusch et al., 2014) showed that a multidisciplinary triage process led by MSK experts, also known as the Saskatchewan Spine Pathway, significantly reduced MRI utilization and inappropriate referrals to spine surgeons compared to the conventional referral process (i.e., patients referred directly by primary physicians). A retrospective audit of data from three Australian public hospital emergency departments (ED) showed that patients with LBP managed by advanced MSK physiotherapists had shorter ED wait times and length of stay and were more effectively discharge compared with patients seen by ED doctors and nurse practitioners (Sayer et al., 2018). Another retrospective review of all new patients visits to eight orthopedic surgeons at a large academic hospital in New York also revealed that patients triaged by MSK healthcare providers were more likely to undergo surgery (Araghi et al., 2023). Isolated surgical decision-making is known to result in suboptimal treatment recommendations (Yanamadala et al., 2017). Although more research is needed in the field, multidisciplinary approaches, drawing on MSK healthcare providers expertise, seem more likely to improve the selection of surgical candidates, while providing other patients with appropriate nonoperative treatment options. In an in-dept review and critical analysis, Foster et al. (Foster, Hartvigsen, & Croft, 2012) evoke compelling arguments for considering other models of first-contact MSK care, notably ones whose point of entry in healthcare are MSK experts such as physiotherapists or chiropractors. Indeed, evidence suggest that access to primary care services run by MSK specialists is associated with higher improvements in patients' outcomes, a

reduction in healthcare use, and with fewer days off work related to back pain (Fritz et al., 2015; Hill et al., 2011).

Strengths and limitations

This study stands out for its comprehensive examination of patients referred to specialized care for LBP, providing a detailed understanding of clinical profiles and referral patterns of patients most likely to benefit from surgical consultation. This is also the first study to explore the appropriateness of referrals to specialized care for LBP in the context of a publicly funded healthcare system operating a CWL, offering insight into the challenges within the existing healthcare infrastructure. Despite a rigorous methodology, this study has some limitations. Although the study provides a detailed description of patients referred to specialized care for LBP and examines referrals appropriateness, its generalizability is limited as it was performed in a single administrative region. The CIUSSS-MCQ covers a vast territory (Institut de la statistique du Québec, 2020) and provides services to diverse populations, including remote and indigenous communities (Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec, 2023). These populations may face additional challenges in terms of availability and accessibility of healthcare resources. Consequently, these results may not be generalizable to large urban centers. The study findings are also limited by the quality of data collected. Indeed, key information was often not documented in medical files, and most information was hand-written, which may have hampered data interpretation. Considering that some medical files were either incomplete, or even had to be excluded for lack of information, it is important to acknowledge the potential presence of selection bias, as the characteristics of the patients who were not included in the analysis may differed from those in our study sample. Several variables could also not be included in the binomial regression model, most of them known for their appropriate diagnostic value or their ability to predict surgical outcomes. Further studies are needed to determine whether these would predict the appropriateness of referrals made to the neurosurgery service. Using a complementary qualitative approach could help fill the gaps in chart documentation and provide a better understanding of both the factors that prompted referrals to medical specialists for LBP, and of the criteria considered by neurosurgeons when selecting the appropriate management strategy.

Conclusion

Through a comprehensive analysis of socio-demographic, administrative, and clinical data, this retrospective chart review echoes the findings of previous studies, suggesting that a significant proportion of patients are inappropriately referred to specialized care for a primary complaint of LBP. The generalizability of the study findings is however limited, as the data were sourced from a single administrative region, and several incomplete medical files had to be excluded from the analysis. Back-dominant chief complaints, the absence of objective neurological deficits, and a non-specific LBP diagnosis were identified as characteristic features of inappropriate referrals. While evidence-based guidelines advocate for a thorough clinical assessment for effective diagnostic triage, this analysis unveiled the absence of key clinical information in referral forms and consultation notes, emphasizing the urgent need to enhance documentation practices. Reliance on imaging findings as a criterion for neurosurgery referral was also questioned, as it seemed to further influence clinical decisions to the detriment of factors known to predict surgical outcomes. This study also suggests that an increased focus should be placed on multidisciplinary approaches that enable LBP patients to get a timely access to the appropriate healthcare provider. Collaborative efforts involving MSK experts in triaging patients with LBP have been shown to improve the selection of surgical candidates, while precluding the use of ineffective diagnostic and therapeutic approaches. However, further research is needed to assess the impact of those innovative strategies within Quebec's healthcare delivery model.

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Chapitre 5 – Article III: Effects of musculoskeletal expert input on low back pain outcomes: a randomised controlled trial

Ce chapitre inclut le troisième article de cette thèse qui a été soumis dans la revue *PLOS One* en janvier 2026.

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Résumé

Contexte : Malgré des données probantes en faveur de la prise en charge conservatrice de la lombalgie, le recours excessif à des interventions de faible valeur et les délais d'accès à des soins appropriés contribuent à l'alourdissement de son fardeau. L'intégration d'expert·e·s en santé musculosquelettique dans les trajectoires de soins pourrait représenter une solution pour améliorer l'accès, la pertinence et l'efficience globale des soins pour la lombalgie.

Objectif : Cette étude visait à évaluer les effets d'une évaluation de triage fondée sur les données probantes, menée par des expert·e·s en santé musculosquelettique, sur l'évolution clinique et les trajectoires de soins de patient·e·s atteints de lombalgie référé·e·s pour une consultation en neurochirurgie. Nous avons émis l'hypothèse que l'intervention mènerait à des résultats cliniques équivalents, tout en améliorant les trajectoires de soins.

Devis de l'étude : Essai contrôlé randomisé à groupes parallèles, monocentrique.

Population : Adultes (≥ 18 ans) référé·e·s pour une première consultation en neurochirurgie pour un motif principal de lombalgie.

Mesures de résultats : Des mesures cliniques et de trajectoires, autorapportées par les patient·e·s, ont été recueillies à 1 semaine, 3, 6 et 12 mois, incluant l'intensité de la douleur lombaire, l'intensité de la douleur à la jambe, l'incapacité liée à la lombalgie, la qualité de vie, la perception du changement et l'utilisation des services de santé.

Méthodes : Cent-un participant·e·s atteints de lombalgie ont été réparti·e·s aléatoirement dans le groupe intervention (n = 49) ou le groupe contrôle (n = 52). Avant de rencontrer le neurochirurgien, tous les participant·e·s ont bénéficié d'une évaluation de triage standardisée réalisée par un·e chiropraticien·ne. Les conclusions et recommandations du·de la chiropraticien·ne ont été transmises au neurochirurgien pour les participant·e·s du groupe intervention, mais non communiquées pour le groupe contrôle. L'équivalence a été évaluée à l'aide de la procédure TOST. Des ANOVA à mesures répétées ont été réalisées pour évaluer les changements intra- et intergroupes des résultats cliniques, et un modèle de régression à effets mixtes a été utilisé pour comparer les variations dans l'utilisation des services de santé.

Résultats : Les deux groupes ont présenté des améliorations significatives de la douleur et de la fonction sur une période de 12 mois. Bien que l'équivalence n'ait pas été démontrée sur le plan statistique, les différences entre les groupes sont demeurées faibles et non cliniquement significatives. À 6 mois de suivi, moins de participant·e·s du groupe intervention ont rapporté avoir consulté un·e omnipraticien·ne pour leur lombalgie (49,0 % vs 69,2 % ; p = 0,04).

Conclusion : À la lumière de données d'études antérieures démontrant une concordance modérée à élevée entre les chiropraticien·ne·s et les neurochirurgien·ne·s pour le diagnostic et la prise en charge de la lombalgie, les résultats de cette étude reflètent probablement une prise de décision clinique concordante. L'intégration d'expert·e·s en santé musculosquelettique dans les trajectoires de soins pourrait représenter une approche novatrice pour la réorganisation des soins. Les recherches futures devraient explorer des stratégies de triage mises en œuvre en soins primaires, où leur potentiel d'optimisation des trajectoires de soins pourrait être encore plus significatif.

Abstract

Background: Despite strong evidence supporting conservative management of low back pain (LBP), overuse of low-value care interventions and delays in accessing appropriate care contribute to its growing burden. Integrating musculoskeletal health experts into care pathways may represent a pragmatic solution to improve access, referral appropriateness, and overall efficiency of spine care delivery.

Purpose: This study aimed to evaluate the effects of an evidence-based triage assessment performed by non-physician musculoskeletal health experts on clinical outcomes and care trajectories of patients with LBP referred for a neurosurgery consultation. We hypothesised that the intervention would result in equivalent clinical outcomes but improved care trajectories.

Study design*:* Single-center, parallel-group randomised controlled trial.

Patient sample*:* Adults (≥18 years) referred for an initial neurosurgical consultation for LBP.

Outcome measures: Patient reported measures were collected at 1 week, 3, 6 and 12 months, including back pain intensity (primary outcome), leg pain intensity, LBP-related disability, quality-of-life, perception of change, and healthcare utilization.

Methods: One hundred and one participants with LBP were randomly allocated to the intervention (n=49) or control group (n=52). Before meeting the neurosurgeon, all participants underwent a standardized chiropractor-led triage evaluation. The chiropractor's conclusions and recommendations were shared with the neurosurgeon for participants in the intervention group but withheld in the control group. Equivalence was evaluated using the TOST procedure. Repeated-measures ANOVAs were conducted to evaluate within- and between-groups changes in clinical outcomes, and a mixed-effects regression model was used to compare changes in healthcare utilization.

Results: Both groups showed significant improvements in pain and function over 12 months. Although equivalence was not statistically demonstrated, between-group differences remained small and not clinically meaningful. A short-term difference in care trajectories was observed,

with fewer participants in the intervention group reporting a general practitioner consultation at 6 months (49.0% vs. 69.2%; p = 0.04). However, this effect was not sustained over time.

Conclusion: Considering previous evidence demonstrating high agreement between chiropractors and neurosurgeons in the diagnosis and management of LBP, these findings likely reflect concordant clinical decision-making. The integration of non-physician musculoskeletal experts into care pathways may represent an innovative approach to care reorganization. Future research should investigate triage strategies implemented in primary care settings, where their potential to optimize patient trajectories may be greater.

Keywords**:** low back pain, triage, care trajectories, tertiary care, health servicesBackground

Background

Underutilization of evidence-based practices, including both overuse of low-value care approaches (e.g., routine diagnostic imaging, opioids, spinal injections, and surgery) and insufficient implementation of high-value care interventions (i.e., patient education, physical activity, and self-management support) (Rachelle Buchbinder et al., 2020) are identified as major contributors to the growing burden of low back pain (LBP) (Foster et al., 2018). A systematic review and meta-analysis of 21 studies from 12 high-income or middle-income countries estimated the prevalence of consultations to emergency departments (ED) for LBP to be 4.39% (95% CI 3.67–5.18), similar to that for shortness of breath, fever, and chills(Edwards, Hayden, Asbridge, Gregoire, & Magee, 2017). In line with these findings, a prospective observational study of patients with LBP attending the ED of a university hospital in Edmonton, Canada, also revealed that most common reasons for seeking care were an inability to control pain and a need to clarify the etiology of symptoms (Kawchuk et al., 2022). In most cases, patients were discharged after nurse triage without a physician consultation (89.0%) (Kawchuk et al., 2022). Interestingly, when asked which clinician they would prefer to manage their LBP, assuming no financial or accessibility constraints, 42.6% of participants still indicated a preference for ED physicians (Kawchuk et al., 2022). All together, these observations suggest that EDs are often not the most appropriate care setting for patients with LBP and underscore the need for patient education, reassurance, and care pathways that engage musculoskeletal health professionals in delivering evidence-based interventions.

The 2018 Lancet Series identified promising directions for the prevention and management of LBP, including the redesign of clinical pathways to enable people to have access to appropriate healthcare resources in a timely manner, while avoiding exposure to ineffective and potentially unsafe treatments (R. Buchbinder et al., 2018; Foster et al., 2018). In recent years, several models of care and clinical pathways have been proposed in high-income countries, aiming to achieve better health outcomes, improved care experience, and more efficient use of healthcare resources for patients with LBP (Rachelle Buchbinder et al., 2020). In a scoping review including 29 studies from multiple countries, Duarte et al. (2024) (Duarte et al., 2024) identified 11 care models implemented in primary care for LBP. General practitioners served as an entry point for

all but 3 models of care, and all but one model included interface services (i.e., services that incorporate any intermediate levels of triage, assessment, and treatment between primary care and secondary care), mostly operated by multidisciplinary teams (National Health Service, 2025). In Canada, three models of care have been developed: the Interprofessional Spine Assessment and Education Clinics (ISAEC) (Zarrabian et al., 2017) in the province of Ontario, the Saskatchewan Spine Pathway (SSP) (Fourney et al., 2011) in the provinces of Ontario, Manitoba and Saskatchewan, and the Spinal Assessment Service (SAS) in the province of Saskatchewan (Brenna Bath, Grona, & Janzen, 2012). ISAEC is characterized by a network structure involving primary care providers (i.e., physicians and nurse practitioners), allied health providers (i.e., physiotherapists and chiropractors), and medical specialists (i.e., surgeons, pain specialists and rheumatologists) that offer evidence-based LBP assessment, education and care recommendations (Zarrabian et al., 2017). Only one study, a retrospective review of prospective data, investigated the effects of ISAEC clinics on LBP management. While the ISAEC model improved referral appropriateness, efficiency of magnetic resonance imaging (MRI) utilization, and wait times for surgical assessment for patients with LBP, its impact on clinical outcomes was not assessed (Zarrabian et al., 2017). The SSP is a model of care in which patients are referred either by a general practitioner or drawn from spine surgeons' waiting list (Fourney et al., 2011). Specialized physiotherapists (i.e., trained in surgical triage through collaboration with spine surgeons) perform an initial assessment using a stratified care approach based on the primary pain pattern (i.e., back-dominant pain aggravated by flexion, back-dominant pain aggravated by extension, constant leg-dominant pain, and intermittent leg-dominant pain) (Fourney et al., 2011). Patients are then directed to conservative management delivered by trained primary care providers (i.e., family physicians, nurse practitioners, chiropractors and physiotherapists), to further specialized investigations or to surgical consultation (Fourney et al., 2011). Three observational studies have reported that the SSP model improves trajectory outcomes for patients with LBP, characterized by an increased tendency to use conservative approaches before being referred to a surgeon (Wu, Liu, & Fourney, 2021), reduced utilization of MRI (Kindrachuk & Fourney, 2014) and shorter wait times for MRI when needed (Wilgenbusch, Wu, & Fourney, 2014; Wu et al., 2021), as well as higher referral appropriateness for surgical care (Kindrachuk &

Fourney, 2014; Wilgenbusch et al., 2014). However, among patients who underwent surgery, pain and disability trajectories over one year were similar whether they had followed the SSP model or usual care (Wu et al., 2021). Lastly, two observational studies and one quasi-experimental study provided evidence of the effects of the SAS on patient trajectories and clinical outcomes (Brenna Bath et al., 2012; B. Bath & Janzen, 2012; B. Bath & Pahwa, 2012). By introducing interface triage assessments to determine the indication of surgical consultation, this model of care achieved a surgical conversion rate (i.e., the proportion of referred patients who ultimately receive surgery) of 70.0% (Brenna Bath et al., 2012). Patients also reported high satisfaction with the service (B. Bath & Janzen, 2012), even though the intervention did not lead to significant changes in pain or disability levels four weeks after the triage assessment(B. Bath & Pahwa, 2012). Nevertheless, despite these promising findings, these models of care are not widely integrated into healthcare systems, primarily due to a lack of high-quality studies supporting their effectiveness (D. R. Murphy et al., 2022).

In Quebec (Canada), LBP also imposes a significant burden on the healthcare system, which operates under a physician-led delivery model with limited integration of non-physician musculoskeletal experts (Gouvernement du Canada, 2019). A retrospective analysis of medical health records revealed that 80.4% of LBP referrals for neurosurgical care at the *Centre intégré universitaire de soins de santé et de services sociaux de la Mauricie-et-du-Centre-du Québec* (CIUSSS MCQ; Quebec, Canada) were inappropriate, with 88.4% of these referrals originating from general practitioners (Mathieu, Robert, Châtillon, Descarreaux, & Marchand, 2024). At the same CIUSSS, over 2 500 patients were currently awaiting a neurosurgery consultation (across all conditions managed by neurosurgeons) (Gouvernement du Québec, 2019), underscoring the need for an alternative model of care that leverages the skills of non-physician musculoskeletal health experts to promote timely and appropriate healthcare delivery for patients with LBP. Previous work conducted within the same clinical context has shown substantial diagnostic and management agreement between chiropractors and neurosurgeons when independently assessing patients referred for neurosurgical consultation for LBP, suggesting that chiropractors may be well positioned to contribute to triage processes (Mathieu et al., 2025). However, it

remains unclear whether integrating such expertise into triage pathways translates into improved patient outcomes or more efficient care trajectories.

Therefore, this study aimed to evaluate the effects of an evidence-based triage assessment performed by non-physician musculoskeletal health experts, specifically chiropractors, on clinical outcomes and care trajectories of patients with LBP referred for a neurosurgery consultation. Within the context of this study, we hypothesised that a chiropractor-informed triage would result in equivalent patients' clinical outcomes but improved care trajectories, including reduced use of diagnostic tests, lower reliance on prescribed pain medication, and fewer follow-up medical visits compared to usual management.

Methods

Design

This study was a single-center, two-armed parallel randomised controlled trial with a 1:1 allocation ratio. The protocol was registered in ClinicalTrials.gov in February 2021 (NCT04923308), and no changes to the methods were made after trial commencement. For logistical reasons related to restricted electronic medical record access, healthcare utilisation data were collected through self-reported questionnaires. This study received ethical approval from CIUSSS MCQ (CER-2021-488,766) and the Université du Québec à Trois-Rivières (UQTR) (CER-20-269-07.13) independent research ethics boards. The trial was designed and reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) statement, including the extension for equivalence and noninferiority randomised trial designs (Piaggio et al., 2012; Schulz, Altman, & Moher, 2010). All methods were performed in accordance with the relevant guidelines and regulations. Written informed consent was obtained from all participants prior to their participation

Setting

The study was conducted in collaboration with the neurosurgery outpatient clinic affiliated to the CIUSSS MCQ. The latter serves a population of more than 530,000 people, including 82.1% over the age of 18 in 2022(CIUSSS MCQ, 2024). Access to the neurosurgery service was managed by

the Service Request Management Center (*Centre de répartition des demandes de services*-CRDS), a centralized waiting list, where patients are placed in a queue based on medical priority (defined by pre-established criteria presented in Appendix C) (Breton et al., 2020). During the study period, the CIUSSS MCQ's neurosurgery department was staffed by 3 neurosurgeons. Data collection was conducted at the UQTR.

Participants

All patients scheduled at the outpatient neurosurgery clinic affiliated with the CIUSSS MCQ for LBP between July 1, 2021 and December 20, 2023 were considered potentially eligible. Patients were identified by the neurosurgery department's administrative staff at the time of appointment scheduling based on the primary complaint listed on the referral request. Patients who provided consent were subsequently contacted by a research assistant to ascertain their eligibility and receive further information about the study. Inclusion criteria were: [1] being ≥18 years of age; [2] being referred for an initial neurosurgery consultation for a primary complaint of LBP (either acute, chronic, or recurring episode); and [3] being able to legally consent to participate. Patients involved in litigation related to their LBP condition (worker's compensation, public automobile insurance plan or other litigations) were excluded from this study.

Interventions

Before meeting with the neurosurgeon, all participants, regardless of group allocation, underwent an evidence-based chiropractor-informed triage evaluation. Chiropractors conducting evaluations were employed as full-time professors or as lecturers at UQTR (Quebec, Canada), with experience in treating patients with musculoskeletal disorders ranging from 4 to 20 years. To ensure consistency in evaluation procedures and to familiarize chiropractors with the referral process to specialized care, an in-person training session was provided, including an overview of the public healthcare system's structure, and of the CRDS's role and pre-established criteria (see Appendix C). The triage evaluation consisted of a 2-step intervention: **[1]** Following a standardized history taking and a physical examination, participants were categorized into one of the following diagnostic groups based on their primary diagnosis (i.e., the most probable) : **i)** non-specific LBP, **ii)** radicular syndrome, **iii)** specific spinal pathology, or **iv)** other causes (i.e., LBP arising from

problems beyond the lumbar spine) **[2]** Participants were subsequently stratified into levels of risk of poor prognosis using the STarT Back Screening Tool (SBST), a brief prognostic screening tool that categorizes psychosocial risk for levels of pain, disability, and distress as low, medium or high (Bruyère et al., 2014). Finally, the most appropriate management strategy was determined for each participant between either **i)** conservative care, **ii)** further diagnostic tests needed, **iii)** neurosurgery referral indicated, **iv)** medical emergency, and **v)** referral to another medical specialist. A detailed description of the variables considered in determining the primary diagnosis and the most suitable management strategy is provided in Appendix E.

Chiropractors only provided conclusions and recommendations to neurosurgeons. This approach was adopted because patients could only be engaged in the trial recruitment process at the time of their neurosurgical appointment, rather than at the point of referral submission, limiting the chiropractors' opportunity to act earlier in the care trajectory. For participants in the intervention group, the triage assessment conclusions, including the primary diagnosis, risk of poor prognosis and referral recommendations, were communicated to the neurosurgeon through a clinical note (Appendix F) at the time of the patient's consultation, without further discussion. The neurosurgeon then performed their own evaluation and determined the best management strategy. In contrast, for participants in the control group, the conclusions of the triage assessment were not shared with the neurosurgeon. Neurosurgeons performed their evaluations according to their usual clinical practice, to reflect typical real-world healthcare settings.

Outcomes

To measure the effects of the chiropractor-informed triage, patient-reported outcomes were monitored over a one-year period (1 week, 3, 6, 12-month follow-up). In accordance with the study hypotheses, two complementary analytical frameworks were adopted.

For the equivalence hypothesis, the primary outcome was back pain intensity, assessed as both current and mean pain over the past week, measured with the 11-point numerical rating scale (NRS-11) (Hawker, Mian, Kendzerska, & French, 2011) at 3 months post-intervention. For the superiority hypothesis, secondary outcomes were used to assess whether the intervention modified patients' clinical and healthcare trajectories over time. These outcomes were collected

at all follow-up time points (1 week, 3, 6, and 12 months). Secondary outcomes were categorized as LBP clinical outcomes and patients' trajectory outcomes. Low back pain clinical outcomes included [1] Current and mean leg pain intensity, measured with the 11-point numerical rating scale (NRS-11) (Hawker et al., 2011), [2] Low back-related disability, measured using the Oswestry Disability Index (ODI) (Denis & Fortin, 2012; Vianin, 2008), [3] Health-related quality of life, assessed with the WHO Quality of Life-BREF (WHOQOL-BREF)(Skevington, Lotfy, & O'Connell, 2004), [4] General expectation of recovery, measured using the NRS-11 by asking patients: "*How likely do you think it is that you will have a complete recovery*" with possible answers ranging from -5 (very unlikely) to +5 (very likely), with 0 being " *I don't know*", [5] Perceived global rating of change, measured using the 7-point scale Patient Global Impression of change(Farrar, Young, LaMoreaux, Werth, & Poole, 2001; Steven J Kamper, Maher, & Mackay, 2009), and [6] Patient satisfaction with the triage assessment, measured at baseline only using items 5 to 9 from the Visit-Specific Satisfaction Instrument (VSQ9) (Rubin et al., 1993). Patients' trajectory outcomes included [1] the diagnosis and clinical management established by the neurosurgeon, retrieved from the patient's medical file after the neurosurgery consultation, [2] Patient-reported use of medical services for their current LBP episode since the previous follow-up, including i) imaging exams, ii) laboratory tests, and iii) medical prescription (participants indicated whether or not they had undergone each type of service since the last assessment), [3] consultation with a general practitioner (GP) (patients were asked at follow-ups whether they sought the expertise of a GP for their current LBP episode since the last assessment time point), and [4] use of non-publicly funded care (patients were asked at follow-ups whether they sought non-publicly funded care for their current LBP episode since the last assessment time point). Sociodemographic data were also collected at baseline via a standardized questionnaire.

Harms

Adverse events were not assessed systematically. Nevertheless, participants were instructed to contact the research team if they had any questions or concerns regarding their condition.

Sample size

The sample size calculation was based on an equivalence study design, intended to demonstrate that the new approach (chiropractor-informed group) led to equivalent clinical outcomes compared to usual care (not chiropractor-informed group). The primary outcome was back pain intensity on a 0-10 numeric rating scale at 3 months. Equivalence was defined as the two-sided 95% confidence interval for the between-group mean difference (chiropractor-informed minus usual care) lying entirely within −1.2 to +1.2 points (equivalence margin Δ=1.2). This margin was deliberately set narrower than the commonly accepted minimal clinically important difference (MCID) of around 2 points(Ostelo et al., 2008), providing a conservative threshold to reduce the risk of incorrectly concluding equivalence when a meaningful difference may exist. Assuming a common SD of 2.0 points(Angarita-Fonseca et al., 2023) and a true mean difference of 0, a 1:1 allocation with the two one-sided tests (TOST) procedure (α=0.025 per one-sided test) required n = 80 participants per group to achieve 80% power. Allowing 15% attrition, we planned to recruit 70 participants per group (N=140).

Randomisation and blinding

Randomisation determined whether the neurosurgeon received the triage assessment conclusions following the triage process. Block randomisation with blocks of 10 was used to allocate participants to the study groups. The randomisation sequence was computer-generated, and group assignments were concealed in sequentially numbered sealed opaque envelopes, managed by a research assistant who was blinded to the study objectives. Both chiropractors conducting the triage evaluations and the patients were blinded to group allocation. Chiropractors remained unaware of the participant's assignment until completing their assessment.

Statistical analysis

The Shapiro-Wilk normality test was performed for all continuous variables to determine data distribution. Between-group comparisons at baseline were performed using independent-samples t tests for continuous variables and chi-square tests for categorical variables. For the equivalence hypothesis, between-group comparisons of pain outcomes at the primary endpoint

(3 months) were conducted using independent-samples *t* tests on pain change scores. Equivalence was evaluated using the TOST procedure, with equivalence margins set at ±1.2 points on the NRS-11. Equivalence was concluded when the 95% confidence interval of the difference in pain change scores (Δ intervention − Δ control) was entirely contained within the predefined equivalence bounds. Missing follow-up data were handled using a multiple imputation approach based on random forest imputation, implemented through the miceRanger package in R (version 4.5.1)(Wilson, 2023). This method combines the flexibility of multivariate imputation by chained equations (MICE) with the predictive performance and robustness of tree–based ensemble models(Wilson, 2023). Repeated-measures ANOVAs were conducted to evaluate within-group and between-group changes in clinical outcomes over time, and Bonferroni post hoc tests were performed only when supported by a significant group or group × time effect. For these analyses, a two-tailed p value < 0.05 indicated statistical significance, while the MCID was used to determine whether observed changes were clinically meaningful. In addition, a generalized linear mixed model was used to compare changes in healthcare utilization over time between groups. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 18.0.0 (Armonk, NY: IBM Corp.) and followed the intention-to-treat principle, with participants analyzed according to randomly assigned group. Given the absence of protocol deviations or crossovers, no separate per-protocol analyses were conducted.

Results

Recruitment

Between July 2021 and December 2023, 150 eligible patients were contacted, of whom 118 (78.7%) agreed to participate. Of these, 17 patients did not attend the triage assessment, leading to 101 participants that were randomly assigned to the intervention group (n=49) or the control group (n=52). Figure 3 presents, for each group, the flow of participants including the numbers and reasons for attrition and non-participation. Recruitment was ultimately stopped due to the challenges of scheduling assessments on short notice before neurosurgery appointments and because preliminary analyses suggested that the addition of participants was unlikely to lead to meaningful differences between groups.

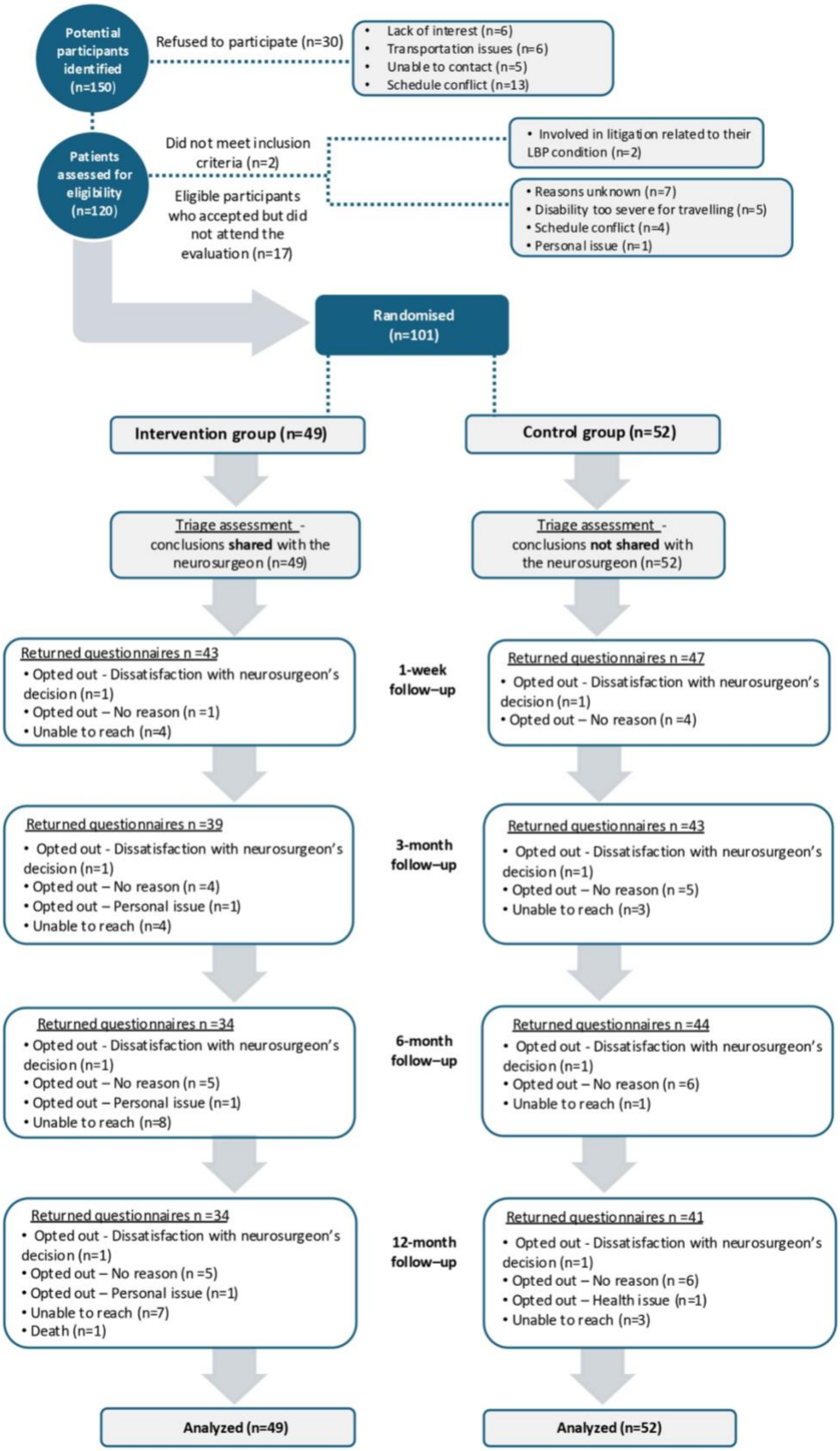


Figure 3. Flowchart of study participants.

Participants 'characteristics

Table 15 and 16 present baseline demographic and clinical characteristics for each group. No significant difference between groups were found in baseline characteristics.

Table 15. Baseline characteristics

	Intervention group (n=49)	**Control group (n=52)**	***p-value***
Sociodemographic data	**n (%) or Mean ± SD**		
Age (years)	61.8 ± 13.4	58.9 ± 15.8	0.3
Sex			
Male	25 (51.0)	28 (53.8)	0.8
Female	24 (46.2)	24 (49.0)	
Gender, n (%)			
Male	23 (46.9)	26 (50.0)	0.9
Female	24 (49.0)	23 (44.2)	
Other	2 (4.1)	3 (5.8)	
Member of an indigenous community (*yes)*	2 (4.1)	5 (9.6)	0.3
Belonging to an ethnic minority group (*yes*)	0 (0)	0 (0)	-
Religion			
Christianism	39 (79.6)	41 (80.4)	0.7
Atheism	7 (14.3)	8 (15.7)	
Other	3 (6.1)	2 (3.8)	
Marital status			
Married	30 (61.2)	27 (51.9)	
In a relationship – not married	5 (10.2)	8 (15.4)	0.7
Single	7 (14.3)	7 (13.5)	
Divorced	5 (10.2)	5 (9.6)	

Widowed	2 (4.1)	5 (9.6)	
Employment status			
Full time	16 (33.3)	11 (21.2)	
Part time	5 (10.4)	1 (1.9)	
Retired	21 (42.9)	25 (48.1)	0.07
At home	2 (4.2)	1 (1.9)	
Temporary sick leave	4 (8.3)	11 (21.2)	
Welfare beneficiary	0 (0.0)	3 (5.8)	
Highest educational attainment			
Primary (elementary) school education	9 (18.8)	4 (7.8)	
Secondary education (high school)	13 (27.1)	18 (35.3)	
College degree (pre-university or technical diploma)	7 (14.6)	13 (25.5)	
Trade school (Technical or occupational certificate)	13 (27.1)	8 (15.7)	0.3
Undergraduate degree (Bachelor or advanced diploma)	4 (8.3)	6 (11.8)	
Graduate degree	0 (0.0)	1 (2.0)	
Other	2 (4.2)	1 (2.0)	
Annual personal income ($ CAD)			
< 10 000	0 (0.0)	3 (5.9)	
10 000-29 999	16 (32.7)	18 (35.3)	
30 000- 49 999	12 (24.5)	15 (29.4)	
50 000- 69 999	3 (6.1)	6 (11.8)	0.1
70 000- 89 999	3 (6.1)	2 (3.8)	
90 000-109 999	1 (2.0)	2 (3.8)	
110 000-129 999	3 (6.1)	2 (3.8)	
≥ 130 000	1 (2.0)	2 (3.8)	
Prefers not to answer	10 (20.4)	1 (2.0)	

Private insurance coverage			
Prescription drugs	27 (55.1)	24 (47.1)	0.4
Imaging	21 (41.2)	11 (22.4)	0.07
Privately funded healthcare	12 (24.5)	17 (33.3)	0.6

CAD: Canadian dollar; LBP: Low back pain; SD: Standard deviation

Table 16. Clinical profiles at baseline

	Intervention group (n=49)	**Control group (n=52)**	***p-value***
Primary outcomes	**Mean ± SD**	**Mean ± SD**	***p***
Current back pain intensity (/10)	5.3 ± 2.6	5.2 ± 2.5	0.8
Mean back pain intensity (/10)	6.1 ± 2.3	6.4 ± 2.7	0.5
Secondary outcomes – *LBP clinical outcomes*	**n (%) or Mean ± SD**	**n (%) or Mean ± SD**	***p***
Current leg pain intensity (/10)	4.2 ± 2.8	4.3 ± 2.9	1.0
Mean leg pain intensity (/10)	5.5 ± 2.6	5.5 ±2.8	1.0
Low back-related disability (/100)	41.1 ± 16.9	37.7 ± 17.1	0.3
Health-related QoL (/100)			
Physical domain	45.4 ± 20.3	44.0 ± 20.7	0.7
Psychological domain	61.2 ± 16.8	63.8 ± 16.3	0.5
Social domain	64.9 ± 15.8	67.1 ± 19.2	0.6
Environmental domain	72.0 ± 13.8	74.4 ± 16.1	0.4
General expectation of recovery, n (%)			
-5 (very unlikely)	15 (31.3)	9 (17.6)	
-4	4 (8.3)	2 (3.9)	0.4
-3	4 (8.3)	7 (13.7)	
-2	2 (4.2)	3 (5.9)	
-1	1 (2.1)	1 (2.0)	

0 (I don't know)	12 (25.0)	18 (35.3)	
1	2 (4.2)	2 (3.9)	
2	4 (8.3)	1 (2.0)	
3	3 (6.3)	2 (3.9)	
4	0 (0.0)	2 (3.9)	
5 (very likely)	1 (2.1)	4 (7.8)	
Risk of poor prognosis (SBST)			
Low risk	11 (22.4)	14 (26.9)	
Medium risk	23 (46.9)	20 (38.5)	0.7
High risk	15 (30.6)	18 (34.6)	
Patient satisfaction (/100)	100 (0)	100 (0)	0.07
Secondary outcomes – *Patients' trajectory outcomes*	**n (%)**	**n (%)**	***p***
Neurosurgeon's diagnosis, n (%)			
Non-specific LBP	21 (45.7)	21 (40.4)	
Radicular syndrome	25 (54.3)	27 (51.9)	0.4
Specific LBP	0 (0)	2 (3.8)	
Other	4 (8.2)	2 (3.8)	
Neurosurgeon's management strategy, n (%)			
Conservative care	25 (52.1)	26 (50.0)	0.8
Further diagnostic tests needed	1 (2.1)	2 (3.8)	
Neurosurgery referral indicated	21 (43.8)	21 (40.4)	
Falls under another specialty	1 (2.1)	3 (5.8)	

LBP: Low back pain; QoL: Quality of life; SD: Standard deviation

Equivalence testing of primary pain outcomes

For current back pain intensity, the mean change from baseline was −0.47 ± 2.44 in the control group and −0.03 ± 2.56 in the intervention group. The mean difference in change scores between groups (Δ intervention − Δ control) was 0.44 ± 0.54 (95% CI 0.63-1.51.) As the confidence interval extended beyond the predefined equivalence margins of ± 1.2 points on the NRS-11, equivalence between groups could not be concluded for current back pain intensity at 3 months. For mean back pain intensity**,** the mean change from baseline was −1.21 ± 2.23 in the control group and −0.40 ± 2.15 in the intervention group. The between-group difference in change scores was 0.81 ± 0.44 (95% CI 0.06-1.68). As the upper bound of the confidence interval exceeded the equivalence margin, equivalence was likewise not demonstrated for mean back pain intensity at the primary endpoint.

Intervention effect on clinical outcomes

Back pain intensity

Current and mean back pain intensity scores decreased significantly over time in both groups ($p < 0.05$). Current back pain intensity scores at 12 months were significantly lower than both baseline (–0.9 ± 0.3; $p = 0.01$) and 1-week follow-up (–0.8 ± 0.2; $p = 0.006$). Overall, the control group showed greater improvements than the intervention group ($F(1, 99) = 4.25$, $p = 0.04$, $\eta^2 = 0.04$). A significant group × time interaction ($F(3.42, 339) = 3.08$, $p = 0.02$, $\eta^2 = 0.03$) was observed, reflecting larger decreases in current back pain intensity in the control group at both 6-month (mean difference: 1.3 ± 0.5; $p = 0.02$) and 12-month (mean difference: 1.6 ± 0.6; $p = 0.003$) follow-ups. For mean back pain intensity, no main effect of group or group x time interaction was found ($p \geq 0.05$). Detailed results are shown in Table 17. Changes in both current and mean back pain intensity are not considered clinically meaningful, as a minimum 2-point difference on the NRS-11 is generally required to reach MCID (Ostelo et al., 2008).

Table 17. Intervention effects on back pain intensity

Outcome	Timepoint	Control group (C) n=52	Intervention group (I) n=49	Mean difference	95% CI	*p*
		Mean ± SD (95% CI)		(I - C) ± SD		
Current back pain intensity	**Group effect**	4.4 ± 0.3 (3.8-5.0)	5.3 ± 0.3 (4.7-5.9)	0.9 ± 0.4	0.08 -1.7	0.03*
	Baseline	5.2 ± 0.4 (4.5-5.9)	5.3 ± 0.4 (4.6-6.0)	0.1 ± 0.5	-0.9 – 1.1	0.8
	1-week	4.6 ± 0.3 (4.0-5.3)	5.5 ± 0.3 (4.9-6.2)	0.9 ± 0.5	-0.02 – 1.8	0.05
	3-month	4.6 ± 0.4 (3.9-5.4)	5.3 ± 0.4 (4.5-6.1)	0.7 ± 0.5	-0.4 – 1.7	0.2
	6-month	4.0 ± 0.4 (3.3-4.8)	5.3 ± 0.4 (4.5-6.1)	1.3 ± 0.5	0.2 – 2.3	0.02*
	12-month	3.5 ± 0.4 (2.8-4.2)	5.1 ± 0.4 (4.4-5.9)	1.6 ± 0.5	0.6 – 2.7	0.003*
Mean back pain intensity	**Group effect**	5.1 ± 0.3 (4.6-5.7)	5.7 ± 0.3 (5.1-6.3)	0.6 ± 0.4	-1.4 – 0.2	0.2
	Baseline	6.4 ± 0.3 (5.7-7.1)	6.1 ± 0.4 (5.4-6.8)			
	1-week	5.3 ± 0.3 (4.6-5.9)	6.0 ± 0.3 (5.4-6.7)			
	3-month	5.2 ± 0.3 (4.6-5.9)	5.7 ± 0.3 (5.0-6.4)			
	6-month	4.6 ± 0.4 (3.8-5.3)	5.6 ± 0.4 (4.8-6.4)			
	12-month	4.2 ± 0.4 (3.5-5.0)	5.3 ± 0.4 (4.5-6.1)			

SD: Standard deviation; * $p < 0.05$

Leg pain intensity

For both current and mean leg pain intensity, no main effect of group or group × time interaction was found ($p \geq 0.05$). A significant effect of time was found only for leg pain reported over the past week ($F(3.52, 352) = 7.82$, $p < 0.001$, $\eta^2 = 0.07$), with significant reductions observed from baseline to 6 months (–1.0 ± 0.3; $p = 0.002$) and from baseline to 12 months (–1.4 ± 0.3; $p < 0.001$). However, these differences are not clinically meaningful. Table 18 presents within-group descriptive data across time.

Table 18. Intervention effects on leg pain intensity

Outcome	Timepoint	Control group (C) n=52	Intervention group (I) n=49	Mean difference	95% CI	*p*
		Mean ± SD (95% CI)		(I - C) ± SD		
Current leg pain intensity	**Group effect**	3.8 ± 0.3 (3.1-4.4)	4.6 ± 0.3 (3.9-5.3)	0.8 ± 0.5	-0.1 – 1.7	0.08
	Baseline	4.2 ± 0.4 (3.4-5.0)	4.2 ± 0.4 (3.4-5.0)			
	1-week	3.9 ± 0.4 (3.2-4.7)	5.2 ± 0.4 (4.5-6.0)			
	3-month	4.2 ± 0.4 (3.4-5.0)	4.5 ± 0.4 (3.6-5.3)			
	6-month	3.5 ± 0.4 (2.7-4.3)	4.5 ± 0.4 (3.6-5.3)			
	12-month	3.1 ± 0.4 (2.2-4.0)	4.6 ± 0.5 (3.7-5.5)			
Mean leg pain intensity	**Group effect**	5.1 ± 0.3 (4.6-5.7)	5.7 ± 0.3 (5.1-6.3)	0.6 ± 0.4	-1.4 – 0.2	0.2
	Baseline	6.4 ± 0.3 (5.7-7.1)	6.1 ± 0.4 (5.4-6.8)			
	1-week	5.3 ± 0.3	6.0 ± 0.3			

		(4.6-5.9)	(5.4-6.7)			
	3-month	5.2 ± 0.3 (4.6-5.9)	5.7 ± 0.3 (5.0-6.4)			
	6-month	4.6 ± 0.4 (3.8-5.3)	5.6 ± 0.4 (4.8-6.4)			
	12-month	4.2 ± 0.4 (3.5-5.0)	5.3 ± 0.4 (4.5-6.1)			

SD: Standard deviation; * $p < 0.05$

Low back-related disability

No main effect of group ($p = 0.1$) or group × time interaction ($p = 0.06$) was found for low back-related disability. A significant time effect was observed (F (2.91, 290) = 10.38, $p < 0.001$, η^2 = 0.10), indicating progressive improvement across all follow-up assessments, with a mean difference of 8.85 ± 1.86 points at 12 months compared to baseline ($p < 0.001$). However, such difference is not considered clinically meaningful, as a minimum 20-point difference on the ODI is required to reach the minimal clinically important difference (MCID) (Ostelo et al., 2008). Table 19 presents within-group descriptive data across time.

Table 19. Intervention effects on low back-related disability

Timepoint	**Control group (C) n=52**	**Intervention group (I) n=49**	**Mean difference**	**95% CI**	***p***
	Mean ± SD (95% CI)		**(I - C) ± SD**		
Group effect	32.4 ± 2.4 (27.6-37.1)	37.8 ± 2.5 (32.9-42.6)	5.4 ± 3.4	-1.4 – 12.2	0.1
Baseline	37.7 ± 2.3 (33.0-42.3)	41.1 ± 2.4 (36.3-45.9)			
1-week	33.7 ± 2.4	38.8 ± 2.5			

	(28.9-38.5)	(33.8-43.7)			
3-month	33.5 ± 2.6 (28.3-38.7)	35.8 ± 2.7 (30.5-41.2)			
6-month	31.6 ± 2.9 (25.9-37.4)	37.0 ± 3.0 (31.1-43.0)			
12-month	25.4 ± 3.1 (19.3-31.5)	36.1 ± 3.2 (29.8-42.4)			

SD: Standard deviation; * $p < 0.05$

Quality of life

There was no main effect of group or group × time interactions for any of the quality-of-life outcomes. Both groups showed significant improvements over time in the physical quality of life domain ($F(2.92, 292) = 13.47$, $p < 0.001$, $\eta^2 = 0.12$), with increases in WHOQOL-Bref scores from baseline to 6 months (+6.84 ± 2.09; $p = 0.02$) and from baseline to 12 months (+10.39 ± 2.18; $p < 0.001$). Significant time effects were also observed for the psychological ($F(3.27, 327) = 3.46$, $p = 0.01$, $\eta^2 = 0.03$) and social ($F(3.27, 327) = 5.76$, $p < 0.001$, $\eta^2 = 0.06$) quality of life domains. Both domains displayed variability over time, with alternating improvements and declines. Social scores were significantly lower at 1 week (-8.49 ± 2.13; $p = 0.001$) and 6 months (-5.21 ± 1.73; $p = 0.03$) compared with baseline measures. By 12 months, the psychological domain showed a slight, non-significant improvement from baseline, whereas the social domain remained below baseline levels. No significant effects were observed for the environmental domain. Table 20 presents within-group descriptive data for each quality-of-life domains across time.

Table 20. Intervention effect on quality-of-life domains

Outcome	Timepoint	Control group (C) n=52	Intervention group (I) n=49	Mean difference	95% CI	*p*
		Mean ± SD (95% CI)		(I - C) ± SD		
Physical domain (/100)	**Group effect**	50.5 ± 2.5 (45.5-55.5)	47.3 ± 2.6 (42.2-52.5)	-3.2 ± 0.4	-10.2 – 4.0	0.4
	Baseline	44.1 ± 2.8 (38.4-49.7)	45.6 ± 2.9 (39.8-51.4)			
	1-week	45.9 ± 2.8 (40.5-51.4)	43.4 ± 2.8 (37.8-49.1)			
	3-month	49.8 ± 2.8 (44.3-55.3)	47.0 ± 2.9 (41.3-52.6)			
	6-month	53.3 ± 3.2 (46.9-59.6)	49.5 ± 3.3 (43.0-56.1)			
	12-month	59.4 ± 3.2 (53.1-65.8)	51.1 ± 3.3 (44.6-57.7)			
Psycholo-gical domain (/100)	**Group effect**	62.9 ± 2.3 (58.4-67.4)	59.5 ± 2.3 (54.8-64.1)	-3.4 ± 3.3	-9.9 – 3.1	0.3
	Baseline	63.6 ± 2.3 (59.1-68.1)	61.2 ± 2.3 (56.6-65.9)			
	1-week	59.1 ± 2.8 (53.6-64.6)	57.3 ± 2.9 (51.6-63.0)			
	3-month	64.2 ± 2.6 (59.1-69.3)	59.9 ± 2.6 (54.6-65.1)			
	6-month	61.9 ± 2.8 (56.2-67.5)	57.9 ± 2.9 (52.1-63.7)			
	12-month	65.7 ± 2.7 (60.3-71.1)	61.1 ± 2.8 (55.6-66.7)			

Social domain (/100)	**Group effect**	62.9 ± 2.2 (58.6-67.2)	59.9 ± 2.2 (55.5-64.3)	-3.0 ± 3.1	-9.1 – 3.2	0.3
	Baseline	66.9 ± 2.4 (62.1-71.7)	64.9 ± 2.5 (59.9-70.0)			
	1-week	58.8 ± 3.0 (52.9-64.7)	56.0 ± 3.1 (49.9-62.0)			
	3-month	61.9 ± 2.5 (57.0-66.8)	59.9 ± 2.6 (54.8-65.0)			
	6-month	62.5 ± 2.8 (57.0-68.0)	58.8 ± 2.9 (53.1-64.4)			
	12-month	64.3 ± 2.7 (58.9-69.7)	60.1 ± 2.8 (54.6-65.7)			
Environm e-ntal domain (/100)	**Group effect**	73.5 ± 2.0 (69.6-77.4)	70.0 ± 2.0 (66.0-74.1)	-3.5 ± 2.8	-9.1 – 2.2	0.2
	Baseline	74.3 ± 2.1 (70.2-78.4)	72.0 ± 2.1 (67.8-76.2)			
	1-week	72.0 ± 2.3 (67.4-76.6)	69.4 ± 2.4 (64.7-74.1)			
	3-month	72.7 ± 2.2 (68.3-77.1)	70.9 ± 2.3 (66.3-75.4)			
	6-month	72.8 ± 2.4 (68.0-77.6)	69.0 ± 2.5 (64.1-74.0)			
	12-month	75.7 ± 2.6 (70.5-80.8)	69.0 ± 2.7 (63.7-74.2)			

SD: Standard deviation; * $p < 0.05$

Perception of change

Table 21 presents the distribution of participants' perceived change (improved, unchanged, or worsened) in the intervention and control groups. At 1, 3, 6, and 12 months, both groups showed similar proportions reporting improvement, no change, or deterioration, with no statistically significant between-group differences at any time point (all $p \geq 0.05$). Overall, the proportion of participants reporting improvement increased from 1 week to 3 months in the intervention (from 14.3% to 40.8%) and control (from 19.2% to 38.5%) groups, then stabilized or fluctuated slightly through 6–12 months.

Table 21. Participants' perceived global change over time by group

Global impression of change	**Intervention group (n=49)**	**Control group (n=52)**	*p*
1-week follow-up (n, %)			
Improved	7 (14.3)	10 (19.2)	0.4
Unchanged	33 (67.3)	37 (71.2)	
Worsened	9 (18.4)	5 (9.6)	
3-month follow-up (n, %)			
Improved	20 (40.8)	20 (38.5)	0.6
Unchanged	19 (38.8.)	17 (32.7)	
Worsened	10 (20.4)	15 (28.8)	
6-month follow-up (n, %)			
Improved	16 (32.7)	16 (30.8)	0.7
Unchanged	20 (40.8)	18 (34.6)	
Worsened	13 (26.5)	18 (34.6)	
12-month follow-up (n, %)			
Improved	17 (34.7)	20 (38.5)	0.6
Unchanged	17 (34.7)	21 (40.2)	
Worsened	15 (30.6)	11 (21.2)	

Intervention effect on healthcare trajectory outcomes

Figure 4 presents the proportion of participants in each group who reported using healthcare resources since the previous assessment. No significant between-group differences were observed for the use of publicly funded care, prescribed pain medication, or imaging and laboratory investigations. At the 6-month follow-up, a significantly smaller proportion of participants in the intervention group (49.0%) reported consulting a general practitioner since the 3-month follow-up compared with 69.2% of participants in the control group ($p = 0.04$). However, this difference was not maintained at 12 months, and generalized linear mixed models revealed no significant group effects or group × time interactions, suggesting that both groups followed similar care trajectories over time. Although the differences were not statistically significant, participants in the control group tended to have slightly lower odds of using non–publicly funded care at the 3-month follow-up, and slightly higher odds of having consulted a general practitioner between the 3- and 6-month assessments. Significant time effects were observed for the use of non–publicly funded care ($p = 0.03$), prescribed pain medication ($p < 0.001$), laboratory tests ($p <0.001$), and for consultations with a general practitioner ($p < 0.001$), reflecting that the odds of using healthcare resources varied significantly across time points in both groups. Specifically, the overall odds of consulting with a general practitioner (OR 5.92; 95% CI [2.56 – 13.70], $p < 0.001$) were significantly higher 12 months after the triage evaluation compared to 1-week follow-up.

Harms

No adverse events or unintended effects were observed during the triage evaluation nor were any reported during the week following the assessment.

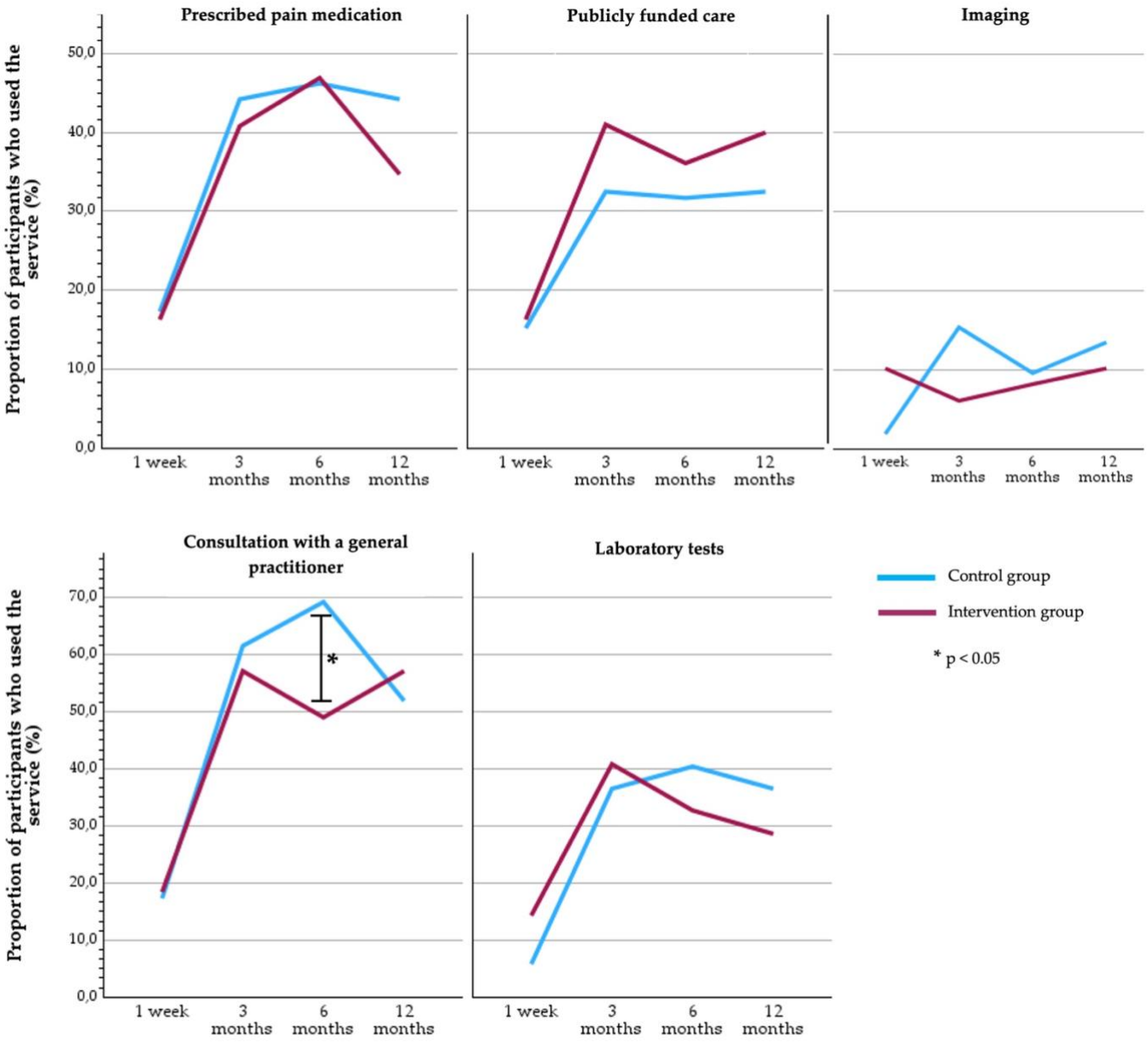


Figure 4. Healthcare service utilization over time.

Discussion

This study aimed to evaluate the effects of an evidence-based triage assessment performed by musculoskeletal health experts on the clinical outcomes and care trajectories of patients with LBP referred for a neurosurgery consultation. It was hypothesized that this intervention would lead to equivalent clinical outcomes while optimizing care trajectories compared to usual management.

Equivalence between groups for back pain outcomes could not be demonstrated based on the predefined margins. However, the observed differences at each time point remained below the minimal clinically important difference, suggesting clinical similarity between groups. Overall, both groups experienced small but statistically significant improvements over time across most clinical outcomes, with no consistent evidence that the triage intervention led to superior clinical benefits compared with usual care. These results were expected given that chiropractors were responsible for providing conclusions and recommendations to neurosurgeons, a role intended to guide rather than directly change clinical decisions.

The triage assessment appeared to have a modest, short-term influence on care trajectories, with participants in the intervention group reporting lower rates of consultation with a general practitioner at the 6-month follow-up ($p=0.04$). However, the mixed model analysis accounting for repeated measures and intra-subject correlation showed no statistically significant differences, suggesting that this effect was not sustained over time. The lower proportion of patients reporting general practitioner consultations in the intervention group may reflect the influence of the shared triage recommendations. Evidence from a systematic review including 11 prospective cohort studies suggests that recovery from a new episode of LBP typically occurs within the initial 6–12 weeks, after which persistent symptoms are less likely to resolve spontaneously (Itz et al., 2013). Therefore, the 6-month difference may represent a stage at which persistent symptoms in the control group prompted greater reliance on medical consultations. Providing neurosurgeons with the chiropractor's assessment and management conclusions may have promoted evidence-based care, and participants in the intervention group may have been more likely to seek conservative care approaches for new episodes of LBP.

To optimize the potential benefits of the triage assessment on clinical outcomes and care trajectories, evidence suggests that priority should be given to minimizing inappropriate referrals and promoting timely access to the most appropriate healthcare professional(Hartvigsen et al., 2018). This perspective is particularly relevant when interpreted alongside our study results. Indeed, a secondary analysis of our study findings showed that neurosurgeons recommended conservative care as the most appropriate management strategy for 51.0% of participants (Mathieu et al., 2025). Among these patients, nearly 70% had been waiting for more than six months to see the neurosurgeon, and almost one quarter for over twelve months (Mathieu et al., 2025). Informally, several of these patients reported having neither initiated conservative treatment nor engaged in self-management strategies during the waiting period, mentioning uncertainty about appropriate interventions and concern about exacerbating their condition. Furthermore, among patients considered surgical candidates, about one third were seen after seven months or more (Mathieu et al., 2025). These results not only suggest that non-surgical patients are denied timely and appropriate care for their condition, but also that suboptimal referral practices contributed to long and avoidable delays for those in need of spine surgery. Together, these results suggest that an evidence-based triage service led by musculoskeletal experts might have a greater impact on clinical outcomes and care trajectories if implemented earlier in the care pathway, either within primary care settings or as an intermediate assessment service.

Interestingly, most studies assessing the effectiveness of LBP clinical pathways with intermediate services have largely focused on system-level outcomes, such as patient flow and healthcare resource utilization, while evidence on clinical outcomes remains limited (C. Murphy, French, McCarthy, & Cunningham, 2022). Reported improvements in care trajectories included greater appropriateness of referrals to spinal surgeons (Brenna Bath et al., 2012; B. Bath & Pahwa, 2012; Blackburn, Cowan, Cary, & Nall, 2009; Fleuren et al., 2010; Hart & Ryton, 2014; Kindrachuk & Fourney, 2014; Wilgenbusch et al., 2014; Wood, Hendrick, Boszczyk, & Dunstan, 2016; Zarrabian et al., 2017), higher use of conservative treatments prior to surgical consultation(Wu et al., 2021), reduced use of unnecessary imaging (Kindrachuk & Fourney, 2014; Whedon et al., 2020; Wilgenbusch et al., 2014), similar or shorter wait times to access secondary or tertiary care

services (Blackburn et al., 2009; Kindrachuk & Fourney, 2014; Konstantinou et al., 2020; McKeag et al., 2020; Wilgenbusch et al., 2014), and fewer subsequent consultations with general practitioners (Murray, 2011). To date, only one randomised controlled trial investigated the effects of a stratified care pathway, implemented as an interface service, on the resolution of LBP and sciatica symptoms(Konstantinou et al., 2020). Compared with patients receiving usual care, patients managed through the stratified care model showed no significant differences in median time to symptoms resolution, nor in back or leg pain intensity, physical function, anxiety, depression, and kinesiophobia symptoms at both 4-month and 12-month follow-ups(Konstantinou et al., 2020). Another prospective non-randomised study compared the clinical profiles and lumbar spine surgery outcomes of patients referred to a spine surgeon through a multidisciplinary spine care pathway (SSP) with those who accessed the service by conventional referral processes (Wu et al., 2021). The SSP assessment did not result in significant differences in LBP intensity or functional status of patients at initial presentation to the spine surgeon, nor did it lead to different surgical outcomes (Wu et al., 2021). However, patients referred through the SSP tended to experience shorter waiting times for both the surgical consultation and subsequent surgery(Wu et al., 2021). Finally, an observational study by Jess et al. (2021) reported that patients with LBP of less than 3 months duration enrolled in the North East of England Regional Back Pain and Radicular Pain Pathway demonstrated larger clinical improvements in pain intensity, disability and quality of life at 12-month follow-up compared with patients enrolled in the pathway but experiencing symptoms for 12 months or longer (Jess et al., 2021). Although this study did not include a usual care comparator group, these findings suggest that triage services may achieve greater effectiveness when introduced early in the patient management process**,** potentially preventing the transition to chronicity. Nonetheless, additional research is warranted to determine the clinical effectiveness of triage services led by musculoskeletal experts prior to advocating their implementation in primary care or as intermediate interface models.

Future research should also examine potential barriers to implementing alternative care models to ensure their clinical applicability and acceptability. Some authors have reported resistance from healthcare professionals who either bypassed established care pathways or expressed reluctance toward collaborative models, perceived as diminishing their autonomy or

competencies (Brenna Bath et al., 2012; Hart & Ryton, 2014). Additionally, clinicians have reported frustration over their limited ability to influence the timing of subsequent treatments once patients entered the alternative pathway(Saunders, Konstantinou, Artus, Foster, & Bartlam, 2020). Some patients also perceived these models as overly protocol-driven, reducing their participation in shared decision-making (Ryan, Pope, & Roberts, 2020), or described their experience as fragmented, occasionally resulting in conflicting opinions or additional delays to access services (Ryan et al., 2020). Overall, these observations underscore that the successful implementation of triage services requires the active engagement of all stakeholders, including administrators, clinicians, and patients, to promote collaboration, shared decision-making, and a coordinated care experience.

Strengths and limitations

This study advances understanding of the effects of an evidence-based triage intervention on clinical outcomes and care trajectories for patients referred to tertiary care for LBP. Given that prior research on the integration of non-physician musculoskeletal experts into care pathways has mostly relied on observational studies, the present work enhances the quality and robustness of available data. However, some limitations should be acknowledged. Although standardized assessment methods were applied to minimize variability among chiropractors, inter-rater reliability was not directly measured. Beyond this methodological consideration, a qualitative assessment involving neurosurgeons could have provided valuable insights into whether the reports were perceived as useful and whether they influenced clinical decision-making. The external validity of the study is also limited by its single-site setting, the small number of participating chiropractors and neurosurgeons, and the relatively homogeneous sociodemographic profile of participants. As a result, the findings may not fully represent the broader population of patients referred for specialized low back pain management. Lastly, healthcare utilization data were based on self-reported measures and may therefore be subject to recall bias. Additionally, these data were not analyzed according to patients' psychosocial risk profiles or diagnostic categories**,** preventing assessment of how care patterns differed across patient subgroups.

Conclusion

This study examined the impact of a novel, evidence-based triage intervention led by musculoskeletal health experts on clinical outcomes and care trajectories for patients referred to tertiary care for LBP. Despite not meeting formal equivalence criteria, the consistently small differences observed between groups over time suggest that the triage intervention performs similarly to usual management. Although this may indicate that the chiropractors' involvement did not substantially alter patient trajectories, evidence from previous work suggest that these findings may instead reflect the high level of concordance between chiropractors' and neurosurgeon's clinical decisions. In this context, future studies should explore the implementation of triage services led by non-physician musculoskeletal experts earlier in the care pathway, either within primary care or as an intermediate assessment service, where their potential to optimize patient trajectories may be greater.

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Chapitre 6 – Article IV: Diagnostic and management concordance between chiropractors and neurosurgeons for patients with low back pain.

Ce chapitre inclut le quatrième article de cette thèse qui a été publié dans la revue « Scientific Reports » en 2025.

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Résumé

Contexte : La lombalgie est la principale cause d'incapacité dans le monde et un motif fréquent de consultation en soins primaires. Des modèles de soins alternatifs, tirant parti de l'expertise et des compétences des professionnels spécialisés en santé musculosquelettique, suscitent un intérêt croissant en raison de leur potentiel à améliorer l'accès opportun à des soins appropriés pour les patients présentant des troubles musculosquelettiques.

Objectif : L'objectif de cette étude était d'évaluer la concordance diagnostique et de prise en charge entre les chiropraticiens, reconnus comme experts en santé musculosquelettique, et les neurochirurgiens pour des patients souffrant de lombalgie.

Méthodes : Une analyse secondaire des données d'un essai contrôlé randomisé a été menée. L'essai clinique visait à évaluer les effets d'un triage fondé sur les données probantes, effectué par un chiropraticien, sur les résultats cliniques et les trajectoires de soins des patients présentant une lombalgie (www.clinicaltrials.gov**,** NCT04923308). Dans cet essai, la randomisation ne déterminait pas si le participant recevait un traitement ou non, mais plutôt si les conclusions de l'évaluation du chiropraticien étaient communiquées au neurochirurgien. Autrement dit, quel que soit le groupe d'attribution, tous les participants ont été évalués par un chiropraticien, puis par un neurochirurgien. Les conclusions et les recommandations des chiropraticiens ont été partagées aux neurochirurgiens pour les participants du groupe intervention.

Résultats : Avant d'être vus par un neurochirurgien, 101 participants admissibles (âge moyen : 60,32 ans) ont été évalués par un chiropraticien. L'accord diagnostique global entre les chiropraticiens et les neurochirurgiens était de 74,7 %, avec un accord inter-évaluateur modéré ($\kappa = 0,51$; IC à 95 % [0,35–0,68]). Les chiropraticiens étaient significativement moins susceptibles de poser un diagnostic de lombalgie non spécifique (31,6 %) comparativement aux neurochirurgiens (43,2 %) ($p = 0,02$), avec une proportion d'accord de 80,0 %. L'accord global concernant la prise en charge était de 82,0 %, indiquant que les chiropraticiens possèdent les compétences pour trier adéquatement les patients présentant une lombalgie. Cette intervention est susceptible d'optimiser les trajectoires de soins en accélérant la prise en charge des cas non chirurgicaux et en réduisant les listes d'attente pour les consultations en chirurgie spinale.

Conclusion: Des études prospectives sont nécessaires pour évaluer l'impact d'un triage réalisé par un chiropraticien sur les résultats cliniques et l'utilisation des services de santé chez les patients souffrant de lombalgie.

Mots clés : lombalgie, concordance, modèles de soins, accès aux soins, services spécialisés, soins tertiaires

Abstract

Background : Low back pain is the leading contributor to disability worldwide and a major cause of primary care visits. Alternative models of care delivery drawing on musculoskeletal experts' skills and knowledge have received increasing attention for their potential ability to improve timely access to appropriate healthcare for patients with musculoskeletal disorders. The aim of this study was to evaluate diagnostic and management concordance between chiropractors, known as musculoskeletal experts, and neurosurgeons for patients with low back pain.

Methods: The aim of this study was to evaluate diagnostic and management concordance between chiropractors, known as musculoskeletal experts, and neurosurgeons for patients with low back pain. Before being seen by a neurosurgeon, 101 eligible participants (mean age: 60.32 years) were evaluated by a chiropractor.

Results: Overall diagnostic agreement between chiropractors and neurosurgeons was 74.7%, with a moderate inter-rater diagnosis agreement (κ= 0.51; 95%CI [0.35-0.68]). Chiropractors were significantly less likely to attribute a diagnosis of non-specific LBP to participants (31.6%) compared to neurosurgeons (43.2%) (p=0.02), with an agreement proportion of 80.0%. Overall management agreement was 82.0%, indicating that chiropractors possess good skills in triaging patients with low back pain, which can optimize patient trajectories by accelerating management of non-surgical cases and reducing waiting lists for spine surgery consultations.

Conclusion: Prospective studies are needed to evaluate the impact of a chiropractor-informed triage on clinical outcomes and healthcare utilization for patients with low back pain.

Keywords: low back pain, concordance, models of care, access to care, specialized services, tertiary care

Background

Musculoskeletal disorders (MSDs) are the leading contributor to disability worldwide, with low back pain (LBP) being the primary cause of disability in 160 countries (GBD Study, 2018; World Health Organization, 2022). The prevalence of MSDs has steadily increased, from 23.0% in 1990 to 27.8% in 2017 in Canada, which may be influenced by factors such as sedentary lifestyles and population aging (GBD Study, 2018). In its latest report addressing costs associated with major diseases and injuries, the Public Health Agency of Canada reported that $6.7 billion, representing 6.0% of Canada's annual health expenditures, were attributed to direct costs related to MSDs (i.e., medications, hospital care and physicians care) (Public Health Agency of Canada, 2017). An analysis of Ontario's administrative databases for the 2013-2014 fiscal year revealed that 28.5% of adults made one or more ambulatory visit to a physician for MSDs during the study year, representing 5.6 million primary care visits annually (Power et al., 2022).

Although international practice guidelines for the management of LBP exist, significant gaps between evidence and clinical practices persist, contributing to the inappropriate use of diagnostic and therapeutic approaches, including the overuse of opioid prescriptions and imaging, as well as the over-reliance on medical specialists' expertise (Bishop & Wing, 2003; Debono, Sabatier, Koudsie, Buffenoir, & Hamel, 2017). In 2016, in the province of Quebec, Canada, the Ministry of Health and Social Services introduced the Service Request Management Center (*Centre de répartition des demandes de services*-CRDS), a centralized waiting list for all specialized services, where patients are placed in a queue based on medical priority (defined by pre-established criteria presented in Appendix C) (Breton et al., 2020; Gouvernement du Québec, 2022). In 2018, a CRDS has been implemented to enhance timely access to specialized care within the area served by the *Centre intégré universitaire de soins de santé et de services sociaux de la Mauricie-et-du-Centre-du Québec* (CIUSSS-MCQ). In this administrative region, neurosurgeons are the exclusive specialists responsible for patients with LBP requiring specialized care, except for trauma cases. This limits accessibility further compared to other regions, where care is distributed among multiple specialties. Accordingly, during the year 2024-2025, 2156 patients (covering all conditions managed by neurosurgeons) were awaiting a neurosurgery consultation at CIUSSS-MCQ (Gouvernement du Québec, 2025). Of these consultations, 83.1% were deemed overdue

according to patients' medical priority (Gouvernement du Québec, 2025). Furthermore, a retrospective analysis of medical health records revealed that 80.4% of LBP referrals to the neurosurgery department at CIUSSS-MCQ were inappropriate either due to the patient's clinical profile or non-compliance with CRDS criteria, with 88.4% of these referrals originating from general practitioners (Mathieu, Robert, Châtillon, Descarreaux, & Marchand, 2024). These findings highlight that, despite the CRDS's prioritization criteria, the current system remains insufficient to ensure optimal referral pathways for patients with LBP.

In recent years, alternative models of care delivery drawing on musculoskeletal experts' skills and knowledge have received increasing attention for their potential ability to improve access to care and promote optimal use of healthcare resources for patients with MSDs. A systematic review with meta-analyses including 19 concordance studies and 6 randomized controlled trials revealed that advanced practice physiotherapists (APPTs) and physicians displayed good to very good diagnostic (pooled κ 0.76 [95% CI 0.68-0.85]) and management (pooled κ 0.71 [95% CI 0.63-0.78]) agreement for patients with MSDs (Lafrance, Vincent, Demont, Charron, & Desmeules, 2023). Additionally, patients with MSDs managed by APPTs in these studies reported comparable or superior clinical outcomes (i.e., reductions in pain and disability) when compared to the physician-led model of care. In the provinces of Ontario, Manitoba, and Saskatchewan, Canada, the Inter-professional Spine Assessment and Education Clinics (ISAEC) were established to improve access, referral appropriateness and delivery of care for both surgical and nonsurgical patients, using nurse practitioners, chiropractors, and physical therapists (PTs) as adjunctive members of the medical team (Fourney et al., 2011). A retrospective review of prospective data from ISAEC clinics in Ontario showed that this shared-care interprofessional model significantly improved referral appropriateness, efficiency of MRI utilization, and wait times for surgical assessment for patients with LBP (Zarrabian et al., 2017).

In the province of Quebec, Canada, similar initiatives have been evaluated, most of them focusing on the ability of PTs to assess and manage patients suffering from peripheral MSDs (Décary et al., 2017; Desmeules et al., 2013; Gagnon et al., 2020; Lafrance et al., 2024; Lowry et al., 2020; Matifat et al., 2019). One study specifically investigated the impact of a model of care led by APPTs on health-related outcomes in surgical and non-surgical patients with spinal disorders and reported

high diagnostic and management concordance between APPTs and spine surgeons (Lafrance et al., 2024). As a result, PTs are being increasingly integrated into a variety of clinical settings, such as emergency departments and orthopedic clinics (Matifat et al., 2019). Given their professional training and expertise (Schneider, Murphy, & Hartvigsen, 2016), chiropractors also have the potential to play a key role in triaging patients with LBP and optimizing referral pathways, whether by offering an alternative entry point into the healthcare system, or by triaging patients already crowded onto waiting lists. However, the lack of integration of chiropractors into the public healthcare system prevents them from directing patients to appropriate healthcare resources.

To address gaps in the current referral process for LBP, we aimed, as a first step, to assess the level of agreement between chiropractors and neurosurgeons in both diagnosis and management decisions. This assessment will help determine whether chiropractors can serve as intermediaries in the care pathways of patients with LBP, potentially reducing unnecessary waits times for medical specialist consultations. Accordingly, this study aimed to evaluate diagnostic and management concordance between chiropractors and neurosurgeons for patients with LBP referred for a neurosurgery consultation. Secondarily, we aimed to determine the patients' characteristics that influence the odds of diagnostic and management disagreements.

Methods

Design

To address these objectives, a secondary analysis of a randomized controlled trial (RCT) was conducted. The RCT aimed to evaluate the effects of evidence-based triaging by a chiropractor on patients' clinical outcomes and care trajectories for LBP (www.clinicaltrials.gov, NCT04923308). In the RCT, the randomization did not determine whether the participant received treatment but rather whether the chiropractor's assessment conclusions were communicated to the neurosurgeon. In other words, regardless of group allocation, all participants underwent a chiropractor's assessment and were subsequently evaluated by the neurosurgeon. For participants in the intervention group, neurosurgeons were kept blinded to the chiropractors' conclusions until they completed their own patient evaluation. This study was reviewed and

approved by the Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec (CIUSSS-MCQ) (CER-2021-488-766) and the Université du Québec à Trois-Rivières (UQTR) (CER-20-269-07.13) independent research ethics boards. All methods were performed in accordance with the relevant guidelines and regulations. All participants signed an informed consent form prior to participation.

Setting

The study was conducted in collaboration with the neurosurgery outpatient clinic affiliated to the CIUSSS-MCQ. The latter serves a population of more than 530,000 people, including 82.5% over the age of 18 (Centre intégré universitaire de santé et de services sociaux de la Mauricie-et-du-Centre-du-Québec, 2023). During the study period, the CIUSSS-MCQ's neurosurgery department was staffed by 3 neurosurgeons. Chiropractors' evaluations were conducted by 3 licensed chiropractors, employed as full-time professors or as lecturers at the UQTR *(*Quebec, Canada), with experience in treating patients with MSDs ranging from 4 to 20 years. To ensure standardized evaluation procedures, chiropractors received an in-person training. The training program was specifically designed to leverage chiropractors' existing knowledge and expertise. As chiropractors are not formally integrated into the public health system in Canada, the training included a 3-hour theoretical session that provided an overview of the public healthcare system's structure, the procedures for referring patients to specialized care, the CRDS's role and pre-established criteria, as well as a revision of key LBP-related topics. These concepts were integrated into a clinical decision-making algorithm (see Appendix G), which served as a decision-aid. To familiarize chiropractors with the application of the algorithm, a 3-hour practical session was conducted, involving case-based scenarios that participants completed individually and then discussed in groups led by the lead clinician of the research team. The training focused on providing chiropractors with the tools to seamlessly integrate their existing expertise into the structured referral process, ensuring they could confidently navigate the system. Neurosurgeons, on the other hand, carried out their evaluations according to their usual clinical practice, to reflect typical real-world healthcare settings.

Participants

All patients referred for a neurosurgery consultation for LBP from July 2021 to November 2023 were identified by the neurosurgery department's administrative staff using primary complaint reported at the time of appointment scheduling. Each patient who consulted in the neurosurgery department was assigned a priority code (A to E) that corresponds to a specific timeframe within which the neurosurgery consultation should occur after the referral is sent (Appendix C). Patients for whom consent was obtained were subsequently contacted by a research assistant to ascertain their eligibility. Inclusion criteria were: [1] being aged 18 years or older; [2] referred for an initial neurosurgery consultation for a primary complaint of LBP (either acute, chronic, or recurring episode); and [3] able to legally consent to participate. As this study was part of an RCT examining the effect of a triage approach led by musculoskeletal experts on patients' clinical outcomes and care trajectories, patients were excluded if they were involved in litigation related to their LBP condition (worker's compensation, public automobile insurance plan or other litigations) as these situations were considered likely to impact patients' prognosis and healthcare utilization.

Procedures and data collection

Before being seen by the neurosurgeon, each eligible participant was invited to come to the facilities of UQTR's *Chaire de recherche internationale en santé neuromusculosquelettique* to be evaluated by the chiropractor. Participants first completed a standardized questionnaire with the research assistant where they provided sociodemographic data, followed by an 11-point numerical rating scale (NRS) to measure back and leg pain intensity, the Oswestry Disability Index (ODI) for LBP-related disability, and the STart Back Screening Tool (SBST) designed to screen patients with LBP for poor prognostic factors. The NRS, ODI and SBST are all valid, reliable, and responsive assessment tools that are suitable for use in clinical practice (Bruyère et al., 2014; Hawker, Mian, Kendzerska, & French, 2011; Vianin, 2008). The chiropractor then conducted an evidence-based triage evaluation (J. Mathieu, Pasquier, Descarreaux, & Marchand, 2023), which consisted of a standardized history taking and physical examination. Table 22 presents all variables that were considered by the chiropractor in determining the primary diagnosis (i.e., the most probable) and the most suitable management strategy for each patient.

Table 22. Variables used to inform diagnostic and management strategies

Category	Variable	Outcome
Clinical data		
History taking	Presence of red flags (i.e., indicators of an underlying pathology)	Bladder and bowel dysfunction, saddle anesthesia, fever, chills, progressive neurological symptoms, history of trauma, prolonged corticosteroid use, recent history of infection, previous history of cancer, unexplained weight loss, intravenous drug use, being immunocompromised, morning stiffness, improvement in back pain with exercise but not with rest, awakening because of pain in the second half on the night, alternating buttock pain, and failure to improve with conservative care
	Pain dominance	Back, leg(s) or both
	Pain status	Intermittent, constant
	Pain duration	Acute (< 4 wks), Subacute (4-12wks) or chronic (> 12 wks)
	Symptoms progression	Stable, aggravating, improving
	Prognostic factors	History of spinal surgery Smoking status Type and number of comorbidities

Self-reported questionnaires	Pain intensity	NRS-11 (Hawker et al., 2011): measure of pain intensity ranging from 0 (no pain) to 10 (pain as bad as it could be)
	Disability	ODI (Vianin, 2008): regroups 10 questions related to different domains including pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sexual life, social life, and traveling. Each question is rated on a scale of 0 to 5 points with a maximum score of 50. Higher scores indicate greater disability.
	Risk of poor prognosis	SBST (Bruyère et al., 2014; Robarts, Razmjou, Yee, & Finkelstein, 2023): brief validated tool (9-item version): designed to screen patients with LBP for prognostic factors and group patients in 3 categories of risk of poor outcome – low, medium, and high risk
Physical examination	Presence of neurological deficits	Sensory, motor, deep tendon reflex deficits
	CNS disorder	Presence of pathological reflexes
Care trajectories data		
History taking	Use of advanced imaging and diagnostic testing for LBP prior to the neurosurgery consult	Number and type

	Use of conservative care prior to the neurosurgery consult	Number and type of treatments Type of health professional seen

CNS: Central nervous system; NRS-11: 11-point Numerical Rating Scale; ODI: Oswestry Disability Index; SBST: STarT Back Screening Tool; wks: weeks

After the assessment, chiropractors completed a standardized clinical note (see Appendix F) where they recorded their final conclusions. Table 23 defines the possible consultation outcomes (i.e., the diagnostic and management categories in which patients were stratified). The diagnosis was determined by considering patient demographics, pain characteristics (i.e., primary site of pain, pain distribution, aggravating and relieving factors), the presence of objective neurological deficits, and the presence of red flags (i.e., indicators of an underlying pathology). The best management strategy was established based on the patient's history of treatments and diagnostic tests, progression of symptoms, level of disability (ODI questionnaire), risk of poor prognosis (as determined by the SBST) and risk of aggravation of the condition. In cases where an underlying pathology was suspected, the International Framework For Red Flags published by Finucane et al. (Finucane et al., 2020) was used to clinically assess the relevance of the information gathered and to determine the most appropriate course of clinical action. To facilitate comparability of decisions made by chiropractors and neurosurgeons, diagnostic and management categories were determined considering best evidence synthesis (J. Mathieu et al., 2023) and after consultation with the neurosurgeon team member (C-É.C). Of note, chiropractors were not tasked to determine whether surgery was indicated or not. Their role was limited to assessing whether the patient required the expertise of a neurosurgeon, either surgical or non-surgical. Similarly, neurosurgeons were not required to specify which type of conservative care was needed but rather to decide if a conservative approach was the most appropriate management strategy for the patient. The use of general diagnostic and management categories in this study allowed both chiropractors and neurosurgeons to evaluate cases based on their respective expertise and knowledge. Neurosurgery consultations' outcomes were retrieved from patients' medical files by a trained research assistant that was kept blinded to the study objectives.

Table 23. Consultation outcomes

Diagnosis		
Category	Main characteristics	Nomenclature
1.Non-specific LBP	Exclusion of radicular syndrome and specific LBP No known pathoanatomical cause	Mechanical LBP, chronic primary LBP, SIJ dysfunction
2.Radicular syndrome	Radicular pain	Sciatica
	Leg pain typically worse than back pain Dermatomal distribution Unilateral (below the knee for L4, L5, S1)	Lumbar disc herniation Lumbar nerve root involvement/compression/impingement
	Radiculopathy	
	Presence of weakness, loss of sensations, or loss of deep tendon reflexes Dermatomal distribution Unilateral Can coexist with radicular pain	
	LSS	
	Typically, bilateral leg pain with or without LBP Pain relief upon sitting, or when bending forward Pain exacerbation while standing up or walking	Neurogenic claudication
3.Specific LBP	Pain arises from an underlying pathoanatomical cause	Spinal fracture Cauda equina syndrome Malignancy/spinal tumor

	Presence of red flags (i.e., indicators of an underlying pathology)	Spinal infection Axial spondyloarthritis
4.Other	Pain arises from problems beyond the lumbar spine	e.g., Cervical myelopathy, vascular disorders, peripheral joints disorders
Management strategies		
Category	Chiropractors	Neurosurgeons
1.Conservative care	Indication to pursue or to initiate conservative treatments Surgical consultation not indicated	a) The patient is discharged from the neurosurgery service or b) A FUP visit, or phone call is scheduled after the conservative care trial
2.Further diagnostic tests needed	Lack of appropriate diagnostic tests or tests not sufficiently up to date to determine the primary diagnosis and the best management strategy	Neurosurgeons determined that there was a lack of appropriate diagnostic tests to establish the diagnosis or identify the best management strategy The patient is advised to undergo the appropriate diagnostic tests (e.g., imaging, EMG) and a FUP visit is scheduled
3.Neurosurgery referral indicated	The patient's clinical profile warrants a neurosurgical consultation (e.g., progressive neurological signs and symptoms, high levels of disability combined to failure of conservative treatments or with evidence of structural abnormalities)	a) Clear surgical indication (i.e., preoperative examinations are scheduled) b) Relative surgical indication[a], a FUP visit is scheduled to monitor the progression of symptoms c) The neurosurgeon determined the surgery was not indicated at this stage but prescribed other tests or interventions, along with a follow-up visit

4.Medical emergency	The patient presents a condition that poses an immediate risk to their life or long-term health (e.g., suspicion of a leaking aortic aneurysm)	Immediate referral to the emergency department
5.Falls under another specialty	Spinal surgery not indicated but the patient needs to be seen by another specialist (e.g., vascular surgeon)	The patient is discharged from the neurosurgery service and is referred to another specialist

FUP: Follow-up; LBP: Low back pain; LSS: Lumbar spinal stenosis; SIJ: Sacro-iliac joint

[a] Potential surgical indication if symptoms persist or worsen after conservative treatment or for clinically stable patients with persistent disabilities.

Statistical analysis

The Kolmogorov-Smirnov normality test was performed for all continuous variables to determine data distribution. Patients' clinical profiles, care trajectories and consultation outcomes were summarized using frequency distributions for categorical variables, and means, medians and standard deviations for continuous variables. Two independent evaluators (J.M., A-A.M.) reviewed diagnoses and management strategies to establish if they were concordant. A third evaluator (M.D.) was involved when consensus was not reached. The proportion of agreement was calculated for overall diagnostic and management agreement, and Cohen's kappa (κ) with associated 95% confidence intervals (95% CI) were calculated for overall diagnostic and management agreement, as well as for each diagnostic category. The strength of agreement for κ was interpreted as described in previous studies on diagnostic agreement: 0.00-0.20: weak; 0.21-0.40: slight; 0.41-0.60: moderate; 0.61-0.80: good; 0.81-0.90: very good, and 0.91-1.00: excellent (Lafrance et al., 2023).

Chi-square tests were used to compare the proportions of patients assigned to each diagnostic category and management strategy. Binomial logistic regression analyses using the Wald

backward selection method was also conducted to determine if any clinical or care trajectories variables predicted diagnostic or management disagreement. Odds ratios (OR) and 95% CI were calculated and reported for each included variable. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 18.0.0 (Armonk, NY: IBM Corp.). Statistical significance was defined as a two-tailed p value < 0.05. A posteriori power analysis was used to determine if an appropriate statistical power was reached. In our study, data from the RCT (www.clinicaltrials.gov, NCT04923308) were used to perform a secondary analysis exploring the diagnostic concordance between professionals and post hoc power analyses provide insight into whether the sample size was adequate for detecting an effect. Considering the sample size, a significance level of 0.05 and a null hypothesis $\kappa_0 \leq 0.4$, we reached a statistical power of 0.8.

Results

Participants

One hundred and fifty potential participants were identified by the neurosurgery department staff at appointment scheduling. Figure 5 presents a flowchart summarizing the recruitment of participants. A total of 101 eligible patients agreed to participate and were included in the study. The mean age of the sample was 60.32 years (SD = 14.69) and 52.5% of included participants were male. The number of days between the chiropractor evaluation and the neurosurgery consultation ranged from 0 to 27 days (median: 1.0; IQR: 1.0-3.0). All participants included in this study were assigned to priority codes C (appointment needed within 28 days), D (appointment needed within 3 months) and E (appointment needed within 12 months).

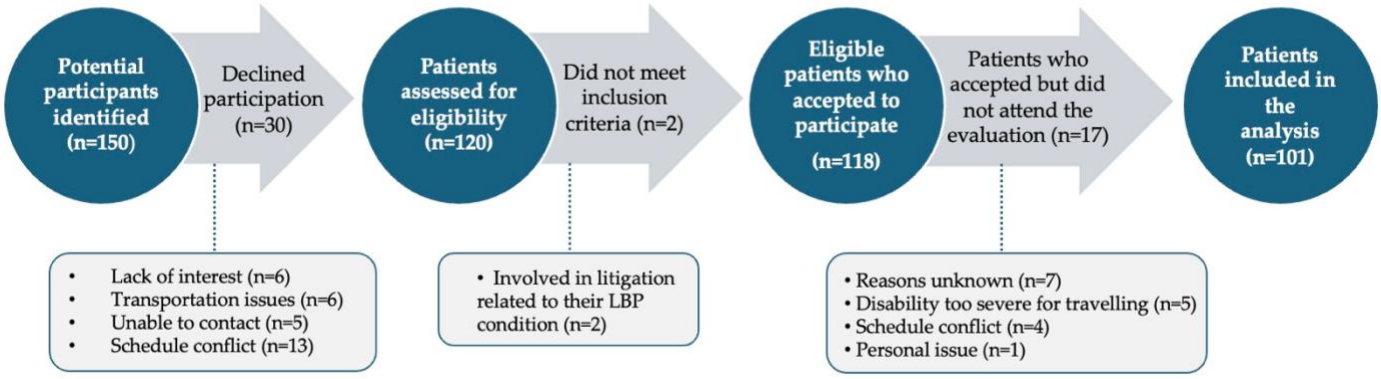


Figure 5. Flowchart of study participants.

Clinical profiles

Patients' clinical characteristics are detailed in Table 24. Of the 101 participants included in the analysis, 42.6% presented with one or more red flags (range 1-6), the most frequent being unusual fatigue (29.7%), night pain (28.8%), and progressive neurological deficit (23.8%). Sixty-one participants (60.4%) reported back pain worse than leg pain, and 57.4% exhibited intermittent symptoms. Most participants (94.1%) were experiencing chronic pain (> 12 weeks), 45.5% had an impaired sensory function, 70.3% had objective motor deficits, and 27.7% showed asymmetrically diminished deep tendon reflexes. Thirty-one participants (30.7%) had stable or improving symptoms at the time of the chiropractor's assessment, and 55.4% exhibited a deterioration in symptomatology. A review of participants' medical history revealed that 10.9% had a previous history of lumbar surgery, and that 15.8% were current smokers. In 67.3% of cases, participants were classified as multimorbid, presenting two or more comorbidities (Belche et al., 2015), the most frequent being cardiovascular diseases (60.4%), endocrine diseases (37.6%) and gastrointestinal disorders (18.8%). Participants experienced moderate back (M=5.3 $\pm$ 2.5) and leg pain intensity (M=4.2 $\pm$ 2.8) and reported moderate LBP-related disability (M= 39.4 $\pm$ 17.0). As for risk of poor prognosis determined by the SBST, 24.8% of patients were stratified as low risk, 41.6% as medium risk, and 32.7% as high risk.

Table 24. Clinical profiles based on chiropractors' assessments

Characteristics (N=101)	N (%) or Mean ± SD	Missing value, n (%)
Presence of one or more red flags (yes)	43 (42.6)	-
Red flags (type)		-
Unusual fatigue	30 (29.7)	
Night pain	29 (28.7)	
Progressive neurological deficit	24 (23.8)	
Morning stiffness	19 (18.8)	
Urinary or fecal incontinence	18 (18.7)	
History of cancer	17 (16.8)	
Urinary retention	16 (15.8)	
Night sweats	14 (13.9)	
Other	20 (19.8)	
Pain dominance		-
Back dominant	61 (60.4)	
Leg dominant	40 (39.6)	
Pain status		-
Constant pain	43 (42.6)	
Intermittent pain	58 (57.4)	
Pain duration		-
Acute	2 (2.0)	
Subacute	4 (4.0)	
Chronic	95 (94.1)	
Symptom progression		14 (13.9)
Stable	12 (11.9)	
Aggravation	56 (55.4)	
Improvement	19 (18.8)	

History of spinal surgery (yes)	11 (10.9)	-
Smoking status		3 (3.0)
Non-smoker	51 (50.5)	
Current smoker	16 (15.8)	
Former smoker	30 (29.7)	
Comorbidities (number)		-
0-1	33 (32.7)	
Multimorbidity ($\geq$ 2)	68 (67.3)	
Comorbidities (type)		-
Cardiovascular	61 (60.4)	
Endocrine	38 (37.6)	
Gastrointestinal	19 (18.8)	
Psychological	18 (17.8)	
Neurological	13 (12.9)	
Other	50 (49.5)	
Pain intensity (NRS-11)		1 (1.0)
Back pain	5.3 ± 2.5	
Leg pain	4.2 ± 2.8	
Disability (ODI)	39.4 ± 17.0	1 (1.0)
Risk of poor prognosis (SBST)		1 (1.0)
Low risk	25 (24.8)	
Medium risk	42 (41.6)	
High risk	33 (32.7)	
Sensory function		4 (4.0)
Hypoesthesia	44 (43.6)	
Hyperesthesia	1 (1.0)	
Allodynia	1 (1.0)	
Normal	51 (50.5)	

Motor function		1 (1.0)
Motor deficit	71 (70.3)	
Normal	28 (27.7)	
Reflexes		2 (2.0)
Hyporeflexia	28 (27.7)	
Hyperreflexia	0 (0.0)	
Normal	70 (69.3)	
Presence of pathological reflexes		1 (1.0)
Clonus	5 (5.0)	
Positive Babinski sign	1 (1.0)	
Positive Hoffman sign	1 (1.0)	

NRS-11: 11-point Numerical Rating Scale; ODI: Oswestry Disability Index; SBST: STarT Back Screening Tool; SD: Standard deviation.

Care trajectories

Table 25 presents detailed information regarding participants' care trajectories for their current LBP episode. Nearly all (92.1%) participants were referred by their primary physician for further diagnostic testing prior to their initial neurosurgery consultation, with MRI (85.1%) and CT-scan (20.8%) being the most frequently prescribed imaging procedures. Seventy-five participants (74.3%) received conservative treatments prior to the neurosurgery consultation, including 41.8% for whom pain medication was prescribed, 46.5% who received anesthetic injections, 51.5% who underwent physiotherapy treatments, and 34.7% who had seen a chiropractor.

Table 25. Previous examinations and treatments

Characteristics (N=101)	N (%)	Missing value, n (%)
Diagnostic tests prior to the neurosurgery consultation (yes)	93 (92.1)	2 (2.0)
Diagnostic tests (type)		1 (1.0)
MRI	86 (85.1)	
CT-scan	21 (20.8)	
X-rays	7 (6.9)	
Other[a]	8 (7.9)	
Conservative treatments prior to the consultation (yes)	75 (74.3)	-
Non-pharmacological conservative treatments prior to the consultation		-
Physiotherapy	52 (51.5)	
Massage therapy	17 (16.8)	
Chiropractic	35 (34.7)	
Other[b]	16 (15.8)	
Pharmacological conservative treatments prior to the consultation		26 (25.7)
Pain medication	91 (90.1)	
Anesthetic injections	47 (46.5)	
Previous consultation with a neurosurgeon for the same LBP problem (yes)	22 (21.8)	-

CT-scan: Computed tomography; MRI: Magnetic resonance imaging; X-rays, Radiographs.

[a]Angiography scan, Electromyography, Scintigraphy

[b]Kinesiology, Osteopathy, Acupuncture, Occupational therapy

Consultation outcomes

The final conclusions of the chiropractors' assessments are presented in Table 26. Sixty-five participants (64.4%) were diagnosed with a radicular syndrome, with each participant having one of the following conditions: radicular pain, lumbar radiculopathy or lumbar spinal stenosis. The diagnosis of non-specific LBP was attributed to 29.7% of participants, with the remaining suffering from specific LBP (1.0%) or experiencing symptoms unrelated to lumbar spine disorders (5.0%). Upon chiropractors' assessment, conservative care was considered the most appropriate management strategy for 50.5% of participants, while 43.6% were deemed to require a neurosurgery consultation. For 3 participants, further diagnostic tests were considered necessary to determine the best management strategy.

Table 26. Outcomes of chiropractors' evaluation

Characteristics (N=101)	**N (%)**
Diagnostic	
1.Non-specific LBP	30 (29.7)
2.Radicular syndrome	65 (64.4)
3.Specific LBP	1 (1.0)
4.Other	5 (5.0)
Management strategies	
1.Conservative care	50 (50.5)
2.Further diagnostic tests needed	3 (3.0)
3.Neurosurgery referral indicated	44 (43.6)
4.Medical emergency	0 (0.0)
5.Falls under another specialty	4 (4.0)

LBP: Low back pain

Of the 101 participants, 100 attended their consultation with the neurosurgeon. Neurosurgery consultation outcomes are presented in Table 27. A clear spinal surgery indication was documented in 9.0% of participants. Thirty-five percent of participants were discharged from the neurosurgery service and advised to pursue or initiate conservative treatments, and 16.0% were prescribed a follow-up visit after their conservative care trial. For participants non-surgically managed by neurosurgeons (i.e., those for whom the neurosurgeon determined the surgery was not indicated at this stage but prescribed other tests or interventions, along with a follow-up visit) (33.0%), 20.0% were referred for anesthetic injections, and 11.0% for advanced imaging or other tests (e.g., EMG). Three participants (3.0%) attended the neurosurgery consultation without the required imaging. As a result, neurosurgeons determined that there was a lack of appropriate diagnostic tests to establish the diagnosis or identify the best management strategy.

Table 27. Neurosurgery consultations' outcomes

Characteristics (N=100)	**N (%)**	**Missing value, n (%)**
Diagnostic		
1.Non-specific LBP	41 (41.0)	5 (5.0)
2.Radicular syndrome	52 (52.0)	
3.Specific LBP	0 (0.0)	
4.Other	2 (2.0)	
Management strategies		
1.Conservative care		-
a) Discharge from the neurosurgery service and advise to pursue or initiate conservative treatments	35 (35.0)	
b) Conservative care and FUP	16 (16.0)	
2. Further diagnostic tests needed[a]	3 (3.0)	

3. Neurosurgery referral indicated		
a) Clear surgical indication (surgery performed)	9 (9.0)	
b) Relative surgical indication	2 (2.0)	
c) Other tests and FUP Anesthetic injections and FUP Imaging and FUP	20 (20.0) 11 (11.0)	
4.Falls under another specialty	4 (4.0)	
5.Medical emergency	0 (0.0)	

FUP: Follow-up; LBP: Low back pain

[a] Neurosurgeons determined that there was a lack of appropriate diagnostic tests to establish the diagnosis or identify the best management strategy

Diagnostic agreement

Of the 101 participants, 6 were excluded from the diagnostic agreement analysis, including 5 for whom no formal diagnosis was retrieved from the patient's file by the research assistant and 1 who did not attend the neurosurgery consultation (due to a personal issue). Overall diagnostic agreement between chiropractors and neurosurgeons was 74.7 % (71/95) and inter-rater diagnosis agreement was moderate (κ= 0.51; 95%CI [0.35-0.68]). Table 28 presents agreement proportions and inter-rater diagnosis agreement per diagnostic category. Chiropractors were significantly less likely to attribute a diagnosis of non-specific LBP to participants (31.6%) compared to neurosurgeons (43.2%) (p=0.02), with an agreement proportion of 80.0%. Sixty participants (63.2%) were diagnosed with a radicular syndrome by the chiropractors, compared to 54.7% by the neurosurgeons (p=0.09), with an agreement proportion of 75.0%. Chiropractors were more likely than neurosurgeons to consider a problem beyond the lumbar spine as the cause of LBP (5.3% vs 2.1%), but this difference was not statistically significant (p=0.08).

Table 28. Diagnostic agreement

Primary diagnosis	Chiropractors (%)	Neurosurgeons (%)	Chi-square test (p value)	Agreement proportion (%)	κ (95% CI)
1.Non-specific LBP	30 (31.6)	41 (43.2)	5.26 (0.02)*	24/30 (80.0)	0.49 (0.32-0.66)
2.Radicular syndrome	60 (63.2)	52 (54.7)	2.91 (0.09)	45/60 (75.0)	0.53 (0.35-0.70)
3.Specific LBP	0 (0.0)	0 (0.0)	-	-	-
4.Other	5 (5.3)	2 (2.1)	3.00 (0.08)	2/5 (40.0)	0.56 (1.12-0.99)

κ: Cohen's kappa; LBP: Low back pain; **p<0.05*

Management agreement

Of the 101 participants, one was excluded from the management agreement analysis for not attending the neurosurgery consultation (due to a personal issue). Overall management agreement between chiropractors and neurosurgeons was 82.0% (82/100), with good inter-rater agreement (κ 0.68; 95%CI [0.54-0.82]). Table 29 presents agreement proportion per management category. Chiropractors determined that undergoing conservative care treatments was the best management strategy for 49.0% of participants, compared to 51.0 % for neurosurgeons (p=0.815), with an agreement proportion of 83.7%. Both the chiropractors and neurosurgeons identified 3 participants that needed to undergo further diagnostic tests and 4 participants that needed to be seen by another specialist (i.e., vascular surgeon, ENT specialist), with an agreement proportion of 100.0%. Chiropractors determined that 44.0% of participants presented with a condition warranting the expertise of a neurosurgeon, while 42.0% of the participants were managed by neurosurgeons (p= 0.481), either surgically or non-surgically, with an agreement proportion of 77.3%.

Table 29. Management agreement

Management strategy	Chiropractors (%)	Neurosurgeons (%)	Chi-square test (p value)	Agreement proportion (%)
1.Conservative care	49 (49.0)	51 (51.0)	0.22 (0.815)	41/49 (83.7)
2.Further diagnostic tests needed	3 (3.0)	3 (3.0)	-	3/3 (100.0)
3.Neurosurgery referral indicated[a]	44 (44.0)	42 (42.0)	0.89 (0.481)	34/44 (77.3)
4.Medical emergency	0 (0.0)	0 (0.0)	-	-
5.Falls under another specialty	4 (4.0)	4 (4.0)	-	4/4 (100.0)

*p<0.05

[a]Chiropractors determined that the participant's condition warranted the expertise of a neurosurgeon. Neurosurgeons managed the participant either surgically or non-surgically

Figure 6 details neurosurgeons' decisions for the participants for whom chiropractors recommended conservative care or a neurosurgery consultation. We defined agreement between providers for conservative care as occurring when neurosurgeons also recommended conservative care, with or without a follow-up visit. We defined an agreement between providers for a neurosurgery referral as occurring when neurosurgeons managed the patient either surgically or non-surgically (i.e., by prescribing additional tests or interventions along with a follow-up visit). Of the 49 participants who were advised to initiate or pursue conservative care by chiropractors, 28 (57.1%) were discharged from the neurosurgery service upon initial consultation (i.e., the neurosurgeon determined that their expertise was not required, and that the patient should initiate or pursue conservative treatment), and 13 (26.5%) were recommended conservative care combined with a follow-up visit. Eight participants (16.3%) for which conservative care was determined to be the best management strategy by the chiropractors were managed by neurosurgeons, of whom 7 (14.3%) were prescribed other tests with a follow-up visit, and one (2.0%) who underwent spinal surgery. Ten participants (22.7%) for whom the

neurosurgery consultation was deemed necessary by the chiropractors were advised by neurosurgeons to pursue conservative treatments, including 7 (15.9%) who were discharged from the neurosurgery service, and 3 (6.8%) for which a follow-up visit was scheduled. Thirty-four participants (77.3%) were managed by neurosurgeons as recommended by the chiropractors including 26 (59.1%) who were prescribed other tests with a follow-up visit, and 8 (18.2%) who underwent spinal surgery.

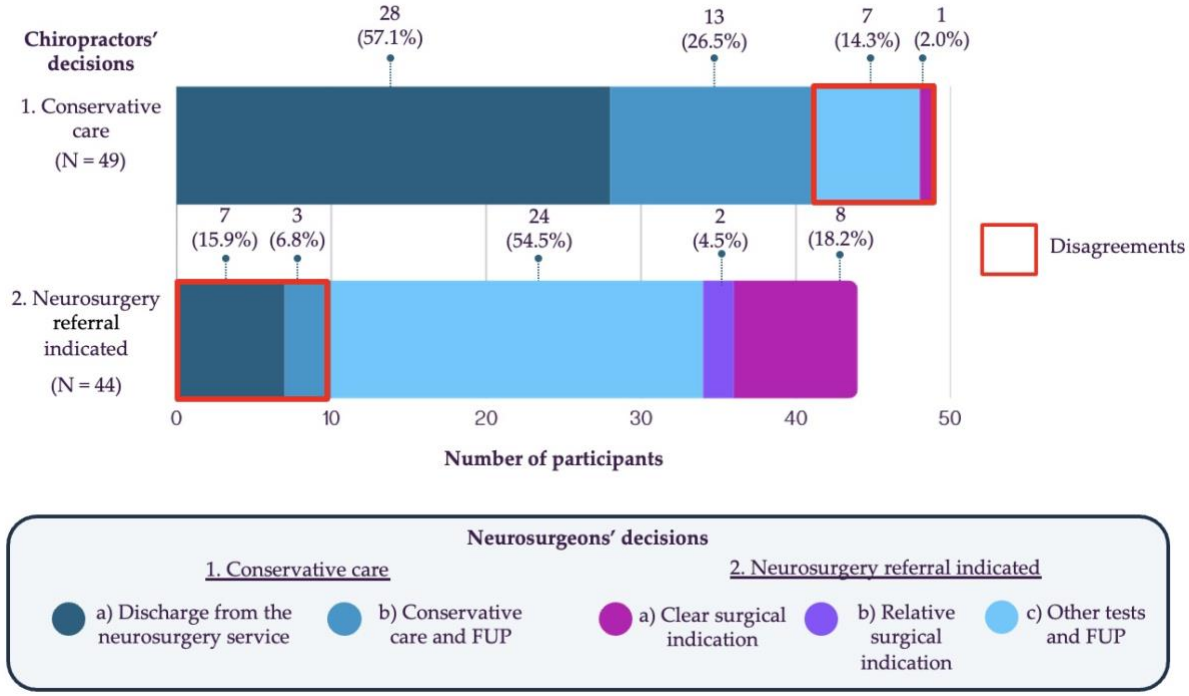


Figure 6. Comparison of recommended management strategies between chiropractors and neurosurgeons.

Predictors of diagnostic and management disagreement

Regression analyses revealed two predictors of diagnostic disagreement. The presence of urinary retention was associated with a six-fold increase in the odds of diagnostic disagreement (p=0.007; OR 6.397; 95% CI [1.648-24.831]). Additionally, the presence of asymmetrically diminished tendon reflexes was associated with a 77.9% decrease in the odds of diagnostic disagreement

(p=0.040; OR 0.221; 95% CI [0.052-0.937]. None of the variables included in the binomial regression analysis emerged as predictors of management disagreement. Results of regression analyses are detailed in Appendix H.

Discussion

The increasing prevalence of MSDs, especially LBP, has strained healthcare systems' capacity to manage limited resources. Overreliance on the expertise of medical specialists has contributed to long waiting lists, delaying access to appropriate care for patients with LBP. Given their expertise, chiropractors can play a crucial role in triaging patients with LBP and optimizing referral pathways, enabling a more efficient use of healthcare resources while minimizing unnecessary wait times for specialist consultations. As a first step, this study aimed to evaluate the diagnostic and management concordance between chiropractors and neurosurgeons for patients with LBP referred for a neurosurgery consultation, and to identify the patients' characteristics that influence the odds of diagnostic and management disagreements between providers.

One hundred and fifty eligible patients were identified by the neurosurgery department, including 30 (20.0%) who declined to participate. Compared to previous diagnostic concordance studies where non-participation rates ranged from 0.0%-to 11.4% (Décary et al., 2017; Desmeules et al., 2013; Gagnon et al., 2020; Lafrance et al., 2024; Lowry et al., 2020; Matifat et al., 2019), this study observed higher rates of non-participation. The primary reasons cited to decline participation were schedule conflicts and transportation issues. In this study, chiropractors and neurosurgeons were not working in the same facilities, requiring patients to travel to both sites and allocate extra time in their schedules to participate, which may explain these differences.

Ultimately, the study sample included 101 participants, with a mean age of 60 years. Chiropractors' and neurosurgeons' diagnostic agreement was moderate. Diagnostic agreement was slightly lower compared to previous diagnostic concordance studies focusing on various MSK disorders and peripheral joints disorders (i.e., hip, knee, and shoulder), reporting overall agreement ranging from 86.0% to 92.2% and good to very good inter-rater agreement (κ 0.63; 95%CI [0.13-1.00] – 0.89; 95%CI [0.83-0.94]) (Décary et al., 2017; Desmeules et al., 2013; Gagnon et al., 2020; Lafrance et al., 2024; Lowry et al., 2020; Matifat et al., 2019). However, several

contextual factors, had they been different, may have contributed to a higher level of agreement between providers. For instance, some assessments were not performed on the same day as the neurosurgery consultation, as the timing of the neurosurgery appointment did not leave sufficient time for chiropractors to perform their assessments beforehand. For 5 out of the 8 participants for whom the delay between appointments exceeded one week, disagreements between the two providers regarding diagnosis and/or management strategy were observed. As chronic LBP is fluctuating in nature (Kongsted, Hestbæk, & Kent, 2017; Kongsted, Kent, Axen, Downie, & Dunn, 2016), a shorter delay between assessments would likely minimize changes in the clinical profile, thereby limiting the potential for conflicting clinical decisions. Higher diagnostic concordance might also have been achieved if chiropractors had access to the same diagnostic tests as neurosurgeons (e.g. bladder scan, MRI). This is particularly relevant in cases involving bladder dysfunction, which can result from a wide range of conditions. In such situations, a subjective assessment of symptoms may not be sufficient for definitive diagnosis, which could partly explain the differences observed in diagnostic conclusions. Furthermore, considering the variability in performance of evaluation components for the diagnostic triage of patients with LBP and the potential for subjectivity in interpreting results (J. Mathieu et al., 2023), the lack of standardization in assessment protocols between chiropractors and neurosurgeons could also be a factor contributing to diagnostic discordance.

Overall management agreement between chiropractors and neurosurgeons was good. This result is comparable to previous studies investigating management agreement for diverse MSK conditions, reporting overall management agreement ranging from 64.0% to 91.6% and slight to good inter-rater agreement (κ 0.27 95%CI [0.07-0.45] - 0.77 95%CI [0.65-0.88]) between providers (Décary et al., 2017; Desmeules et al., 2013; Lafrance et al., 2024; Lowry et al., 2020; Matifat et al., 2019). Overall agreement for conservative care was high, with only 8 disagreements, including 7 patients for whom other tests were prescribed with neurosurgery follow-up. Neurosurgeons mentioned informally that they might be more likely to provide immediate care (i.e., either surgical or non-surgical) to patients with complex clinical profiles, even when conservative care could have been beneficial, acknowledging that these patients often face long waiting lists to see a medical specialist, which might partly explain these discrepancies.

Higher management concordance might also have been achieved if chiropractors had access to imaging results. These were not available to chiropractors as they did not share the neurosurgery clinic's facilities and therefore had no access to centralized patient medical records. Out of 10 cases where neurosurgeons recommended conservative care despite chiropractors determining that a neurosurgery consultation was necessary, imaging findings supported neurosurgeons' decisions in 3 of these cases, showing a discordance between MRI results and the patient's clinical profile or a reduction in disc herniation compared to previous imaging. One patient also informed the chiropractor of a sacral tumor, which was later rule out with imaging. Considering that chiropractors have since gained access to the Dossier Santé Québec, a secure platform that facilitates real-time sharing of health information between authorized organizations and healthcare providers, diagnostic concordance between chiropractors and neurosurgeons is likely to improve further. Additionally, a better access to health information should help to minimize situations of uncertainty, where chiropractors refer patients to neurosurgeons as a precaution. A patient with dominant leg pain, without objective neurological signs, yet with severe disability, may be an example where primary care clinicians might be concerned about the progression or severity of the condition and judge that a referral to the medical specialist is appropriate despite the absence of objective neurological signs. Another difference lies in the use of the SBST and ODI questionnaires (Bruyère et al., 2014; Vianin, 2008), which informed chiropractors on the patient's level of disability and risk of poor prognosis. In addition to providing information on the risk of persistent pain and disability, the SBST questionnaire was designed to directly guide treatment or referral decisions by using risk-prediction thresholds (Croft, Hill, Foster, Dunn, & van der Windt, 2024). Stratified care approaches using the SBST questionnaire have been shown to lead to better health outcomes compared to usual care for patients with LBP (Choudhry et al., 2022; Hill et al., 2011). Incorporating the results of the SBST and ODI questionnaires into the neurosurgeons' assessments could have increased the level of agreement in management decisions.

Nevertheless, chiropractors and neurosurgeons agreed that a significant proportion of patients with LBP could have benefited from conservative management. These study findings suggest that a chiropractor-led model of care could help reduce unnecessary wait times for medical specialist consultations and improve timely access to appropriate care for patients with LBP.

Strengths and limitations

To our knowledge, this is the first study to evaluate diagnostic and management agreement between chiropractors and neurosurgeons, specifically for patients suffering from LBP and referred for neurosurgery consultation. The sample encompasses patients with diverse clinical profiles representative of the study population, which enhances the generalizability of the results. However, our study has some limitations. Although the sample is representative, it primarily includes patients with more complex clinical profiles than those typically seen by chiropractors. Additionally, for patients where two types of pain coexist (e.g., non-specific and radicular pain), the delay between consultations may have led to a shift in the dominant pain type. Categorizing these patients into a single diagnostic category could have potentially created an impression of disagreement between providers where none existed. Furthermore, this study did not account for the nociplastic dimension of pain. While this represents a critical aspect of pain assessment, current LBP clinical practice guidelines do not yet provide clear recommendations for evaluating this type of pain. Another limitation is that chiropractors were aware that the patient had already been referred to neurosurgery, and given the high proportion of referrals deemed inappropriate (Janny Mathieu et al., 2024), this may have introduced a perception bias. It remains unclear whether this bias overestimated or underestimated the level of agreement between the professionals. However, it is possible that these results may not be generalizable to primary care settings where chiropractors assess patients before any referral decision has been made. Additionally, this study focuses solely on evaluating the concordance between the two types of providers. Although both neurosurgeons and chiropractors are highly trained and are expected to inform their decisions based on clinical practice guidelines, the study does not allow us to draw conclusions about the validity of their diagnoses or management strategies. This study also involved clinical assessments whose results may vary based on personal judgment and clinical experience. The inter-rater reliability was not measured in this study, which could have help quantify the impact of these variations on study's validity. However, to mitigate variability, only skilled and experienced clinicians conducted the assessments. Consequently, results might differ if chiropractors with less training and experience were involved.

Conclusion

Despite clinical evaluations by chiropractors and neurosurgeons occurring at different time points and chiropractors having limited access to medical records, moderate diagnostic agreement and good management agreement were observed between the two groups of providers. This underscores the potential for chiropractors to play a key role as intermediaries in the care pathway of patients with LBP, potentially leading to a more efficient use of health resources. Future research is needed to evaluate the impact of a chiropractor-integrated model of care, including triaging, on clinical outcomes, care pathways and healthcare utilization for patients with LBP.

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Chapitre 7 - Discussion

L'objectif de cette thèse était de documenter les pratiques actuelles d'évaluation et d'analyser les pratiques de référencement des patient·e·s consultant pour une lombalgie et leur l'adéquation avec les plus récents guides de bonnes pratiques basées sur les données probantes, afin d'éclairer le développement de stratégies mobilisant l'expertise de professionnel·le·s en santé musculosquelettique destinées à optimiser les trajectoires de soins. Pour répondre à cet objectif, quatre études ont été menées. La première, une revue de la portée, a permis de recenser les plus récentes données probantes portant sur la valeur diagnostique des composantes de l'évaluation clinique pour la lombalgie en première ligne de soins et ainsi préciser dans quelle mesure celles-ci pouvaient informer la prise de décision clinique. La deuxième étude, une analyse rétrospective sur dossiers médicaux, a permis de décrire les profils cliniques et les trajectoires de référencement de patient·e·s référé·e·s vers des soins spécialisés pour une lombalgie. L'évaluation de la pertinence de ces références a mené à l'identification de facteurs cliniques et organisationnels pouvant potentiellement expliquer une proportion importante de références sous-optimales. Enfin, les troisième et quatrième études s'inscrivent dans un essai clinique contrôlé randomisé dont l'objectif était d'évaluer les effets d'une intervention de triage, menée par un·e expert·e en santé musculosquelettique, sur l'évolution des profils cliniques et les trajectoires de soins de patient·e·s présentant une lombalgie. Ces deux études ont également mis en lumière les limites potentielles de l'implantation d'une telle intervention en milieu de soins tertiaires.

Le prochain chapitre présentera les principaux constats soulevés par chacune des études contenues dans cette thèse à la lumière des connaissances actuelles, et proposera des axes de recherche à approfondir lors de travaux futurs.

Évaluation de la lombalgie en soins primaires: La valeur diagnostique des composantes de l'anamnèse et de l'examen physique

De nombreux guides de bonnes pratiques cliniques présentent des recommandations concernant l'évaluation et la prise en charge de la lombalgie chez l'adulte. Ces guides proposent une approche diagnostique relativement uniforme, reposant sur une entrevue clinique et un examen physique ciblé. L'évaluation de la lombalgie consiste principalement à établir la probabilité d'une pathologie sous-jacente et à relever la présence d'atteintes neurologiques, de comorbidités et de facteurs pronostiques pouvant affecter le rétablissement. Ultimement, cette démarche doit permettre aux clinicien·ne·s de préciser le type de lombalgie (c.-à-d. lombalgie non spécifique, syndrome radiculaire, lombalgie spécifique) et de déterminer si l'état du·de la patient·e nécessite des examens complémentaires ou une référence vers un·e autre professionnel·le de la santé. Toutefois, bon nombre de professionnel·le·s jugent les recommandations en matière d'évaluation imprécises et difficiles à interpréter, notamment parce qu'elles détaillent rarement les critères qui sous-tendent la prise de décision clinique, en particulier la valeur diagnostique des éléments cliniques questionnés ou des tests physiques effectués (Finucane et al., 2020; Verhagen, Downie, Maher, & Koes, 2017).

Premier constat : Peu d'études sont issues des milieux de soins primaires

La revue de la portée réalisée recense 27 revues systématiques, dont l'ensemble intègre des résultats issus d'au moins deux niveaux de soins distincts, majoritairement en contexte de soins secondaires et tertiaires. Seules 16 études primaires répertoriées dans ces revues systématiques ont été réalisées exclusivement en milieu de soins primaires. Aucune revue systématique ne discute toutefois de l'influence du contexte clinique sur la performance des tests diagnostiques. De plus, l'ensemble des méta-analyses réalisées combinent sans distinction les données de différents niveaux de soins. Cette constatation soulève un enjeu méthodologique important lié à la validité externe des résultats de ces études. D'abord, la prévalence d'une condition et le profil clinique des patient·e·s peuvent varier de façon significative selon le niveau de soins (Finucane et

al., 2020). À titre d'exemple, la probabilité d'avoir une hernie discale est plus élevée en contexte de soins tertiaires (où les patient·e·s y sont généralement référé·e·s à la suite d'une confirmation de la hernie par imagerie) qu'en soins primaires (Hincapié et al., 2024). L'évaluation de la performance d'un test diagnostique auprès d'une population dont les caractéristiques cliniques ne reflètent pas celles de la population où le test est utilisé peut induire un biais de spectre (Hall, Kea, & Wang, 2019). Plus précisément, le biais de spectre correspond à une surestimation ou à une sous-estimation de la performance diagnostique d'un élément clinique ou d'un test lorsque celui-ci est évalué dans une population dont le spectre clinique (prévalence, sévérité de la condition, comorbidités) diffère de la population cible (Hall et al., 2019). Ce biais compromet donc la transférabilité des résultats obtenus en milieux spécialisés à la prise en charge en soins primaires. En l'absence d'études évaluant spécifiquement la performance des éléments d'anamnèse et d'examen physique pour la lombalgie en soins primaires, les professionnel·le·s œuvrant dans les milieux de première ligne devraient être sensibilisés aux limites de ces résultats et encourager à adapter leur processus de raisonnement diagnostique en conséquence.

Dans ce contexte, la International Federation of Orthopaedic Manipulative Physical Therapists a développé un outil décisionnel destiné à guider les professionnel·le·s en santé musculosquelettique dans leur processus de raisonnement clinique, notamment en présence d'indicateurs de pathologies sous-jacentes affectant le rachis (Finucane et al., 2020). Cet outil suggère d'abord aux professionnel·le·s d'évaluer leur niveau d'inquiétude en regard de la situation clinique. Le niveau d'inquiétude est déterminé en considérant la qualité et la nature des données scientifiques soutenant la performance diagnostique de chaque élément clinique, ainsi que la prévalence de la condition dans le contexte de soins concerné. Le profil clinique du·de la patient·e est également à prendre en compte, notamment la progression des symptômes, la nature et la gravité des conséquences associées à une prise en charge retardée, ainsi que la réponse aux traitements antérieurs. L'interprétation intégrée de ces composantes permet d'identifier l'action clinique appropriée. Cette action peut prendre différentes formes, définies, sur un continuum allant de la prise en charge conservatrice, jusqu'à une référence médicale urgente. Selon l'action clinique engagée, cet outil encourage également les professionnel·le·s à coordonner la continuité des soins lorsque cela est nécessaire, en définissant le parcours optimal

du·de la patient·e, tout en tenant compte des ressources locales disponibles et des voies locales de référencement.

En résumé, les données actuelles portant sur la valeur diagnostique des éléments d'évaluation pour la lombalgie comportent certaines lacunes méthodologiques et sont principalement issues de contextes de soins secondaires et tertiaires. Les professionnel·le·s de première ligne devraient poser un regard critique sur les résultats obtenus et tenir compte de ces limites dans leur prise de décision clinique. L'utilisation d'un cadre intégrant les données scientifiques, cliniques et socio-démographiques apparaît également nécessaire pour soutenir des actions cliniques pertinentes auprès des personnes atteintes de lombalgie.

Deuxième constat : La combinaison d'éléments cliniques favorise une meilleure valeur diagnostique

La majorité des études primaires recensées dans le premier article de cette thèse portent sur la valeur diagnostique d'éléments cliniques isolés. Bien que cette approche permette de préciser l'apport relatif de chaque signe clinique ou test, son applicabilité en contexte réel demeure limitée. En effet, lors de l'évaluation de la lombalgie, les professionnel·le·s s'appuient sur un ensemble d'éléments cliniques qu'ils analysent dans leur globalité, plutôt que sur l'interprétation d'un seul signe isolé. Les études sur les règles de prédiction clinique, bien que peu nombreuses, suggèrent que celles-ci présentent généralement une valeur diagnostique supérieure à celle des éléments cliniques qui la compose. Par exemple, le diagnostic clinique de la sténose spinale lombaire repose majoritairement sur des caractéristiques cliniques et socio-démographiques telles que l'âge avancé, la présence de symptômes bilatéraux aux membres inférieurs, une douleur dominante à la jambe, une aggravation des symptômes en position debout statique ou à la marche, ainsi qu'une diminution des symptômes en position assise (C. J. Cook et al., 2020; de Schepper et al., 2013; Shultz, Averell, Eickelman, Sanker, & Donaldson, 2015). Considérés séparément, ces éléments présentent une faible valeur diagnostique, notamment caractérisée par un rapport de vraisemblance positif (LR+) variant entre 1,2 et 2,5. Autrement dit, la probabilité de présenter l'une de ces caractéristiques augmente seulement de 1,2 à 2,5 fois chez les

personnes atteintes de sténose spinale, en comparaison aux personnes non atteintes de cette condition. En revanche, les travaux de Cook et al. (2011) montrent que la combinaison de ces caractéristiques contribue à augmenter leur valeur diagnostique, présentant un LR+ de 4,6 lorsqu'au moins 4 de ces caractéristiques sont présentes. Ce résultat demeure toutefois modeste, puisqu'il est inférieur au seuil généralement requis pour confirmer un diagnostic, soit un LR+ > 10 (Deeks & Altman, 2004). Un constat similaire est observé pour le diagnostic de la lombalgie non-spécifique. En effet, les résultats soulevés par la revue de la portée réalisée dans le cadre de cette thèse montrent qu'individuellement, près de la totalité des composantes d'évaluation n'atteignent pas un seuil diagnostic pertinent. Cependant, les revues systématiques menées par Han et al. (2023), Sivayogam et al. (2011) ainsi que Hancock et al. (2007) rapportent une amélioration de la valeur diagnostique des tests de provocation de la douleur à la région sacro-iliaque lorsqu'ils sont combinés. Ainsi, trois réponses positives ou plus parmi une séquence de six tests (c.-à-d. distraction, compression, thigh thrust, sacral thrust et Gaenslen) présentent une valeur LR + variant entre 1,9 et 6,97. En revanche, chacun de ces tests pris isolément présente une faible valeur diagnostique, caractérisée par un LR+ <2 dans la majorité des études primaires.

Des conclusions similaires ont été observées concernant la valeur diagnostique des éléments de l'anamnèse et de l'examen physique utilisés pour le diagnostic de la radiculopathie lombaire. La présence d'une douleur au membre inférieur suivant une distribution dermatomale, un antécédent de blessure nerveuse et l'aggravation de la douleur lors de l'augmentation de la pression abdominale (toux, éternuement ou effort physique) présentent une valeur diagnostique modérée à faible lorsque considérés séparément (Coster, de Bruijn, & Tavy, 2010; K. M. Smart, Blake, Staines, Thacker, & Doody, 2012). Une plus grande variabilité dans la valeur diagnostique des éléments de l'examen physique est toutefois notée, principalement pour les composantes de l'examen neurologique. Dans certaines études, la faiblesse motrice, l'hypoesthésie et l'altération des réflexes au membre inférieur atteignent un seuil diagnostic acceptable. Cependant, une hétérogénéité importante demeure, particulièrement lorsque chaque composante de l'examen moteur ou sensitif est évaluée séparément. Par exemple, l'exécution d'un test moteur unique ou l'évaluation de la sensibilité d'un seul dermatome pour détecter l'atteinte d'une racine nerveuse spécifique possède une valeur diagnostique nulle à faible. En revanche, la valeur diagnostique

s'avère plus élevée lorsque les résultats de ces tests (c.-à-d. examen moteur, examen sensitif et évaluation des réflexes) sont considérés de manière globale (Al Nezari, Schneiders, & Hendrick, 2013; Tawa, Rhoda, & Diener, 2017).

Enfin, ces données soulignent l'importance d'interpréter les signes cliniques et les résultats de tests physiques de façon intégrée afin de favoriser une meilleure précision diagnostique. Néanmoins, la valeur diagnostique des éléments utilisés dans l'évaluation de la lombalgie demeure généralement faible, ce qui exige de considérer l'ensemble du contexte clinique. Ce raisonnement est particulièrement essentiel pour les professionnel·le·s de la santé en soins primaires, puisque leurs décisions cliniques influencent directement le parcours de soins du·de la patient·e. Un diagnostic erroné, établi sur la base d'un seul élément clinique, peut contribuer à l'utilisation inefficace des ressources de santé et retarder le rétablissement du·de la patient·e.

Troisième constat : L'interprétation de la valeur diagnostique du test index doit davantage tenir compte des limites du test de référence

Le processus de validation clinique d'un test diagnostique suit un continuum, allant de l'évaluation de sa capacité à distinguer les personnes avec et sans la condition (phase 1), jusqu'à la démonstration de son aptitude à prédire l'évolution clinique d'une condition auprès d'un échantillon représentatif de la population cible (phase 4) (Lumbreras et al., 2008). Pour établir l'utilité clinique d'un signe clinique ou d'un test, des études diagnostiques de phase 3 sont minimalement requises (Lumbreras et al., 2008; Sackett & Haynes, 2002). Ces études sont réalisées auprès de personnes chez qui la condition est suspectée et consistent à comparer le résultat du test index (c.-à-d. le test évalué) à celui d'un test de référence afin d'en déterminer les propriétés métrologiques (Lumbreras et al., 2008). La validité d'un test index dépend donc directement du test de référence choisi (Fletcher, Fletcher, & Fletcher, 2012). Or, aucun test de référence n'est parfait : il existe toujours un risque de faux positifs et de faux négatifs (Schmidt & Factor, 2013). Ces erreurs peuvent introduire un biais de classement, c'est-à-dire une mauvaise catégorisation des personnes (ex : lorsqu'on considère comme atteintes des personnes qui ne le sont pas, ou inversement) (Biesheuvel, Irwig, & Bossuyt, 2007). Ainsi, l'estimation de la

performance du test index peut être faussée. Il est donc essentiel que le test de référence retenu soit la meilleure méthode disponible pour établir, avec le plus haut degré de certitude possible, la présence ou l'absence de la condition.

En pratique, le choix du test de référence repose toutefois sur un compromis entre sa validité scientifique et des considérations contextuelles comme l'accessibilité, la disponibilité du personnel qualifié pour administrer le test, les risques liés au test lui-même, ou encore les coûts associés (Biesheuvel et al., 2007). La nature de la condition évaluée influence également ce choix. Ainsi, une procédure invasive peut être retenue pour le diagnostic d'une maladie grave, tandis qu'un test moins coûteux et non invasif sera privilégié pour une condition chronique ne mettant pas en jeu le pronostic vital (Fletcher et al., 2012). De plus, pour une même condition, le test de référence retenu peut varier selon la sévérité de l'atteinte. Un examen d'imagerie avancée pourrait être jugé nécessaire pour confirmer les cas persistants et complexes, alors que l'opinion d'expert·e·s pourrait être considérée suffisante pour les profils cliniques moins sévères (Fletcher et al., 2012). Par exemple, dans le cas de la radiculopathie lombaire, un consensus d'expert·e·s sur les critères diagnostics pourrait servir de test de référence pour les cas peu complexes et susceptibles de bénéficier de traitements conservateurs, tandis que l'IRM ou l'électromyographie pourraient être privilégiées pour les cas persistants ou potentiellement candidats à une chirurgie. C'est d'ailleurs ce que reflètent les résultats de la revue de la portée réalisée dans le cadre de cette thèse, où plusieurs tests de référence distincts sont employés pour diagnostiquer une même condition.

Le choix du test de référence influence directement l'estimation de la sensibilité et de la spécificité d'un test index (Biesheuvel et al., 2007). Ce phénomène peut être illustré en considérant un déficit sensitif identifié à l'examen clinique comme test index dans le diagnostic de la radiculopathie lombaire. Si l'opinion clinique d'expert·e·s est utilisée comme test de référence, certains cas dont les symptômes sont atypiques ou transitoires peuvent être jugés « négatifs », même si un déficit sensitif objectif est présent. Le déficit sensitif est alors comptabilisé comme un faux positif, ce qui conduit à une sous-estimation de la spécificité du test index. Dans le même ordre d'idée, lorsque l'IRM sert de test de référence, on obtient une mesure plus objective, mais également imparfaite. Par exemple, si l'IRM est prescrite même en l'absence de

déficits neurologiques, il est possible que ce test puisse détecter des anomalies cliniquement silencieuses ou qui ne correspondent pas au profil clinique du·de la patient·e (Brinjikji et al., 2015; Varun, Jishnu, & Sahana, 2025). Ainsi, il est conclu, à tort, que ces personnes sont atteintes d'une radiculopathie lombaire. Dans ce cas précis, la sensibilité du test index risque d'être sous-estimée, puisque les personnes ne présentant aucun déficit sensitif malgré la présence d'anomalies structurelles à l'imagerie seront classées comme des « faux négatifs ». Ainsi, l'utilisation de tests de référence distincts non seulement modifie le sens du biais introduit dans les estimations de la performance diagnostique, mais rend également les résultats des études difficilement comparables.

Pourtant, les études répertoriées dans le premier article de cette thèse discutent rarement de l'impact de ces différences méthodologiques sur la performance diagnostique des tests index. Pour les professionnel·le·s en soins primaires, cette variabilité dans le choix du test de référence signifie que les données de performance rapportées pour un même signe clinique ou test diagnostique doivent être interprétées avec prudence. En pratique, cela peut influencer la confiance accordée au résultat obtenu et dans quelle mesure celui-ci peut justifier le besoin de recourir à des examens complémentaires ou à l'expertise d'un médecin spécialiste. Reconnaître ces limites apparait essentiel pour mieux contextualiser l'information disponible et pour éviter de sur- ou sous-estimer la valeur des tests cliniques utilisés.

Pratiques en matière de référencement vers des soins spécialisés pour une lombalgie

À l'instar de plusieurs pays occidentaux à haut développement économique, le système de soins de santé canadien est structuré autour d'un modèle de prestation dirigé par les professionnel·le·s en soins primaires, les médecins généralistes représentant le point d'entrée principal aux services de santé publics (Bury & Stokes, 2013). Ces professionnel·le·s occupent donc un rôle crucial dans la coordination des soins et assurent la continuité du parcours de soins vers les services spécialisés lorsqu'ils sont nécessaires (Gouvernement du Canada, 2019). L'accès aux médecins spécialistes est une préoccupation majeure au Québec, notamment marquée par de récentes négociations entre la Fédération des médecins spécialistes du Québec (FMSQ) et le MSSS. Malgré l'implantation des CRDS en 2016, près de 910 000 personnes étaient toujours en attente d'une consultation avec un médecin spécialiste au mois de juillet 2025 (Québec, 2025). Dans un article de *La Presse* du 16 juin 2025 intitulé « Fermer le bar ouvert de la médecine inutile », l'éditorialiste en chef, Mme Stéphanie Grammond, dénonce une hausse significative de la prescription inutile de tests supplémentaires par les médecins généralistes et les urgentologues. Parmi les exemples cités, on évoque notamment le recours injustifié aux examens de tomodensitométrie (CT scan) ou à l'IRM pour les patient·e·s atteint·e·s de lombalgie, et ce, malgré l'absence de symptômes neurologiques ou d'indicateurs de pathologies sous-jacentes (Grammond, 2025). En Mauricie et Centre-du-Québec, les neurochirurgien·ne·s observent la même problématique, évoquant informellement qu'une proportion importante de patient·e·s référé·e·s vers leur service pour une lombalgie ne requièrent pas leur expertise. Un article publié le 9 septembre 2025 par le président sortant de l'Association des neurologues du Québec, Dr François Evoy, intitulé « La pertinence qui fait fondre les listes d'attente » presse le gouvernement et les organisations de soins de miser sur l'amélioration de la pertinence des actes médicaux pour favoriser de meilleurs résultats cliniques et une utilisation plus efficace des ressources de santé (Evoy, 2025). Pour ce faire, il importe de mieux comprendre les pratiques de référencement actuelles, incluant les profils cliniques des patient·e·s, les motifs de référencement, l'adéquation aux critères de référence en vigueur, ainsi que les parcours de soins favorables à une prise en charge spécialisée. Le deuxième projet de cette thèse, une étude transversale, avait donc pour objectif de décrire les différentes

composantes du processus de référencement et d'évaluer la pertinence des références parmi un échantillon aléatoire de 500 patient·e·s référé·e·s pour une lombalgie vers le service de neurochirurgie du CIUSSS MCQ sur une période de 3 ans (2018-2021).

L'analyse des dossiers médicaux sélectionnés montre d'abord qu'une proportion significative de patient·e·s référé·e·s vers les services spécialisés de neurochirurgie du CIUSSS MCQ pour une lombalgie présentent des profils cliniques ne nécessitant pas une prise en charge chirurgicale. Ce constat soulève un questionnement quant aux raisons pour lesquelles les critères pré-établis par le CRDS ne sont pas systématiquement appliqués par les professionnel·le·s référents.

Premier constat : La structure du CRDS peut exercer une influence bidirectionnelle sur la pertinence des références

L'approche méthodologique réaliste s'intéresse aux conditions nécessaires pour qu'une intervention ou une innovation produise les résultats attendus (Rycroft-Malone et al., 2012). Ainsi, plutôt que d'évaluer simplement si une intervention est efficace ou non, la méthodologie réaliste vise à produire un modèle explicatif permettant de comprendre les mécanismes et les facteurs contextuels favorables à son implantation et son fonctionnement (Rycroft-Malone et al., 2012). Par l'utilisation d'une approche réaliste de synthèse des connaissances, les travaux de Breton et al. (2020) identifient certains facteurs pouvant exercer une influence sur l'utilisation et les retombées d'une liste d'attente centralisée, telle que le CRDS. D'abord, cette synthèse des connaissances précise que l'efficacité des listes d'attente centralisées n'est pas seulement intrinsèque à l'innovation elle-même, mais repose également sur le niveau d'engagement et d'adhésion des prestataires de soins (Breton et al., 2020). Cet engagement dépend, entre autres, du caractère obligatoire ou non de la liste d'attente centralisée, de sa complexité et de la charge de travail qu'elle impose, de son utilité perçue, ainsi que son adéquation avec le contexte clinique (Breton et al., 2020). Au Québec, sauf exceptions (ex : cas urgents), les professionnel·le·s en soins primaires doivent recourir au CRDS pour toute demande de soins spécialisés. Cependant, la perception d'un système dysfonctionnel ou en conflit avec le jugement clinique réduit son acceptabilité (Breton et al., 2020).

Dans le contexte où le deuxième projet de cette thèse a été mené, une demande de consultation en neurochirurgie devait être faite via un formulaire standardisé du CRDS contenant des critères d'admissibilité pré-établis, associés à une échelle de priorité clinique (voir Annexe C). L'application constante de ces critères devrait en théorie assurer la pertinence des références et un accès équitable pour les patient·e·s ayant la même priorité clinique (Breton et al., 2020). Toutefois, le formulaire du CRDS laisse la possibilité aux professionnel·le·s de contourner les critères pré-établis et de modifier la priorité clinique du·de la patient·e s'ils en jugent la nécessité. Ainsi, il est possible que certains professionnel·le·s puissent être tentés d'attribuer une priorité clinique plus élevée pour favoriser un accès plus rapide, et ce, même en l'absence des prérequis (Breton et al., 2020). Il est donc plausible que cette « option de dérogation », si inadéquatement utilisée, puisse contribuer au nombre important de références inadmissibles identifiées pour une lombalgie dans le cadre de cette étude. De plus, il est étonnant de constater qu'aucun des critères du formulaire du CRDS n'évoque la nécessité d'avoir eu recours à des traitements conservateurs pour une durée raisonnable (c.-à-d. généralement 4 à 6 semaines). Conformément aux guides de bonnes pratiques, des discussions informelles avec les neurochirurgiens confirment que cet aspect est pris en compte avant d'envisager des approches thérapeutiques plus invasives, bien que le formulaire n'en fasse pas mention. Ainsi, il est recommandé que des initiatives d'amélioration continue de la qualité soient déployées afin de soutenir la mise en œuvre et l'utilisation adéquate des listes d'attente centralisée (Breton et al., 2020). Celles-ci pourraient entre autres se traduire par une révision des critères pour s'assurer qu'ils soient exhaustifs et qu'ils soient compris par les professionnel·le·s. Au CIUSSS MCQ, le personnel administratif du CRDS peut vérifier certains pré-requis lors de la prise de rendez-vous, soit principalement la prise d'imagerie. Cependant, les résultats obtenus par l'analyse de dossiers médicaux réalisée dans le cadre de cette thèse invitent à réfléchir à la valeur ajoutée d'un pré-triage par un expert en santé musculosquelettique, capable d'identifier les profils cliniques ne nécessitant pas une prise en charge chirurgicale.

Deuxième constat: Des facteurs professionnels et contextuels sont susceptibles d'affecter la capacité à appliquer les critères du CRDS

La compréhension des critères d'admissibilité est un élément clé pour assurer l'identification et la classification adéquate des patient·e·s au sein d'une liste d'attente centralisée (Breton et al., 2020). C'est pourquoi ces critères sont communément développés en collaboration avec les professionnel·le·s afin de favoriser leur clarté, leur applicabilité ainsi que leur pertinence (Breton et al., 2020). L'analyse des dossiers médicaux réalisée dans le cadre du deuxième projet de cette thèse évoquent toutefois la possibilité que des lacunes existent dans le processus de décision clinique des professionnel·le·s en soins primaires, notamment illustrées par une proportion significative (35,4%) de patient·e·s référé·e·s pour une lombalgie non-spécifique ou malgré l'absence de signes neurologiques objectifs (28,1%). Une analyse comparative de la pertinence des références effectuées au service de neurochirurgie avant et pendant la pandémie révèle une baisse notable du nombre de références pour une lombalgie en période de pandémie, conséquence probable d'un accès limité aux soins et services de santé. Puisque le contexte pandémique imposait une priorisation des cas urgents, il aurait été raisonnable de s'attendre à une amélioration de la pertinence des références effectuées au sein du service de neurochirurgie. Pourtant, une proportion similaire de références inappropriées pour une lombalgie a été comptabilisée durant cette période. Ces résultats suggèrent une application partielle ou variable des critères de référence et des lacunes dans l'évaluation clinique. Ainsi, il semble que des mécanismes d'encadrement et de soutien soient nécessaires pour mieux accompagner les professionnel·le·s et favoriser l'optimisation des pratiques de référencement.

Il est également important de considérer que certains facteurs contextuels pourraient affecter la capacité des professionnel·le·s à appliquer les critères d'admissibilité du CRDS adéquatement. Par exemple, l'accès au service de neurochirurgie requiert un rapport d'IRM datant de moins de 3 mois. Or, il peut être complexe de coordonner la prise d'imagerie à la consultation, compte tenu des délais particulièrement longs et variables pour accéder à ces deux services. Il est également pertinent de se questionner si ce critère ne risque pas d'augmenter le nombre d'examens inutiles

et de réduire la pertinence des références. En effet, certain·e·s professionnel·le·s pourraient être tenté de précipiter un tel examen pour répondre aux critères du CRDS ou encore de référer un·e patient·e sur la base de trouvailles à l'imagerie, même si celles-ci ne correspondent pas au profil clinique. Pour atténuer ces effets, il pourrait encore une fois être utile de renforcer la formation des professionnel·le·s sur l'application des critères d'admissibilité et sur la valeur diagnostique des éléments de l'évaluation clinique, dont les résultats d'imagerie. Parallèlement, des initiatives de sensibilisation auprès des patient·e·s pourraient aider à clarifier les attentes et à favoriser l'adhésion aux approches conservatrices avant de recourir à l'imagerie ou à des interventions plus invasives.

Enfin, la deuxième étude de cette thèse identifie des lacunes importantes dans les pratiques de référencement vers des soins spécialisés pour une lombalgie. Une incompréhension des critères d'admissibilité au service ou un défaut d'appliquer ceux-ci pourraient en partie expliquer la proportion significative de références inappropriées. Néanmoins, cette analyse reste limitée par la nature et la qualité des informations consignées dans les dossiers médicaux. Une étude qualitative permettrait d'obtenir une compréhension plus approfondie et nuancée des facteurs influençant la prise de décision clinique en soins primaires. L'utilisation d'un cadre conceptuel validé, tel que le *Theoretical Domains Framework*, offrirait par ailleurs une évaluation plus systématique des éléments intrinsèques et extrinsèques susceptibles d'influencer la prise de décision clinique (Cane, O'Connor, & Michie, 2012).

Intégration de l'expert en santé musculosquelettique dans la trajectoire de soins des personnes atteintes de lombalgie

Publiée en 2018 dans la revue scientifique *The Lancet*, une série de trois articles coécrits par plus de 25 expert·e·s internationaux·ales a mis en lumière l'ampleur du fardeau mondial de la lombalgie (R. Buchbinder et al., 2018; Foster et al., 2018; Hartvigsen et al., 2018). Dans un appel à l'action, ces expert·e·s ont interpellé directement les décideurs politiques et les organismes de santé publique nationaux et internationaux, notamment l'OMS, les pressant de mettre en œuvre des stratégies concertées afin de favoriser l'accès opportun aux ressources de santé appropriées, tout en minimisant le recours à des pratiques cliniques inefficaces ou nuisibles pour les patient·e·s

(R. Buchbinder et al., 2018). Parmi les stratégies proposées par ces expert·e·s, on retrouve notamment la révision des politiques de remboursement des compagnies d'assurances afin qu'elles soient exclusivement dédiées aux soins de grande valeur (c.-à-d. ceux qui procurent des bénéfices cliniques démontrés, proportionnels aux coûts et aux risques), l'adoption d'une approche de « santé positive » misant sur la capacité des personnes à s'adapter et à s'auto-gérer face aux différents défis physiques, psychologiques ou sociaux associés à la lombalgie, ainsi que l'amélioration de la formation des médecins généralistes (R. Buchbinder et al., 2018). Enfin, une meilleure intégration de l'expertise des autres professionnel·le·s en soins primaires, tels que les physiothérapeutes, les chiropraticien·ne·s et les infirmier·ère·s, est recommandée afin de minimiser le recours inutile aux soins médicaux (R. Buchbinder et al., 2018).

Au cours des dernières années, des modèles de soins alternatifs ont été développés et mis en place dans plusieurs pays à haut développement économique, dans le but d'optimiser les résultats cliniques, de favoriser une expérience de soins positive, ainsi que pour promouvoir l'utilisation appropriée des ressources de santé pour les personnes atteintes de lombalgie (Duarte et al., 2024; C. Murphy et al., 2022). Dans une revue intégrative regroupant 29 études, Duarte et al.(2024) ont identifié 11 modèles de soins déployés en première ligne pour la lombalgie. Huit de ces modèles avaient pour porte d'entrée les médecins généralistes, qui assuraient l'évaluation initiale des patient·e·s et, lorsque nécessaire, la continuité du parcours de soins vers des services intermédiaires (c.-à-d. des services intégrant un niveau de triage, d'évaluation ou de traitement entre les soins primaires et les soins secondaires), généralement coordonnés par des équipes multidisciplinaires. À ce jour, peu d'études ont mesuré les effets cliniques de ces modèles de soins, en comparaison aux soins médicaux usuels (Cherkin et al., 2018; Hill et al., 2011; Konstantinou et al., 2020; Morsø et al., 2021; Schröder et al., 2021). De plus, parmi les cinq modèles de soins pour lesquels des données sur l'efficacité clinique sont disponibles, quatre d'entre eux reposaient sur une approche de soins stratifiée similaire, proposant des interventions sélectionnées en fonction du pronostic des patient·e·s, établi à l'aide du questionnaire STarT Back (Cherkin et al., 2018; Hill et al., 2011; Konstantinou et al., 2020; Morsø et al., 2021). Dans l'ensemble, bien que ces études présentent certaines différences méthodologiques, leurs résultats ont montré que l'approche stratifiée sur la base du risque de mauvais pronostic

n'entrainait pas de changement significatif comparativement aux soins usuels en ce qui concerne l'intensité de la douleur, les capacités fonctionnelles, les indicateurs de santé psychologique (anxiété, dépression, peur du mouvement) et le sentiment d'auto-efficacité des patient·e·s. Ainsi, l'analyse des données probantes actuellement disponibles justifie la réalisation d'études supplémentaires afin de mieux documenter les effets cliniques et l'impact sur les trajectoires de soins de modèles alternatifs qui ne reposent pas exclusivement sur un seul outil de stratification. De plus, considérant le fardeau clinique et administratif déjà porté par les médecins omnipraticiens au sein du système de santé public québécois, il paraît plausible qu'un modèle de soins alternatif, reposant sur l'expertise des expert·e·s en santé musculosquelettique, puisse mieux répondre aux défis cliniques et organisationnels actuels.

Ainsi, les articles 3 et 4 de cette thèse portent sur une étude contrôlée randomisée dont l'objectif était d'évaluer l'impact d'une intervention de triage, coordonnée par un·e expert·e en santé musculosquelettique et fondée sur les plus récentes données probantes, sur les profils cliniques et les trajectoires de soins de personnes atteintes de lombalgie. Contrairement aux modèles de soins évalués précédemment, cette intervention repose sur une approche intégrée combinant les résultats d'une anamnèse, d'un examen physique ciblé et de questionnaires auto-rapportés portant sur la douleur, la fonction, la qualité de vie et le risque de mauvais pronostic, afin de guider à la fois l'identification du diagnostic le plus probable et la sélection de la stratégie de prise en charge la plus appropriée. Pour des raisons de faisabilité, cette intervention a été implantée en contexte de soins tertiaires et était donc destinée aux patient·e·s en attente d'une consultation en neurochirurgie pour un motif principal de lombalgie. Les expert·e·s en santé musculosquelettique, en l'occurrence des chiropraticien·ne·s dans le cadre de cette étude, ont procédé à une évaluation des patient·e·s quelques heures à quelques jours avant leur consultation en neurochirurgie. La randomisation visait à déterminer si les conclusions et recommandations formulées par les chiropraticien·ne·s seraient transmises ou non aux neurochirurgien·ne·s. En d'autres termes, les chiropraticien·ne·s n'ont pu interférer directement avec la trajectoire des patient·e·s. L'ensemble des patient·e·s ont tout de même rencontré le·la médecin spécialiste (avec en main les recommandations du·de la chiropraticien·ne pour les participant·e·s du groupe intervention), et celui·celle-ci a ensuite déterminé la stratégie de prise

en charge appropriée. Cet aspect méthodologique doit être pris en compte dans l'interprétation des résultats, puisqu'il est plausible que ceux-ci reflètent davantage le potentiel informatif de l'intervention pour les médecins spécialistes, plutôt que son effet réel sur les trajectoires de soins.

Premier constat: L'expert·e en santé musculosquelettique est susceptible d'optimiser les trajectoires de soins pour la lombalgie en identifiant adéquatement les profils non-chirurgicaux

Les résultats de l'essai clinique contrôlé randomisé (article 3 de la thèse) montrent une amélioration significative au fil du temps des scores d'intensité de la douleur au dos et à la jambe, de l'incapacité et de la qualité de vie physique et psychologique dans les deux groupes, particulièrement marquée lors du dernier suivi à 12 mois, en comparaison à l'évaluation initiale. Cependant, cette intervention n'a entrainé aucun changement cliniquement significatif en comparaison à la trajectoire de soins usuelle. L'évaluation de triage semble avoir exercé une influence modeste et de courte durée sur les trajectoires de soins, le groupe intervention comptant une proportion plus faible de participant·e·s ayant consulté un·e médecin généraliste à 6 mois ($p = 0,04$). Bien que cet effet n'ait pas été maintenu dans le temps, ce résultat pourrait refléter l'impact des recommandations issues de l'évaluation de triage partagée aux neurochirurgien·ne·s.

Les conclusions d'une revue systématique incluant 11 études de cohortes prospectives montrent que la résolution complète d'un nouvel épisode de lombalgie survient généralement au cours des 6 à 12 premières semaines suivants le début des symptômes. Après cette période, la probabilité que les symptômes se résorbent spontanément est significativement moindre (Itz et al., 2013). Par conséquent, la différence observée à 6 mois pourrait correspondre au moment où les symptômes persistants affectant certain·e·s participant·e·s dans le groupe contrôle ont mené à un recours accru aux consultations médicales. Il est plausible que le partage des conclusions de l'évaluation et des recommandations de prise en charge du·de la chiropraticien·ne aux neurochirurgien·ne·s ait favorisé une approche de soins basée sur les données probantes. Ainsi, les participant·e·s du groupe intervention ont pu être davantage orienté·e·s vers des stratégies

d’autogestion et vers des modalités actives comme l’exercice et la thérapie manuelle lors de nouveaux épisodes de lombalgie.

Les compromis méthodologiques qui ont été nécessaires pour assurer la faisabilité de l’essai clinique peuvent en partie expliquer l’absence d’effets cliniques significatifs attribuables à l’intervention de triage. Tel que discuté précédemment, l’expert·e en santé musculosquelettique n’a pu modifier directement la trajectoire des participant·e·s, la décision finale concernant la prise en charge relevant du de·la neurochirurgien·ne. Néanmoins, une analyse secondaire des données de l’essai clinique, correspondant à l’article 4 de cette thèse, permet de mieux contextualiser ces résultats et d’en éclairer la portée.

L’évaluation de la concordance diagnostique et décisionnelle entre les chiropraticien·ne·s et les neurochirurgien·ne·s a révélé des niveaux d’accord modéré à élevé entre les deux groupes de professionnel·le·s, se traduisant par un accord global de 74,7% pour le diagnostic et de 82,0% pour les stratégies de prise en charge (Mathieu et al., 2025). Parmi les 100 participant·e·s évalué·e·s successivement par les deux professionnel·le·s, chacun·e a identifié qu’une proportion significative de patient·e·s présentait une lombalgie non spécifique ou une douleur radiculaire sans signes neurologiques objectifs, correspondant à des profils cliniques ne nécessitant généralement pas de prise en charge chirurgicale (Mathieu et al., 2025). De plus, plus de 80% des patient·e·s dont la référence vers des soins spécialisés a été jugée inadéquate par les chiropraticien·ne·s ont été invité·e·s par leur neurochirurgien·ne à entreprendre ou poursuivre des traitements conservateurs. Parmi ces patient·e·s, plus de la moitié ont été directement libéré·e·s du service de neurochirurgie à l’issue de la consultation initiale (Mathieu et al., 2025). Bien que la validité des décisions prises n’a pas été mesurée, ces résultats suggèrent que l’intégration de l’expert·e en santé musculosquelettique formé·e au triage est susceptible d’optimiser les parcours de soins pour la lombalgie, en identifiant et redirigeant les personnes qui ont été inadéquatement référées vers les services spécialisés.

Deuxième constat: Les décisions cliniques prises en milieux de soins primaires pour la lombalgie doivent être optimisées

Les décisions cliniques prises par les professionnel·le·s de la santé en première ligne ont un impact crucial sur le parcours de soins des patient·e·s. De récentes études suggèrent que la nature du·de la premier·ère professionnel·le consulté·e pour une lombalgie influence l'utilisation subséquente de soins et services de santé (Zouch et al., 2022). En effet, une revue de la portée synthétisant les données de 11 études observationnelles a révélé que consulter initialement un·e professionnel·le «non-médical» (majoritairement un·e physiothérapeute ou un·e chiropraticien·ne dans les études identifiées) pour un nouvel épisode de lombalgie était associé à des taux plus faibles d'utilisation d'analgésiques opioïdes et d'examens d'imagerie (Zouch et al., 2022). Toutefois, l'hétérogénéité des données relatives aux consultations médicales subséquentes, combinée à l'absence d'essais contrôlés randomisés fournissant des données comparatives, limite la portée des conclusions pouvant être tirées de cette revue de la littérature.

Tel que discuté précédemment, le système de santé public québécois repose sur un modèle de prestation des soins et services dirigé par les médecins, qui représentent le principal point d'accès aux services de santé financés par l'État (Gouvernement du Canada, 2019). D'abord, cette structure rend l'accès aux soins particulièrement vulnérable à la pénurie de médecins, ce qui engendre des retards dans la prise en charge des patient·e·s, notamment dans les communautés éloignées ou mal desservies (Ansell, Crispo, Simard, & Bjerre, 2017). De plus, ce modèle de soins implique que les autres professionnel·le·s en soins primaires jouent un rôle limité dans la prise de décision clinique et, par conséquent, exercent peu d'influence sur les trajectoires de soins des patient·e·s consultant pour une lombalgie dans le système public. Ainsi, ce contexte accentue la portée des décisions cliniques initiales, soulignant l'importance d'aligner celles-ci sur les données probantes (Zouch et al., 2022). Les projets menés dans le cadre de cette thèse traduisent des lacunes dans la prise de décision clinique en première ligne de soins pour la lombalgie, identifiées à la fois par les chiropraticien·ne·s et les neurochirurgien·ne·s. Parmi les patient·e·s évalué·e·s dans le cadre de l'essai clinique, plus de 60% présentaient une douleur lombaire dominante

d'intensité modérée et près de 30% n'avaient aucun signe neurologique objectif, correspondant à des profils cliniques pour lesquels une prise en charge chirurgicale n'est généralement pas indiquée (Halicka, Wilby, Duarte, & Brown, 2023; van Hooff et al., 2018). De plus, près du tiers des patient·e·s n'avaient entrepris aucun traitement conservateur avant d'être référé·e·s vers des soins spécialisés. En revanche, plus de 90% des participant·e·s avaient reçu une prescription pharmacologique pour la gestion de la douleur. À l'issue de leur évaluation, les neurochirurgien·ne·s ont recommandé des soins conservateurs pour plus de la moitié des patient·e·s. Parmi ces patient·e·s, près de 70% étaient en attente de leur consultation en neurochirurgie depuis plus de 6 mois et près du quart depuis plus de 12 mois. De manière informelle, plusieurs de ces patient·e·s ont rapporté n'avoir ni initié de traitements ni adopté de stratégies d'autogestion durant cette période d'attente, invoquant une incertitude quant aux interventions appropriées et une crainte d'aggraver leur condition. Ces observations suggèrent que ces patient·e·s ont non seulement été privé·e·s d'une prise en charge adaptée à leur condition dans des temps opportuns, mais que leur référencement non optimal a également contribué à alourdir les listes d'attente, avec des répercussions sur l'accès pour les patient·e·s nécessitant effectivement une expertise neurochirurgicale. En effet, près de 30 % des patient·e·s dont la condition relevait d'une prise en charge spécialisée ont attendu un minimum de sept mois, et la moitié d'entre eux·elles ont été évalué·e·s plus d'un an après la demande de consultation initiale.

Ces résultats suggèrent d'abord que des efforts sont nécessaires pour mieux accompagner les professionnel·e·s en soins primaires, dont les omnipraticien·ne·s, dans la prise en charge de la lombalgie. Bien que les troubles musculosquelettiques soient hautement prévalents, plusieurs études ont montré que la formation en santé musculosquelettique dispensée aux étudiant·e·s en médecine au premier cycle demeure insuffisante (Harkins, Burke, & Conway, 2023). Cette situation est préoccupante, puisque le manque de connaissances constitue un facteur reconnu limitant l'application et l'adhésion aux guides de bonnes pratiques cliniques (Slade et al., 2016). Les résultats de cette thèse doivent également être interprétés à la lumière du fardeau clinique et administratif qui repose sur les omnipraticien·nes. Dans ce contexte, l'intégration de l'expert·e en santé musculosquelettique en première ligne pourrait mieux répondre aux besoins des milieux cliniques, notamment en offrant un point d'entrée supplémentaire pour les patient·e·s consultant

pour une lombalgie. Toutefois, les modèles de soins alternatifs pour la lombalgie qui reposent sur un·e expert·e en santé musculosquelettique en première ligne demeurent, pour la plupart, accessibles uniquement sur référence médicale, ce qui en minimise l'impact sur l'efficience des soins (Brenna Bath et al., 2012; Kindrachuk & Fourney, 2014; S. Murphy, Blake, Power, & Fullen, 2013; Paskowski, Schneider, Stevans, Ventura, & Justice, 2011; Whedon et al., 2020; Zarrabian et al., 2017). Par ailleurs, bien que ces initiatives aient démontré des résultats prometteurs sur l'utilisation des ressources de santé, les données disponibles quant à leur efficacité relèvent uniquement de devis rétrospectif ou quasi-expérimental, ce qui limite la portée de leurs conclusions.

Les résultats présentés dans les articles 3 et 4 de cette thèse suggèrent que les expert·e·s en santé musculosquelettique, dont les chiropraticien·ne·s, ont le potentiel d'optimiser les trajectoires de soins des personnes atteintes de lombalgie en favorisant l'accès opportun aux soins appropriés. De ce fait, il est plausible que l'implantation d'une intervention de triage, dès l'entrée dans le système de santé public, puisse avoir un impact plus marqué que des initiatives similaires mises en place à titre de services intermédiaires ou dans des milieux de soins tertiaires. Néanmoins, au regard de l'état actuel des connaissances, des études comparatives sont d'abord nécessaires pour documenter l'efficacité de ces modèles, ainsi que pour en évaluer la faisabilité et l'acceptabilité dans l'organisation actuelle des soins de santé au Québec.

Troisième constat: Une réflexion quant aux conditions favorables à l'implantation d'un modèle de soins alternatif est nécessaire pour favoriser son acceptabilité et son efficacité

L'implantation d'un modèle de soins alternatif peut s'accompagner de défis importants susceptibles d'en limiter l'efficacité réelle. Bien que les études réalisées dans le cadre de cette thèse n'aient pas porté spécifiquement sur ces enjeux, la littérature montre que les interventions complexes peinent souvent à produire les effets attendus lorsqu'elles rencontrent une acceptabilité limitée de la part des clinicien·ne·s, un soutien organisationnel insuffisant ou une mise en œuvre inadéquate (Cherkin et al., 2018). Les obstacles à l'implantation fréquemment

rapportés incluent notamment l'absence de stratégies efficaces pour soutenir les changements de comportements et de pratiques, dont des mesures pour atténuer les contraintes de temps, les ressources limitées et le manque d'intérêt (Delitto et al., 2021). De plus, des études soulignent l'influence des croyances, des attentes et besoins des patient·e·s, des limitations technologiques, du faible engagement du personnel ou encore du manque de temps dédié en clinique pour intégrer de nouveaux protocoles (Cherkin et al., 2018; Morsø et al., 2021; Schröder et al., 2021). L'absence de ressources supplémentaires, qu'il s'agisse de supervision, de mécanismes de rétroaction ou de temps protégé pour soutenir le changement compromet l'adoption durable d'une innovation, particulièrement pour les modèles de soins exigeant une réorganisation significative des processus cliniques (Peters et al., 2020).

Perspectives de recherche

Les résultats obtenus à l'issu des projets menés dans le cadre de cette thèse soulignent la nécessité de poursuivre les recherches afin de mieux comprendre les leviers et les barrières à l'adoption et la pérennisation de modèles de soins alternatif dans le système de santé public. Les devis hybrides efficacité-implantation représentent une avenue méthodologique particulièrement pertinente pour évaluer simultanément l'acceptabilité, la faisabilité et l'efficacité des interventions et des stratégies d'implantation mises en place (Landes, McBain, & Curran, 2019). Cependant, au-delà de la démonstration de la faisabilité et de la sécurité de tels modèles de soins, l'enjeu réside également dans leur capacité à s'inscrire durablement dans les pratiques cliniques et organisationnelles existantes, tout en répondant aux besoins des patient·e·s et aux contraintes du système. En ce sens, une récente revue de la littérature identifie plusieurs priorités de recherche, notamment le développement d'approches collaboratives mobilisant les professionnel·le·s de la santé et les patient·e·s afin de soutenir le changement de comportements et de pratiques, ainsi que l'évaluation de l'impact de ces modèles sur les pratiques courantes à travers des essais cliniques multicentriques permettant de mesurer rigoureusement les effets cliniques et les retombées sur les trajectoires de soins (Croft et al., 2024). Par ailleurs, cette revue insiste sur la nécessité d'obtenir un accès amélioré à de l'information clinique complète et de qualité afin de soutenir la prise de décision. Cette priorité s'arrime particulièrement avec les constats présentés dans les articles 3 et 4 de cette thèse, où

l’accès limité aux données des dossiers médicaux électroniques a représenté un obstacle pour les chiropraticien·ne·s. Ne bénéficiant ni des infrastructures médicales ni d’une autorisation d’accès aux dossiers électroniques, conformément aux exigences éthiques du projet de recherche, ces professionnel·le·s ont parfois dû prendre des décisions cliniques sur la base d’informations partielles, illustrant ainsi une barrière structurelle importante à l’intégration efficace d’un modèle de soins alternatif.

Les données générées par cette thèse offrent également un cadre propice à l’émergence de nouvelles pistes de recherche visant à mieux comprendre la diversité des trajectoires de soins pour la lombalgie. Elles permettent entre autres d’envisager l’identification des profils cliniques et sociodémographiques associés à des trajectoires cliniques et à une utilisation distinctive des services de santé et d’évaluer la pertinence d’approches de prise en charge adaptées en fonction de celles-ci. Cette approche pourrait soutenir la planification des services dans une perspective de responsabilité populationnelle, en permettant de mieux arrimer l’offre de soins aux besoins de la population et de favoriser une utilisation plus efficiente des ressources disponibles. Enfin, dans un contexte où les recommandations de bonnes pratiques privilégient les interventions non pharmacologiques en première intention pour la lombalgie, il est crucial de repenser l’organisation et le financement des soins afin de lever les barrières persistantes à l’accès, particulièrement pour les populations vulnérables (Croft et al., 2024). Soutenir un accès équitable et efficace est en effet indispensable pour que l’expert en santé musculosquelettique puisse assurer la continuité des soins et permettre l’implantation à grande échelle d’un corridor de soins alternatif.

Conclusion

L'objectif de cette thèse était de documenter les pratiques actuelles d'évaluation et de référencement des patient·e·s consultant pour une lombalgie, puis d'en examiner l'adéquation avec les guides de bonnes pratiques fondés sur les plus récentes données probantes, afin d'éclairer le développement de stratégies mobilisant l'expertise de professionnel·le·s en santé musculosquelettique pour optimiser les trajectoires de soins. Les résultats de cette thèse mettent en évidence la faible validité diagnostique des éléments d'évaluation utilisés en soins primaires pour la lombalgie, soulignant la nécessité d'adopter une approche d'évaluation intégrée combinant les différents résultats cliniques pour optimiser la prise de décision. Ils révèlent également des pratiques de référencement sous-optimales pour la lombalgie, marquées par un recours injustifié à l'expertise de médecins spécialistes au détriment d'approches conservatrices, réitérant l'importance d'accompagner les professionnel·le·s en soins primaires dans cette démarche. Enfin, l'intervention de triage implantée en milieu de soins tertiaire n'a pas généré d'effets cliniques significatifs ou de retombées directes sur les trajectoires de soins. Cependant, la concordance des conclusions entre les chiropraticien·ne·s et les neurochirurgien·ne·s indiquent que ces professionnel·le·s en soins primaires ont le potentiel d'améliorer les parcours de soins, en identifiant adéquatement les patient·e·s nécessitant des soins chirurgicaux. Enfin, les travaux de cette thèse soutiennent l'implantation d'un modèle de soins alternatif centré sur l'expertise musculosquelettique. L'analyse des pratiques de référencement suggère toutefois que ce type d'initiative pourrait avoir un impact plus marqué si elle était mise en œuvre dès le début du parcours de soins. Des recherches futures permettront de documenter ses effets cliniques et de préciser les conditions d'implantation favorables à une intégration efficace, équitable et durable de ce modèle au sein du système de santé.

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Annexe A – Scoping review search strategy (Article I)

Medline search strategy

sensitivity or specificity or validity or accuracy or ''predictive value'' or ''predictive validity'' or ''diagnostic accuracy'' or ''diagnostic performance'' or ''diagnostic value'' or ''test performance'' or ''diagnostic utility'' or ''diagnostic ability'' or ''posttest probability'' or ''predictive validity'' or (discriminative N3 (value or validity or performance or ability

((diagnos* or clinical) N3 (test* or examination or evaluation* or assessment* or indicator* or finding* or feature* or history or sign* or symptom*)) or (neurologic* N3 (test* or examination*)) or "diagnostic test*" or (physical N3 (examination* or test* or evaluation* or assessment* or sign* or symptom*)) or "sensory test*" or "motor test*" or "muscle test*" or “muscle strength” or evaluation or assessment or imaging or x-rays or radiograph* or "magnetic resonance imaging" or MRI or tomograph* or scan or ultraso* or electromyograph* or EMG or electrodiagnos* or (conduction N3 (nerve or motor)) or “electrical stimulation” or “nerve root block*” or (injection* N3 (“nerve root*” or epidural or joint)) or discograph* or scintigraph* or (history N3 (taking or patient or clinical or medical or family)) or "patient interview" or (screening N3 (tool* or instrument* or question*)) or questionnaire* or prognosis or prediction or discriminat* or “prognostic screening” or ((prognostic or predictive) N3 (factor* or indicator*)) or “prediction rule*” or ((criteria or model) N3 (diagnostic or classification) or "yellow flag*" or "red flag*" or biomarker* or (blood N3 (test* or analysis or marker* or factor* or work* or count or parameter*))" or (laboratory N3 (test* or analysis or profile or marker* or biomarker* or parameter*)) or HLAB27 or HLA-B27 or (inflammat* N3 (marker* or biomarker*)) or (gene* N3 (marker* or biomarker*)) or antibod*

("low back pain" or "lower back pain" or "lumbar radiculopath*" or “lumbosacral radiculopath*” or ("lumbar dis*” N3 hernia*) or ("intervertebral dis*” N3 hernia*) or "lumbar spinal stenosis" or "lumbar pain" or "low back ache" or lombago or lumbalgia or "lumbar spine" or "low back disorder*" or "lumbar spinal condition*" or "lumbar radicular pain" or "lumbar radicular symptom*" or "lumbosacral pain" or sciatica or "radiating leg pain" or "low back related leg pain" or "back pain" or "back ache" or "neurogenic claudication" or "intermittent claudication" or "axial

spondyloarthritis" or "inflammatory back pain" or “ankylosing spondylitis” or "cauda equina syndrome" or "underlying spinal condition*" or (spin* N3 (fracture* or malignancy or neoplasm* or pathology*)))

AB ((systematic N3 review*) or guideline*) OR TI ((systematic N3 review*) or guideline*) OR SU ((systematic N3 review*) or guideline*) OR PT ((systematic N3 review*) or guideline*)

Annexe B – Primary studies characteristics (Article I)

Table S1: Diagnostic accuracy of demographics for lumbar spinal stenosis (LSS)

Systematic review of diagnostic accuracy of patient history, clinical findings, and physical tests in the diagnosis of lumbar spinal stenosis (Cook, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Cook	2011	Tertiary	N= 1448	Consecutive patients with suspicion of a condition associated with origin at the lumbar spine	Expert opinion based on clinical findings and imaging (MRI	Age > 48 years	Se 0.88 (0.85, 0.91); SP 0.49 (0.46, 0.52); +LR 1.70 (1.60, 1.80); -LR 0.25 (0.21, 0.32); +PTP % (95% CI): 53.46 (52, 56); +PTP absolute differences %: 13.33 **(medium)**; -PTP % (95% CI): 14.45 (11, 17); -PTP absolute differences %: 25.88 **(large)**
Diagnosis of Lumbar Spinal Stenosis An Updated Systematic Review of the Accuracy of Diagnostic Tests (De Shepper, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data

Konno	2007	Primary and secondary	N=468	Consecutive patients showing primary symptoms of pain or numbness in the lower extremities, including the buttocks, thighs, and lower legs	Consensus diagnostic impression of expert physicians, confirmation by x-rays and MRI	Age < 60 years	Se 0.15 (0.11,0.20); Sp 0.62 (0.56,0.68); +LR 0.41; -LR 1.4
						Age > 70 years	Se 0.64 (0.58, 0.71); Sp 0.68 (0.62, 0.74); +LR 2.0; -LR 0.52
Katz	1995	Tertiary	N=75	Patients with low back pain with or without radiation to the lower extremities	Expert opinion (>80% confidence in diagnosis for cases and <20% for non-cases)	Age > 65 years	Se 0.77 (0.64,0.90); Sp 0.69 (0.53,0.85); +LR 2.5; -LR 0.33

Table S2: Diagnostic accuracy of patient history findings for LSS

Systematic review of diagnostic accuracy of patient history, clinical findings, and physical tests in the diagnosis of lumbar spinal stenosis (Cook, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Cook	2011	Tertiary	N= 1448	Consecutive patients with suspicion of a condition associated with origin at the lumbar spine	Expert opinion based on clinical findings and imaging (MRI)	Bilateral symptoms	Se 0.03 (0.02, 0.05); Sp 0.98 (0.97, 0.99); +LR 2.30 (1.10, 4.80); -LR 0.98 (0.97, 0.99); +PTP %(95% CI): 60.85 (35, 66); +PTP absolute differences %: 20.52 (medium); -PTP %(95% CI): 39.84 (40, 41); -PTP absolute differences %: 0.49 (small)
						Leg or back pain worse	Se 0.17 (0.14, 0.20); Sp 0.92 (0.90, 0.94); +LR 2.10 (1.50, 2.80); -LR 0.91 (0.87, 0.94); +PTP %(95% CI): 58.66 (50, 64); +PTP absolute differences %: 18.33 (medium); −PTP % (95% CI): 38.02 (37, 38); −PPT absolute differences %: 2.31 (small)
						Moderate back pain	"Se 0.95 (0.93, 0.97); Sp 0.02 (0.01, 0.03); +LR 0.97 (0.96, 0.99); -LR 2.10 (1.20, 3.90); PTP %(95% CI): 39.59 (39, 40); +PTP absolute differences %: 0.74 (small); −PTP %

							(95% CI): 63 (49, 75); −PPT absolute differences %: 22.67 (medium)"
						Moderate buttock pain	Se 0.81 (0.78, 0.84); Sp 0.33 (0.30, 0.36); +LR 1.20 (1.10, 1.30); -LR 0.60 (0.46–0.72); PTP %(95% CI): 44.78 (44, 47); +PTP absolute differences %: 4.45 (small); -PTP % (95% CI): 28.85 (24, 32); −PPT absolute differences %: 11.48 (small)
						Moderate leg pain	Se 0.90 (0.87, 0.92); Sp 0.24 (0.21, 0.27); +LR 1.20 (1.10, 1.20); -LR 0.43 (0.32, 0.58); PTP %(95% CI): 44.78 (43, 46); +PTP absolute differences %: 4.45 (small); −PTP % (95% CI):22.51 (18, 27); −PPT absolute differences %: 18.72 (medium)
						Pain constancy	Se 0.23 (0.20, 0.27); Sp 0.78 (0.75, 0.81); +LR 1.10 (0.86, 1.30); -LR 0.98 (0.92, 1.04); PTP %(95% CI):42.64 (37, 46) ; +PTP absolute differences %: 2.31 (small);−PTP % (95% CI): 39.84 (39, 41); −PPT absolute differences %: 0.49 (small)

						Pain with walking/ standing	Se 0.67 (0.64, 0.69); Sp 0.44 (0.42, 0.46); +LR 1.2; -LR 0.75
						Sitting relieves pain	Se 0.26 (0.24, 0.29); Sp 0.86 (0.84,0.88); +LR 1.9, -LR 0.86
Sugiokia	2008	Primary and secondary	N=469	Patients showing primary symptoms of pain or numbness in the lower limbs, including the buttocks, thighs and lower legs	Physician-diagnosed LSS	Change position frequently to try and get lower extremities comfortable	Se 0.73 (0.66, 0.79); Sp 0.39 (0.32, 0.47); +LR 1.19 (1.03, 1.38); -LR 0.70 (0.52, 0.94); +PTP % 57.50 (54, 61); +PTP absolute differences %: 4.29 (small); −PTP % 44.32 (37, 51); −PPT absolute differences %: 8.89 (small)
						Improvement of symptoms when bending backward	Se 0.16 (0.11, 0.21); Sp 0.78 (0.71, 0.84); +LR 0.70 (0.45, 1.08); -LR 1.08 (0.98, 1.20); +PTP % 45 (34, 56); +PTP absolute differences %: 8.21 (small); −PTP % 55 (53, 58); −PPT absolute differences %: 1.79 (small)
						Have to hold onto something to get out of an easy chair due to lower extremities	Se 0.43 (0.36, 0.50); Sp 0.68 (0.61, 0.75); +LR 1.35 (1.03, 1.76); -LR 0.83 (0.71, 0.98); +PTP % 60.55 (54, 67); +PTP absolute differences %: 7.34 (small); −PTP % 48.55 (45, 53); −PPT absolute differences %: 4.66 (small)
						Numbness of lower legs while walking	Se 0.75 (0.68, 0.81); Sp 0.37 (0.29, 0.44); +LR 1.18 (1.03, 1.36); -LR

							0.68 (0.50, 0.93); +PTP % 58.29 (54, 61); +PTP absolute differences %: 5.08 (small); −PTP % 43.60 (36, 51); −PPT absolute differences %: 9.61 (small)
						Only stand for short periods of time due to lower extremities	Se 0.71 (0.65, 0.78); Sp 0.43 (0.35, 0.51); +LR 1.25 (1.07, 1.46); -LR 0.67 (0.50, 0.88); +PTP % 58.70 (55, 62); +PTP absolute differences %: 5.49 (small); −PTP % 43.24 (37, 50); −PPT absolute differences %: 10 (small)
						Only walk for short distances due to lower extremities	Se 0.76 (0.69, 0.82); Sp 0.37 (0.29, 0.44); +LR 1.21 (1.05, 1.38); -LR 0.65 (0.47, 0.89); +PTP % 57.91 (54, 61); +PTP absolute differences %: 4.70 (small); −PTP % 57 (49, 65); −PPT absolute differences %: 3.79 (small)
						Use a handrail to get upstairs due to lower extremities	Se 0.66 (0.59, 0.73); Sp 0.66 (0.57, 0.75); +LR 1.27 (1.06, 1.50); -LR 0.71 (0.55, 0.91); +PTP % 59.08 (55, 63); +PTP absolute differences %: 5.87 (small); −PTP % 44.67 (38, 51); −PPT absolute differences %: 8.54 (small)

						Walking is easier when bending forward	Se 0.55 (0.48, 0.62); Sp 0.61 (0.53, 0.68); +LR 1.42 (1.14, 1.78); -LR 0.73 (0.60, 0.89); +PTP % 61.75 (56, 67); +PTP absolute differences %: 8.54 (small); −PTP % 45.36 (41, 50); −PPT absolute differences %: 7.85 (small)
						Walk more slowly than usual due to lower extremities	Se 0.86 (0.81, 0.91); Sp 0.27 (0.20, 0.34); +LR 1.17 (1.06, 1.30); -LR 0.52 (0.34, 0.79); +PTP % 57.09 (55, 60); +PTP absolute differences %: 3.88 (small); −PTP % 37.16 (28, 47); −PPT absolute differences %: 16.05 (medium)
						Change position frequently to try and get lower extremities comfortable	Se 0.73 (0.66, 0.79); Sp 0.39 (0.32, 0.47); +LR 1.19 (1.03, 1.38); -LR 0.70 (0.52, 0.94); +PTP % 57.50 (54, 61); +PTP absolute differences %: 4.29 (small); −PTP % 44.32 (37, 51); −PPT absolute differences %: 8.89 (small)
						Improvement of symptoms when bending backward	Se 0.16 (0.11, 0.21); Sp 0.78 (0.71, 0.84); +LR 0.70 (0.45, 1.08); -LR 1.08 (0.98, 1.20); +PTP % 45 (34, 56); +PTP absolute differences %: 8.21 (small); −PTP % 55 (53, 58); −PPT absolute differences %: 1.79 (small)

						Exacerbated while standing up	Se 0.92 (0.88, 0.96); Sp 0.20 (0.14, 0.27); +LR 1.2; -LR 0.39
						Wake up to urinate at night	Se 0.86 (0.82, 0.91); Sp 0.27 (0.20, 0.33); +LR 1.2; -LR 0.51
Konno	2007	Primary and secondary	N=468	Consecutive patients showing primary symptoms of pain or numbness in the lower extremities, including the buttocks, thighs and lower legs	MRI	Bilateral plantar numbness	Se 0.27 (0.21, 0.33); Sp 0.87 (0.83, 0.91); +LR 2.14 (1.45, 3.18); -LR 0.83 (0.76, 0.92); +PTP % 65.88 (57, 74); +PTP absolute differences %: 18.44 (medium); −PTP % 42.82 (41, 45); −PPT absolute differences %: 4.62 (small)
						Leg pain or numbness	Se 0.58 (0.51, 0.64); Sp 0.55 (0.49, 0.62); +LR 1.30 (1.09, 1.56); -LR 0.76 (0.63, 0.92); +PTP % 53.98 (49, 58); +PTP absolute differences %: 6.54 (small); −PTP % 40.68 (36, 46); −PPT absolute differences %: 6.76 (small)
						Low back pain	Se 0.66 (0.60, 0.72); Sp 0.41 (0.35, 0.48); +LR 1.13 (0.98, 1.30); -LR 0.82 (0.64, 1.03); +PTP % 50 (47, 54); +PTP absolute differences %: 2.56 (small); −PTP % 42.53 (37, 48); −PPT absolute differences %: 4.91 (small)
						Numbness of perineal region	Se 0.05 (0.02, 0.08); Sp 0.99 (0.96, 1.00); +LR 3.69 (1.03, 13.25); -LR

							0.97 (0.94, 1.00); +PTP % 76.90 (48, 93); +PTP absolute differences %: 29.46 (large); −PTP % 46.68 (46, 47); −PPT absolute differences %: 0.76 (small)
Fritz	1997	Tertiary	N=45	Patients with low back and lower extremity pain and self-reported limitations in walking tolerance	MRI and CT scan	Walk better holding onto a shopping cart	Se 0.63 (0.38, 0.84); Sp 0.67 (0.35, 0.90); +LR 1.89 (0.79, 4.53); -LR 0.55 (0.27, 1.13); +PTP %(95% CI):75 (56, 88) ; +PTP absolute differences %: 14 (medium) ; −PTP % (95% CI): 47 (30, 64) ; −PPT absolute differences %: 14 (medium)
Roach	1997	Tertiary	N=106	Patients with recurrent or chronic low back pain	Patient's complaints, results of physical examination, diagnostic radiologic tests, laboratory work, consultations, and any other diagnostic tests	Pseudoclaudication	Se 0.63 (0.41, 0.81); Sp 0.71 (0.60, 0.80); +LR 2.20 (1.38, 3.50); -LR 0.52 (0.31, 0.89); +PTP % 39.16 (29, 50); +PTP absolute differences (%): 16.52 (medium); −PTP % 13.20 (8, 21); −PPT absolute differences (%): 9.44 (small)
Katz	1995	Tertiary	N=75	Patients with low back pain with or without	The expert attending physician's confidence in the	No pain with flexion	Se 0.79 (0.64, 0.90); Sp 0.44 (0.26, 0.62); +LR 1.41 (1.00, 1.98); -LR 0.48 (0.24, 0.96); +PTP % 65.45 (57, 73); +PTP absolute differences %:

				radiation to the lower extremities	diagnosis of LSS (>80% confidence in diagnosis for cases and <20% for non-cases)		25.12 (large); −PTP % 39.20 (24, 56); −PPT absolute differences %: 1.13 (small)
						No pain when seated	Se 0.47 (0.31, 0.62); Sp 0.94 (0.79, 0.99); +LR 7.21 (1.82, 28.61); -LR 0.57 (0.43, 0.77); +PTP % 90.64 (71, 97); +PTP absolute differences %: 33.31 (large); −PTP % 43.36 (37, 51); −PPT absolute differences %: 13.97 (medium)
						Numbness	Se 0.63 (0.47, 0.77); Sp 0.59 (0.41, 0.76); +LR 1.50 (0.93, 2.40); -LR 0.64 (0.39, 1.05); +PTP % 66.83 (56, 77); +PTP absolute differences %: 9.50 (small); −PTP % 46.23 (34, 58); −PPT absolute differences %: 11 (medium)
						Pain below buttocks	Se 0.88 (0.75, 0.96); Sp 0.34 (0.19, 0.53); +LR 1.35 (1.02, 1.77); -LR 0.34 (0.13, 0.88); +PTP % 64.46 (58, 70); +PTP absolute differences %: 7.13 (small); −PTP % 31.35 (16, 55); −PPT absolute differences %: 25.98 (large)
						Pain below knees	Se 0.56 (0.40, 0.71); Sp 0.63 (0.44, 0.79); +LR 1.49 (0.88, 2.50); -LR 0.71 (0.46, 1.09); +PTP % 66.68 (55, 77); +PTP absolute differences %:

							9.35 (small); −PTP % 52 (41, 62); −PPT absolute differences %: 5.33 (small)
						Severe lower extremity pain	Se 0.65 (0.49, 0.79); Sp 0.66 (0.47, 0.81); +LR 2.02 (1.16, 3.52); -LR 0.51 (0.32, 0.83); +PTP % 73.07 (61, 82); +PTP absolute differences %: 15.74 (medium); −PTP % 40.66 (31, 53); −PPT absolute differences %: 16.67 (medium)
Diagnostic accuracy of self-report and subjective history in the diagnosis of low back pain with non-specific lower extremity symptoms: A systematic review (Shultz, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Beattie	2000	NA	N=428	Patients with low back pain or lower extremity radiculopathy	MRI	Lower extremity pain for LSS	DOR: 2.09 (1.03,4.26)
Diagnosis of Lumbar Spinal Stenosis An Updated Systematic Review of the Accuracy of Diagnostic Tests (De Schepper, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data

Cook	2011	Tertiary	N=1448	Consecutive patients with suspicion of a condition associated with origin at the lumbar spine	Expert opinion based on clinical findings and imaging (MRI)	Pain with walking/ standing	Se 0.67 (0.64, 0.69); Sp 0.44 (0.42, 0.46); +LR 1.2; -LR 0.75
						Sitting relieves pain	Se 0.26 (0.24, 0.29); Sp 0.86 (0.84,0.88); +LR 1.9, -LR 0.86
Sugiokia	2008	Primary and secondary	N=469	Consecutive patients showing primary symptoms of pain or numbness in the lower extremities, including the buttocks, thighs and lower legs	Consensus diagnostic impression of expert physicians, confirmation by x-rays and MRI	Exacerbated while standing up	Se 0.92 (0.88, 0.96); Sp 0.20 (0.14, 0.27); +LR 1.2; -LR 0.39
						Treatment for symptoms needs to be repeated every year	Se 0.40 (0.33, 0.47); Sp 0.81 (0.75, 0.86); +LR 2.1; -LR 0.74
						Wake up to urinate at night	Se 0.86 (0.82, 0.91); Sp 0.27 (0.20, 0.33); +LR 1.2; -LR 0.51
Konno	2007	Primary and secondary	N=468	Patients showing primary symptoms of pain or numbness in the lower	Consensus diagnostic impression of expert physicians, confirmation by x-rays and MRI	Burning sensation around the buttocks and/or intermittent priapism associated with walking	Se 0.06 (0.03, 0.09); Sp 0.99 (0.98, 1.00); +LR 7.2; -LR 0.95
						Intermittent claudication	Se 0.82 (0.77, 0.87); Sp 0.78 (0.73, 0.83); +LR 3.7; -LR 0.23

				extremities, including the buttocks, thighs and lower legs		Exacerbation when standing up	Se 0.68 (0.62, 0.74); Sp 0.70 (0.65, 0.76); +LR 2.3; -LR 0.45
						Improvement when bending forward	Se 0.52 (0.45, 0.58); Sp 0.92 (0.88, 0.95); +LR 6.4; -LR 0.52
						Urinary disturbance	Se 0.14 (0.09, 0.19); Sp 0.98 (0.96, 1.00); +LR 6.9; -LR 0.88
Fritz	1997	Tertiary	N=45	Patients with low back and lower extremity pain and self-reported limitations in walking tolerance	MRI or CT scan	Pain in legs relieved by sitting	Se 0.81 (0.61, 0.93); Sp 0.16 (0.03, 0.40); +LR 1.0; -LR 1.2
						Sitting best posture with regard to symptoms	Se 0.89 (0.70, 0.98); Sp 0.39 (0.17, 0.64); +LR 1.5, -LR 0.28
						Walk/stand worst posture with regard to symptoms	Se 0.89 (0.70, 0.98); Sp 0.33 (0.13, 0.59); +LR 1.3, -LR 0.33
Roach	1997	Tertiary	N=106	Patients with recurrent or chronic low back pain	Patient's complaints, results of physical examination, diagnostic radiologic tests, laboratory work, consultations, and any other diagnostic tests	Radiating leg pain	Se 0.94; Sp 0.21; +LR 1.2; -LR 0.29
Katz	1995	Tertiary	N=75	Patients with low back pain	Expert opinion (>80%	Symptoms improve when seated	Se 0.52 (0.37,0.67); Sp 0.83 (0.70,0.96); +LR 3.1; -LR 0.58

				with or without radiation to the lower extremities	confidence in diagnosis for cases and <20% for non-cases)	Worse when walking	Se 0.71 (0.57,0.85); Sp 0.30 (0.14,0.46); +LR 1.0; -LR 0.97
Ljunggren	1991	Secondary	N=179	Consecutive patients with lumbago-sciatica and no previous back surgery.	Diagnosis by physical and neurological examination, imaging and surgery	Pain relief with assuming a suitable body position	Se 0.61 (0.50,0.72); Sp 0.55 (0.45, 0.65); +LR 1.4; -LR 0.71
						Bilateral buttock or leg pain	Se 0.51 (0.40,0.62); Sp 0.92 (0.87,0.97); +LR 6.3; -LR 0.54
						Lumbosacral pain	Se 0.75 (0.65,0.84); Sp 0.27 (0.18,0.36); +LR 1.0; -LR 0.94
						Gluteal pain	Se 0.84 (0.75,0.92); Sp 0.05 (0.01,0.09); +LR 0.88; -LR 3.3
						Thigh pain	Se 0.95 (0.90,1.00); Sp 0.14 (0.07,0.20); +LR 1.1, -LR 0.37
						Calf pain	Se 0.91 (0.85,0.97); Sp 0.06 (0.01, 0.11); +LR 0.97; -LR 1.5
						Foot pain	0.57 (0.46–0.68) 0.27 (0.18–0.36) 0.78 1.6

Table S3: Diagnostic accuracy of physical examination findings for LSS

Systematic review of diagnostic accuracy of patient history, clinical findings, and physical tests in the diagnosis of lumbar spinal stenosis (Cook, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Dobbs	2016	NA	N= 30	Subjects aged 50 or over with subjective report of unilateral or bilateral pain or paraesthesia radiating below the gluteal fold	MRI	Modified extension test	Se 0.92 (0.74, 0.99); Sp 0.40 (0.05, 0.85); +LR 1.53 (0.74, 1.36); -LR 0.20 (0.00, 1.36); +PTP %(95% CI): 88 (79, 94); +PTP absolute differences (%): 5 (small); −PTP % (95% CI): 50 (17, 85); −PPT absolute differences (%): 33 (large)
Konno	2007	Primary and secondary	N=468	Consecutive patients showing primary symptoms of pain or numbness in the lower	Consensus diagnostic impression of expert physicians, confirmation by x-rays and MRI	Straight leg raising test positive	Se 0.17 (0.12, 0.22); Sp 0.67 (0.61, 0.73); +LR 0.51 (0.36, 0.72); -LR 1.24 (1.12, 1.38); +PTP % 31.52 (25, 39); +PTP absolute differences (%): 15.92 (medium); −PTP % 52.81 (50, 55); −PPT absolute differences (%): 5.37 (small)
						Symptoms induced by	Se 0.18 (0.13, 0.23); Sp 0.63 (0.56, 0.69); +LR 0.48 (0.34, 0.66); -LR 1.31

				extremities, including the buttocks, thighs, and lower legs		having patients bend forward	(1.17, 1.47); +PTP % 30.22 (23, 37); +PTP absolute differences (%): 17.22 (medium); −PTP % 54.17 (51, 57); −PPT absolute differences (%): 6.73 (small)
						Symptoms induced by having patients bend backward	Se 0.70 (0.63, 0.76); Sp 0.54 (0.48, 0.61); +LR 6.34 (4.09, 9.84); -LR 0.53 (0.46, 0.61); +PTP % 58 (54, 62); +PTP absolute differences (%): 10.56 (small); −PTP % 32.35 (28, 39); −PPT absolute differences (%): 15.09 (medium)
Fritz	1997	Tertiary	N=45	Patients with low back and lower extremity pain and self-reported limitations in walking tolerance	MRI or CT scan	Prolonged recovery after level walking	Se 0.82 (0.60, 0.95); Sp 0.68 (0.43, 0.87); +LR 2.59 (1.30, 5.17); -LR 0.26 (0.10, 0.68); +PTP %(95% CI): 75 (60, 86) ; +PTP absolute differences (%): 21 (medium); −PTP % (95% CI): 24 (10, 44); −PPT absolute differences (%): 30 (large)
						Two-stage treadmill test (on a level; earlier onset of symptoms with level walking)	Se 0.68 (0.46, 0.85); Sp 0.83 (0.59, 0.96); +LR 4.0 (1.40, 11.86); -LR 0.38 (0.21, 0.71); +PTP %(95% CI): 84.55 (66, 94) ; +PTP absolute differences (%): 26.55 (large); −PTP % (95% CI):34.21 (23, 50); −PPT absolute differences (%): 23.79 (medium)
						Two-stage treadmill test (on an inclined treadmill; longer	Se 0.50 (0.25, 0.75); Sp 0.92 (0.64, 1.00); +LR 6.50 (0.93, 45.50); -LR 0.54 (0.32, 0.91); +PTP %(95% CI): 89.89 (53, 98) ; +PTP absolute differences (%):

						total walking time during inclined walking)	34.89 (large) ; −PTP % (95% CI): 40 (28, 53); −PPT absolute differences (%): 15 (medium)
Katz	1995	Tertiary	N=75	Patients with low back pain with or without radiation to the lower extremities	Expert opinion (>80% confidence in diagnosis for cases and <20% for non-cases)	Thigh pain with 30 s of lumbar extension	Se 0.51 (0.35, 0.67); Sp 0.69 (0.50, 0.84); +LR 1.64 (0.91, 2.96); -LR 0.71 (0.48, 1.04); +PTP % 68.78 (55, 80); +PTP absolute differences %: 11.45 (medium); −PTP % 48.82 (39, 58); −PPT absolute differences %: 8.51 (small)
						Abnormal Romberg	Se 0.40 (0.25, 0.56); Sp 0.91 (0.75, 0.98); +LR 4.06 (1.29, 12.76); -LR 0.68 (0.53, 0.89); +PTP % 84.50 (64, 95); +PTP absolute differences (%): 27.17 (large); −PTP % 47.74 (41, 54); −PPT absolute differences (%): 8.87 (small)
						Absent Achilles reflex	Se 0.47 (0.31, 0.62); Sp 0.78 (0.60, 0.91); +LR 2.07 (0.99, 4.31); -LR 0.70 (0.50, 0.98); +PTP % 73.55 (58, 85); +PTP absolute differences (%): 16.22 (medium); −PTP % 48.46 (40, 56); −PPT absolute differences (%): 8.87 (small)
						Pinprick deficit (sensibility)	Se 0.47 (0.31, 0.62); Sp 0.81 (0.64, 0.93); +LR 2.54 (1.16, 5.58); -LR 0.64 (0.46, 0.90); +PTP % 77.33 (61, 88); +PTP absolute differences (%): 20

							(medium); −PTP % 46.23 (39, 55); −PPT absolute differences (%): 11.10 (medium)
						Poor balance	Se 0.70 (0.54, 0.83); Sp 0.53 (0.35, 0.71); +LR 1.49 (0.98, 2.26); -LR 0.57 (0.33, 0.99); +PTP % 66.68 (57, 75); +PTP absolute differences (%): 9.35 (small); −PTP % 43.36 (30, 57); −PPT absolute differences (%): 13.97 (medium)
						Vibration deficit	Se 0.53 (0.38, 0.69); Sp 0.81 (0.64, 0.93); +LR 2.79 (1.28, 6.07); -LR 0.59 (0.41, 0.84); +PTP % 78.94 (63, 89); +PTP absolute differences (%): 21.61 (medium); −PTP % 44.21 (36, 53); −PPT absolute differences (%): 13.12 (medium)
						Weakness	Se 0.47 (0.31, 0.62); Sp 0.78 (0.60, 0.91); +LR 2.18 (1.05, 4.51); -LR 0.67 (0.48, 0.94); +PTP % 74.54 (58, 86); +PTP absolute differences (%): 17.21 (medium); −PTP % 47.37 (40, 56); −PPT absolute differences (%): 9.96 (small)
Jensen	1989	NA	N=23	Indication for myelography; symptoms: neurogenic	Myelographical examination	Any change of neurological status after walk test (treadmill)	Se 1.00 (0.63, 1.00); Sp 0.33 (0.12, 0.62); +LR 1.50 (1.05, 2.15); -LR 0; +PTP % 44.44 (34, 53); +PTP absolute differences (%): 9.44 (small); −PTP % 0

				claudication, unilateral in 14 cases, bilateral in 9 cases			(0, 58); −PPT absolute differences (%): 35 (large)
						Bilateral paresis after walk test (treadmill)	Se 0.38 (0.09, 0.76); Sp 0.87 (0.60, 0.98); +LR 2.81 (0.59, 13.52); -LR 0.72 (0.41, 1.28); +PTP % 59.97 (24, 88); +PTP absolute differences (%): 25 (medium); −PTP % 27.74 (18, 41); −PPT absolute differences (%): 7.26 (small)
						Bilateral reflex changes after walk test (treadmill)	Se 0.50 (0.16, 0.84); Sp 0.80 (0.52, 0.96); +LR 2.50 (0.73, 8.52); -LR 0.62 (0.30, 1.31); +PTP % 57.14 (28, 82); +PTP absolute differences (%): 22.14 (large); −PTP % 24.84 (14, 41); −PPT absolute differences (%): 10.16 (small)
						Functional test (neurological status change as a result of a treadmill test)	Se 1.00 (0.63, 1.00); Sp 0.33 (0.12, 0.62); +LR 1.50 (1.05, 2.15); -LR 0; +PTP % 44.44 (34, 53); +PTP absolute differences (%): 9.44 (small); −PTP % 0 (0, 58); −PPT absolute differences (%):35 (large)
						Symptom-march after a walk test (treadmill)	Se 0.63 (0.24, 0.91); Sp 0.80 (0.52, 0.96); +LR 3.12 (0.99, 9.83); -LR 0.46 (0.19, 1.19); +PTP % 62.45 (35, 84); +PTP absolute differences (%): 27.45 (large); −PTP % 19.69 (9, 39); −PPT absolute differences (%): 15.31 (medium)
Diagnosis of Lumbar Spinal Stenosis An Updated Systematic Review of the Accuracy of Diagnostic Tests							

(De Shepper, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Cook	2011	Tertiary	N=1448	Consecutive patients with suspicion of a condition associated with origin at the lumbar spine	Expert opinion based on clinical findings and imaging (MRI)	Gait abnormality	Se 0.29 (0.27, 0.32); Sp 0.81 (0.79, 0.83); +LR 1.6; -LR 0.87
Katz	1995	Tertiary	N=75	Patients with low back pain with or without radiation to the lower extremities	Expert opinion (>80% confidence in diagnosis for cases and <20% for non-cases)	Wide-based gait	Se 0.43 (0.28, 0.58); Sp 0.97 (0.91,1.00); +LR 14; -LR 0.59

Table S4: Diagnostic accuracy of clinical diagnostic support tool for LSS

Diagnostic Clinical Prediction Rules for Specific Subtypes of Low Back Pain: A Systematic Review (Haskins, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Sugiokia	2008	Primary and secondary	N=469	Patients showing primary symptoms of pain or numbness in the lower limbs, including the buttocks, thighs and lower legs	Physician-diagnosed LSS	Clinical prediction rule (score ≥5 : older age, duration of symptoms > 6m, improvement of symptoms when bending backward, occurrence of symptoms when standing up, improvement of symptoms while resting, urinary incontinence	Se 0.75; Sp 0.51; LRs not reported but calculated to be LR+ 1.5 (1.1, 2.1); LR- 0.50 (0.29, 0.88)

Diagnosis of Lumbar Spinal Stenosis An Updated Systematic Review of the Accuracy of Diagnostic Tests (De Shepper, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Cook	2011	Tertiary	N=1448	Consecutive patients with suspicion of a condition associated with origin at the lumbar spine	Expert opinion based on clinical findings and imaging (MRI)	1 of 5 positive findings (bilateral symptoms, leg pain more than back pain, pain during walking/standing, pain relief upon sitting, age > 48 yr)	Se 0.96 (0.94, 0.97); Sp 0.20 (0.19, 0.21); +LR 1.2, -LR 0.19
						2 of 5 positive findings	Se 0.68 (0.65,0.71); Sp 0.62 (0.60, 0.64); +LR 1.8 ; -LR 0.51
						3 of 5 positive findings	Se 0.29 (0.27,0.31); Sp 0.88 (0.87,0.90); +LR 2.5; -LR 0.80
						4 of 5 positive findings	Se 0.06 (0.05, 0.07); Sp 0.98 (0.98, 0.99); +LR 4.6; -LR 0.95

Kato	2009	Secondary	N=119	Patients with symptoms in lower extremities	Consensus diagnostic impression of expert physicians, confirmation by x-rays, CT and MRI	Clinical diagnostic support tool (LSS ≥ 7)	Se 0.95 (0.89, 1.00); Sp 0.40 (0.28,0.52); +LR 1.6; -LR 0.13
Konno	2007	Primary and secondary	N=468	Consecutive patients showing primary symptoms of pain or numbness in the lower extremities, including the buttocks, thighs, and lower legs	Consensus diagnostic impression of expert physicians, confirmation by x-rays and MRI	Clinical diagnostic support tool (LSS ≥ 7)	Se 0.95 (0.89, 1.00); Sp 0.40 (0.28,0.52); +LR 1.6; -LR 0.13

Table S5: Diagnostic accuracy of demographics for lumbar radiculopathy

Diagnostic utility of patient history, clinical examination and screening tool data to identify neuropathic pain in low back related leg pain: a systematic review and a narrative synthesis (Mistry, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Verwoerd	2014	Secondary	N=395	Adults patients diagnosed by neurologist with incapacitating lumbosacral radicular syndrome	MRI	Age > 40	(Nerve root compression/herniated disc): Se 57%/58%; Sp 37%/36%; LR+ 0.9/0.9; LR- 1.16/1.17
						Male sex	Se 66%/65%; Sp 47%/45%; LR+1.25/1.18; LR- 0.23/0.78
						BMI ≥ 30	Se 13%/12%; Sp 78%/72%; LR+ 0.59/0.43; LR- 0.74/0.74
						Health-related absenteeism	Se 80%/81%; Sp 20%/24%; LR+ 1/0.7; LR- 1/0.79
						Having an intellectually heavy job	Se 69%/69%; Sp 42%/42%; LR+ 1.19/1.19; LR- 0.74/0.74

						Having a physically heavy job	Se 38%/39%; Sp 57%/60%; LR+ 0.95/0.95; LR- 1.05/1.03
						Smoking	Se 39%/39%; Sp 58%/59%; LR+ 0.95/0.95; LR- 1.05/1.03
Diagnostic accuracy of self-report and subjective history in the diagnosis of low back pain with non-specific lower extremity symptoms: A systematic review (Shultz, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Coster	2010	Tertiary	N= 202	Patients had suspicion of lumbosacral radiculopathy	Radiological nerve root compression	Age > 40 years	DOR: 1.20 (0.60, 2.20)
						Gender male	DOR: 1.70 (0.90, 3.00)
Vroomen	2002	Primary and secondary	N=274	Patients with pain radiating into the leg	MRI	Age 41-50	DOR: 1.30 (0.70, 2.30)
						Age 51-81	DOR: 2.20 (1.20, 4.00)
						Male Sex	DOR: 1.80 (1.10, 3.00)
						Living Alone	DOR: 1.30 (1.70, 2.40)
						High Education Level	DOR: 1.60 (0.90, 2.90)
						Job Type: Cognitive	DOR: 1.10 (0.60, 2.00)

						Job Type: Standing/walking/lifting	DOR: 0.50 (0.30, 0.95)
Vucetic	1997	NA	N=274	Patients with pain radiating into the leg (suspicion of LDH)	MRI	Education	DOR: 3.22 (1.30, 7.80)

Table S6: Diagnostic accuracy of patient history findings for lumbar radiculopathy

Diagnostic utility of patient history, clinical examination and screening tool data to identify neuropathic pain in low back related leg pain: a systematic review and a narrative synthesis (Mistry, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Verwoerd	2014		N=395	Adults patients diagnosed by neurologist with incapacitating lumbosacral radicular syndrome	MRI	Duration of pain in leg ≥ 9 weeks	(Nerve root compression/herniated disc): Se 26%/25%; Sp 73%/71%; LR+ 0.96/0.86; LR- 1.01/1.06
						Pain worse in leg than back	Se 53%/52%; Sp 59%/59%; LR+ 1.29/1.27; LR- 0.8/0.81
						Having pain in the back > 12 weeks	Se 34%/36%; Sp 58%/61%; LR+ 0.81/0.92; LR- 1.14/1.25

						Sudden onset	Se 58%/60%; Sp 24%/24%; LR+ 0.76/0.79; LR- 1.75/0.53
						Paroxysmal pain	Se 38%/39%; Sp 59%/61%; LR+ 1.29/1.27; LR- 0.8/0.81
						Having had pain in the same leg previously	Se 12%/12%; Sp 90%/91%; LR+ 1.2/1.2; LR- 0.98/0.98
						Subjective sensory loss	Se 89%/90%; Sp 18%/25%; LR+ 1.09/1.2; LR- 0.61/0.13
						Subjective muscle weakness	Se 66%/67%; Sp 27%/31%; LR+ 0.9/0.97; LR- 1.63/1.06
						Positive family history	Se 42%/43%; Sp 62%/67%; LR+ 0.88/1.3; LR- 0.94/1.73

						Pain worse on coughing/sneezing/straining	Se 71%/71%; Sp 32%/31%; LR+ 1.04/1.03; LR- 0.91/0.94
						Worsening on sitting	Se 73%73%; Sp 22%/22%; LR+ 0.94/0,94; LR- 1.23/1.23
Diagnostic accuracy of self-report and subjective history in the diagnosis of low back pain with non-specific lower extremity symptoms: A systematic review (Shultz, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Smart	2012	Secondary	N=102	Patients >18 years of age with low back (±leg) pain referred for	Experienced clinical judgment regarding the likely	History of nerve injury	DOR: 12.64 (3.59, 44.49)
						Dermatomal distribution	DOR: 24.29 (6.33, 93.19)

				physiotherapy assessment and/or treatment	dominant mechanisms		
Coster	2010	Tertiary	N= 202	Patients had suspicion of lumbosacral radiculopathy	Radiological nerve root compression	Duration of symptoms 3-12w	DOR: 1.40 (0.80, 2.60)
						Lumbago	DOR: 1.10 (0.50, 2.20)
						HNP Surgery	DOR: 0.50 (0.20, 1.10)
						Diabetes Mellitus	DOR: 0.80 (0.20, 3.00)
						Physiotherapy	DOR: 1.10 (0.60, 1.90)
						Use of pain killers	DOR: 1.70 (0.80, 3.60)
						Dermatomal radiation	DOR: 4.10 (2.20, 7.80)
						More pain on coughing, sneezing or straining	DOR: 3.20 (1.80, 5.70)
						More pain on sitting	DOR: 1.90 (1.10, 3.40)
						Less pain on standing	DOR: 0.90 (0.50, 1.50)
						Less pain on lying down	DOR: 1.50 (0.80, 2.90)
						Subjective muscle weakness	DOR: 2.20 (1.20, 4.00)
						Subjective sensory loss	DOR: 2.10 (1.00, 4.20)

						Disturbed Urinary Passage	DOR: 2.3 (0.20, 25.60)
Vroomen	2002	Primary and secondary	N=274	Patients with pain radiating into the leg	MRI	Duration 15-30 days	DOR: 1.70 (0.90, 3.20)
						Duration >30 days	DOR: 0.70 (0.40, 1.20)
						Any Comorbidity	DOR: 1.30 (0.80, 2.10)
						Smoking	DOR: 0.70 (0.40, 1.10)
						Sports Activities	DOR: 1.10 (0.70, 2.2)
						Exercised back/abd muscles	DOR: 0.80 (0.50, 1.30)
						Family History Sciatica	DOR: 1.10 (0.70, 1.90)
Beattie	2000		N=428	Patients with low back pain or lower extremity radiculopathy	MRI	Leg pain for lumbar radiculopathy	DOR: 2.35 (1.36, 4.06)
						Weakness for LDH	DOR: 1.86 (.99, 3.50)
Vucetic	1997	NA	N=274	Patients with pain radiating into the leg (suspicion of LDH)	MRI	Duration of sciatica (week)	DOR: 0.76 (0.41, 1.11)
						Progressive Sciatic Pain	DOR: 2.77 (1.20, 6.30)
						Previous non-spinal surgery	DOR: 3.52 (1.60, 8.00)

Table S7: Diagnostic accuracy of physical examination findings for lumbar radiculopathy

Diagnostic utility of patient history, clinical examination and screening tool data to identify neuropathic pain in low back related leg pain: a systematic review and a narrative synthesis (Mistry, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Lin	2017	Tertiary	N=60	Patients with back pain with or without leg pain lasting > 3 months	MRI	Low strength	Se 82; Sp 92; LR+ 10.25; LR- 2.25
						High strength	Se 73; Sp 97; LR+ 24.33; LR- 0.97
						Pinprick	Se 55; Sp 100; LR+ 0; LR- 0.45
						Brush	Se 46; Sp 100; LR+ 0; LR- 0.54
						Blunt	Se 59; Sp 97; LR+ 10.67; LR- 0.42
						Vibration	Se 59; Sp 92; LR+ 7.38; LR- 0.45
						Warm	Se 68; Sp 97; LR+ 22.67; LR- 0.33
						Cold	Se 59; Sp 87; LR+ 4.54; LR- 0.47

Urban	2015	Secondary	N=21	Patients with LBP with or without leg pain, 25 years or >	Standard clinical assessment	Slump test	Se 91; Sp 70; LR+ 3.03; LR- 0.13
Walsh	2009	NA	N=45	Patients with unilateral LBLP	SLR + slump tests	Nerve palpation: 2 more of sciatic, tibial, common peroneal	Se 83; Sp 73; LR+ 3.07; LR- 0.23
Poiraudeau	2001	Secondary	N=78	Patients hospitalised for acute or chronic sciatica of mechanical origin	MRI, CT, saccoradiculography	Bell's test	Se 46; Sp 62; LR+ 1.21; LR- 0.87
						HE test	Se 44; Sp 67; LR+ 1.33; LR- 0.83
						Lasegue signs	Se 79; Sp 37; LR+ 1.25; LR- 0.57
						Crossed Lasegue sign	Se 29; Sp 83; LR+ 0.41; LR- 0.85
Accuracy of clinical neurological examination in diagnosing lumbo-sacral radiculopathy: a systematic literature review (Tawa, 2017)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data

Iversen	2013	Outpatient multidisciplinary back clinics	N=116	Patients with history & clinical presentation suggestive of chronic lumbar radiculopathy	MRI and CT	Sensory tests	Se 0.33 (0.06, 0.79); Sp 0.88 (0.81, 0.93); +LR 2.8; -LR 1.3
						Motor tests	Se 0.33 (0.06, 0.97); Sp 0.68 (0.59, 0.76); +LR 1.0; -LR 1.0
						Patellar reflex	Se 0.67 (0.21, 0.94); Sp 0.83 (0.75, 0.89); +LR 4.0; -LR 2.5
						Achilles reflex	Se 0.67 (0.21,0.94); Sp 0.60 (0.51, 0.69); +LR 1.7, -LR 1.8
Suri	2011	Hospital spine center	N=54	Patients with lower extremity radiating pain	MRI	Motor tests	**L3:** Se 0.50 (0.19, 0.81); Sp 0.77 (0.62, 0.89); +LR 2.2; -LR 1.5; **L4:** Se 0.54 (0.25, 0.81), Sp 0.80 (0.65, 0.91); +LR 2.7; -LR 1.7; **L5:** Se 0.61 (0.36, 0.83); Sp 0.86 (0.71, 0.95); +LR 4.4; -LR 2.2; **S1:** Se 0.29 (0.10, 0.56); Sp 0.97 (0.85, 1.00); +LR 1.0; -LR 1.4

						Achilles reflex	Se 0.33 (0.13, 0.59); Sp 0.91 (0.77, 0.98); +LR 3.7; -LR 1.4
						SLR	Se 0.29 (0.28, 0.32); Sp 0.57 (0.48, 0.58); +LR 0.7; -LR 0.8
Trainor	2011	Orthopedic spinal clinic	N=16	Patients with pain radiating into one or both legs distal to the groin or gluteal fold Distribution of pain in dermatomal pattern	MRI	Slump test	Se 1.00 (0.40, 1.00); 0.83 (0.52, 0.98); +LR 5.9; -LR 0.8
Coster	2010	Tertiary	N=202	Subjects referred by general practitioners with clinical suspicion of Lumbo-Sacral Radicular Syndrome (LSRS)	EMG	Patellar reflex	Se 0.18 (0.10, 0.18); Sp 0.66 (0.58, 0.71); +LR 0.5; -LR 0.8
						SLR	Se 0.44 (0.38, 0.52); Sp 1.00 (0.48, 1.00); +LR 0.4; -LR 1.8

Suri	2010	Hospital spine center	N=51	Patients presenting with lower extremity radiating pain and MRI- visible lumbar disk herniation.	MRI	Sensory (soft touch & pin prick)	**L2**: Se 0.08 (0.01, 0.27); Sp 0.96 (0.82, 1.00); +LR 2.0; -LR 1.0; **L3**: Se 0.17 (0.05, 0.37); Sp 0.96 (0.82, 1.00); +LR 4.3; -LR 1.2; **L4:** Se 0.17 (0.05, 0.37); Sp 1.00 (0.88, 1.00); +LR 0.2; -LR 1.2; **L5:** Se 0.13 (0.03, 0.34); Sp 0.82 (0.63, 0.94); +LR 0.7; -LR 0.9; **S1:** Se 0.08 (0.01, 0.27); Sp 0.79 (0.59, 0.92); +LR 0.4; -LR 0.9
						Motor (heel raise & sit-to-stand)	Se 0.39 (0.32, 0.52); Sp 0.83 (0.78, 0.87); +LR 2.3; -LR 1.4
						Patellar reflex	Se 0.32 (0.31, 0.53); Sp 0.90 (0.89, 0.95); +LR 3.2; -LR 1.3
						SLR	Se 0.64 (0.47, 0.82); Sp 0.48 (0.45, 0.50); +LR 1.2; -LR 1.3

Bertilson	2010	Radiology clinic	N=61	Patients referred for lumbar spine MRI	MRI	Sensory (soft touch & pain prick)	**L4:** Se 0.07 (0.01, 0.22); Sp 0.81 (0.63, 0.93); +LR 0.4; -LR 0.9; **L5:** Se 0.17 (0.06, 0.35); Sp 0.58 (0.39, 0.75); +LR 0.4; -LR 0.7; **S1**: Se 0.20 (0.08, 0.39); Sp 0.84 (0.66, 0.95); +LR 1.3; -LR 1.1
						Motor (hypotrophy)	L4: Se 0.13 (0.04, 0.31); Sp 0.87 (0.28, 3.76); +LR 1.0; -LR 1.0; **L5**: Se 0.27 (0.12, 0.46); Sp 0.68 (0.49, 0.83); +LR 0.8; -LR 0.9; **S1:** Se 0.17 (0.06, 0.35); Sp 0.81 (0.63, 0.93); +LR 0.9; -LR 1.0
Majilesi	2008	Secondary	N=180	Patients with complaints suggestive of lumbar disc herniation with low back, leg, or low back and leg pain	MRI	SLR	Se 0.52 (0.42, 0.58); Sp 0.89 (0.79, 0.95); +LR 4.7; -LR 1.9
						Slump test	Se 0.84 (0.74, 0.90); Sp 0.83 (0.73, 0.90); +LR 5.0; -LR 5.2

Rabin	2007	Tertiary	N=38	Low back pain or paraesthesia radiation below the knee	MRI	Seated SLRT and supine SLRT	Se 0.67 (0.53, 0.79); Sp 0.43 (0.38, 0.46); +LR 1.0; -LR 1.3
Vroomen	2002	Primary	N=58	Patients referred to the neurology department with a new episode of pain radiating into the leg below the gluteal fold	MRI	Sensory tests	Se 0.14 (0.09, 0.21); Sp 0.93 (0.87, 0.97); +LR 2.0; -LR 1.1
						Motor tests (paresis)	Se 0.27 (0.20, 0.35); Sp 0.93 (0.87, 0.97); +LR 3.9; -LR 1.3
						Achilles reflex	Se 0.14 (0.09, 0.21); Sp 0.93 (0.87, 0.97); +LR 2.0; -LR 1.1
						SLR	Se 0.64 (0.56, 0.71); Sp 0.57 (0.47, 0.66); +LR 1.5; -LR 1.6
Haldeman	1998	Secondary	N=10	Patients with complaints of low-back pain and leg pain, consistent with a diagnosis of sciatica	CT and electro-diagnostics	SLR	Se 0.37 (0.19, 0.58); Sp 0.78 (0.67, 0.87); +LR 1.7; -LR 1.2

Albeck	1996	Secondary	N=80	Patients with mono-radicular pain from L5 or S1	Surgery	Sensory tests	Se 0.61 (0.47, 0.73); Sp 0.63 (0.38, 0.84); +LR 1.6; -LR 1.6
						Motor tests	Se 0.34 (0.23, 0.48); Sp 0.47 (0.24, 0.71); +LR 0.6; -LR 0.7
						Achilles reflex	Se 0.61 (0.47, 0.73); Sp 0.63 (0.38, 0.84); +LR 1.8; -LR 1.6
						SLR	Se 0.84 (0.72, 0.92); Sp 0.21 (0.06, 0.46); +LR 1.1; -LR 1.3

Neurological examination of the peripheral nervous system to diagnose lumbar spinal disc herniation with suspected radiculopathy: a systematic review and meta-analysis
(Al Nezari, 2013)

POOLED DATA

First author	Year of publication	Setting(s) of data collection	Number of participants (N) / Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Al Nezari	2013	Mixed	N=7200	Patients with LBP with suspicion of	Surgery	Sensory deficits	Se (0.40; CI 0.38, 0.43); Sp (0.59; CI 0.51, 0.67)

				radiculopathy caused by a potential LDH	Imaging findings		Se (0.32; CI 0.28, 0.37); Sp (0.72; CI 0.67, 0.77) for diagnosis made at any lumbar segmental level and Se (0.35; CI 0.33, 0.38); Sp (0.64; CI 0.61, 0.66) for diagnosis made at a specific segmental level.
					Surgery	Motor deficits (paresis)	Se (0.22; CI 0.21, 0.23); Sp (0.79; CI 0.77, 0.80); +LRs (1.05; CI 0.87, 1.26)
					Imaging findings		Se (0.40; CI 0.37, 0.42); Sp (0.62; CI 0.60, 0.64); +LRs (1.17; CI 0.99, 1.38)
			n=14		Surgery	Motor deficits (atrophy)	Se (0.31; CI 0.26, 0.36); Sp (0.76; CI 0.65, 0.85);+LRs (1.08; CI 0.34, 3.46)
					Surgery	Reflex deficits	Se (0.29; CI 0.28, 0.30); Sp (0.78; CI 0.76, 0.80); +LRs (1.26; CI 1.01, 1.58);-LR (0.87; CI 0.76, 0.98)

					Imaging findings		Se (0.25; CI 0.22, 0.28); Sp (0.75; IC 0.73, 0.78); +LR (1.25; CI 0.71, 2.20); -LR (0.96; CI 0.82, 1.12)

The pain provocation-based straight leg raise test for diagnosis of lumbar disc herniation, lumbar radiculopathy, and/or sciatica: a systematic review of clinical utility
(Scaia, 2012)

PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Capra	2011	NA	N=1305	Patients with suspected lumbar disc herniation, lumbar radiculopathy or sciatica	MRI	SLR	Se 36; Sp 74; +LR 1.39; -LR 0.87
Poiraudeau	2001	Secondary	N=78		Electrodiagnosis		Se 19; Sp 84; +LR 1.19; -LR 0.96
Lauder	2000	NA	N=170		Myelography		Se 96; Sp 10; +LR 1.07; -LR 0.4
Kostelinatz	1984	Secondary	N=100		Myelography		Se 76; Sp 45; +LR 1.38; -LR 0.53
Spangfort	1972	Secondary	N=2377		MRI, CT or Myelography		Se 52; Sp 89; +LR 4.73; -LR 0.54
Knuttson	1961	Secondary	N=206		Myelography		Se 77–83; Sp 36–39; +LR 1.20–1.36; -LR 0.44–0.63

Physical examination for lumbar radiculopathy due to disc herniation in patients with low-back pain (Van der Windt, 2010)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Van der Windt	2010	Primary and secondary care	Cohort studies: Median N = 126, range 71 to 2504; Case control studies: 38 to 100 cases n=19	Patients with low-back pain with pain radiating into the leg (sciatica), who were suspected of having radiculopathy due to disc herniation	Imaging	SLR	Se 0.64 (0.56 to 0.71); Sp 0.57 (0.47 to 0.66)
					Surgery		Se 0.92 (0.87, 0.95); Sp 0.28 (0.18, 0.40); +LR 1.3 (1.1, 1.4); -LR 0.30 (0.24, 0.39)
					Surgery	Crossed SLR	Se 0.28 (0.22, 0.35); Sp 0.90 (0.85, 0.94); +LR 2.1 (1.6, 2.8); -LR 0.86 (0.83, 0.89)
					Surgery	Scoliosis	Se range: 0.39 to 0.68; Sp range: 0.62 to 0.89
					Surgery	Paresis or muscle weakness	Se range: 0.29 to 0.62; Sp range: 0.50 to 0.89
					MRI		Se 0.27 (0.20, 0.37); Sp 0.93 (0.88, 0.97)

					Surgery	Muscle wasting	Se range: range: 0.15 to 0.38; Sp range: 0.50 to 0.94
					Surgery	Impaired reflex	Se range: 0.31 to 0.62; Sp range: 0.60 to 0.89
			n=16		MRI		Se 0.15 (0.09, 0.21); Sp 0.93 (0.88, 0.97)
					Surgery	Sensory deficits	Se range: 0.26 to 0.67; Sp range: 0.42 to 0.69
					MRI		Se 0.28 (0.21, 0.36); Sp 0.66 (0.56, 0.74)
					Surgery	Forward flexion	Se range: 0.85 and 0.90; Sp range: 0.16 and 0.29
					MRI		Se 0.45 (0.37, 0.53); Sp 0.74 (0.65, 0.81)
					MRI-CT	Extension test (sciatia was reproduced or worsened)	Se range: 0.13 to 0.90; Sp range: 0.17 to 0.94 (depending on cut-off point)
					MRT-CT	Slump test	Se range: 0.44 to 0.87; Sp range: 0.23 to 0.63 (depending on cut-off point)
					MRI-CT	Bell test	Se 0.49 (0.33, 0.65); Sp 0.63 (0.45, 0.79)

The test of Lasègue: systematic review of the accuracy in diagnosing herniated discs. (Devillé, 2000)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Devillé	2000	Mixed	NA	Unclear	Surgery	SLR typical (+ SLR reproduces the sciatic pain between 30° and 60–75°. An atypical SLR was defined by three studies as pain produced in the back only)	Se 0.91 (0.82, 0.94); Sp 0.26 (0.16, 0.38); DOR 3.97 (3.22, 4.9)
			n=15			Crossed SLR	Se 0.29 (0.24, 0.34); Sp 0.88 (0.86, 0.90); DOR 4.39 (0.74–25.9)

Table S8: Diagnostic accuracy of demographics for non-specific LBP

Systematic review of patient history and physical examination to diagnose chronic low back pain originating from the facet joints (Maas, 2017)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2006	Secondary	N=120	Adult patients, of either gender, suffering from CLBP	ZJ block 95% reduction standard	Age 50 or more	Se 0.62 (0.36, 0.82); Sp 0.77 (0.68,0.84)
Manchikanti	2000	Secondary (One private pain management practice, in a non-university setting)	N=200		Double diagnostic block	Age ≥ 65	Se 0.21 (0.14, 0.31); Sp 0.85 (0.78, 0.91)
						Old age	Se 0.25 (0.17, 0.35); Sp 0.84 (0.77, 0.90)
						Positive work status	Se 0.34 (0.23, 0.47); Sp 0.62 (0.51, 0.72)
						BMI (normal)	Se 0.40 (0.30, 0.51); Sp 0.69 (0.60, 0.77)
Manchikanti	1999		N=120			Age > 65	Se 0.19 (0.10, 0.31); Sp 0.82 (0.71, 0.89)
						Gender male	Se 0.39 (0.27, 0.52); Sp 0.56 (0.44, 0.67)

Revel	1998	Tertiary	N=80		75% response on Lidocaine block	Age > 65	Se 0.38 (0.18, 0.64); Sp 0.74 (0.62, 0.90)
Diagnostic utility of patient history and physical examination data to detect spondylolysis and spondylolisthesis in athletes with low back pain: A systematic review (Grodahl, 2016)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Gregg	2009	Sports medicine clinic	N=71	All patients with LBP referred for a SPECT scan to confirm suspected diagnosis of spondylolysis	SPECT scan	Age at bone scan (<20 yrs)	Se 80.77; Sp 43.64
						Gender male	Se 73.08; Sp 57.4
Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain (Hancock, 2007)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Manchikanti	2000	Secondary (One private pain	N=200	Patients presenting to private pain management	Intra-articular local anaesthetic	Age > 65	Se 22 (14, 32); Sp 85 (77, 91); +LR 1.5 (0.8, 2.6); -LR 0.92 (0.80, 1.05)

Manchikanti	1999	management practice, in a non-university setting)	N=120	centre, with chronic LBP +/- lower extremity pain	blocks for SIJ pain; and either intra-articular blocks or medial branch blocks for facet joint pain.	Age > 65	Se 19 (10, 32); Sp 66 (54,78); +LR 0.6 (0.3, 1.1); -LR 1.21 (0.98, 1.51)
Revel	1998	Tertiary	N=42	Patients with LBP >3/12 referred for facet injection		Age > 65	Se 39 (15, 68); Sp 78 (60,91); +LR 1.8 (0.7,4.7); -LR 0.78 (0.49, 1.23)

Table S9: Diagnostic accuracy of patient history findings for non-specific LBP

Low back pain of disc, sacroiliac joint, or facet joint origin: a diagnostic accuracy systematic review (Han, 2023)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Depalma	2011	Tertiary care	N=160	Patients with LBP that was either recalcitrant to spine-focused physical therapy, oral analgesics, or oral anti-inflammatory medication	Discography with a concordant pain provocation score of 6 out of 10 or greater and an adjacent pain-free control disc	Midline LBP (for pain originating from the disc)	Se 95.8 (88.1, 99.1); Sp 74.7 (65.0, 82.9); LR+ 3.79 (2.69, 5.34); LR- 0.06 (0.02, 0.17)
						Para-midline LBP (for pain originating from the disc)	67.3 (52.9 to 79.7) 9.3 (3.8 to 18.3) 3.50 (1.56 to 7.84) 0.74 (0.61 to 0.91)
					Greater than or equal to 80% pain relief with double blocks	Absence of midline LBP (for facet joint origin)	Se 15.4 (6.9, 28.1); Sp 28.0 (20.1, 37.0); LR+ 3.03 (2.22, 4.13); LR- 0.21 (0.11, 0.41)
						Para-midline LBP (for facet joint origin)	Se 95 (83.1, 99.4); Sp 25.3 (16.6, 35.7); LR+ 1.27 (1.10, 1.47); LR- 0.20 (0.05, 0.80)

					Greater than or equal to 50% pain relief with SIJ double blocks	Absence of midline LBP (pain originating from the SIJ)	Se 12.9 (3.6, 29.8); Sp 36.0 (28.0, 44.5); LR+ 2.42 (1.87, 3.14); LR- 0.20 (0.08, 0.51)
						Absence of midline LBP (pain originating from the SIJ)	Se 96 (79.6, 99.9); Sp 22.5 (14.9, 31.9); LR+ 1.24 (1.09, 1.41); LR- 0.18 (0.03, 1.25)
Lewinnek	1986	NA	N=21	Patients with LBP	Greater than or equal to 80% pain relief with double blocks	Wakes from sleep (for pain originating from the facet joint)	Se 58.3 (27.7, 84.8); Sp 94.1 (56.7, 100.0); LR+ 9.92 (0.65, 152.24); LR- 0.44 (0.22, 0.88)
						Acute onset	Se 95.2 (63.3, 100.0); Sp 50.0 (18.7, 81.3); LR+ 1.91 (1.01, 3.59); LR- 0.10 (0.01, 1.53)
						Pain below knee	Se 88.9 (51.8, 99.7); Sp 63.6 (30.8, 89.1); LR+ 2.44 (1.08, 5.52); LR- 0.18 (0.03, 1.17)
						Sitting increases pain	Se 63.6 (30.8, 89.1); Sp 83.3 (35.9, 99.6); LR+ 3.82

							(0.60, 24.14); LR- 0.44 (0.19, 1.03)
						Time-dependent positional distress	Se 78.6 (49.2, 95.3); Sp 66.7 (22.3, 95.7); LR+ 2.36 (0.74, 7.55); LR- 0.32 (0.10, 1.02)
						NSAID helped	Se 50.0 (11.8, 88.2); Sp 91.7 (61.5, 99.8); LR+ 6.00 (0.78, 46.14); LR- 0.55 (0.24, 1.24)

Systematic review of patient history and physical examination to diagnose chronic low back pain originating from the facet joints (Maas, 2017)

PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Jung	2007	Secondary	N=259	Patients had pain lasting more than 3 months and pain	Single or double diagnostic nerve blocks	Paravertebral area	Se 0.64 (0.55, 0.72); Sp 0.65 (0.56, 0.72)
						Paravertebral area combined	Se 0.11 (0.07, 0.18); Sp 0.94 (0.88, 0.97)

				intensity greater than 5 on the NRS		to leg pain in the posterior thigh and calf	
						Paravertebral area combined to leg pain in the posterior thigh only	Se 0.06 (0.03, 0.12); Sp 0.98 (0.95, 0.10)
						Paravertebral area combined with leg pain in the calf only	Se 0.05 (0.03, 0.11); Sp 0.93 (0.87, 0.96)
						Mixed patterns	Se 0.13 (0.08, 0.20); Sp 0.88 (0.81, 0.92)
Laslett	2006	Secondary	N=120	Adult patients, of either gender, suffering from CLBP	ZJ block 95% reduction standard	Best activity is walking	Se 0.31 (0.13, 0.58); Sp 0.92 (0.85, 0.95)
						Best activity is sitting	Sp 0.33 (0.14, 0.61); Sp 0.90 (0.82, 0.94)
						Onset pain is paraspinal	Se 0.75 (0.47, 0.91); Sp 0.72 (0.63, 0.80)
						MSPQ>13	Se 0.46 (0.23, 0.71); Sp 0.70 (0.60, 0.77)
Manchikanti	2000	Secondary (One private pain	N=200		Double diagnostic block	Pain well relieved by supine	Se 0.94 (0.86, 0.97); Sp 0.16 (0.11, 0.24)

		management practice, in a non-university setting)				Pain not exacerbated by coughing	Se 0.90 (0.82, 0.95); Sp 0.13 (0.08, 0.20)
						Traumatic onset	Se 0.48 (0.37, 0.58); Sp 0.50 (0.41, 0.59)
						Prior history of LBP	Se 0.70 (0.59, 0.79); Sp 0.25 (0.18, 0.33)
						Post surgery	Se 0.20 (0.13, 0.30); Sp 0.63 (0.54, 0.72)
						Onset occupational	Se 0.14 (0.08, 0.23); Sp 0.72 (0.63, 0.79)
						Positive work status	Se 0.34 (0.23 0.47); Sp 0.62 (0.51, 0.72)
						Duration < 1 year	Se 0.21 (0.14 0.31); Sp 0.79 (0.71, 0.86)
						Low back. hip buttocks pain	Se 0.98 (0.92 0.99); Sp 0.00 (0.00 0.03)
						Bilateral pain	Se 0.76 (0.66 0.84); Sp 0.35 (0.27, 0.44)
						Back pain with groin or thigh	Se 0.35 (0.25, 0.45); Se 0.68 (0.59, 0.76)
						Pseudoradicular pain	Se 0.51 (0.41, 0.62); Sp 0.43 (0.34, 0.52)

						Leg pain	Se 0.59 (0.48, 0.69); Sp 0.34 (0.26, 0.43)
						Subjective pain ≥8/10	Se 0.38 (0.28, 0.49); Sp 0.66 (0.57, 0.74)
						Cramping pain above knees	Se 0.43 (0.33, 0.54); Sp 0.56 (0.47, 0.65)
						Paresthesia	Se 0.74 (0.64, 0.82); Sp 0.16 (0.11, 0.24)
						Low back pain stiffness	Se 0.58 (0.47, 0.68); Sp 0.38 (0.30, 0.48)
Manchikanti	1999		N=120			Traumatic onset	Se 0.54 (0.41, 0.66); Sp 0.47 (0.35, 0.59)
						Previous surgery	Se 0.17 (0.09, 0.29); Sp 0.67 (0.55, 0.77)
						Duration of pain > 4 years	Se 0.56 (0.42, 0.68); Sp 0.64 (0.52, 0.76)
Revel	1998	Tertiary	N=80		75% response on Lidocaine block	Pain well relieved by recumbency	Se 0.92 (0.67, 0.99); Sp 0.24 (0.12, 0.42)
						Pain not exacerbated by coughing	Se 1.00 (0.77, 1.00); Sp 0.35 (0.20, 0.53)
Scwharzer	1994	Secondary	N=176	Adult patients with LBP referred by	Double diagnostic block	Left groin pain referral	Se 0.21 (0.09, 0.43); Sp 0.84 (0.78, 0.90)

				neurosurgeons, orthopaedic surgeons, and physiatrists		Right groin pain referral	Se 0.04 (0.01, 0.20); Sp 0.82 (0.75, 0.88)
						Left buttock pain referral	Se 0.17 (0.09, 0.28); Sp 0.85 (0.76, 0.90)
						Right buttock pain referral	Se 0.15 (0.08, 0.25); Sp 0.83 (0.74, 0.89)
						Left thigh pain referral	Se 0.17 (0.09, 0.28); Sp 0.84 (0.77, 0.90)
						Right thigh pain referral	Se 0.14 (0.08, 0.25); Sp 0.86 (0.79, 0.91)
						Left calf pain referral	Se 0.17 (0.09, 0. 31); Sp ewq0.85 (0.77,0.89)
						Right calf pain referral	Se 0.08 (0.03, 0.17); Sp 0.81 (0.73, 0.87)
						Left foot pain referral	Se 0.26 (0.14, 0.43); Sp 0.86 (0.79, 0.91)
						Right foot pain referral	Se 0.07 (0.02, 0.21); Sp 0.82 (0.75, 0.88)
Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	Relief with recumbency	Se 0.91 (0.72, 0.97); Sp 0.44 (0.25, 0.66)
						Pain not worse with cough	Se 0.82 (0.62, 0.93); Sp 0.50 (0.29, 0.71)
Diagnostic utility of patient history and physical examination data to detect spondylolysis and spondylolisthesis in athletes with low back pain: A systematic review							

(Grodahl, 2016)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Gregg	2009	Sports medicine clinic	N=71	All patients with LBP referred for a SPECT scan to confirm suspected diagnosis of spondylolysis	SPECT scan	Injured period < 3 months	Se 65.38; Sp 54.55
						Onset of symptoms (sudden)	Se 87.5; Sp 50.91
						Sports participation (yes)	Se 84.62; Sp 33.93
Kalpakcioglu	2009	Hospital setting	N=130	Patients with LBP and radiological diagnosis of spondylolisthesis	Antero-posterior, lateral, oblique and lateral flexion/extension radiograph flexion	Pain localised to the low back	Se 23; Sp 76.67
						Sciatica	Se 61; Sp 26.67
						Pain in the gluteal region or backside of the femur	Se 16; Sp 96.67
Diagnostic performance of clinical tests for sacroiliac joint pain (Sivayogam, 2011)							
PRIMARY STUDIES							

First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Dreyfuss	1996	Tertiary	N=85	Patients ≥ 18 years with non-specific, non-pregnancy related low back pain and/or buttock pain, with or without lower extremity symptoms	SIJB {with 1.5 ml lidocaine 2% and 0.5 ml corticosteroids; 90% pain relief on VAS)	Pain over SIJ	Se 0.85; Sp 0.08; +LR 0.9; -LR 1.87
						Pain over groin	Se 0.19; Sp 0.63; +LR 0.5; -LR 1.28
						Buttock pain	Se 0.80; Sp 0.14; +LR 0.9; -LR 1.42
						Sitting position	Se 0.03; Sp 0.90; +LR 0.3; -LR 1.07
						PSIS pointing	Se 0.76; Sp 0.47; +LR 1.4; -LR 0.51
Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain (Hancock, 2007)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Manchikanti	2000	Secondary (One private pain	N=200	Patients presenting to private pain	Double diagnostic block	Pain reduced with recumbency	Se 94 (86, 98); Sp 17 (10,25); +LR 1.1 (1.0,1.2); -LR 0.39 (0.18,0.96)

		management practice, in a non-university setting)		management centre, with chronic LBP +/- lower extremity pain		Pain not increased with cough	Se 90 (82, 95); Sp 13 (8, 21); +LR 1.0 (0.9, 1.1); -LR 0.76 (0.34,1.66)
						Traumatic onset	Se 48 (37,59); Sp 50 (41, 59); +LR 1.0 (0.7, 1.3); -LR 1.05 (0.80–1.37)
Manchikanti	1999		N=120			Traumatic onset	Se 54 (40, 67); Sp 47 (35, 60); +LR 1.01 (0.7, 1.4); -LR 0.99 (0.67, 1.44)
Revel	1998	Tertiary	N=42	Patients with LBP >3/12 referred for facet injection	75% response on Lidocaine block	Pain reduced with recumbency	Se 89 (62, 99); Sp 25 (11, 44); +LR 1.2 (0.9, 1.6); -LR 0.43 (0.08–2.20)
						Pain not increased with cough	Se 96 (71, 100); Sp 35 (19, 55); +LR 1.5 (1.1, 2.0); -LR 0.10 (0.01,1.62)
Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	Pain reduced with recumbency	Se 89 (69, 98); Sp 45 (22, 69); +LR 1.6 (1.1,2.5); -LR 0.24 (0.07, 0.87)
						Pain not increased with cough	Se 80 (59, 94); Sp 50 (27, 73); +LR 1.6 (1.0, 2.6); -LR 0.39 (0.15, 1.01)

Table S10: Diagnostic accuracy of physical examination findings for non-specific LBP

Low back pain of disc, sacroiliac joint, or facet joint origin: a diagnostic accuracy systematic review (Han, 2023)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Han	2023	Secondary and tertiary care	N = ranged from 15 to 736	Patients with low back pain without serious pathology such as cancer, infection, or fracture	Greater than or equal to 50% pain relief with double SIJ block	Gaenslen's test	Se 47.9 (38.7, 57.2); Sp 47.9 (37.5, 58.4); LR+ 0.85 (0.56, 1.28); LR- 1.12 (0.77, 1.62)
						Sacral thrust test	Se 57.3 (45.9, 68.2); Sp 48.8 (37.9, 59.9); LR+ 1.13 (0.73, 1.75); LR- 0.87 (0.52, 1.44)
						Thigh thrust test	Se 54.1 (48.1, 60.1); Sp 53.7 (44.9, 62.3); LR+ 1.13 (0.83, 1.55); LR- 0.91 (0.67, 1.22)
						Compression test	Se 48.6 (31.9, 65.6); Sp 71.7 (56.5, 84.0); LR+ 1.79 (1.03, 3.11); LR- 0.74 (0.52, 1.05)

			n=62			Patrick's test (FABER test)	Se 76.4 (70.2, 81.8); Sp 32.3 (23.3, 42.5); LR+ 1.05 (0.69, 1.60); LR- 0.86 (0.30, 2.48)
						Distraction test	Se 41.7 (25.5, 59.2); Sp 80.4 (66.1, 90.6); LR+ 2.18 (1.08, 4.38); LR- 0.73 (0.54, 0.99)
						Gillet's test	Se 67.5 (56.4, 77.3); Sp 45.5 (31.2, 60.2); LR+ 1.01 (0.80, 1.28); LR- 1.08 (0.75, 1.55)
						Absence of midline LBP	Se 24.6 (14.1, 37.8); Sp 34.3 (27.2, 42.0); LR+ 2.41 (1.89, 3.07); LR- 0.35 (0.12, 1.01)
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Mekhail	2021	Tertiary	N=199	Patients with LBP evaluated by diagnostic SIJ injections	Greater than or equal to 50% pain relief with double SIJ block	Mekhail test	80.4 (73.3 to 86.3) 26.8 (14.2 to 42.9) 1.10 (0.90 to 1.34) 0.73 (0.40 to 1.33)
						Patrick test	81.6 (74.7 to 87.3) 43.9 (28.5 to 60.3)

							1.46 (1.10 to 1.93) 0.42 (0.26 to 0.67)
						Thigh thrust test	53.2 (45.1 to 61.1) 48.8 (32.9 to 64.9) 1.04 (0.74 to 1.45) 0.96 (0.67 to 1.37)
						Mekhail/Patrick test	94.3 (89.5 to 97.4) 17.1 (7.2 to 32.1) 1.14 (0.99 to 1.31) 0.34 (0.13 to 0.84)
						Mekhail/thigh thrust test	89.9 (84.1 to 94.1) 14.6 (5.6 to 29.2) 1.05 (0.92 to 1.21) 0.69 (0.29 to 1.66)
						Patrick/thigh thrust test	89.2 (83.3 to 93.6) 29.3 (16.1 to 45.5) 1.26 (1.03 to 1.55) 0.37 (0.19 to 0.71)
Nejati	2020	Secondary	N=48	Patients with LBP evaluated by diagnostic SIJ injections	Greater than or equal to 50% pain relief with double SIJ block	FABER test	Se 71.8 (55.1, 85.0); Sp 66.7 (29.9, 92.5); LR+ 2.15 (0.84, 5.54); LR- 0.42 (0.21, 0.84)
						Thigh thrust test	Se 74.4 (57.9, 87.0); Sp 44.4 (13.7, 78.8); LR+ 1.34 (0.73, 2.47); LR- 0.58 (0.23, 1.43)

						Gaenslen test	Se 38.5 (23.4, 55.4); Sp 33.3 (7.5, 70.1); LR+ 0.58 (0.31, 1.06); LR- 1.85 (0.71, 4.81)
						Yeoman test	Se 64.1 (47.2, 78.8); Sp 33.3 (7.5, 70.1); LR+ 0.96 (0.57, 1.61); LR- 1.08 (0.39, 2.97)
						Gillet test	Se 98.7 (88.8, 100.00); Sp 5.3 (0.0, 39.7); LR+ 1.04 (0.89, 1.22) LR- 0.24 (0.01, 11.36)
						Forward flexion test	Se 98.7 (88.8, 100.00); Sp 5.3 (0.0, 39.7); LR+ 1.04 (0.89, 1.22) LR- 0.24 (0.01, 11.36)
Lewinnek	1986	NA	N=21	Patients with LBP	Greater than or equal to 80% pain relief with double blocks	Pain on extension (for pain originating from the facet joint)	Se 73.3 (44.9, 92.2); Sp 80.0 (28.4, 99.5); LR+ 3.67 (0.62, 21.73); LR- 0.33 (0.13, 0.86)
						SLR (pain originating from the facet joint)	Se 66.7 (22.3, 95.7); Sp 76.9 (46.2, 95.0); LR+ 2.89 (0.92, 9.06); LR- 0.43 (0.13, 1.40)
Reliability and validity of manual palpation for the assessment of patients with low back pain: a systematic and critical review (Nolet, 2021)							
PRIMARY STUDIES							

First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Adelmanesh	2016	NA	N=777	Adult patients with LBP with or without radiculopathy of any duration	Multidisciplinary panel of experts based on examination of clinical evaluations, MRI, and if needed, electrodiagnostic testing	Palpation of the superior-lateral quadrant of the gluteal muscle to identify GTrP representing the combination of tenderness, taut band and pain	Se 74.1 (67.7, 80.3); Sp 91.4 (86.8, 96); +LR 8.6; -LR 0.28; PPV 91.9 (87.6, 96.3); NPV 72.7 (66.1, 79.3); ROC curve 0.827 (0.781, 0.874)
Koppenhaver	2014	NA	N=51	Adult patients with chronic LBP, with modified ODI ≥20/100	Spinal stiffness was quantified using a mechanized indentation device.	Palpation of spinal stiffness: the spinous processes of L1-L5 palpated with the subject lying prone	Se 0.45 (0.28, 0.62); Sp 0.38 (0.21, 0.59); +LR 0.69 (0.37, 1.31); -LR 1.38 (0.82, 2.33)
Evidence and recommendations for the use of segmental motion testing for patients with LBP - A systematic review (Stolz, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Fritz	2005	Tertiary	N=49	Adult patients with a chief	F/E radiographs	PAIVMs	Hypomobility: Se 0.43 (0.27, 0.61); Sp 0.95

				complaint of LBP of any duration			(0.77, 0.99); LR+: 9.00 (1.3, 63.9); LR-: 0.60 (0.43, 0.84) Hypermobility: Se 0.46 (0.30, 0.64); Sp 0.81 (0.60, 0.92); LR+: 2.42 (0.93, 6.4) LR- 0.66 (0.44, 0.99)
Abbot	2005	Physical therapy clinics	N=123	Patients with a new episode of LBP or history of LBP at least three months before recruitment	F/E radiographs	PAIVMs	Rotation LSI (by segment): Se 0.17 (0.03, 0.56); Sp 0.95 (0.92, 0.96); LR+: 3.10 (0.50, 19.39); LR- : 0.88 (0.62, 1.26); Translation LSI (by segment): Se 0.19 (0.07, 0.43); Sp 0.95 (0.92, 0.97); LR 3.73 (1.24, 11.23); LR- 0.86 (0.68, 1.08)
						Flex PPIVMs	Rotation LSI (by segment): Se 0.07 (0.01, 0.44); Sp 0,99 (0.98, 1,00); LR+ 12.71 (0.67, 241.27); LR- 0.93 (0.76, 1.15); Translation LSI (by

							segment): Se 0.03 (0.00, 0.22); Sp 0.99 (0.92, 1.00); LR+ 4.82 (0.24, 96.82); LR- 0.98 (0.90, 1.06)
						Ext PPVMs	Rotation LSI (by segment) Se 0.07 (0.01, 0.44); Sp 0.99 (0.97, 1.00); LR+ 6.75 (0.39, 110.76); LR- 0.94 (0.76, 1.15); Translation LSI (by segment): Se 0.03 (0.00, 0.25); Sp 1.00 (1.00, 1.00); LR+ 26.8 (0.55, 1305.5); LR- 0.97 (0.88, 1.06)
Philips and Twoney	1996	NA	N=63	NA	Spinal anaesthetic block	PAIVMs and PPIVMs	Se 0.53; Sp 0.80
Systematic review of patient history and physical examination to diagnose chronic low back pain originating from the facet joints (Maas, 2017)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2006	Secondary	N=120	Adult patients, of either gender,	ZJ block 75% reduction standard	Extension rotation test	Se 0.86 (0.69, 0.94); Sp 0.22 (0.14, 0.32)

				suffering from CLBP	ZJ block 80% reduction standard		Se 0.87 (0.69,0.96); Sp 0.22 (0.14, 0.32)
					ZJ block 85% reduction standard		Se 0.91 (0.72, 0.97); Sp 0.22 (0.15, 0.31)
					ZJ block 90% reduction standard		Se 0.94 (0.72, 0.99); Sp 0.22 (0.15, 0.31)
					ZJ block 95% reduction standard		Se 1.00 (0.76,1.00); Sp 0.22 (0.15, 0.31)
					ZJ block 95% reduction standard	Absence of centralization phenomenon	Se 1.00 (0.74., 1.00); Sp 0.17 (0.11., 0.27)
Gonzales	2004	Pain clinic	N=150	Adult patients with lumbar zygapophysial joint pain	Double diagnostic blocks (corresponding facet joints, combination of local anesthetic and corticosteroid)	Lumbar facet sign	Se 0.95 (0.84, 0.99); Sp unable to estimate
Young	2003	Secondary (Private radiology practice)	N=81	Adult patients with chronic lumbar or lumbopelvic pain who were referred to a private radiology practice	≥80% pain relief after lumbar zygapophysial joint injection	Centralization	Se 0.00 (0.00, 0.22); Sp 0.89 (0.56, 0.98)
						Non-centralization	Se 1.00 (0.78, 1.00); Sp 0.11 (0.02, 0.44)

Manchikanti	2000	Secondary (One private pain management practice, in a non- university setting)	N=200	Patients presenting to private pain management centre, with chronic LBP +/- lower extremity pain	Double diagnostic block	Pain not exacerbated by forward flexion	Se 0.15 (0.09,0.25); Sp 0.82 (0.74, 0.88)
						Pain not exacerbated by deflexion	Se 0.55 (0.44,0.65); Sp 0.48 (0.39, 0.57)
						Pain not exacerbated by hyperextension	Se 0.10 (0.05,0.18); Sp 0.86 (0.79, 0.91)
						Pain not exacerbated by extension/rotation	Se 0.68 (0.57,0.77); Sp 0.30 (0.23, 0.39)
						Pain with flexion	Se 0.85 (0.75, 0.91); Sp 0.18 (0.12, 0.26)
						Pain with deflexion	Se 0.57 (0.46, 0.67); Sp 0.46 (0.37, 0.55)
						Pain with extension	Se 0.88 (0.79, 0.93); Sp 0.14 (0.09, 0.21)
						Pain with lateral rotation	Se 0.68 (0.57, 0.77); Sp 0.30 (0.23, 0.39)
						Pain with sitting and bending	Se 0.49 (0.38, 0.59); Sp 0.56 (0.47, 0.65)
						Normal gait	Se 0.98 (0.92, 0.99); Sp 0.10 (0.06, 0.17)
						Muscle spasm	Se 0.48 (0.37, 0.58); Sp 0.46 (0.37, 0.55)

						Paravertebral tenderness	Se 0.93 (0.85, 0.97); Sp 0.13 (0.08, 0.20)
						Pain increased by cough/valsalva	Se 0.14 (0.08, 0.23); Sp 0.86 (0.79, 0.91)
						Back pain with SLR	Se 0.49 (0.39, 0.60); Sp 0.37 (0.29, 0.46)
						Negative neurological exam	Se 0.91 (0.83, 0.95); Sp 0.25 (0.18, 0.34)
Revel	1998	Tertiary	N=80	Adult patients with lumbar zygapophysial joint pain	75% response on Lidocaine block	Pain not exacerbated by forward flexion	Se 1.00 (0.77, 1.00); Sp 0.48 (0.31, 0.66)
						Pain not exacerbated by rising from flexion	Se 1.00 (0.77, 1.00); Sp 0.59 (0.41, 0.74)
						Pain not exacerbated by hyperextension	Se 0.92 (0.67,0.98); Sp 0.62 (0.44, 0.77)
						Pain not exacerbated by extension/rotation	Se 0.76 (0.50, 0.92); Sp 0.48 (0.31, 0.66)
Scwharzer	1994	Secondary	N=176	Adult patients with LBP referred by neurosurgeons, orthopaedic surgeons, and physiatrists	Double diagnostic block	Absence of pain on combined rotation and extension	Se 0.18 (0.12, 0.25); Sp 1.0 (0.81, 1.0)

Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	Pain not worse with forward flexion	Se 0.64 (0.43, 0.80); Sp 0.78 (0.55, 0.91)
						Pain not worse with raising from forward flexion	Se 0.77 (0.57, 0.90); Sp 0.56 (0.34, 0.75)
						Pain not worse with hyperextension	Se 0.55 (0.35,0.73); Sp 0.72 (0.49, 0.88)
						Pain not worse with extension/rotation	Se 0.68 (0.47, 0.84); Sp 0.78 (0.55, 0.91)
Diagnostic utility of patient history and physical examination data to detect spondylolysis and spondylolisthesis in athletes with low back pain: A systematic review (Grodahl, 2016)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Anh and Juhn	2015	Pain management clinic	N=86	Patients with LBP/lumbar radicular pain	Lumbar lateral radiography	Step deformiy (palpation)	Se 81.3; Sp 89.1; +LR 7.43; -LR 0.21
Ferrari	2014	Pain management clinic	N=119	Patients with LBP with/without referred pain and	Radiographs, MRI or CT	ASLR	Se 64; Sp 45; +LR 1.16; -LR 0.80
						Prone instability test	Se 44; Sp 45; +LR 0.80; -LR 1.24

				a diagnosis of spondylolisthesis		Passive lumbar extension	Se 43; Sp 86; +LR 3.07; -LR 0.66
						Abberant movement	Se 41; Sp 77; +LR 1.78; -LR 0.76
Sundell	2013	Physiotherapy clinic	N=25	Patients practicing 6 h of sports/week and >3 weeks of LBP, hindering their ADL or physical activity, with suspected spondylolisis	MRI and CT	OLHET	Se 61.54; Sp 0; +LR 0.62
						Prone back extension with fixed pelvis test	Se 46.15; Sp 33.33; +LR 0.69; -LR 1.62
						Coin test	Se 84.62; Sp 16.67; +LR 1.02; -LR 0.92
						Percussion test with reflex hammer	Se 38.76; Sp 50; +LR 0.77; -LR 1.12
						Rocking test	Se 69.23; Sp 25; +LR 0.92; -LR 1.23
						Sacrum nutation test	Se 23; Sp 58.33; +LR 0.55; -LR 1.32
						HOOK test	Se 46.15; Sp 75; +LR 1.85; -LR 0.72
						MCI control test	Se 69.23; Sp 50; +LR 1.38; -LR 0.62
Gregg	2009	Sports medicine clinic	N=71	All patients with LBP referred for a SPECT scan to confirm suspected	SPECT scan	OLHET	Se 73; Sp 17.2

				diagnosis of spondylolysis			
Kalpakcioglu	2009	Hospital setting	N=130	Patients with LBP and radiological diagnosis of spondylolisthesis	Antero-posterior, lateral, oblique and lateral flexion/extension radiograph flexion	Gait disorder	Se 5; Sp 93.33; +LR 0.75; -LR 1.02
						Weak/ dropping abdominal wall	Se 99; Sp 40; +LR 1.65; -LR 0.03
						Paravertebral muscles hypertrophy	Se 65; Sp 70; +LR 2.17; -LR 0.50
						Paravertebral muscles spasm	Se 87; Sp 13.33; +LR 1.0; -LR 0.98
						Increase in lumbar lordosis	Se 58; Sp 63; +LR 1.58; -LR 0.66
						Signs of slipping (inspection)	Se 21; Sp 100; -LR 0.29
						Step deformiy (palpation)	Se 88; Sp 100; -LR 0.12
						Hamstring muscle spasm	Se 27; Sp 96.67; +LR 8.10; -LR 0.76;
						Contracting hamstring muscle	Se 1; Sp 90; +LR 0.10; -LR 1.10
						Z posture	Se 2; Sp 100; -LR 1.10
						Lumbar flexion	Se 19; Sp 3.33; +LR 0.20; -LR 24.3

						Lumbar extension	Se 79; Sp 66.67; +LR 2.37; -LR 0.31
						Lumbar lateral flexion	Se 46; Sp 83.33; +LR 2.76; -LR 0.65
						Lumbar rotation	Se 10; Sp 96.67; +LR 3; -LR 0.93
						SLR	Se 10; Sp 90; +LR 1; -LR 1
						ASLR	Se 87; Sp 76.67; 3.73; -LR 0.17
						Femoral stretch test	Se 14; Sp 96.67; +LR 4.20; -LR 0.89
						Achilles reflex	Se 13; Sp 93.33; +LR 2.40; -LR 0.95
						Patellar reflex	Se 8; Sp 96.67; +LR 0.30; -LR 1.02
						Loss of strength	Se 1; Sp 96.67; +LR 0.3; -LR 1.02
						Sensorial change	Se 2; Sp 100; -LR 0.98
						Walking distance < 250 m	Se 74; Sp 60; +LR 1.85; -LR 0.43
Masci	2006	Sports medicine clinic	N=82	Patients engaged in regular activity, symptoms of LBP <6 months, provisional	Bone scintigraphy with SPECT/CT	OLHET	Left leg: Se 50, Sp 32.4; +LR 0.74; -LR 1.54; Right leg: Se 55; Sp 45.4; +LR 1.01; -LR 0.98

				diagnosis of active spondylolysis			
Collaer	2006	Hospital/Sports medicine clinic	N=30	Patients with LBP and/or radiculopathy	Lumbar lateral radiography	Step deformiy (palpation)	Se 60; Sp 87; +LR 4.68; -LR 0.46
Möller	2000	Hospital setting	N=111	Patients with lumbar isthmic spondylolisthesis of all grades with at least 1 year of low back pain or sciatica and severely restricted functional ability	Radiographs	EHL-reduced power	Se 6.31; +LR 0.06
						SLR	Se 11.71; +LR 0.12
						Femoral stretch test	Se 1.80; +LR 0.02
						Lateral flexion	Se 42.34; +LR 0.42
						Hamstring tightness	Se 20.72; +LR 0.21
						Achilles reflex	Se 5.41; +LR 0.05
						Patellar reflex	Se 4.50; +LR 0.05
						Sensorial change	Se 23.42; +LR 0.43
						Lumbosacral tenderness	Se 66.67; +LR 0.67
A literature review of clinical tests for lumbar instability in low back pain: validity and applicability in clinical practice (Ferrari, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Fritz	2005	Tertiary	N=38	Patients with LBP with or without	Dynamic X-Ray (Flexion/extension)	Aberrant movement pattern: Painful	Se 0.18 (0.08, 0.36); Sp 0.95 (0.77, 0.99); +LR

				buttock or leg pain		arc on flexion; Painful arc on return; Instability catch; Gower sign (“thigh climbing”); Reverse lumbopelvic rhythm. (Positive test when at least 1 of the previous 5 signs was present.)	3.75 (0.47, 29.75); -LR (0.71, 1.05)
						Prone Instability Test (Positive test when pain provoked during the first part of the test decreases when the test is repeated with the legs off the floor)	Se 0.71 (0.53, 0.85); Sp 0.57 (0.37, 0.76); +LR 1.67 (0.97, 2.88); -LR 0.50 (0.97, 2.88)
						Posterior Shear Test: Positive test if familiar symptoms are provoked.	Se 0.50 (0.34,0.66); Sp 0.48 (0.28, 0.68); +LR 0.96 (0.56, 1.63); -LR 1.05 (0.60, 1.85)

Kasai	2006	NA	N=122	Patients with lumbar degenerative diseases (89 lumbar spinal canal stenosis; 21 lumbar spondylolisthesis; 12 lumbar degenerative scoliosis)	Dynamic x-ray: flexion-extension films of the lumbar spine, lateral vision.	Passive lumbar extension test	Se 0.84 (0.7, 0.93); Sp 0.90 (0.82, 0.95); +LR 8.84 (4.51,17.34); -LR 0.18 (0.08, 0.37)
						Instability catch sign	Se 0.26 (0.15,0.42); Sp 0.86 (0.77, 0.92); +LR 1.84 (0.87, 3.89); -LR 0.86 (0.87, 1.06)
Clinical Tests to Diagnose Lumbar Segmental Instability: A Systematic Review (Alqarni, 2011)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Kasai	2006	NA	N=122	Patients with lumbar degenerative diseases (89 lumbar spinal canal stenosis; 21	Dynamic x-ray: flexion-extension films of the lumbar spine, lateral vision.	Painful catch sign	Se 37 (22, 54); Sp 73 (62, 82); +LR 1.4 (0.8, 2.3); -LR 0.9 (0.7, 1.1)
						Apprehension sign	Se 18 (8, 35); Sp 88 (79,94); +LR 1.6 (0.6, 3.8); -LR 0.9 (0.8, 1.1)

				lumbar spondylolisthesis; 12 lumbar degenerative scoliosis)			
Maigne	2003	Tertiary	N=42	Patients with chronic LBP	Radiographic diagnosis of translational LSI (flexion-extension radiographs)	Sit-to-stand test (pain upon sitting down and relieved by standing up)	Se 31 (10, 61); Sp 100 (85, 100); -LR 0.7 (0.5, 1.0)
Diagnostic performance of clinical tests for sacroiliac joint pain (Sivayogam, 2011)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2005	Secondary	N=48	Patients with buttock pain, with or without lumbar or lower extremity symptoms	Double SIJB with 1.5 ml lidocaine and bupivacaine; pain provocation followed by 80% pain relief on NRS1	Distraction	Se 0.60 (0.36, 0.80); Sp 0.81 (0.65, 0.91); +LR 3.20; -LR 0.49
						Compression	Se 0.69 (0.44, 0.86); Sp 0.69 (0.51); +LR 2.20; - LR 0.46

						Thigh thrust	Se 0.88 (0.64, 0.97); Sp 0.69 (0.82); +LR 2.80; -LR 0.18
						Gaenslen's right	Se 0.53 (0.30, 0.75); Sp 0.71 (0.53, 0.84); +LR 1.84; -LR 0.66
						Gaenslen's left	Se 0.50 (0.27,0.73); Sp 0.77 (0.60, 0.89); +LR 2.21; -LR 0.65
						Sacral thrust	Se 0.63 (0.39, 0.82); Sp 0.75 (0.58, 0.87); +LR 2.50; -LR 0.50
Broadhurst and Bond	1998	NA	N=40	NA	SIJB with 4 ml lidocaine 1% or 0.9% NaCl; 70% pain relief on VAS	Patrick's sign	Se 0.77; Sp 1.00
						Thigh thrust	Se 0.80; Sp 1.00
						Resisted abduction	Se 0.87; Sp 1.00
Dreyfuss	1996	Tertiary	N=85	Patients ≥ 18 years with non-specific, non-pregnancy related low back pain and/or buttock pain, with or without lower extremity symptoms	SIJB {with 1.5 ml lidocaine 2% and 0.5 ml corticosteroids; 90% pain relief on VAS)	Gillet test	Se 0.43; Sp 0.68; +LR 1.3; -LR 0.83
						Thigh thrust	Se 0.36; Sp 0.50; +LR 0.7; -LR 1.28
						Patrick's sign	Se 0.69; Sp 0.16; +LR 0.8; -LR 1.93
						Gaenslen's test	Se 0.71; Sp 0.26; +LR 1.0; -LR 1.11
						Sacral thrust	Se 0.53; Sp 0.29; +LR 0.8; -LR 1.62

						Sacral spring	Se 0.75; Sp 0.35; +LR 1.2; -LR 0.71
						Sacral sulcus	Se 0.95; Sp 0.09; +LR 1.0; -LR 0.55
Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain (Hancock, 2007)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2006	Secondary	N=120	Adult patients, of either gender, suffering from CLBP	NA	No centralisation	Se 96 (65, 100); Sp 16 (8, 28); +LR 1.1 (1.0, 1.4); -LR 0.28 (0.02, 4.43)
Laslett	2005	Secondary	N=48	Patients with buttock pain, with or without lumbar or lower extremity symptoms	Double SIJB with 1.5 ml lidocaine and bupivacaine; pain provocation followed by 80% pain relief on NRS1	Thigh thrust	Se 69 (45, 87); Sp 64 (44,81); +LR 1.9 (1.1,3.3); -LR 0.49 (0.24,0.97)
						Sacral thrust	Se 51 (36,66); Sp 40 (25, 57); +LR 0.9 (0.6, 1.2); -LR 1.22 (0.76, 1.96)
Young	2003	Secondary (Private radiology practice)	N=81	Adult patients with chronic lumbar or lumbopelvic pain who were referred to a	≥80% pain relief after lumbar zygapophysial joint injection	No centralisation	Se 97 (73, 100); Sp 15 (1, 50); +LR 1.1 (0.9, 1.5); -LR 0.22 (0.01, 4.93)

				private radiology practice			
Manchikanti	2000	Secondary (One private pain management practice, in a non- university setting)	N=200	Patients presenting to private pain management centre, with chronic LBP +/- lower extremity pain	Double diagnostic block	Pain not increased with forward flexion	Se 16 (9,25); Sp 82 (73, 88); +LR 0.9 (0.5,1.6); -LR 1.03 (0.91,1.17)
						Pain not increased with rising from flexion	Se 55 (44,65); Sp 48 (39, 58); +LR 1.1 (0.8,1.4); -LR 0.94 (0.70, 1.26)
						Pain not increased with hyperextension	Se 10 (5,18); Sp 86 (78,92); +LR 0.7 (0.3,1.5); +LR 1.05 (0.95,1.16)
						Pain not increased with extension / rotation	Se 68 (57,77); Sp 30 (22, 40); +LR 1.0 (0.8, 1.2); -LR 1.07 (0.71, 1.61)
Revel	1998	Tertiary	N=42	Patients with LBP >3/12 referred for facet injection	75% response on Lidocaine block	Pain not increased with forward flexion	Se 89 (62, 99); Sp 25 (11, 44); +LR 1.2 (0.9, 1.6); -LR 0.43 (0.08–2.20)
						Pain not increased with rising from flexion	Se 96 (71, 100); Sp 35 (19, 55); +LR 1.5 (1.1,2.0); -LR 0.10 (0.01–1.62)

						Pain not increased with hyperextension	Se 96 (71, 100); Sp 48 (30, 67); +LR 1.9 (1.3, 2.7); -LR 0.07 (0.01, 1.15)
						Pain not increased with extension / rotation	Se 96 (71, 100); Sp 58 (39, 76); +LR 2.3 (1.5, 3.6); -LR 0.06 (0.00, 0.97)
Dreyfuss	1996	Tertiary	N=85	Patients ≥ 18 years with non-specific, non-pregnancy related low back pain and/or buttock pain, with or without lower extremity symptoms	SIJB {with 1.5 ml lidocaine 2% and 0.5 ml corticosteroids; 90% pain relief on VAS)	Sacral thrust	Se 51 (36, 66); Sp 40 (25,57), +LR 0.9 (0.6, 1.2); -LR 1.22 (0.76, 1.96)
Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	Pain not increased with forward flexion	Se 63 (41, 82); Sp 76 (52, 92); +LR 2.7 (1.1, 6.3); -LR 0.48 (0.27, 0.87)
						Pain not increased with rising from flexion	Se 76 (54, 91); Sp 55 (31, 78); +LR 1.7 (1.0, 2.9); -LR 0.43 (0.19, 1.00)

						Pain not increased with hyperextension	Se 54 (33, 75); Sp 71 (46, 89); +LR 1.9 (0.8, 4.2); -LR 0.64 (0.38, 1.09)
						Pain not increased with extension / rotation	Se 68 (45, 85); Sp 76 (52, 92); +LR 2.8 (1.2, 6.7); -LR 0.43 (0.23, 0.81)
Accuracy of spinal orthopaedic tests: a systematic review (Simpson, 2006)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2003	Tertiary	N=48	Patients with buttock pain, with or without lumbar or lower extremity symptoms, referred to a private radiology practice	SIJB	SI Compression	Se 91; Sp 83
						SI Distraction	Se 92; Sp 83
						Thigh trust	Se 93; Sp 83
						Gaenslen	Se 94; Sp 83
						Sacral Thrust	Se 95; Sp 83
Leboeuf	1990	Primary	N=68	Patient with lumbosacral pain attending a chiropractic clinic	NA	Fabere	Se 10; Sp 86
						SI Aggravation	Se 20; Sp 59
						Ely	Se 44; Sp 83
						Yoeman	Se 46; Sp 72
						Sacral Base Spring	Se 33; Sp 59

Table S11: Diagnostic accuracy of clinical diagnostic support tools for the diagnosis of non-specific LBP

Low back pain of disc, sacroiliac joint, or facet joint origin: a diagnostic accuracy systematic review (Han, 2023)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Han	2023	Secondary and tertiary care	N = ranged from 15 to 736 n=62	Patients with low back pain without serious pathology such as cancer, infection, or fracture	Greater than or equal to 50% pain relief with double SIJ block	3 or more positive SIJ pain provocation test	Se 80.5 (72.0, 87.4); Sp 68.1 (60.4, 75.2); LR+ 2.44 (1.50, 3.98); LR- 0.31 (0.21, 0.47)
Systematic review of patient history and physical examination to diagnose chronic low back pain originating from the facet joints (Maas, 2017)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Laslett	2006	Secondary	N=120	Adult patients, of either gender,	ZJ block 95% reduction standard	Clinical prediction rule (CPR) 1	Se 1.00 (0.70, 1.00); Sp 0.87 (0.70, 0.93)

				suffering from CLBP		Clinical prediction rule (CPR) 2	Se 1.00 (0.76, 1.00); Sp 0.36 (0.27, 0.45)
						Clinical prediction rule (CPR) 3	Se 1.00 (0.76,1.00); Sp 0.26 (0.19, 0.35)
						Clinical prediction rule (CPR) 4	Se 1.00 (0.76, 1.00); Sp 0.50 (0.41, 0.60)
						Clinical prediction rule (CPR) 5	Se 0.85 (0.58,0.96); Sp 0.91 (0.84, 0.95)
Laslett	2004	Secondary	N=151	Patients with low back pain with or without lower extremity symptoms, referred to a private radiology practice	ZJ block 75% reduction standard	Revel's criteria	Se 0.11 (0.02, 0.29); Sp 0.91 (0.83, 0.96)
					ZJ block 100% reduction standard	Revel's criteria.	Se 0.06 (0.01, 0.28); Sp 0.93 (0.86, 0.97)
Manchikanti	2000	Secondary (One private pain management practice, in a	N=200	Patients presenting to private pain management centre, with chronic LBP +/-	Double diagnostic block	Revel's criteria	Se 0.13 (0.07, 0.22); Sp 0.84 (0.76, 0.90)
						> 3 inappropriate symptoms	Se 0.24 (0.16, 0.34); Sp 0.68 (0.59, 0.76)

		non-university setting)		lower extremity pain		> 3 inappropriate signs	Se 0.54 (0.43, 0.64); Sp 0.59 (0.49, 0.67)
Revel	1998	Tertiary	N=80	Patients with LBP >3/12 referred for facet injection	75% response on Lidocaine block	5 of 7 characteristics	Se 1.00 (0.75,1.00); Sp 0.66 (0.46, 0.82)
						5 of 7 characteristics including relieved by recumbancy	Se 0.92 (0.67, 0.99); Sp 0.79 (0.62, 0.91)
Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	6 of 7 variables	Se 0.45 (0.27, 0.65); Sp 1.00 (0.82, 1.00)
						5 of 7 variables	Se 0.64 (0.41, 0.83); Sp 0.89 (0.65, 0.99)
						4 of 7 variables	Se 0.82 (0.61, 0.93); Sp 0.78 (0.55, 0.91)
Diagnostic performance of clinical tests for sacroiliac joint pain (Sivayogam, 2011)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Stanford and Burnhan	2010	NA	N=34	Patients with LBP that was refractory to non-invasive conservative spine	Pre-block (SIJB with 1.5 ml lidocaine 2% and bupivacaine	Composites of distraction, thigh trust, Gaenslen's test,	Se 0.82 (0.58, 0.95); Sp 0.57 (0.45, 0.63); +LR 1.9; -LR 0.31

				treatment for >6/12	0.25%; 80% index pain relief)	compression and sacral thrust (3 or more positive tests)	
					Post-block (normalization)		Se 0.89 (0.71, 0.98); Sp 0.57 (0.45, 0.63); +LR 1.3; -LR 0.36
Van der Wurff	2006	Tertiray	N=140	Patients referred for SIJ blocks, with pain principally below L5	Double SIJB with 2 ml lidocaine 2% or bupivacaine 0.25%; 50% pain relief on VAS	One or more positive tests	Se 1.00 (1.00, 1.00); Sp 42.4 (25.5, 60.8); +LR 1.74; -LR 0.00
						Two or more positive tests	Se 0.93 (0.76, 0.99); Sp 0.58 (0.39, 0.75); +LR 2.18; -LR 0.13
						Three or more positive tests	Se 0.85 (0.72,0.99); Sp 0.79 (0.65, 0.93); +LR 4.02; -LR 0.19
						Four or more positive tests	Se 0.30 (0.11, 0.46); Sp 0.82 (0.64, 0.93); +LR 1.43; -LR 0.91
						Five or more positive tests	Se 0.00 (0.00, 0.00); Sp 1.00 (1.00, 1.00), +LR 0.00; -LR 1.00
Laslett	2005	Secondary	N=48	Patients with buttock pain, with	Double SIJB with 1.5 ml lidocaine and	One or more positive tests	Se 1.00 (0.81,1.00); Sp 0.44 (0.28, 0.61); +LR 1.78; -LR 0.00

				or without lumbar or lower extremity symptoms	bupivacaine; pain provocation followed by 80% pain relief on NRS	Two or more positive tests	Se 0.93 (0.72, 0.99); Sp 0.66 (0.48, 0.80); +LR 2.73; -LR 0.10
						Three or more positive tests	Se 0.94 (0.72, 0.99); Sp 0.78 (0.61, 0.89); +LR 4.29; -LR 0.80
						Four or more positive tests	Se 0.60 (0.36, 0.80); Sp 0.81 (0.65, 0.91); +LR 3.20; -LR 0.49
						Five or more positive tests	Se 0.27 (0.11, 0.52); Sp 0.88 (0.72, 0.95); +LR 2.13; -LR 0.84
						Two positive tests of distraction, thigh thrust, compression, and sacral thrust	Se 0.88 (0.64, 0.97); Sp 0.78 (0.61, 0.89); +LR 4.00; -LR 0.16
Laslett	2003	Tertiary	N=48	Patients with buttock pain, with or without lumbar or lower extremity symptoms, referred to a		Three or more positive tests	Se 0.91 (0.62, 0.98); Sp 0.78 (0.61, 0.89); +LR 4.16; -LR 0.12
						Three or more positive tests in the absence of centralization	Se 0.91 (0.62, 0.98); Sp 0.87 (0.68, 0.96); +LR 6.97; -LR 0.10

				private radiology practice		during repeated movement test	
Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain (Hancock, 2007)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants	Population	Reference standard	Index test	Diagnostic accuracy data
Van der Wurff	2006	Tertiary	N=140	Patients referred for SIJ blocks, with pain principally below L5	Double SIJB with 2 ml lidocaine 2% or bupivacaine 0.25%; 50% pain relief on VAS	3 of more positive pain provocation procedures	Se 84 (65, 95); Sp 78 (60, 90); +LR 3.8 (2.0, 7.3); -LR 0.21 (0.09, 0.49)
Laslett	2005	Secondary	N=48	Patients with buttock pain, with or without lumbar or lower extremity symptoms	Double SIJB with 1.5 ml lidocaine and bupivacaine; pain provocation followed by 80% pain relief on NRS	3 of more positive pain provocation procedures	Se 74 (50, 90); Sp 74 (55, 89); +LR 2.9 (1.5, 5.6); -LR 0.35 (0.17, 0.75)

Laslett	2004	Secondary	N=151	Patients with low back pain with or without lower extremity symptoms, referred to a private radiology practice	ZJ blocks	Revel's criteria	Se 18 (5, 43); Sp 93 (86,97); +LR 2.6 (0.8, 8.6); -LR 0.88 (0.70, 1.10)
Laslett	2003	Tertiary (Private radiology practice)	N=81	Adult patients with chronic lumbar or lumbopelvic pain who were referred to a private radiology practice	≥80% pain relief after lumbar zygapophysial joint injection	3 of more positive pain provocation procedures	Se 89 (59,99); Sp 80 (62, 92); +LR 4.4 (2.1, 8.9); -LR 0.15 (0.03, 0.66)
Young	2003	Secondary (Private radiology practice)	N=81	Adult patients with chronic lumbar or lumbopelvic pain who were referred to a private radiology practice	≥80% pain relief after lumbar zygapophysial joint injection	3 of more positive pain provocation procedures	Se 76 (56, 90); Sp 69 (50, 85); +LR 2.5 (1.4, 4.4); -LR 0.35 (0.17, 0.71)
Manchikanti	2000	Secondary (One private pain management practice, in a non-	N=200	Patients presenting to private pain management centre, with chronic LBP +/- lower extremity pain	Double diagnostic block	Revel's criteria	Se 13 (7, 22); Sp 84 (76, 90); +LR 0.8 (0.4, 1.7); -LR 1.03 (0.92, 1.16)

		university setting)					
Revel	1998	Tertiary	N=42	Patients with LBP >3/12 referred for facet injection	75% response on Lidocaine block	Revel's criteria	Se 96 (71, 100); Sp 65 (46, 81); +LR 2.8 (1.7, 4.5); -LR 0.06 (0.00,0.85)
Revel	1992	NA	N=40	Patients suffering from LBP whatever the anatomic structure thought to be involved	75% response on Lidocaine block	Revel's criteria	Se 63 (41, 82); Sp 87 (64, 98); +LR 4.8 (1.4, 15.9); -LR 0.43 (0.24, 0.75)

Table S12: Diagnostic accuracy of demographics for the diagnostic of cauda equina syndrome

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Van Den Bosch	2004	Primary	N=2007	Patients referred with low back pain for lumbar spine radiography	Lumbar radiographs	Age 55 or more	+LR 1.5-8

Table S13: Diagnostic accuracy of demographics for the diagnostic of spinal fracture

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Age > 50	Se 0.74; Sp 0.33; +LR 1.1 (1.05-1.16); -LR 0.79 (0.69-0.91)
						Age > 70	Se 0.39; Sp 0.80; +LR 1.55 (1.36–1.76); -LR 0.86 (0.82–0.91)
Enthoven	2016	Primary	N=669	Patients with back pain consulting their GP	Lumbar radiographs	Age > 75	Se 0.45 (0.28–0.62); Sp 0.85(0.82–0.88); +LR 3.1 (2.0–4.7); -LR 0.6 (0.5–0.9)
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	Age>50	Se 0.95 (0.83–0.95); Sp 0.39 (0.38–0.40); +LR 1.5 (1.3–1.5); -LR 0.14 (0.03–0.45)
						Body mass index < 22	Se 0.38 (0.24, 0.55); 0.83 (0.82, 0.84); +LR 2.3 (1.4, 3.4); -LR 0.74 (0.54, 0.91)
						Female gender	Se 0.90 (0.76, 0.96); 0.41 (0.41, 0,42); +LR 1.5 (1.3, 1.6); -LR 0.26 (0.10, 0.60)

Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Age > 70	Se 0.50; Sp 0.96; +LR 11.0 (4.65, 19.48); -LR 0.52 (0.23,0.82)
Van Den Bosch	2004	Primary	N=2007	Patients referred with low back pain for lumbar spine radiography	Lumbar radiographs	Age 55 or more	+LR 1.5-8
Red flags to screen for vertebral fracture in patients presenting with low-back pain (Williams, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	Age > 52 years	Se 0.95 (0.82, 0.99); Sp 0.39 (0.36, 0.41); LR + 1.52 (1.42, 1.68); LR - 0.14 (0.04, 0.53)
						Gender	Se 0.89 (0.75, 0.97); Sp 0.41 (0.38, 0.44); LR + 1.51 (1.35, 1.71); LR -0.26 (0.10, 0.65)
						BMI <23	Se 0.37 (0.22, 0.54); Sp 0.83 (0.81, 0.85) ; LR +2.22 (1.44 - 3.42); LR- 0.76 (0.59, 0.97)
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Age > 50 years	Se 0.63 (0.24, 0.91); Sp 0.66 (0.63, 0.69); LR + 1.84 (1.07-3.17); LR -0.57 (0.23-1.39)

						Age > 54 years	Se 0.63 (0.24, 0.91); Sp 0.88 (0.86, 0.90); LR+ 2.57 (1.49, 4.44); LR- 0.50 (0.2, 1.21)
						Age > 64 years	Se 0.63 (0.24, 0.91); Sp 0.96 (0.94, 0.97); LR+ 7.13 (4.04,12.59); LR- 0.41 (0.17, 1.01)
						Age > 70 years	Se 0.50 (0.16, 0.84); Sp 0.96 (0.94, 0.97); LR+ 11.19 (5.33, 23.51); LR- 0.52 (0.26, 1.05)
						Age > 74 years	Se 0.25 (0.03, 0.65); Sp 0.97 (0.96, 0.98); LR + 9.39 (2.69, 32.75); LR- 0.77 (0.52, 1.15)
						Female Age > 54 years	Se 0.63 (0.24, 0.91); Sp 0.88 (0.86, 0.90); LR+ 5.39 (3.08, 9.43); LR -0.42 (0.17,1.04)
						Female Age > 64 years	Se 0.63 (0.24, 0.91); Sp 0.96 (0.94, 0.97); LR + 14.59 (8.00, 26.61); LR - 0.39 (0.16, 0.96)
						Female Age > 74 years	Se 0.25 (0.03, 0.65); Sp 0.98 (0.98, 0.99); LR+ 16.17 (4.47, 58.43); LR-0.76 (0.51, 1.14)
						Age > 50 years	Se 0.63 (0.24, 0.91); Sp 0.66 (0.63, 0.69); LR + 1.84 (1.07-3.17); LR -0.57 (0.23-1.39)

Van Den Bosch	2004	Primary	N=2007	Patients referred with low back pain for lumbar spine radiography	Lumbar radiographs	Age > 54 years	Se 0.83 (0.73, 0.90); Sp 0.52 (0.49, 0.54); LR+ 1.72 (1.54, 1.91); LR-0.33 (0.20, 0.53)
						Age > 64 years	Se 0.78 (0.68, 0.87); Sp 0.68 (0.66, 0.70) LR + 2.46 (2.16, 2.8); LR- 0.32 (0.21, 0.48)
						Age > 74 years	Se 0.59 (0.48, 0.70); Sp 0.84 (0.82, 0.86); LR + 3.69 (3.00, 4.53); LR- 0.49 (0.38, 0.63)
						Female Age > 54 years	Se 0.63 (0.51, 0.73); Sp 0.69 (0.67, 0.71); LR +2.01 (1.68, 2.40); LR -0.54 (0.41, 0.72)
						Female Age > 64 years	Se 0.59 (0.48, 0.70); Sp 0.59 (0.48, 0.70); LR + 2.75 (2.26, 3.35); LR -0.52 (0.40, 0.68)
						Female Age > 74 years	LR + 4.14 (3.17, 5.44); LR - 0.62 (0.51 - 0.75)
						Gender	Se 0.72 (0.61, 0.82); Sp 0.43 (0.41, 0.45)
Deyo	1986	Primary	N=621	Patients presenting with LBP, 311 received imaging	X-ray - anteroposterior and lateral lumbar view	Age > 50 years	Se 0.79 (0.49, 0.95); Sp 0.64 (0.58, 0.69); LR+ 2.16 (1.58-2.95); LR- 0.34 (0.12-0.92)

Table S14: Diagnostic accuracy of demographics for the diagnosis of spinal malignancy

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Age > 50	Se 0.72; Sp 0.33; LR+ 1.06 (0.96, 1.17); LR- 0.87 (0.68, 1.11)
						Age > 70	Se 0.22; Sp 0.80; LR+ 1.1 (0.82, 1.47); 0.97 (0.9, 1.06)
Red flags to screen for malignancy in patients with low-back pain (Henschke, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Age > 50	Sp 0.66 (0.63; 0.69)
						Age > 70	Sp 0.95 (0.94; 0.96)
Jacobson	1997	Secondary	N=491	Patients with a complaint of middle to lower back pain	CT Scan	Age > 50	Se 1 (0.81,1); Sp 0.41 (0.35, 0.48)

Frazier	1989	Primary	N=1037	Patients with acute lumbosacral back pain	Diagnostic imaging and follow-up	Age >50	Se 0.50 (0.01, 0.99); Sp 0.74 (0.70, 0.78)
Deyo	1988	Primary	N=1975	Patients with a primary complaint of LBP of less than 1-month duration	Lumbar radiographs	Age > 50	Se 0.77 (0.46, 0.95); Sp 0.71 (0.69, 0.73)
Deyo	1986	Primary	N=621	Patients presenting with LBP, 311 received imaging	X-ray - anteroposterior and lateral lumbar view	Age > 50	Se 0.75(0.19, 0.99); Sp 0.70 (0.66, 0.74)

Table S15: Diagnostic accuracy of demographics for the diagnosis any serious spinal pathology

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Shaw	2020	Primary (ED)	N= 1000	Patients presenting to the ED with back pain	NA	Age over 70 years	Se 48.5; Sp 79.9 ; LR+ 1.9 (1.3, 2.8); LR- 0.7 (0.5–1.0)

Table S16: Diagnostic accuracy of patient history findings for the diagnosis of CES

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Tsiang	2019	Tertiary	N=500	Patients with LBP seen at a large tertiary care spine clinic	NA	Bladder dysfunction	Se 1.00; Sp 0.77
						Bladder dysfunction patient reported	Se 0.50; Sp 0.87
						Bowel dysfunction	Se 0.50; Sp 0.87
						Lower limbs weakness	Se 1.00; 0.77
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Bladder dysfunction	Se 0.22; Sp 0.90; LR+ 2.31 (1.25, 4.27); LR- 0.86 (0.72, 1.03)
						Bowel dysfunction	Se 0.14; Sp 0.95; LR+ 2.78 (1.23, 6.3); LR- 0.91 (0.8, 1.03)
Raison	2014	Primary (ED)	N=206	Patients with LBP attending the ED	MRI	Bladder dysfunction	Se 0.65 (0.44, 0.82); Sp 0.73 (0.66, 0.80); LR+ 2.45

						Bowel dysfunction	Se 0.65 (0.44, 0.82); Sp 0.73 (0.66, 0.80); LR+ 2.45
						Saddle dysfunction	Se 0.27 (0.12, 0.48); Sp 0.87 (0.81, 0.92); LR+ 2.11

What is the diagnostic accuracy of red flags related to cauda equina syndrome (CES), when compared to Magnetic Resonance Imaging (MRI)? A systematic review
(Dionne, 2019)

POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Dionne	2019	Mixed (Secondary and tertiary care settings)	N=869 n=7	Adults who presented with a suspected CES from an insidious onset or herniated disc prolapse	MRI	Bowel incontinence (n=4 studies)	Se 0.18 (0.09, 0.32); Sp 0.86 (0.80, 0.91); LR+ 1.60 (0.65, 3.94); LR- 0.96 (0.78, 1.18)
						Leg pain (n=5 studies)	Se 0.46 (0.32, 0.59); Sp 0.65 (0.58, 0.72); LR+ 1.45 (0.81, 2.58); LR- 0.90 (0.60, 1.35)
						Urinary retention (n=5 studies)	Se 0.36 (0.25, 0.49); Sp 0.61 (0.54, 0.68); LR+ 0.99 (0.61, 1.61); LR- 1.06 (0.86)
						Urinary incontinence (n=5 studies)	Se 0.36 (0.25, 0.48); Sp 0.56 (0.49, 0.64); LR+ 0.80 (0.56, 1.14); LR- 1.13 (0.90, 1.43)

						Back pain (n=3 studies)	Se 0.92 (0.92, 0.98); Sp 0.30 (0.23, 0.37); LR+ 1,23 (0.77, 2.20); LR- 0.40 (0.05, 2.41)

Table S17: Diagnostic accuracy of patient history findings for the diagnosis of spinal fracture

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Tsiang	2019	Tertiary	N=500	Patients with LBP seen at a large tertiary care spine clinic	NA	History of trauma	Se 0.81; Sp 0.79
						Osteoporosis	Se 0.81; Sp 0.79
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	History of trauma	Se 24.7; Sp 88.6; LR+ 2.17 (1.86–2.54); LR- 0.84 (0.81, 0.89)
Enthoven	2016	Primary	N=669	Patients with back pain consulting their GP	Lumbar radiographs	Corticosteroids use	Se 0.18 (0.05, 0.31); Sp 0.93 (0.91, 0.95); LR+ 2.5 (1.1, 5.3); LR- 0.90 (0.8, 1.0)
						History of trauma	Se 0.21 (0.07, 0.35); Sp 0.97 (0.95, 0.98); +LR 6.2 (2.8, 13.5); LR- 0.80 (0.5,1.3)
						Severe disability	Se 0.30 (0.14, 0.46); 0.87 (0.84, 0.90); LR + 2.3 (1.3, 4.2); LR- 0.8 (0.6, 1.0)

						Sudden decrease in height	0.09 (0.01, 0.19); Sp 0.97 (0.95, 0.98); LR+ 2.9 (0.9, 9.4); LR- 0.90 (0.8, 1.0)
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	No regular exercise	Se 0.81 (0.65, 0.91); Sp 0.44 (0.43, 0.45); LR+ 1.5 (1.2, 1.6); LR- 0.43 (0.20, 0.80)
						Sitting decrease pain	Se 0.29 (0.27, 0.32); 0.81 (0.79, 0.83); LR+ 1.6 (1.2, 1.9); LR- 0.87 (0.82, 0.92)
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Corticosteroids use	Se 0.25; Sp 1.00; LR+ 48.5 (11.62, 165.22); LR- 0.75 (0.41, 0.93)
						History of trauma	Se 0.25; Sp 0.98; LR+ 10.0 (2.76, 26.36); LR- 0.77 (0.42, 0.95)
Red flags to screen for vertebral fracture in patients presenting with low-back pain (Williams, 2013)							
PRIMARY STUDIES							

First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	Osteoarthritis	Se 0.50 (0.33, 0.67); Sp 0.52 (0.50, 0.55); LR + 1.05 (0.76, 1.45); LR - 0.95 (0.69, 1.32)
						No regular exercise	Se 0.82 (0.66, 0.92); Sp 0.44 (0.42, 0.47); LR + 1.47 (1.25, 1.75); LR - 0.42 (0.21, 0.81)
						Absence of buttock / leg pain	Se 0.32 (0.18, 0.49); Sp 0.86 (0.84, 0.88); LR+ 2.24 (1.38, 3.64); LR- 0.80 (0.64, 0.99)
						Decreased pain on sitting	Se 0.29 (0.15, 0.46); Sp 0.23 (0.21, 0.25); LR + 1.56 (0.94, 2.59); LR -0.87 (0.71, 1.07)
Reinus	1998	Tertiary	N=482	Patients with back pain presenting to the ED department	Lumbosacral radiographs	History of trauma	Se 0.07 (0.02, 0.18); Sp 0.60 (0.56, 0.65); LR+ 0.18 (0.07, 0.48); LR -1.54 (1.38, 1.71)
Gibson	1992	Tertiary	N=225	Patients presenting to the ED department with lumbar pain of less than 48 hours	Plain radiographs	History of trauma	Se 1.00 (0.59, 1.00); Sp 0.51 (0.41, 0.62); LR+ 1.93 (1.48, 2.52); LR -0.121 (0.01, 1.79)
Deyo	1986	Primary	N=621	Patients presenting with LBP, 311 received imaging	X-ray - anteroposterior	Trauma	Se 0.36 (0.13, 0.65); Sp 0.90 (0.86, 0.93); LR+ 3.97 (0.20, 79.15); LR- 0.98 (0.89, 1.07)

					and lateral lumbar view	Corticosteroids use	Se 0.0 (0.0, 0.23); Sp 0.99 (0.98, 1.00); LR + 3.97 (0.20, 79.15); LR- 0.98 (0.89, 1.07)
Patrick	1983	Tertiary	N=552	Patients complaining of LBP presenting to the ED department	Lumbar radiographs	History of trauma	Se 0.80 (0.64, 0.91); Sp 0.55 (0.50, 0.59); LR+ 1.77 (1.48, 2.13); LR - 0.36 (0.20, 0.68)
Scavone	1981	Primary	N=871	Patients with LBP presenting to the university teaching hospital medical centre	Lumbar radiographs	History of trauma	Se 0.65 (0.44, 0.83); Sp 0.95 (0.93, 0.96); LR+ 12.85 (8.58, 19.24); LR- 0.36 (0.22, 0.62)
						Hip/leg pain	LR + 0.21 (0.01, 3.35); LR - 1.08 (1.02, 1.14)
						Sciatica	Se 0.04 (0.00, 0.20); Sp 0.91 (0.89, 0.93)
A systematic review identifies five "red flags" to screen for vertebral fracture in patients with low back pain (Henschke, 2008)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Holmes	2003	Secondary	N=2404	Patients with back pain presenting to the ED department	Lumbar radiographs	Severe mechanism of injury	Se 0.61; Sp 0.64; LR+ 1.7 (1.4, 1.9); LR- 0.62 (0.50, 0.75)
Reinus	1998	Secondary	N=482	Patients with back pain presenting to the ED department	Lumbosacral radiographs	Acute trauma	Se 0.40; Sp 0.64; LR+ 1.1 (0.5, 2.0); LR- 0.94 (0.49, 1.31)

Table S18: Diagnostic accuracy of patient history findings for the diagnosis of spinal malignancy

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Tsiang	2019	Tertiary	N=500	Patients with LBP seen at a large tertiary care spine clinic	NA	History of malignancy	Se 91.7; Sp 77.8
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Night pain	Se 0.55; Sp 0.42; LR+ 0.85 (0.83,1.1); LR- 1.07 (0.9, 1.27)
						Unexplained weight loss	Se 0.08; Sp 0.96; LR+ 1.87 (1.1, 3.17); LR- 0.96 (0.92, 1.01)
						History of malignancy	Se 0.32; Sp 0.96; +LR 7.25 (5.65, 9.3); -LR 0.71 (0.64, 0.79)
Cook	2011	Tertiary	N=1109	Patients with LBP seen at a spine surgery center	Imaging	No pain during flexion	Se 0.67 (0.55, 0.77); Sp 0.41 (0.40, 0.42); LR+ 1.1 (0.9, 1.3); LR- 0.80 (0.56, 1.1)
						No pain during extension	Se 0.65 (0.54, 0.75), Sp 0.50 (0.49, 0.51); LR+ 1.3 (1.1, 1.5); LR- 0.70 (0.49, 0.94)

						No pain during right side flexion	Se 0.96 (0.88, 0.98); Sp 0.04 (0.04, 0.05); LR+ 0.94 (0.85,1); LR- 1 (0.92, 1.01)
						No pain during left side flexion	Se 0.96 (0.88, 0.98); 0.04 (0.03, 0.04); LR + 0.99 (0.91, 1); LR-1.1 (0.37, 3.2)
Donner-Banzhoff	2006	Primary	N=1378	Patients with LBP presenting to a GP	Experts opinions	Clinical judgment	Se 0.50; Sp 0.83; LR+ 2.95; LR- 0.6
Red flags to screen for malignancy in patients with low-back pain (Henschke, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Constant Progressive Pain	Se 0 (0.0, 0.0); Sp 0.97 (0.96, 0.96)
						Gradual Onset before age 40	Se 0 (0.0, 0.0); Sp 0.91 (0.90, 0.93)
						Insidious onset	Se 0 (0.0, 0.0); Sp 0.83 (0.80, 0.85)
						Previous history of cancer	Se 0 (0.0, 0.0); Sp 0.96 (0.95, 0.97)
						Systematically unwell	Se 0 (0.0, 0.0); Sp 0.96 (0.96, 0.97)

						Tried bedrest with no relief	Se 0 (0.0, 0.0); Sp 0.84 (0.81, 0.86)
						Unexplained weight loss	Se 0 (0.0, 0.0); Sp 1 (0.99, 0.1)
Donner-Banzhoff	2006	Primary	N=1378	Patients with LBP presenting to a GP	Experts opinions	Is the LBP familiar	Se 0 (0.0, 0.97); Sp 0.83 (0.81, 0.85)
Reinus	1998	Tertiary	N=482	Patients with back pain presenting to the ED department	Lumbosacral radiographs	Previous history of cancer	Se 1.0 (0.59, 1); Sp 0.97 (0.95, 0.96)
Deyo	1988	Primary	N=1975	Patients with a primary complaint of LBP of less than 1-month duration	Lumbar radiographs	Duration of this episode >1month	Se 0.50 (0.21, 0.79); Sp 0.81 (0.79, 0.83)
						Insidious onset	Se 0.62 (0.32, 0.86); Sp 0.42 (0.40, 0.44)
						Not improved after 1 month	Se 0.31 (0.09, 0.51); Sp 0.90 (0.89, 0.91)
						Previous history of cancer	Se 0.31(0.09, 0.61); Sp 0.96 (0.97, 0.99)
						Recent back injury	Se 0.0 (0.0, 0.25); Sp 0.82 (0.80, 0.84)
						Severe pain	Se 0.23 (0.05, 0.54); Sp 0.85 (0.83, 0.87)
						Thoracic pain	Se 0.17 (0.02, 0.48); Sp 0.84 (0.82,0.86)
						Tried bedrest with no relief	Se 1 (0.4, 1); Sp 0.46 (0.43, 0.49)

						Unexplained weight loss	Se 0.15 (0.02, 0.45); Sp 0.94 (0.93, 0.95)
Deyo	1986	Primary	N=621	Patients presenting with LBP, 311 received imaging	X-ray - anteroposterior and lateral lumbar view	Not improved after 1 month	Se 0.25 (0.01,0.81); Sp 0.90 (0.88,0.93)

Table S19: Diagnostic accuracy of patient history findings for the diagnosis of spinal infection

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Chills	Se 0.12; Sp 0.93; LR+ 1.71 (1.04, 2.81); LR- 0.95 (0.89, 1.01)
						Night pain	Se 0.58; Sp 0.42; LR+ 0.99; LR- 1.02
						Sweating	Se 0.12; Sp 0.93; LR+ 1.71 (1.04, 2.81); LR- 0.95 (0.89, 1.01)
						Persistent night sweating	Se 0.18; Sp 0.86, +LR 1.26 (0.85, 1.86); LR- 0.96 (0.88, 1.04)
						Recent infection	Se 0.24; Sp 0.97; LR+ 9.31 (6.63, 13.07); LR- 0.78 (0.7, 0.86)
Low Back Pain in the Emergency Department: Prevalence of Serious Spinal Pathologies and Diagnostic Accuracy of Red Flags (Galliker, 2020)							
PRIMARY STUDIES							

First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Davis	2011	Primary (ED)	N=55	Patients who present to ED with spine pain	Imaging	Intravenous drug abuse	LR+ 13.7 (11.4, 16.5); LR- 0.4 (0.3, 0.5)
						Recent spine fracture	LR+ 0.5 (5.0, 17.8); LR- 0.9 (0.8, 1.0)
						Immunocompromised	LR+ 5.1 (3.2, 8.0); LR- 0.9 (0.8, 0.9)
						Indwelling vascular catheter	LR+ 15.7 (7.9, 31.0); LR- 0.9 (0.9, 1.0)
						Other infection site	LR+ 13.7 (9.4, 19.8); LR- 0.8 (0.7, 0.9)

Table S20: Diagnostic accuracy of patient history findings for the diagnosis of serious spinal pathology

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Shaw	2020	Primary (ED)	N= 1000	Patients presenting to the ED with back pain	NA	Acute urinary retention or overflow incontinence	Se 15.2; Sp 97.6; LR+ 6.4 (2.6, 15.7); LR- 0.9 (0.8, 0.1)
						Anticoagulated	Se 9.1; Sp 95.4; LR+ 2.0 (0.6, 6.0); LR- 1.0 (0.9, 1.1)
						Constant progressive non-mechanical pain	Se 3; Sp 99.3; LR+ 4.2 (0.5, 33.1); LR- 1.0 (0.9, 1)
						Flank pain	Se 9.1; Sp 87.1; LR+ 0.7 (0.2, 2.1) LR- 1.0 (0.9, 1.2)
						Gradual onset before age 40	Se 0; Sp 99.6; LR+ 0.0; LR- 1.0
						Herpes zoster rash	Se 1.1 ; Sp 100; LR- 1.0 (1.0, 1.0)

						History of cancer	Se 15.2; Sp 92.1; LR+ 1.9 (0.8, 4.5); LR- 0.9 (0.8, 1.1)
						History of trauma (major in young/minor in elderly)	Se 27.3; Sp 90.7; LR+ 2.9 (1.6, 5.3); LR- 0.8 (0.7, 1)
						Immune suppression	Se 12.1; Sp 96.0; LR+ 3.0 (1.1, 7.9); LR- 0.9 (0.8, 1)
						Inflammatory arthritis or osteoporosis fracture	Se 30.3; Sp 93.4; LR+ 4.6 (2.6, 8.1); LR- 0.8 (0.6, 0.9)
						Insidious onset	Se 6.1; Sp 97.2; LR+ 2.2 (0.5, 8.8) LR- 1.0 (0.9–1.1)
						Intravenous drug use	Se 12.1; Sp 98.2; LR+ 6.9 (2.5, 19.4); LR- 0.9 (0.8, 1.0)
						Iritis, skin rashes (psoriasis), colitis, urethral discharge	Se 1.7; Sp 99.6; LR + 4.6 (0.9, 22.6); LR- 1.0 (1.0, 1.0)

						Known nephrolithiasis or abdominal aortic aneurysm	Se 6.1; Sp 95.6; LR+ 1.4 (0.3, 5.4) LR- 1.0 (0.9, 1.1)
						Known spinal Paget's disease	Se 0; Sp 99.9; LR+ 0; LR- 1.0
						Morning back stiffness 30 minutes	Se 0; Sp 99.8; LR+ 0; LR- 1.0
						Pregnancy	Se 0.6; Sp 99.8; LR+ 2.3 (0.2, 25.2); LR- 1.0 (1.0, 1.0)
						Progressive motor weakness in legs or gait disturbances	Se 3.0; Sp 98.4; LR+ 1.8 (0.3, 13.4); LR- 1.0 (0.9, 1.1)
						Prolonged use of corticosteroids	Se 12.1; Sp 96.9; LR+ 3.9 (1.5, 10.5); LR- 0.9 (0.8, 1)
						Recent infection	Se 18.2; Sp 96.0; LR + 4.5 (2.1, 9.9); LR- 0.9 (0.7, 1)
						Recent spinal procedure	Se 3.0; Sp 97.3; LR+ 1.1 (0.2, 8.1) LR- 1.0 (0.9, 1.1)

						Systemically unwell	Se 62.0; Sp 84.2; LR+ 2.8 (0.7, 11.4); LR- 1.0 (1.0, 1.0)
						TB history	Se 3.0; Sp 99.7; LR+ 9.8 (1.0, 91.4); LR- 1.0 (0.9–1.0)
						Thoracic/chest/abdominal pain	Se 3.0; Sp 94.1; LR+ 0.5 (0.1, 3.6); LR- 1.0 (1.0, 1.1)
						Tried bed rest but no relief	Se 0; Sp 99.8; LR+ 0.0; LR- 1.0
						Unexplained weight loss	Se 1.1; Sp 99.9; LR+ 9.2 (0.8, 100.6); LR- 1.0 (1.0, 1.0)
						Urinary symptoms	Se 27.3; Sp 88.7; LR + 2.4 (1.4, 4.3); LR- 0.8 (0.7, 1)
						Writhing in pain	Se 5.0; Sp 99.3; LR+ 6.9 (2.5, 19.9); LR-1.0 (0.9, 1.0)

Low Back Pain in the Emergency Department: Prevalence of Serious Spinal Pathologies and Diagnostic Accuracy of Red Flags (Galliker, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Thiruganasambandamoorthy	2014	Primary (ED)	N=329	Patients who present to an academic ED with nontraumatic LBP	Blood work, imaging or both	Current anticoagulants use	LR + 8.7 (3.1, 24.4); LR – 0.8 (0.6, 1.0)
						New urinary retention	LR+ 7.0 (1.9, 26.0); LR- 0.9 (0.7, 1.0)

Table S21: Diagnostic accuracy of physical examination findings for the diagnosis of CES

Can digital rectal examination be used to detect cauda equina compression in people presenting with acute cauda equina syndrome? A systematic review and meta-analysis of diagnostic test accuracy studies (Tabrah, 2022)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Tabrah	2022	Secondary and tertiary care settings	N=600 n=5	Adults presenting to secondary or tertiary care with acute CES	MRI	Digital rectal examination (anal tone)	LR+ 1.32 (0.94, 1.66); LR- 1.09 (0.94, 1.26); DOR 1.48 (0.87, 2.51)
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Venkatesan	2019	Tertiary	N=92	Adults presenting to tertiary care with acute CES	MRI	Anal squeeze	Se 0.29; Sp 0.96
Gooding	2013	Secondary	N=57	Adults presenting to the radiology department with suspected CES	MRI	Digital rectal examination (internal sensation)	Se 0.4 (0.1, 0.7); Sp (0.35, 0.68)

Domen	2009	Secondary	N=58	Adults presenting to tertiary care with acute CES	MRI	Anal reflexes	Se 0.38; Sp 0.60 (0.2, 4.2)
The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Raison	2014	Primary (ED)	N=206	Patients with LBP attending the ED	MRI	Saddle dysfunction	Se 0.27 (0.12, 0.48); Sp 0.87 (0.81, 0.92); LR+ 2.11
What is the diagnostic accuracy of red flags related to cauda equina syndrome (CES), when compared to Magnetic Resonance Imaging (MRI)? A systematic review (Dionne, 2019)							
POOLED DATA							
First author	Year of publication	Setting(s) of data collection	Number of participants (N) Number of studies (n)	Population	Reference standard	Index test	Diagnostic accuracy data (pooled estimates)
Dionne	2019	Mixed (Secondary and tertiary care settings)	N=869	Adults who presented with a suspected CES from an insidious onset or herniated disc prolapse	MRI	Saddle anesthesia (n=4 studies)	Se 0.43 (0.31, 0.55); Sp 0.79 (0.74, 0.83); LR+ 1.73 (0.98, 3.08); LR- 0.80 (0.61, 1.05)
			n=7			Reduced anal tone (n=3 studies)	Se 0.29 (0.15, 0.47); Sp 0.83 (0.76, 0.88); LR+ 1.72 (0.91, 3.24); LR- 0.90 (0.86, 1.07)

Table S22: Diagnosis accuracy of physical examination findings for the diagnosis of spinal fracture

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Enthoven	2016	Primary	N=669	Patients with back pain consulting their GP	Lumbar radiographs	Percussion tenderness of spine	Se 0.21(0.07, 0.35); Sp 0.81 (0.78, 0.84); +LR 1.1 (0.6, 2.2); LR- 1.0 (0.8, 1.2)
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	Gait abnormality	Se 0.66 (0.50; 0.79); Sp 0.23 (0.22, 0.23); LR+ 0.86 (0.65, 1.02); LR- 1.5 (0.91, 2.2)
Hsu	2003	NA Retrospective chart review	N=200	Patients with confirmed thoraco-lumbar fracture and or following a	NA	Midline tenderness	Se 0.62; Sp 0.92
						Palpable midline step	Se 0.14 Sp 1.00
						Back bruising	Se 0.69; Sp 0.99

				general multi-trauma		Abnormal neurological signs	Se 0.41; Sp 0.96
Red flags to screen for vertebral fracture in patients presenting with low-back pain (Williams, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal alignment, vertebral body compression and spinal canal dimensions	No gait abnormality	Se 0.66 (0.49, 0.80); Sp 0.23 (0.21, 0.25); LR + 0.85 (0.68, 1.08); LR- 1.49 (0.95, 2.34)
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Sensation change	Se 0.0 (0.0, 0.37); Sp 0.98 (0.97, 0.99); LR+ 3.32 (0.22, 50.86); LR- 0.96 (0.82, 1.13)
Reinus	1998	Tertiary	N=482	Patients with back pain presenting to the ED department	Lumbosacral radiographs	Neurological signs	Se 0.05 (0.01, 0.15); Sp 0.92 (0.89, 0.94); LR + 0.69 (0.22, 2.17); LR -1.03 (0.96, 1.10)

Gibson	1992	Tertiary	N=225	Patients presenting to the ED department with lumbar pain of less than 48 hours	Plain radiographs	Neurological signs	Se 0.29 (0.04, 0.71); Sp 0.88 (0.80, 0.94); LR + 2.40 (0.67, 8.70); LR- 0.81 (0.51, 1.30)
Patrick	1983	Tertiary	N=552	Patients complaining of LBP presenting to the ED department	Lumbar radiographs	Sensation change	Se 0.03 (0.00, 0.13); Sp 0.98 (0.97, 0.99); LR + 1.42 (0.19, 10.95); LR - 0.99 (0.94, 1.04)
						Motor deficit	Se 0.02 (0.00, 0.13); Sp 0.99 (0.98, 1.00); LR + 1.39 (0.08, 25.38); LR -0.98 (0.96, 1.03)
						SLR	Se 0.18 (0.07, 0.33); Sp 0.83 (0.79, 0.86); LR + 1.02 (0.51, 2.05); LR -1.00 (0.86, 1.16)
						Tenderness	Se 0.73 (0.56, 0.85); Sp 0.59 (0.54, 0.63); LR + 1.76 (1.42, 2.19); LR- 0.47 (0.28, 0.78)
						Contusion / abrasion	Se 0.85 (0.70, 0.94); Sp 0.97 (0.95, 0.98); LR+ 31.09 (18.25, 52.96); LR - 0.15 (0.07, 0.32)
						Spasm	LR + 1.47 (0.83, 2.60); LR - 0.90 (0.75, 1.09)
Scavone	1981	Primary	N=871	Patients with LBP presenting to the university teaching	Lumbar radiographs	Sensation change	Se 0.27 (0.12, 0.48); Sp 0.27 (0.12, 0.48); LR+ 2.21 (1.14, 4.27); LR - 0.83 (0.66, 1.05)

				hospital medical centre		Motor deficit	Se 0.23 (0.09, 0.44); Sp 0.89 (0.87, 0.91); LR+ 2.19 (1.06, 4.54); LR- 0.86 (0.70, 1.06)
						Tenderness	Se 0.50 (0.30, 0.70); Sp 0.73 (0.70, 0.76); LR+ 0.70 (0.25, 1.97); LR - 1.11 (0.87, 1.41)
						Spasm	LR + 1.25 (0.42, 3.70); LR- 0.98 (0.85, 1.12)
A systematic review identifies five "red flags" to screen for vertebral fracture in patients with low back pain (Henschke, 2008)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Holmes	2003	Secondary	N=2404	Patients with back pain presenting to the ED department	Lumbar radiographs	Spinal pain	Se 0.72; Sp 0.35; LR + 1.1 (1.0, 1.2); LR- 0.79 (0.60, 1.01)
						Tenderness	Se 0.71; Sp 0.28; LR+ 1.0 (0.9, 1.1); LR- 1.04 (0.80, 1.33)
						Abnormal neurological exam	Se 0.09; Sp 0.91; LR+ 1.0 (0.6, 1.6); LR- 1.00 (0.94, 1.05)
Gestring	2002	Secondary	N=71	Blunt trauma patients requiring CT and x-ray	Lumbar radiographs	Tenderness on palpation	Se 0.40; Sp 0.54; LR+ 0.9 (0.4, 1.7); LR- 1.11 (0.56, 1.72)
Terregino	1995	Secondary	N=183		Lumbar radiographs	Pain	Se 0.47; Sp 0.88; LR+ 3.9 (1.9, 7.1); LR- 0.60 (0.35, 0.85)

				Blunt trauma patients able to be evaluated clinically		Tenderness	Se 0.53; Sp 0.93; LR+ 8.0 (3.8, 15.9); LR- 0.50 (0.28, 0.74)
						Deformity or neurological11 deficit	Se 0.12; Sp 1.00; LR+46.4 (2.3, 929.1); LR- 0.86 (0.72, 1.04)
Scavone	1981	Primary	N=871	Patients with LBP presenting to the university teaching hospital medical centre	Lumbar radiographs	Abnormal deep tendon reflex	Se 0.12; Sp 0.89; LR+ 1.1 (0.4, 2.8); LR- 0.99 (0.79, 1.08)

Table S23: Diagnostic accuracy of physical examination findings for the diagnosis of spinal malignancy

Red flags to screen for malignancy in patients with low-back pain (Henschke, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Altered sensation from the trunk down	Se 0 (0.0, 0.0); Sp 0.96 (0.97, 0.99)
Khoo	2003	Primary	N=1030	Patients with LBP; hip, leg, sacroiliac pain or trauma; neurological symptoms; possible malignancy; and inflammatory condition.	Imaging	Neurological symptoms	Se 0.0 (0.0, 0.97); Sp 0.97 (0.95, 0.96)
Deyo	1988	Primary	N=1975	Patients with a primary complaint of LBP of less than 1-month duration	Lumbar radiographs	Fever (> 100°F)	Se 0 (0.0, 0.25); Sp 0.96 (0,97, 0.99)
						Muscle spasm	Se 0.15 (0.02, 0.45) Sp 0.66 (0.64, 0.68)
						Neurological symptoms	Se 0 (0.0, 0.26); Sp 0.91 (0.90, 0.92)

						Spine tenderness	Se 0.15 (0.02, 0.45) Sp 0.60 (0.58, 0.62)

Table S24: Diagnostic accuracy of physical examination findings for the diagnosis of spinal infection

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Fever	Se 0.12; Sp 0.93; LR+ 1.71 (1.04, 2.81); LR- 0.95 (0.89, 1.01)
Low Back Pain in the Emergency Department: Prevalence of Serious Spinal Pathologies and Diagnostic Accuracy of Red Flags (Galliker, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Davis	2011	Primary (ED)	N=55	Patients who present to ED with spine pain	Imaging	Systolic blood pressure <90 mm Hg	LR+ 9.0 (3.9, 20.7)

Table S25: Diagnosis accuracy of physical examination findings for the diagnosis of serious spinal pathology

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Shaw	2020	Primary (ED)	N= 1000	Patients presenting to the ED with back pain	NA	Anal tone loss or faecal incontinence	Se 0.09; Sp 0.99; LR+ 6.3 (1.9, 20.8); LR- 0.9 (0.8, 1)
						Central spine tenderness	Se 0.18; Sp 0.91; LR+ 2.0 (0.9, 4.1); LR- 0.9 (0.8, 1.1)
						Fever	Se 0.03; Sp 0.99; LR+ 2.0 (0.3, 14.4); LR- 1.0 (0.9, 1.1)
						Saddle anesthesia	Se 0.09; Sp 0.99; LR+ 11 (3.1, 39.6); LR- 0.9 (0.8,1.0)
						Sensory level (altered sensation trunk down)	Se 0.6; Sp 0.98; LR+ 0.3 (0.0, 2.0); LR- 1.0 (1.0, 1.0)
Low Back Pain in the Emergency Department: Prevalence of Serious Spinal Pathologies and Diagnostic Accuracy of Red Flags (Galliker, 2020)							
PRIMARY STUDIES							

First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Thiruganasambandamoorthy	2014	Primary (ED)	N=329	Patients who present to an academic ED with nontraumatic LBP	Blood work, imaging or both	Bladder/suprapubic fullness	LR+ 40.2 (1.6; 979.1)
						Disturbance of saddle sensation	LR+ 7.0 (1.4, 36.0)

Table S26: Diagnosis accuracy of diagnostic support tools for the diagnosis of CES

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Combination of recent loss of bladder control and recent loss of bowel control	Se 0.08; Sp 0.97; LR+ 3 (1.01, 8.92); LR- 0.94 (0.85, 1.04)
Raison	2014	Primary (ED)	N=206	Patients with LBP attending the ED	MRI	Combination of bladder dysfunction/bowel dysfunction and saddle anesthesia	Se 0.27 (0.12, 0.48); Sp 0.92 (0.87, 0.96); LR+ 3.46

Table S27: Diagnosis accuracy of diagnostic support tools for the diagnosis of spinal fracture

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Combination of trauma and age > 50 years	Se 0.15; Sp 0.94; LR+ 2.54 (2.05, 3.16); LR- 0.90 (0.87, 0.94)
						Combination of trauma and age > 70 years	Se 0.05; Sp 0.99; LR+ 4.35 (2.92, 6.48); LR- 0.96 (0.94, 0.98)
Enthoven	2016	Primary	N=669	Patients with back pain consulting their GP	Lumbar radiographs	Diagnostic prediction model ≥ 1 positive features (osteoporosis, age of ≥ 75 years, trauma, back pain intensity score ≥ 7 and thoracic pain)	Se 0.88 (0.77, 0.99); Sp 0.42 (0.38, 0.46); LR+ 1.5 (1.3, 1.8); LR- 0.3 (0.1, 0.7)

						≥ 2 positive features	Se 0.70 (0.54, 0.85); Sp 0.81 (0.78, 0.84); LR+ 3.6 (2.8, 4.8); LR- 0.4 (0.2, 0.6)
						≥ 3 positive features	Se 0.30 (0.15, 0.46); Sp 0.95 (0.93, 0.97); LR+ 5.8 (3.2, 10.8); LR- 0.7 (0.6, 0.9)
Henschke	2009	Primary	N= 1172	Patients presenting with acute LBP	Imaging studies and specialist view	Henschke rule 1 sign positive (history of trauma, advanced age, prolonged use of corticosteroids and female gender)	Se 0.88 (0.47, 1.00); Sp 0.50 (0.47, 0.53); LR+ 1.75 (1.34, 2.29); LR- 0.25 (0.04, 1.57)
						Henschke rule 2 sign positive (2/4)	Se 0.63 (0.24, 0.91); Sp 0.96 (0.95, 0.97); LR+ 15.48 (8.45, 28.36); LR -0.39 (0.16, 0.96)
						Henschke rule 3 sign positive (3/4)	Se 0.38 (0.09, 0.76); Sp 1.00 (1.00, 1.00); LR + 906.11 (50.37 - 16299.11); LR - 0.61 (0.36, 1.03)
Roman	2010	Secondary	N=1448	Patients with lumbar-related disorders	Standard radiograph or CT assessing sagittal	1 of 5 positive tests (age > 52 years, no presence of	Se 0.97 (0.89, 0.99); Sp 0.06 (0.06, 0.07); LR+ 1.04 (0.92, 1.1); LR- 0.39 (0.07, 2.1)

					alignment, vertebral body compression and spinal canal dimensions	leg pain, body mass index ≤22, does not exercise regularly and female gender	
						2 of 5 positive tests	Se 0.95 (0.83, 0.99); Sp 0.34 (0.33, 0.34); LR+ 1.4 (1.3, 1.8); LR- 0.16 (0.04, 0.51)
						3 of 5 positive tests	Se 0.76 (0.61, 0.87); Sp 0.68 (0.68, 0.69); LR+ 2.5 (1.9, 2.8); LR- 0.34 (0.19, 0.46)
						4 of 5 positive tests	Se 0.37 (0.24, 0.51); Sp 0.96 (0.95, 0.97); LR+ 9.6 (3.7, 14.9); LR- 0.65 (0.50, 0.79)
						5 of 5 positive tests	Se 0.03 (0.01, 0.08); Sp 0.99 (0.98, 0.99); LR+ 9.3 (1.4, 60.2); LR- 0.97 (0.92, 0.99)

Table S28: Diagnostic accuracy of diagnostic support tools for the diagnosis of spinal malignancy

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Combination of unexplained weight loss and history of malignancy	Se 0.03; Sp 0.99; LR+ 10.25 (3.6, 29.21); LR- 0.98 (0.95,1)
Red flags to screen for malignancy in patients with low-back pain (Henschke, 2013)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Deyo	1988	Primary	N=1975	Patients with a primary complaint of LBP of less than 1-month duration	Lumbar radiographs	Combination of age greater than 50 years, history of malignancy, unexplained weight loss and failure to improve with	Se 1.00

						conservative therapy	

Table S29: Diagnostic accuracy of diagnostic support tools for the diagnosis of spinal infection

The diagnostic value of red flags in thoracolumbar pain: a systematic review (Maselli, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Premkumar	2018	NA Retrospective study of medical files	N= 9940	Patients visiting their medical doctor for a chief complaint of LBP	Imaging reports	Combination of fever, chills or sweating, and a recent infection	Se 0.08; Sp 0.99; LR+ 13.15 (6.66, 25.97); LR- 0.93 (0.88, 0.98)
Low Back Pain in the Emergency Department: Prevalence of Serious Spinal Pathologies and Diagnostic Accuracy of Red Flags (Galliker, 2020)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Davis	2011	Primary (ED)	N=55	Patients who present to ED with spine pain	Imaging	Classic triad (Fever ≥38°C, spine pain and neurological deficit)	LR+ 5.7 (1.4, 23.2)
Davis	2004	Primary (ED)	N=189	Patients with spinal epidural abscess presenting to the ED	Imaging	Classic triad (Fever ≥38°C, spine pain and	Se 0.08; Sp 0.99; LR+ 10.0; LR- 0.93

						neurological deficit)	

Table S30: Diagnostic accuracy of diagnostic support tools for the diagnosis of inflammatory back pain

Diagnostic Clinical Prediction Rules for Specific Subtypes of Low Back Pain: A Systematic Review (Haskins, 2015)							
PRIMARY STUDIES							
First author	Year of publication	Setting(s) of data collection	Number of participants (N)	Population	Reference standard	Index test	Diagnostic accuracy data
Braun	2013	Primary	N= 322	Patients with LBP > 2mo presenting to orthopaedic surgeons, most with ≥ 1 inflammatory back pain symptoms	Diagnosis of axial SpA as determined by a rheumatologist (dichotomous)	(1) age at onset ≤ 35 yrs; (2) alternating buttock pain; (3) improvement with NSAIDs within 48h; (4) waking up in the second half of the night; (5) improvement with movement and not with rest	For 4 or more predictors present: Se 0.48; Sp 0.86; +LR 3.4; -LR 0.6
Chan	2012	NA	N=25	Patients with anterior uveitis	Diagnosis of inflammatory back pain by rheumatologist (dichotomous)	Berlin criteria: (1) morning stiffness, (2) improvement in back pain with exercise but not with rest; (3)	For 2 or more predictors present: Se 0.92; Sp 0.67; LRs not reported but calculated to be +LR 2.8 (1.2, 6.3); -LR 0.12 (0.02, 0.79)

						awakening because of back pain in the second half of the night only; (4) alternating buttock pain	
Sieper	2009	NA	N=648	Patients with chronic back pain of unknown origin that began before 45 yrs of age	Diagnosis of inflammatory back pain by rheumatologist (dichotomous)	Berlin criteria	For 2 or more predictors present; Se 0.70; Sp 0.81; LRs not reported but approximated to be +LR 3.8 (2.8, 5.0); -LR 0.37 (0.31, 0.43)
						(1) age at onset < 40 yrs, (2) insidious onset; (3) improvement with exercise; (4) no improvement with rest; (5) pain at night with improvement on getting up	For 4 or more predictors present: Se 0.80; Sp 0.72; LRs not reported, but approximated to be +LR 2.9 (2.3, 3.6); -LR 0.28 (0.23, 0.35)
Rudwaleit	2004	NA	N=213	Patients with chronic back pain already diagnosed	Diagnosis of As by a rheumatologist or other	Berlin criteria	For 2 or more predictors present: Se 0.70 (0.61, 0.78); Sp 0.81 (0.73, 0.87);

				with either AS or mechanical LBP	specialist prior to the study, using the modified New York criteria (dichotomous)		+LR 3.7 (2.5, 5.6); -LR 0.4 (0.3, 0.5)

Annexe C – Requête pour consultation en neurochirurgie (Articles II, III, IV)

Note to readers: The 2018 CRDS form was used to judge referral appropriateness, considering these referrals were made between September 1, 2018 and September 1, 2021. As the 2018 version of the form is not available in English, we provide the 2022 English version for ease of understanding. Note that in the updated version, the imaging report must now be dated less than 12 months prior to the neurosurgery consultation, whereas it had to be dated less than 3 months in the 2018 version. Other criteria remain unchanged.

Santé et Services sociaux Québec

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CONSULTATION EN NEUROCHIRURGIE ADULTE

Attention :

1- **Pour les priorités A et B (voir verso), communiquer directement avec le neurochirurgien de garde.**

2- **Aviser l'usager d'apporter une copie CD-ROM des imageries pour le rendez-vous avec le spécialiste.**

Nom et prénom de l'usager

N° d'assurance maladie | Expiration Année Mois

Nom et prénom du parent

Ind.rég. N° téléphone | Ind. rég. N° téléphone (autre)

Adresse

Code postal

Raison de consultation — **Échelle de priorité clinique : A : ≤ 3 jrs B : ≤ 10 jrs C : ≤ 28 jrs D : ≤ 3 mois E : ≤ 12 mois**

Rachis cervico-dorsal	☐ Myélopathie compressive avec symptômes > 8 semaines *(Prérequis : rapport d'IRM < 3 mois et autres rapports d'investigation)*		C
	Radiculopathie douloureuse ou sensitivo-motrice *(Prérequis : rapport d'IRM < 3 mois et autres rapports d'investigation)*	☐ Avec symptômes sévères et limitation fonctionnelle (AVD/AVQ) > 8 semaines	D
		☐ Avec symptômes modérés chroniques > 8 semaines	E
	☐ Cervicalgie/dorsalgie **avec instabilité anatomique**, démontrée à l'imagerie, sans atteinte médullaire ou radiculaire *(Prérequis : rapport d'imagerie et autres rapports d'investigation)*		D
Rachis lombo sacré	Radiculopathie douloureuse ou sensitivo-motrice ou claudication neurogénique *(Prérequis : rapport d'IRM < 3 mois et autres rapports d'investigation)*	☐ Avec symptômes sévères et limitation fonctionnelle (AVD/AVQ) > 8 semaines	D
		☐ Avec symptômes modérés chroniques > 8 semaines	E
	☐ Lombalgie isolée sans atteinte radiculaire avec anomalie structurelle (scoliose, spondylolyse, spondylolisthésis) *(Prérequis : rapport d'IRM < 3 mois et autres rapports d'investigation)*		E

Tumeur	☐ Tumeurs extracérébrales : méningiome, neurinome, schwannome, tumeur hypophysaire, base ou voûte du crâne *(Prérequis : rapport d'IRM ou TDM et autres rapports d'investigation)*		D
Vasculaire	☐ Anévrisme cérébral, malformation artério-veineuse fistule durale, angiome caverneux (sans hémorragie) *(Prérequis : rapport d'IRM ou TDM et autres rapports d'investigation)*		D
	☐ Sténose carotidienne asymptomatique (≥ 70 %) *(Prérequis : rapport d'imagerie et autres rapports d'investigation)*		D
Fonctionnel	☐ Névralgie cranio-faciale (ex. : trijumeau) réfractaire au traitement médical *(Prérequis : rapport d'IRM et autres rapports d'investigation)*		D
	☐ Neuromodulation pour syndrome douloureux chronique ou pour spasticité *(Prérequis : rapports d'investigation)*		E
Crânien divers	☐ Hydrocéphalie chronique ou à pression normale *(Prérequis : rapport d'imagerie et autres rapports d'investigation)*		D
	☐ Kyste intracrânien (ex. : arachnoïdien, glande pinéale) *(Prérequis : rapport d'IRM ou TDM et autres rapports d'investigation)*		E
	☐ Lésion osseuse crânienne d'aspect bénin (ex. : kyste, malformation osseuse) *(Prérequis : rapport d'IRM ou TDM et autres rapports d'investigation)*		E
Nerfs périphériques	Neuropathie compressive (ex. : tunnel carpien ou canal cubital) *(Prérequis : EMG < 1 an et autres rapports d'investigation)*	☐ Avec atteinte motrice	D
		☐ Sans atteinte motrice	E
	☐ Tumeur d'un nerf périphérique *(Prérequis : IRM ou échographie < 3 mois)*		D

☐ **Autre raison de consultation non standardisée au formulaire ou modification d'une priorité clinique *(justification OBLIGATOIRE dans la section suivante)* :** — **Priorité clinique**

Impression diagnostique et renseignements cliniques obligatoires

Si prérequis exigé(s) :

☐ **Disponible(s) dans DSQ**

☐ **Annexé(s) à la présente demande**

Besoins spéciaux :

Identification du médecin référent et du point de service

Estampe

Nom du médecin référent — N° de permis

Ind. rég. N° de téléphone — N° de poste — Ind. rég. N° de télécopieur

Nom du point de service

Signature — Date (année, mois, jour)

Médecin de famille : ☐ **Idem au médecin référent** ☐ **Usager sans médecin de famille**

Nom du médecin de famille

Nom du point de service

Référence nominative (si requis)

Si vous désirez une référence à un médecin ou à un point de service en particulier

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Légende

[1] Lien web pour liste des Guichets d'entrée régionaux pour les traumatismes crâniens cérébraux (TCC) légers : http://fecst.inesss.qc.ca/fileadmin/documents/Publications/Liste-contacts-reference-TCCL-decembre-2016.pdf

Alertes cliniques et raisons de consultation de priorité A ou B (liste non exhaustive)
Communiquer avec le neurochirurgien de garde
• Hémorragie intracrânienne • Syndrome d'hypertension intracrânienne avec ou sans altération de l'état de conscience • Apparition soudaine ou rapidement progressive d'un déficit neurologique (localisation cérébrale, médullaire ou queue de cheval ou radiculopathie aiguë avec déficit moteur significatif) • Myélopathie aiguë ou subaiguë (compression médullaire) avec évolution rapide des symptômes • Sténose carotidienne symptomatique • Traumatisme cranio-cérébral (TCC)[1] ou spino-médullaire aigu modéré et sévère • Fracture du crâne ou du rachis • Tumeurs cérébrales intraparenchymateuses : métastases, gliomes ou autres • Tumeurs du rachis intra-durales ou extra-durales (primaires ou métastatiques)

Annexe D – Résultats de l'analyse de régression (Article II)

Variables	OR	95 % CI	p-value
Social deprivation			
1st quintile	1.67	0.53-2.98	0.58
2nd quintile	1.70	0.74-3.89	0.21
3rd quintile	2.75	1.05-7.18	0.04
4th quintile	1.58	0.61-4.11	0.35
5th quintile	1.05	0.46-2.37	0.91
Motor deficits			
Absence of motor deficits	282 (56.4)	191 (38.2)	<0.001

CI : Confidence interval; OR :Odds ratios

Annexe E – Composantes de l'évaluation clinique de la lombalgie (Article III et IV)

Variables used to inform diagnostic and management strategies.

Category	Variable	Outcome
Clinical data		
History taking	Presence of red flags (i.e., indicators of an underlying pathology)	Bladder and bowel dysfunction, saddle anesthesia, fever, chills, progressive neurological symptoms, history of trauma, prolonged corticosteroid use, recent history of infection, previous history of cancer, unexplained weight loss, intravenous drug use, being immunocompromised, morning stiffness, improvement in back pain with exercise but not with rest, awakening because of pain in the second half on the night, alternating buttock pain, and failure to improve with conservative care
	Pain dominance	Back, leg(s) or both
	Pain status	Intermittent, constant
	Pain duration	Acute (< 4 wks), Subacute (4-12wks) or chronic (> 12 wks)
	Symptoms progression	Stable, aggravating, improving
	Prognostic factors	History of spinal surgery Smoking status Type and number of comorbidities

Self-reported questionnaires	Pain intensity	NRS-11: measure of pain intensity ranging from 0 (no pain) to 10 (pain as bad as it could be)
	Disability	ODI: regroups 10 questions related to different domains including pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sexual life, social life, and traveling. Each question is rated on a scale of 0 to 5 points with a maximum score of 50. Higher scores indicate greater disability.
	Risk of poor prognosis	SBST: brief validated tool (9-item version): designed to screen patients with LBP for prognostic factors and group patients in 3 categories of risk of poor outcome – low, medium, and high risk
Physical examination	Presence of neurological deficits	Sensory, motor, deep tendon reflex deficits
	CNS disorder	Presence of pathological reflexes
Care trajectories data		
History taking	Use of advanced imaging and diagnostic testing for LBP prior to the neurosurgery consult	Number and type
	Use of conservative care prior to the neurosurgery consult	Number and type of treatments Type of health professional seen

CNS: Central nervous system; NRS-11: 11-point Numerical Rating Scale; ODI: Oswestry Disability Index; SBST: STarT Back Screening Tool; wks: weeks

Annexe F – Note clinique résumant les résultats de l'évaluation (Article III et IV)

Prénom, Nom du patient : Date de l'évaluation :

DDN :

Présentation clinique

Douleur prédominante : ☐ dos ☐ jambe (_____)
La douleur est : ☐constante ☐ intermittente

Examen physique

Sensibilité : (_____)
Motricité : (_____)
ROT : (_____)
Réflexes pathologiques : (_____)

Niveau d'incapacité fonctionnelle (Oswestry)
☐ minimal ☐ modéré ☐ sévère ☐ majeur ☐ extrême

Niveau de risque de pronostic défavorable (StarT Back)
☐ faible ☐ modéré ☐ élevé

Impressions
☐ lombalgie non-spécifique ☐ syndrome radiculaire ☐ claudication neurogène ☐ pathologie spécifique

☐ Gestion conservatrice possible ☐ Besoin avis externe ☐ Besoin de tests supplémentaires
☐ Urgence médicale

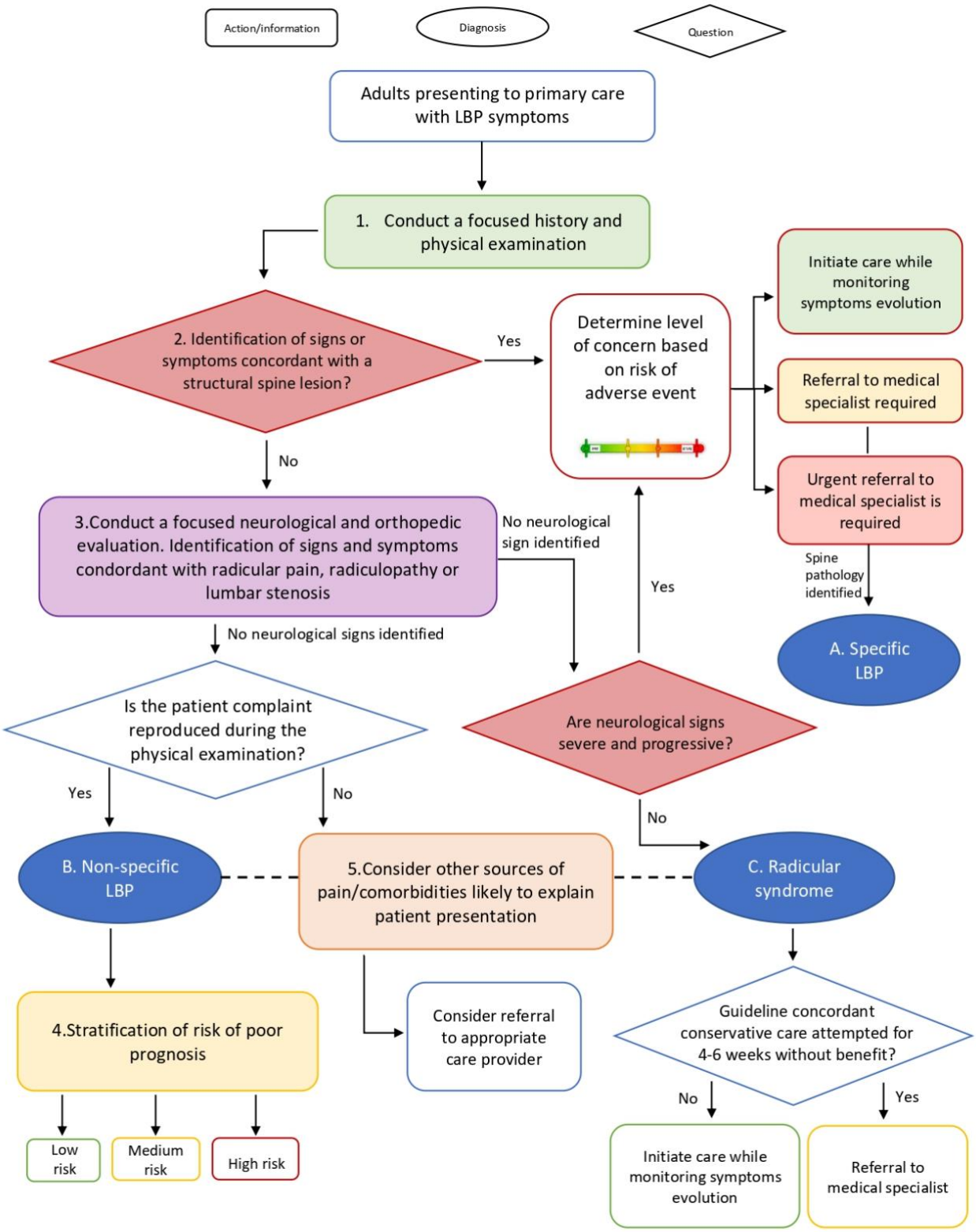
Signature

Section réservée au neurochirurgien

☐ Je confirme avoir pris connaissance des informations partagées par l'équipe de recherche.

Initiales : _____

Annexe G – Algorithme d'évaluation clinique de la lombalgie



Annexe H – Analyses de régression : facteurs associés au niveau d'accord entre les chiropraticiens et les neurochirurgiens (Article III)

Diagnostic disagreement

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	89	77,4
	Missing Cases	26	22,6
	Total	115	100,0
Unselected Cases		0	,0
Total		115	100,0

a. If weight is in effect, see classification table for the total number of cases

Dependant Variable Encoding

Original Value	Internal Value
Agreement	0
Disagreement	1

Categorical Variables Codings

		Frequency	Parameter coding (1)
Bilansensibilité 2	Abnormal	42	1,000
	Normal	47	,000
A-Incontinence	No	72	,000
	Yes	17	1,000
A-Retention	No	76	,000
	Yes	13	1,000
A-neurodeficit	No	68	,000
	Yes	21	1,000
A-Hx-trauma	No	69	,000
	Yes	20	1,000
Bilan-MOT	Abnormal	25	1,000
	Normal	64	,000
Bilan-ROT	Abnormal	26	1,000
	Normal	63	,000
A-dominantsite	Back	54	,000
	Leg	35	1,000

Block 0 : Beginning block

Classification Table[a,b]

Observed			Predicted: Dx agreement: Agreement	Predicted: Dx agreement: Disagreement	Percentage correct
Step 0	Dx agreement	Agreement	67	0	100,0
		Disagreement	22	0	,0
	Overall Percentage				75,3

a.Constant is included in the model.

b. The cut value is ,500

Variables in the Equation

		B	E.S	Wald	ddl	Sig.	Exp(B)
Step 0	Constant	-1,114	,246	20,540	1	<,001	,328

Variables not in the Equation

			Score	ddl	Sig.
Step 0	Variables	A-dominantsite (1)	3,374	1	,066
		A-Incontinence(1)	1,263	1	,261
		A-Retention (1)	6,941	1	,008
		A-neurodeficit(1)	,475	1	,491
		A-Hx-trauma(1)	,001	1	,974
		Bilan-ROT(1)	3,429	1	,064
		Bilan-MOT(1)	1,420	1	,233
		0-NRS_BP_Baseline	,000	1	,996
		0-NRS_LP_Baseline	,154	1	,695

	Bilansensibilité2(1)	1,375	1	,241
Overall Statistics		15,925	10	,102

Block 1 : Method = Backward Stepwise (Wald)

Omnibus Tests of Model Coefficients

		Chi-square	ddl	Sig.
Step 1	Step	17,141	10	,071
	Block	17,141	10	,071
	Model	17,141	10	,071
Step 2[a]	Step	-,045	1	,832
	Block	17,096	9	,047
	Model	17,096	9	,047
Step 3[a]	Step	-,143	1	,705
	Block	16,953	8	,031
	Model	16,953	8	,031
Step 4[a]	Step	-,286	1	,593
	Block	16,666	7	,020
	Model	16,666	7	,020
Step 5[a]	Step	-,390	1	,532
	Block	16,276	6	,012
	Model	16,276	6	,012
Step 6[a]	Step	-,446	1	,504
	Block	15,831	5	,007
	Model	15,831	5	,007
	Step	-,901	1	,342

Step 7[a]	Block	14,930	4	,005
	Model	14,930	4	,005
Step 8[a]	Step	-1,203	1	,273
	Block	13,727	3	,003
	Modèle	13,727	3	,003
Step 9[a]	Pas	-2,355	1	,125
	Block	11,372	2	,003
	Model	11,372	2	,003

Classification Table[a]

			Predicted		
			Dx agreement		
	Observed		Agreement	Disagreement	Percentage correct
Step 1	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3
	Overall Percentage				80,9
Step 2	Dx agreement	Agreement	65	2	97,0
		Disagreement	16	6	27,3
	Overall Percentage				79,8
Step 3	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3
	Overall Percentage				80,9
Step 4	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3
	Overall Percentage				80,9
Step 5	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3

	Overall Percentage				80,9
Step 6	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3
	Overall Percentage				80,9
Step 7	Dx agreement	Agreement	66	1	98,5
		Disagreement	16	6	27,3
	Overall Percentage				80,9
Step 8	Dx agreement	Agreement	65	2	97,0
		Disagreement	16	6	27,3
	Overall Percentage				79,8
Step 9	Dx agreement	Agreement	65	2	97,0
		Disagreement	16	6	27,3
	Overall Percentage				79,8

a. The cut value is ,500

Variables in the Equation

								95% Confidence Interval for EXP(B)	
		B	E.S	Wald	ddl	Sig.	Exp(B)	Inferior	Superior
Step 1[a]	A-dominantsite (1)	-,640	,679	,887	1	,346	,527	,139	1,996
	A-Incontinence(1)	,277	,774	,128	1	,720	1,319	,290	6,008
	A-Retention (1)	2,333	,900	6,718	1	,010	10,307	1,766	60,156
	A-neuro deficit(1)	-,799	,840	,905	1	,341	,450	,087	2,334
	A-Hx-trauma(1)	,505	,706	,512	1	,474	1,657	,415	6,617
	Bilan-ROT(1)	-1,284	,797	2,595	1	,107	,277	,058	1,321

	Bilan-MOT(1)	-,724	,733	,975	1	,323	,485	,115	2,041
	0-NRS_BP_Baseline	-,078	,146	,283	1	,595	,925	,695	1,232
	0-NRS_LP_Baseline	,029	,136	,045	1	,831	1,029	,788	1,345
	Bilansensibilité2(1)	-,448	,595	,568	1	,451	,639	,199	2,050
	Constant	-,395	,728	,295	1	,587	,674		
Step 2[a]	A-dominantsite (1)	-,598	,651	,844	1	,358	,550	,153	1,970
	A-Incontinence(1)	,294	,770	,146	1	,703	1,342	,296	6,072
	A-Retention (1)	2,347	,897	6,850	1	,009	10,451	1,803	60,584
	A-neurodeficit(1)	-,787	,840	,878	1	,349	,455	,088	2,362
	A-Hx-trauma(1)	,465	,680	,468	1	,494	1,592	,420	6,036
	Bilan-ROT(1)	-1,255	,782	2,576	1	,108	,285	,062	1,320
	Bilan-MOT(1)	-,726	,734	,979	1	,322	,484	,115	2,038
	0-NRS_BP_Baseline	-,061	,124	,244	1	,621	,941	,738	1,199
	Bilansensibilité2(1)	-,442	,593	,556	1	,456	,643	,201	2,054
	Constant	-,392	,728	,289	1	,591	,676		
Step 3[a]	A-dominantsite (1)	-,664	,627	1,123	1	,289	,515	,151	1,758
	A-Retention (1)	2,438	,876	7,748	1	,005	11,445	2,057	63,682
	A-neurodeficit (1)	-,706	,802	,775	1	,379	,494	,103	2,378
	A-Hx-trauma(1)	,468	,683	,469	1	,493	1,597	,419	6,090
	Bilan-ROT(1)	-1,299	,781	2,768	1	,096	,273	,059	1,260
	Bilan-MOT(1)	-,716	,736	,945	1	,331	,489	,115	2,070
	0-NRS_BP_Baseline	-,066	,123	,283	1	,595	,936	,735	1,193
	Bilansensibilité2(1)	-,399	,582	,470	1	,493	,671	,214	2,100
	Constant	-,329	,709	,215	1	,643	,720		
Step 4[a]	A-dominantsite (1)	-,608	,616	,973	1	,324	,545	,163	1,822
	A-Retention (1)	2,298	,818	7,898	1	,005	9,954	2,004	49,434
	A-neurodeficit(1)	-,760	,790	,925	1	,336	,468	,099	2,200
	A-Hx-trauma(1)	,422	,670	,398	1	,528	1,525	,411	5,666

	Bilan-ROT(1)	-1,332	,781	2,911	1	,088	,264	,057	1,219
	Bilan-MOT(1)	-,684	,727	,886	1	,346	,504	,121	2,096
	Bilansensibilité2(1)	-,405	,580	,489	1	,484	,667	,214	2,076
	Constant	-,633	,430	2,169	1	,141	,531		
Step 5[a]	A-dominantsite (1)	-,597	,615	,942	1	,332	,551	,165	1,838
	A-Retention (1)	2,219	,795	7,782	1	,005	9,198	1,935	43,731
	A-neurodeficit(1)	-,751	,788	,906	1	,341	,472	,101	2,214
	Bilan-ROT(1)	-1,289	,778	2,743	1	,098	,275	,060	1,267
	Bilan-MOT(1)	-,672	,724	,862	1	,353	,511	,124	2,110
	Bilansensibilité2(1)	-,383	,577	,440	1	,507	,682	,220	2,114
	Constant	-,553	,410	1,822	1	,177	,575		
Step 6[a]	A-dominantsite (1)	-,600	,613	,959	1	,327	,549	,165	1,824
	A-Retention (1)	2,203	,795	7,685	1	,006	9,052	1,907	42,974
	A-neurodeficit(1)	-,804	,788	1,042	1	,307	,448	,096	2,096
	Bilan-ROT(1)	-1,396	,766	3,323	1	,068	,248	,055	1,111
	Bilan-MOT(1)	-,657	,714	,845	1	,358	,519	,128	2,103
	Constant	-,679	,367	3,434	1	,064	,507		
Step 7[a]	A-dominantsite (1)	-,655	,610	1,154	1	,283	,519	,157	1,717
	A-Retention (1)	2,120	,783	7,326	1	,007	8,335	1,795	38,701
	A-neurodeficit(1)	-,930	,778	1,427	1	,232	,395	,086	1,814
	Bilan-ROT(1)	-1,433	,762	3,536	1	,060	,239	,054	1,062
	Constant	-,763	,356	4,589	1	,032	,466		
Step 8[a]	A-Retention (1)	2,225	,771	8,336	1	,004	9,254	2,043	41,910
	A-neurodeficit(1)	-1,078	,755	2,038	1	,153	,340	,078	1,495
	Bilan-ROT(1)	-1,606	,761	4,451	1	,035	,201	,045	,892
	Constant	-,939	,323	8,447	1	,004	,391		

Step 9[a]	A-Retention (1)	1,856	,692	7,192	1	,007	6,397	1,648	24,831
	Bilan-ROT(1)	-1,511	,737	4,197	1	,040	,221	,052	,937
	Constant	-1,115	,306	13,266	1	<,001	,328		

a. Variables entered on Step 1 : A-dominantsite , A-Incontinence, A-Retention , A-neurodeficit, A-Hx-trauma, Bilan-ROT, Bilan-MOT, 0-NRS_BP_Baseline, 0-NRS_LP_Baseline, Bilansensibilité2.

Variables not in the Equation

			Score	ddl	Sig.
Step 2[a]	Variables	0-NRS_LP_Baseline	,045	1	,831
	Overall Statistics		,045	1	,831
Step 3[b]	Variables	A-Incontinence(1)	,146	1	,702
		0-NRS_LP_Baseline	,062	1	,803
	Overall Statistics		,191	2	,909
Step 4[c]	Variables	A-Incontinence(1)	,186	1	,666
		0-NRS_BP_Baseline	,284	1	,594
		0-NRS_LP_Baseline	,005	1	,942
	Overall Statistics		,477	3	,924
Step 5[d]	Variables	A-Incontinence(1)	,176	1	,675
		A-Hx-trauma(1)	,401	1	,527
		0-NRS_BP_Baseline	,215	1	,643
		0-NRS_LP_Baseline	,032	1	,858
	Overall Statistics		,872	4	,928
Step 6[e]	Variables	A-Incontinence(1)	,082	1	,775
		A-Hx-trauma(1)	,348	1	,555
		0-NRS_BP_Baseline	,236	1	,627
		0-NRS_LP_Baseline	,046	1	,829
		Bilansensibilité2(1)	,442	1	,506

	Overall Statistics		1,307	5	,934
Step 7[f]	Variables	A-Incontinence(1)	,042	1	,838
		A-Hx-trauma(1)	,309	1	,579
		Bilan-MOT(1)	,862	1	,353
		0-NRS_BP_Baseline	,199	1	,656
		0-NRS_LP_Baseline	,036	1	,850
		Bilansensibilité2(1)	,422	1	,516
	Overall Statistics		2,141	6	,906
Step 8[g]	Variables	A-locdominante (1)	1,175	1	,278
		A-Incontinence(1)	,217	1	,641
		A-Hx-trauma(1)	,251	1	,616
		Bilan-MOT(1)	1,055	1	,304
		0-NRS_BP_Baseline	,067	1	,795
		0-NRS_LP_Baseline	,094	1	,759
		Bilansensibilité2(1)	,436	1	,509
	Overall Statistics		3,285	7	,857
Step 9[h]	Variables	A-locdominante (1)	1,900	1	,168
		A-Incontinence(1)	,044	1	,834
		A-déficitneuro(1)	2,134	1	,144
		A-Hx-trauma(1)	,171	1	,679
		Bilan-MOT(1)	1,719	1	,190
		0-NRS_BP_Baseline	,208	1	,649
		0-NRS_LP_Baseline	,437	1	,508
		Bilansensibilité2(1)	,768	1	,381
	Overall Statistics		5,144	8	,742

a. Variables removed on Step 2 : 0-NRS_LP_Baseline.

b. Variables removed on Step 3 : A-Incontinence.

c. Variables removed on Step 4 : 0-NRS_BP_Baseline.

d. Variables removed on Step 5 : A-Hx-trauma.

e. Variables removed on Step 6 : Bilansensibilité2.

f. Variables removed on Step 7 : Bilan-MOT.

g. Variables removed on Step 8 : A-dominantsite .

h. Variables removed on Step 9 : A-neurodeficit.

Management disagreement

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	74	73,3
	Missing Cases	27	26,7
	Total	101	100,0
Unselected Cases		0	,0
Total		101	100,0

a. If weight is in effect, see classification table for the total number of cases

Dependent Variable Encoding

Original Value	Internal Value
Agreement	0
Disagreement	1

Categorical Variables Codings

			Parameter coding			
		Frequency	(1)	(2)	(3)	(4)
education2	1	7	,000	,000	,000	,000
	2	23	1,000	,000	,000	,000

	3	15	,000	1,000	,000	,000
	4	16	,000	,000	1,000	,000
	5	13	,000	,000	,000	1,000
Dx	1	31	,000	,000		
	2	41	1,000	,000		
	5	2	,000	1,000		
0-SBST	Low	16	,000	,000		
	Moderate	30	1,000	,000		
	High	28	,000	1,000		
A-Progression	Stable	11	,000	,000		
	Improving	15	1,000	,000		
	Aggravating	48	,000	1,000		
income3	1	33	,000	,000		
	3	21	1,000	,000		
	4	20	,000	1,000		
A-Hx-tx	No	7	,000			
	Yes	67	1,000			
ass	No	35	,000			
	Yes	39	1,000			
sex	Male	38	,000			
	Female	36	1,000			

Block 0 : Beginning Block

Classification Table[a,b]

Observed			Predicted M_agreement		Percentage correct
			Agreement	Disagreement	
Pas 0	M_agreement	Agreement	62	0	100,0
		Disagreement	12	0	,0
	Overall Percentage				83,8

a. Constant is included in the model.

b. The cut value is ,500

Variables in the Equation

		B	E.S	Wald	ddl	Sig.	Exp(B)
Step 0	Constant	-1,642	,315	27,115	1	<,001	,194

Variables in the Equation

		B	E.S	Wald	ddl	Sig.	Exp(B)	95% Confidence Interval for EXP(B)	
								Inferior	Superior
Step 1[a]	sex(1)	1,155	1,615	,511	1	,475	3,174	,134	75,278
	age	,010	,050	,043	1	,836	1,010	,916	1,115
	ass(1)	-2,519	1,882	1,791	1	,181	,081	,002	3,224
	0-NRS_BP_Baseline	,317	,321	,977	1	,323	1,374	,732	2,578
	0-NRS_LP_Baseline	-,351	,239	2,148	1	,143	,704	,441	1,125
	0-SBST			3,423	2	,181			

	0-SBST(1)	1,168	1,793	,424	1	,515	3,215	,096	107,936
	0-SBST(2)	-1,790	1,928	,862	1	,353	,167	,004	7,312
	0-ODI (/100)	,071	,074	,930	1	,335	1,073	,929	1,240
	0-WHOQOL-Phys	,018	,044	,160	1	,689	1,018	,933	1,110
	0-WHOQOL-psycho	-,078	,050	2,383	1	,123	,925	,838	1,021
	0-WHOQOL-social	,019	,034	,297	1	,586	1,019	,953	1,090
	0-WHOQOL-enviro	,062	,061	1,012	1	,314	1,064	,943	1,199
	A-Progression			,130	2	,937			
	A-Progression(1)	,240	1,804	,018	1	,894	1,271	,037	43,654
	A-Progression(2)	-,288	1,386	,043	1	,835	,750	,050	11,341
	A-Hx-tx (1)	1,408	2,141	,433	1	,511	4,089	,062	271,467
	education2			5,081	4	,279			
	education2(1)	-2,783	2,262	1,513	1	,219	,062	,001	5,211
	education2(2)	-5,040	2,845	3,139	1	,076	,006	,000	1,709
	education2(3)	-1,175	2,178	,291	1	,589	,309	,004	22,042
	education2(4)	-24,830	8198,541	,000	1	,998	,000	,000	.
	income3			2,995	2	,224			
	income3(1)	-1,275	1,736	,540	1	,463	,279	,009	8,391
	income3(2)	3,344	2,635	1,611	1	,204	28,330	,162	4955,881
	Dx			,118	2	,943			
	Dx(1)	,390	1,137	,118	1	,731	1,478	,159	13,708
	Dx(2)	-11,812	27229,882	,000	1	1,000	,000	,000	.
	Constant	-6,186	6,390	,937	1	,333	,002		
Step 2[a]	sex(1)	1,109	1,565	,502	1	,479	3,032	,141	65,204
	age	,010	,049	,041	1	,839	1,010	,917	1,113

	ass(1)	-2,594	1,906	1,852	1	,174	,075	,002	3,133
	0-NRS_BP_Baseline	,295	,317	,867	1	,352	1,344	,721	2,503
	0-NRS_LP_Baseline	-,334	,231	2,092	1	,148	,716	,455	1,126
	0-SBST			3,376	2	,185			
	0-SBST(1)	1,132	1,802	,395	1	,530	3,103	,091	106,067
	0-SBST(2)	-1,695	1,949	,756	1	,384	,184	,004	8,370
	0-ODI (/100)	,076	,071	1,163	1	,281	1,079	,939	1,240
	0-WHOQOL-Phys	,023	,042	,315	1	,574	1,024	,944	1,110
	0-WHOQOL-psycho	-,075	,050	2,285	1	,131	,928	,841	1,023
	0-WHOQOL-social	,021	,034	,371	1	,542	1,021	,955	1,091
	0-WHOQOL-enviro	,060	,061	,984	1	,321	1,062	,943	1,196
	A-Progression			,171	2	,918			
	A-Progression(1)	,109	1,728	,004	1	,950	1,115	,038	32,996
	A-Progression(2)	-,420	1,315	,102	1	,749	,657	,050	8,645
	A-Hx-tx (1)	1,134	1,925	,347	1	,556	3,109	,071	135,314
	education2			4,988	4	,289			
	education2(1)	-2,565	2,126	1,455	1	,228	,077	,001	4,966
	education2(2)	-4,961	2,797	3,145	1	,076	,007	,000	1,685
	education2(3)	-1,073	2,097	,262	1	,609	,342	,006	20,826
	education2(4)	-24,503	8105,256	,000	1	,998	,000	,000	.
	income3			3,035	2	,219			
	income3(1)	-1,218	1,729	,497	1	,481	,296	,010	8,756
	income3(2)	3,455	2,666	1,680	1	,195	31,664	,170	5887,665
	Constant	-6,349	6,347	1,001	1	,317	,002		
Step 3[a]	sex(1)	,767	1,304	,346	1	,556	2,154	,167	27,733
	age	,013	,049	,068	1	,794	1,013	,920	1,115

	ass(1)	-2,225	1,641	1,839	1	,175	,108	,004	2,693
	0-NRS_BP_Baseline	,258	,271	,905	1	,341	1,294	,761	2,203
	0-NRS_LP_Baseline	-,304	,216	1,972	1	,160	,738	,483	1,128
	0-SBST			3,590	2	,166			
	0-SBST(1)	1,364	1,676	,663	1	,416	3,913	,147	104,481
	0-SBST(2)	-1,505	1,809	,693	1	,405	,222	,006	7,689
	0-ODI (/100)	,067	,065	1,087	1	,297	1,070	,943	1,214
	0-WHOQOL-Phys	,026	,040	,415	1	,519	1,026	,949	1,109
	0-WHOQOL-psycho	-,079	,049	2,597	1	,107	,924	,840	1,017
	0-WHOQOL-social	,021	,033	,395	1	,530	1,021	,957	1,090
	0-WHOQOL-enviro	,056	,058	,950	1	,330	1,058	,945	1,185
	A-Hx-tx (1)	1,153	1,946	,351	1	,554	3,167	,070	143,490
	education2			5,032	4	,284			
	education2(1)	-2,285	1,837	1,548	1	,214	,102	,003	3,726
	education2(2)	-4,553	2,480	3,371	1	,066	,011	,000	1,359
	education2(3)	-,794	1,859	,182	1	,669	,452	,012	17,287
	education2(4)	-23,620	8667,036	,000	1	,998	,000	,000	.
	income3			2,969	2	,227			
	income3(1)	-1,352	1,653	,669	1	,413	,259	,010	6,601
	income3(2)	2,978	2,221	1,797	1	,180	19,649	,253	1528,189
	Constant	-6,205	5,760	1,160	1	,281	,002		
Step 4[a]	sex(1)	,919	1,184	,603	1	,437	2,508	,246	25,514
	ass(1)	-2,337	1,606	2,118	1	,146	,097	,004	2,249
	0-NRS_BP_Baseline	,240	,259	,858	1	,354	1,272	,765	2,115
	0-NRS_LP_Baseline	-,318	,208	2,349	1	,125	,727	,484	1,093
	0-SBST			4,082	2	,130			

	0-SBST(1)	1,340	1,672	,642	1	,423	3,819	,144	101,226
	0-SBST(2)	-1,358	1,690	,646	1	,422	,257	,009	7,059
	0-ODI (/100)	,073	,060	1,477	1	,224	1,076	,956	1,211
	0-WHOQOL-Phys	,026	,039	,432	1	,511	1,026	,950	1,108
	0-WHOQOL-psycho	-,077	,048	2,627	1	,105	,926	,843	1,016
	0-WHOQOL-social	,021	,033	,405	1	,524	1,021	,957	1,089
	0-WHOQOL-enviro	,063	,051	1,566	1	,211	1,066	,965	1,177
	A-Hx-tx (1)	1,210	1,953	,384	1	,535	3,355	,073	154,173
	education2			5,026	4	,285			
	education2(1)	-2,409	1,783	1,826	1	,177	,090	,003	2,958
	education2(2)	-4,794	2,335	4,213	1	,040	,008	,000	,805
	education2(3)	-1,093	1,493	,536	1	,464	,335	,018	6,250
	education2(4)	-24,241	8479,953	,000	1	,998	,000	,000	.
	income3			4,096	2	,129			
	income3(1)	-1,572	1,432	1,206	1	,272	,208	,013	3,435
	income3(2)	3,040	2,224	1,870	1	,171	20,915	,268	1633,454
	Constant	-6,047	5,717	1,119	1	,290	,002		
Step 5[a]	sex(1)	1,113	1,136	,960	1	,327	3,042	,328	28,176
	ass(1)	-2,475	1,590	2,422	1	,120	,084	,004	1,900
	0-NRS_BP_Baseline	,271	,256	1,120	1	,290	1,312	,794	2,169
	0-NRS_LP_Baseline	-,305	,204	2,240	1	,135	,737	,494	1,099
	0-SBST			3,751	2	,153			
	0-SBST(1)	1,026	1,567	,429	1	,513	2,790	,129	60,167
	0-SBST(2)	-1,441	1,686	,730	1	,393	,237	,009	6,450
	0-ODI (/100)	,072	,060	1,426	1	,232	1,074	,955	1,209
	0-WHOQOL-Phys	,028	,040	,515	1	,473	1,029	,952	1,112
	0-WHOQOL-psycho	-,078	,049	2,495	1	,114	,925	,840	1,019

	0-WHOQOL-social	,026	,032	,660	1	,417	1,027	,963	1,094
	0-WHOQOL-enviro	,061	,050	1,482	1	,223	1,063	,963	1,174
	education2			5,045	4	,283			
	education2(1)	-2,482	1,728	2,062	1	,151	,084	,003	2,474
	education2(2)	-4,883	2,280	4,587	1	,032	,008	,000	,661
	education2(3)	-1,306	1,400	,870	1	,351	,271	,017	4,210
	education2(4)	-24,505	8465,599	,000	1	,998	,000	,000	.
	income3			4,111	2	,128			
	income3(1)	-1,205	1,272	,897	1	,343	,300	,025	3,627
	income3(2)	3,522	2,159	2,662	1	,103	33,869	,492	2330,942
	Constant	-5,337	5,607	,906	1	,341	,005		
Step 6[a]	sex(1)	1,109	1,135	,953	1	,329	3,030	,327	28,042
	ass(1)	-2,261	1,494	2,291	1	,130	,104	,006	1,948
	0-NRS_BP_Baseline	,244	,253	,930	1	,335	1,277	,777	2,098
	0-NRS_LP_Baseline	-,296	,202	2,156	1	,142	,744	,501	1,104
	0-SBST			3,829	2	,147			
	0-SBST(1)	,824	1,538	,287	1	,592	2,279	,112	46,427
	0-SBST(2)	-1,606	1,626	,976	1	,323	,201	,008	4,856
	0-ODI (/100)	,047	,049	,937	1	,333	1,049	,953	1,154
	0-WHOQOL-psycho	-,068	,044	2,385	1	,123	,934	,856	1,019
	0-WHOQOL-social	,028	,032	,744	1	,389	1,028	,965	1,095
	0-WHOQOL-enviro	,056	,047	1,412	1	,235	1,057	,964	1,159
	education2			4,676	4	,322			
	education2(1)	-2,097	1,601	1,716	1	,190	,123	,005	2,832
	education2(2)	-4,312	2,092	4,248	1	,039	,013	,000	,810
	education2(3)	-,975	1,295	,566	1	,452	,377	,030	4,779

	education2(4)	-23,674	8826,398	,000	1	,998	,000	,000	.
	income3			3,927	2	,140			
	income3(1)	-1,269	1,270	,999	1	,318	,281	,023	3,385
	income3(2)	2,805	1,816	2,387	1	,122	16,533	,471	580,658
	Constant	-3,261	4,554	,513	1	,474	,038		
Step 7[a]	sex(1)	1,067	1,127	,896	1	,344	2,907	,319	26,473
	ass(1)	-2,410	1,487	2,626	1	,105	,090	,005	1,656
	0-NRS_BP_Baseline	,198	,244	,663	1	,416	1,219	,756	1,965
	0-NRS_LP_Baseline	-,274	,198	1,909	1	,167	,760	,515	1,122
	0-SBST			3,441	2	,179			
	0-SBST(1)	,519	1,461	,126	1	,722	1,680	,096	29,425
	0-SBST(2)	-1,578	1,615	,954	1	,329	,206	,009	4,891
	0-ODI (/100)	,050	,049	1,039	1	,308	1,051	,955	1,157
	0-WHOQOL-psycho	-,049	,035	1,956	1	,162	,952	,890	1,020
	0-WHOQOL-enviro	,057	,047	1,519	1	,218	1,059	,967	1,160
	education2			4,165	4	,384			
	education2(1)	-1,843	1,563	1,390	1	,238	,158	,007	3,390
	education2(2)	-3,733	1,937	3,713	1	,054	,024	,001	1,066
	education2(3)	-,865	1,275	,461	1	,497	,421	,035	5,123
	education2(4)	-23,250	9147,426	,000	1	,998	,000	,000	.
	income3			3,376	2	,185			
	income3(1)	-,936	1,193	,615	1	,433	,392	,038	4,066
	income3(2)	2,632	1,810	2,114	1	,146	13,906	,400	483,199
	Constant	-2,674	4,453	,361	1	,548	,069		
	sex(1)	,980	1,093	,804	1	,370	2,666	,313	22,714

Step 8[a]	ass(1)	-2,158	1,441	2,241	1	,134	,116	,007	1,949
	0-NRS_LP_Baseline	-,230	,193	1,413	1	,235	,795	,544	1,161
	0-SBST			3,459	2	,177			
	0-SBST(1)	,744	1,419	,275	1	,600	2,104	,130	33,952
	0-SBST(2)	-1,304	1,527	,730	1	,393	,271	,014	5,408
	0-ODI (/100)	,063	,046	1,935	1	,164	1,066	,974	1,165
	0-WHOQOL-psycho	-,040	,032	1,574	1	,210	,961	,903	1,023
	0-WHOQOL-enviro	,059	,046	1,620	1	,203	1,060	,969	1,160
	education2			3,666	4	,453			
	education2(1)	-1,480	1,482	,997	1	,318	,228	,012	4,157
	education2(2)	-3,479	1,925	3,266	1	,071	,031	,001	1,342
	education2(3)	-,795	1,269	,393	1	,531	,452	,038	5,429
	education2(4)	-23,015	9145,688	,000	1	,998	,000	,000	.
	income3			3,494	2	,174			
	income3(1)	-1,134	1,161	,955	1	,328	,322	,033	3,128
	income3(2)	2,401	1,780	1,819	1	,177	11,031	,337	361,352
	Constant	-3,327	4,228	,619	1	,431	,036		
Step 9[a]	sex(1)	-,277	,776	,128	1	,721	,758	,165	3,471
	ass(1)	-1,018	,998	1,039	1	,308	,361	,051	2,557
	0-NRS_LP_Baseline	-,141	,172	,676	1	,411	,868	,620	1,216
	0-SBST			4,259	2	,119			
	0-SBST(1)	,489	,987	,246	1	,620	1,631	,236	11,284
	0-SBST(2)	-1,716	1,257	1,863	1	,172	,180	,015	2,113
	0-ODI (/100)	,032	,033	,932	1	,334	1,033	,967	1,103
	0-WHOQOL-psycho	-,023	,029	,603	1	,437	,978	,924	1,035
	0-WHOQOL-enviro	-,002	,031	,003	1	,955	,998	,940	1,060

	income3			1,592	2	,451			
	income3(1)	-1,119	,989	1,279	1	,258	,327	,047	2,270
	income3(2)	,142	1,127	,016	1	,900	1,153	,126	10,503
	Constant	,191	3,500	,003	1	,957	1,210		
Step 10[a]	sex(1)	-,282	,773	,133	1	,715	,754	,166	3,432
	ass(1)	-1,020	,998	1,046	1	,307	,361	,051	2,548
	0-NRS_LP_Baseline	-,140	,171	,672	1	,412	,869	,622	1,215
	0-SBST			4,264	2	,119			
	0-SBST(1)	,496	,981	,255	1	,614	1,641	,240	11,232
	0-SBST(2)	-1,707	1,246	1,876	1	,171	,181	,016	2,087
	0-ODI (/100)	,033	,033	,985	1	,321	1,033	,969	1,102
	0-WHOQOL-psycho	-,023	,028	,654	1	,419	,977	,924	1,033
	income3			1,595	2	,450			
	income3(1)	-1,120	,989	1,282	1	,258	,326	,047	2,267
	income3(2)	,142	1,128	,016	1	,900	1,152	,126	10,511
	Constant	,064	2,679	,001	1	,981	1,066		
Step 11[a]	ass(1)	-1,039	,983	1,116	1	,291	,354	,051	2,431
	0-NRS_LP_Baseline	-,160	,161	,984	1	,321	,852	,621	1,169
	0-SBST			4,150	2	,126			
	0-SBST(1)	,453	,972	,217	1	,641	1,573	,234	10,577
	0-SBST(2)	-1,711	1,249	1,876	1	,171	,181	,016	2,090
	0-ODI (/100)	,036	,032	1,304	1	,253	1,037	,975	1,103
	0-WHOQOL-psycho	-,020	,027	,546	1	,460	,980	,929	1,034
	income3			1,722	2	,423			
	income3(1)	-1,142	,987	1,339	1	,247	,319	,046	2,208
	income3(2)	,169	1,114	,023	1	,880	1,184	,133	10,514

	Constant	-,264	2,529	,011	1	,917	,768		
Step 12[a]	ass(1)	-,985	,979	1,011	1	,315	,374	,055	2,545
	0-NRS_LP_Baseline	-,168	,158	1,122	1	,290	,846	,620	1,153
	0-SBST			3,695	2	,158			
	0-SBST(1)	,403	,955	,178	1	,673	1,496	,230	9,716
	0-SBST(2)	-1,518	1,222	1,542	1	,214	,219	,020	2,406
	0-ODI (/100)	,047	,029	2,643	1	,104	1,048	,990	1,108
	income3			1,624	2	,444			
	income3(1)	-1,093	,972	1,264	1	,261	,335	,050	2,253
	income3(2)	,160	1,115	,021	1	,886	1,173	,132	10,435
	Constant	-1,974	1,119	3,114	1	,078	,139		
Step 13[a]	ass(1)	-,890	,716	1,545	1	,214	,411	,101	1,671
	0-NRS_LP_Baseline	-,151	,151	1,002	1	,317	,860	,640	1,156
	0-SBST			3,268	2	,195			
	0-SBST(1)	-,003	,889	,000	1	,997	,997	,174	5,699
	0-SBST(2)	-1,705	1,189	2,057	1	,152	,182	,018	1,869
	0-ODI (/100)	,045	,028	2,648	1	,104	1,046	,991	1,105
	Constant	-1,996	1,054	3,590	1	,058	,136		
Step 14[a]	ass(1)	-,736	,697	1,114	1	,291	,479	,122	1,878
	0-SBST			3,310	2	,191			
	0-SBST(1)	-,246	,854	,083	1	,774	,782	,147	4,172
	0-SBST(2)	-1,888	1,180	2,561	1	,110	,151	,015	1,528
	0-ODI (/100)	,033	,025	1,851	1	,174	1,034	,985	1,085
	Constant	-2,028	1,037	3,827	1	,050	,132		
Step 15[a]	0-SBST			4,052	2	,132			
	0-SBST(1)	-,128	,832	,024	1	,878	,880	,172	4,496

	0-SBST(2)	-1,973	1,173	2,826	1	,093	,139	,014	1,387
	0-ODI (/100)	,035	,024	2,069	1	,150	1,036	,987	1,086
	Constant	-2,453	,975	6,331	1	,012	,086		
Step 16[a]	0-SBST			2,621	2	,270			
	0-SBST(1)	,277	,772	,128	1	,720	1,319	,290	5,993
	0-SBST(2)	-1,099	,974	1,272	1	,259	,333	,049	2,249
	Constant	-1,466	,641	5,241	1	,022	,231		
Step 17[a]	Constant	-1,642	,315	27,115	1	<,001	,194		

a. Variables entered on Step 1 : sex, age, ass, 0-NRS_BP_Baseline, 0-NRS_LP_Baseline, 0-SBST, 0-ODI (/100), 0-WHOQOL-Phys, 0-WHOQOL-psycho, 0-WHOQOL-social , 0-WHOQOL-enviro, A-Progression, A-Hx-tx , education2, income3, Dx.