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Assessing online patient education materials for major lower extremity amputation

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ABSTRACT

Objective: The aim of the study was to assess the readability, quality, transparency, and clinical content of online patient education materials related to major lower extremity amputation (LEA) due to vascular disease.

Methods: We conducted a descriptive audit of online patient education materials on major LEA due to vascular disease. Using Google Chrome Incognito mode, we searched eight search terms ("leg amputation," "below-knee amputation," "above-knee amputation," "amputation for poor circulation," "amputation for peripheral artery disease," "vascular surgery leg amputation," "diabetic leg amputation," "foot amputation surgery") and reviewed the first 30 results per term to identify relevant websites and patient education. Readability was assessed using five validated tools (Flesch-Kincaid, Gunning Fog, SMOG, Coleman-Liau, Automated Readability index). Quality was assessed using JAMA and DISCERN criteria. Content was analyzed for key clinical elements.

Results: Of 240 websites screened, 58 were included. Mean readability scores exceeded the recommended sixth-grade level: Flesch-Kincaid (10.47), Gunning Fog (12.55), SMOG (12.95), Coleman Liau (10.83), Automated readability index (9.86). The average JAMA Benchmark score was 1.54/4, with 59% reporting currency, 36% disclosure, 33% reporting authorship, and 26% attribution. DISCERN scores averaged 46.8/80 ("fair" quality). Content coverage of key clinical concepts was low: 26% reported alternative procedures, 33% reported surgical risks, 41% operation description, 50% quality of life, 67% prosthetics/mobility aids, 74% postoperative care, and 74% indications. DISCERN and content scores were moderately correlated ($r = 0.5$), Flesch-Kincaid and SMOG were highly correlated ($r = 1.0$). Quality and readability scores were uncorrelated, suggesting reliable sources may remain hard to understand.

Conclusions: Despite the burden of major LEA, online patient education resources often have low readability and quality and lack critical content. There is an urgent need to develop high-quality, accessible materials to support education and shared decision-making. (J Vasc Surg 2026;84:189-97.)

Keywords: Lower extremity amputation; Online health information; Patient education; Peripheral arterial disease; Website

Peripheral arterial disease affects over 236 million people globally.[1] Major lower extremity amputation (LEA), defined as an amputation above or at the ankle, has been shown to account for up to 55,000 vascular amputations per year,[2] and 90% to 96% of major LEAs are due to vascular disease.[3] With a projected 220% rise in the global prevalence of peripheral arterial disease[4] and a 60% rise in the prevalence of diabetes[5] by 2050, one can expect these numbers to increase. This is particularly important given the wide-ranging impact that major LEAs can have on an individual's quality of life. Major LEAs have been associated with physical disability, mental health challenges, financial struggles, relationship changes, and lifestyle disruptions.[3]

Given the substantial implications on quality of life, and the limited time with health care practitioners, patients and caregivers often turn to the internet for additional information. In fact, up to two-thirds of patients use the internet for health care-related information.[6] Furthermore, 62% of patients have indicated their desire for physicians to provide them with online material to learn more about their disease.[7] Despite the widespread availability of disease-related information on the internet, it often requires health literacy above the average patient's level.[8] For patients, it is recommended that material be at the level of a sixth grader for appropriate understanding.[9-11]

Studies have assessed the readability of online patient materials for vascular conditions such as carotid disease,

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abdominal aortic aneurysm, and peripheral arterial disease, all concluding that readability levels are above recommended standards, resulting in difficulty for patients' understanding.[12-14] However, to date no study has assessed online patient-related information for major LEA. Given the profound impact on patients' lives and the increase in online health information, it is crucial to understand the material patients may encounter outside a hospital setting. The present study aims to assess the readability, transparency, quality, and content of online patient-directed materials related to major LEA, with the goal of informing strategies to improve patient-centered communication and education.

ARTICLE HIGHLIGHTS

- **Type of Research:** Retrospective observational cross-sectional study
- **Key Findings:** Among 58 patient education websites on major lower extremity amputation due to vascular disease, mean readability exceeded sixth-grade level. The average DISCERN quality score was 46.8/80, and mean JAMA Benchmark transparency score was 1.5 of 4. Only 33% of websites reported surgical risks, 26% reported alternative procedures, and 41% operation description.
- **Take Home Message:** Online patient education materials for major lower extremity amputation due to vascular disease are often difficult to read, lack transparency, are of low quality, and omit critical clinical content, underscoring the need for standardized, patient-centered resources.

METHODS

Design. This study was designed as an audit evaluating the readability, content, transparency, and quality of publicly available online patient education material related to major LEAs performed for vascular conditions. No ethical approval was required, as all materials were publicly accessible.

In the absence of a standardized methodological framework for evaluating the readability and quality of online patient education materials, we adopted the framework of a clinical audit. Although traditionally used to assess clinical care, the audit model was adapted here as a structural framework to assess patient education materials. A clinical audit involves the following sequential steps: (1) topic identification; (2) determining consensus-based practices; (3) establishing criteria and benchmarks; (4) data collection; (5) data analysis; (6) implementing improvements; (7) audit repetition; and (8) documentation of audit findings.[15]

To determine consensus-based practice (step 2), we reviewed previously published studies that evaluated online patient education materials across various medical specialities.[14,16-19] To determine criteria and benchmarks (step 3), the authors included the most frequently used validated tools in similar studies. Although no formal standard exists for this type of analysis, these studies provide methodological precedents that are consistent and well-validated. Our approach was therefore aligned with the most frequently used and reproducible methods described in the literature. To ensure transparency and reproducibility in the search, screening, and selection of materials, the process was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines.[20] Although implementing improvements (step 6) and audit repetition (step 7) were not feasible within the scope of this project, areas for improvement are discussed in the Discussion section, and the potential for a future reaudit following such changes would be possible if suggested changes are applied.

Search strategy. A web-based search was conducted in English on Google (Incognito mode) on June 1, 2025. Searches were performed in English to reflect the language used in the majority of online patient education materials[21] and to ensure consistency in readability and quality assessments, which are influenced by linguistic and grammatical structure.

Google was used as it accounts for 90% of internet searches worldwide.[22] Incognito mode, freely accessible to all users, was used in the present study to minimize personalization and bias by limiting Google's tailoring of results based on individuals prior browsing history, geographic location, or search behaviors. The following eight search terms were used: "leg amputation," "below-knee amputation," "above-knee amputation," "amputation for poor circulation," "amputation for peripheral artery disease," "vascular surgery leg amputation," "diabetic leg amputation," and "foot amputation surgery." These terms were selected to reflect commonly used patient language as encountered by the authors of this study and to capture major clinical indications for major vascular LEAs. Similar patient-oriented terminology and methodology has been used in prior studies evaluating online health information and readability.[14,23-25] For each search term, the first 30 unique results were extracted as 92% of internet users do not go beyond these results.[26]

Inclusion/exclusion. Included websites were limited to the English language, freely accessible, directed to patients or caregivers, and containing educational information about major LEA related to vascular disease. Websites were determined to be directed to patients or caregivers if they were freely accessible, and if their audience was explicitly stated or if their contents, tone, language, and structure reflected a nonmedical audience.

Table I. Description of included readability and quality assessment tools for patient education materials

Tool	Variable/criteria	Output scale	Interpretation
FKGL	Words per sentence, syllables per word	U.S. grade level	Lower = easier to read
FKRES	Words per sentence, syllables per word	0-100	Higher = easier to read
GFI	Sentence length, complex word frequency	U.S. grade level	Lower = easier to read
SMOG Index	Polysyllabic words	U.S. grade level	Lower = easier to read
CLI Index	Characters per word, words per sentence	U.S. grade level	Lower = easier to read
ARI Index	Characters per word, words per sentence	U.S. grade level	Lower = easier to read
DISCERN	16-item questionnaire evaluating readability and quality of information	15-80 (or 1-5 per item)	Higher = higher quality
JAMA Benchmark	Authorship, attribution, disclosure, and currency	0-4	Higher = greater transparency

ARI, Automated Readability Index; *CLI*, Coleman-Liau Index; *DISCERN*, DISCERN Instrument; *FKGL*, Flesch-Kincaid Grade Level; *FKRES*, Flesch-Kincaid Reading Ease Score; *GFI*, Gunning Fog Index; *JAMA Benchmark*, JAMA Benchmark Criteria; *U.S.*, United States.

Major LEA was defined as any surgical removal of lower limb at the level of the ankle or more proximal.[27] Minor amputations such as toe or partial foot were excluded. Patient-facing websites produced by academic or hospital institutions were eligible and included when they met these criteria; however, websites consisting primarily of clinician-focused academic content (eg, journal articles or professional guidelines), blogs, advertisements, videos, and social media posts were excluded. These formats differ in purpose, authorship, and structure from formal patient education materials, and inclusion would limit the validity of standardized assessment tools as they are often promotional or user-generated content. Although patients may encounter these types of material during online searches, their inclusion would introduce substantial heterogeneity and reduce comparability of our results and were thus excluded. The selection was done by two reviewers (B.L. and K.E.).

Readability, quality, transparency, and content analysis. Readability was assessed using six validated tools that are commonly used in similar studies: Flesch-Kincaid Grade Level, Flesch Reading Ease Score, Gunning Fog Index, SMOG Index, Coleman-Liau, and the Automated readability Index (Supplementary Table I, online only). Each formula estimates the education level required to comprehend a text by analyzing sentence and word complexity. These readability tools were informed by a systematic review of systematic reviews, identifying them as commonly used to validate patient education materials.[28] As they represent some of the most frequently applied English-language readability formulas and each assess different aspects of text complexity, such as syllable count, character count, and sentence length, their combined use provides a more comprehensive estimate of the reading level required to understand the material. First, the website transparency was assessed by two independent reviewers (B.L., K.E.) using the JAMA benchmark criteria evaluating whether the webpage indicated authorship, references, conflicts of interest, and publication/update date.[29] Then, the quality was further assessed by the same two reviewers using the DISCERN instrument, a validated 16-question tool that rates the quality of written health information with a particular focus on treatment options, with total scores categorized from "very poor" to "excellent"[30] (Table I). As no validated instrument exists for evaluating content of online patient materials on LEA, a seven-item checklist was developed by the research team. The checklist was informed by the Canadian Medical Protective Association's guidelines on information to include during patient consent,[31] the key domains of informed consent outlines in contemporary frameworks for surgical communication,[32] and expert medical opinion of the senior authors. Content was analyzed by the same two reviewers as "yes" or "no" based on whether key terms were present on the website. Content items included information related to: (1) Indications for amputation; (2) Description of surgical procedure; (3) Postoperative care and rehabilitation; (4) Prosthesis or mobility aids; (5) Psychological or quality of life implications; (6) Alternative treatments for LEA; and (7) Surgical risks/complications. Discrepancies were resolved by consensus.

Statistical analysis. Descriptive statistics (mean, median, range, standard deviation, percentages) were used to summarize readability scores for readability indexes, quality scores, and content analysis. Duplicates were removed from the overall analysis to avoid overrepresentation. A subgroup analysis was conducted to evaluate

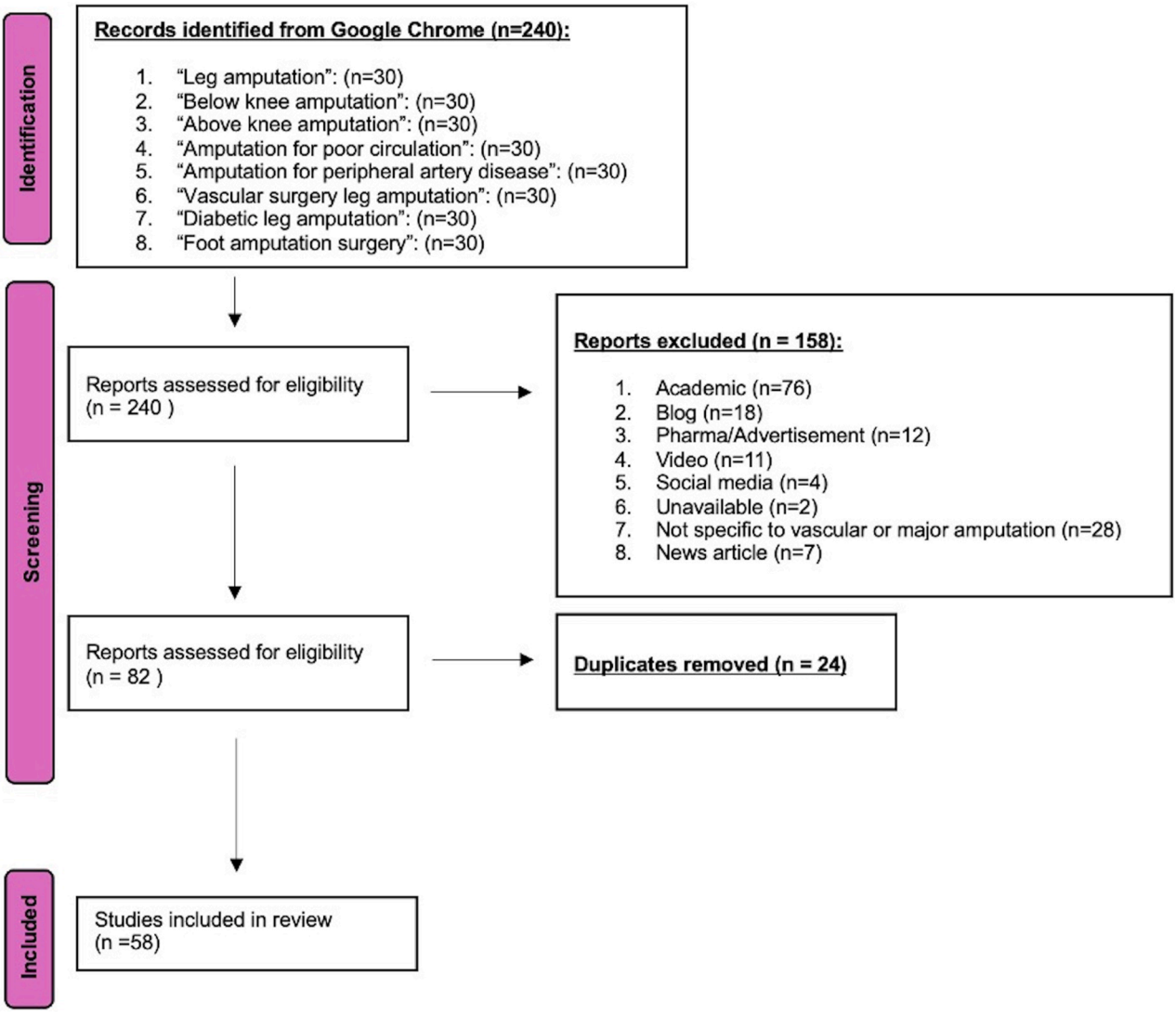


Fig 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram outlining website selection process.

readability, quality, and content outcomes for each individual search term. This analysis included duplicate websites to ensure that results accurately reflected the relative performance of each search term, given that some websites appeared across multiple searches. Pearson correlation coefficients (r) were calculated using Microsoft Excel to describe the linear relationships between different measured indices. Flesch-Kincaid Grade Level and SMOG were used as representative readability indices in the Pearson correlation because all six readability tools yielded similar patterns, and these two are among the most commonly used and interpretable grade-level measures in health literacy research.

RESULTS

Across all search terms, 240 websites were screened; 158 were excluded according to the prespecified criteria and 24 duplicates were removed, leaving 58 unique patient-directed websites included in the analysis (Fig 1; Supplementary Table II [online only]).

Readability. Mean readability scores exceeded the recommended sixth-grade level for patient education materials. The mean grade levels per readability index were: 10.5 ± 3.8 for Flesch-Kincaid Grade Level, 12.6 ± 3.2 for Gunning Fog, 13 ± 2.8 for SMOG Index, 10.9 ± 2.6 for Coleman Liau, and 9.9 ± 3.5 for Automated Readability Index (Fig 2). Only 27% (16/58) met the sixth-grade or lower threshold according to the Flesch-Kincaid Grade Level, with scores ranging from 5.4 to 23.

Quality/transparency. Quality, as assessed by JAMA Benchmark criteria[29] was overall poor, with websites meeting an average 1.5 of four criteria. Only 15 websites (26%) referenced where they obtained their information,

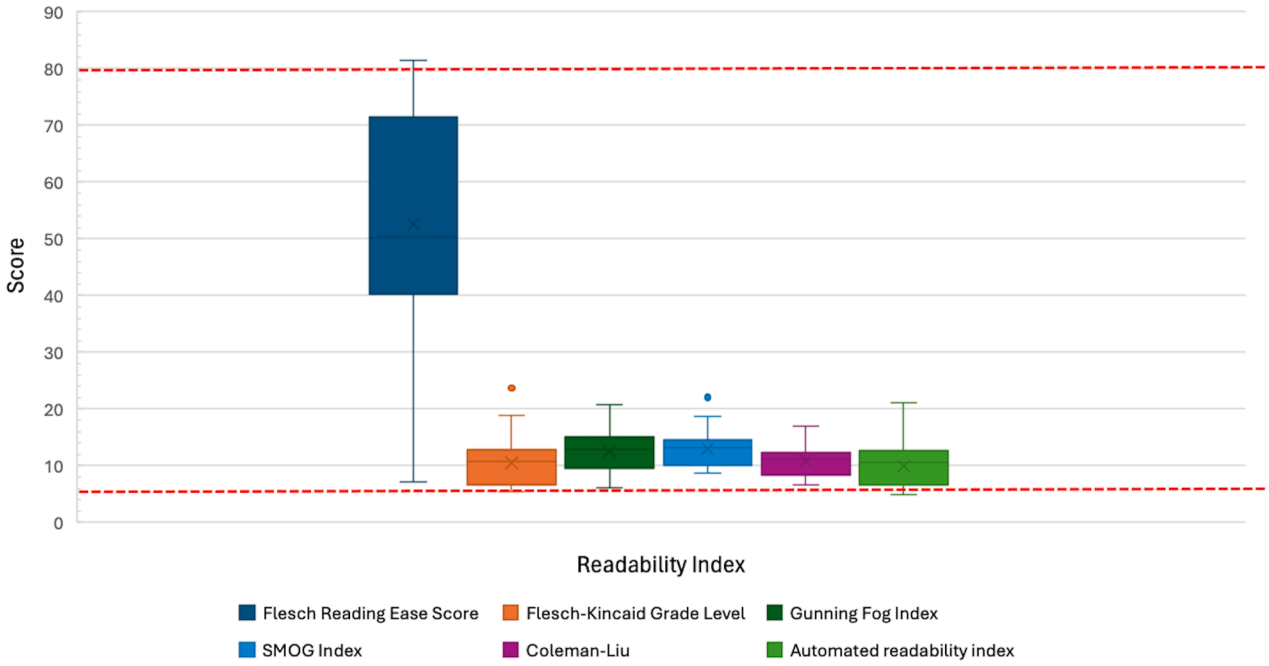


Fig 2. Distribution of readability index score across websites. *Red dotted line* at 80 is approximate grade six level for Flesch reading ease score (lower = more advanced grade level). *Red dotted line* at six = grade six level for other scores (higher = more advanced grade level).

19 (33%) reported authorship, 21 (36%) disclosed conflicts of interest, and 34 (59%) indicated when their website was published and/or updated. Notably, 10 websites (17%) did not report any of the JAMA criteria, whereas only five (8%) met all four criteria.

The average quality of websites as per DISCERN criteria was 46.8, which is considered fair (41-51). Two websites (3%) were considered very poor quality, 10 (17%) were considered poor quality, 34 (59%) were considered fair quality, 10 (17%) were considered good quality, and 2 (3%) were considered excellent quality. The least frequently reported measure with an average score of 1.9/5 was "does it provide support for shared decision-making" and the most reported measure with an average score of 4.8 was "are the aims clear." A breakdown of average scores per individual DISCERN item is represented in (Fig 3).

Content. The mean content score across all included websites was 3.7 of 7. Forty-three websites (74%) mentioned indications for amputation, 43 websites (74%) mentioned postoperative care and rehabilitation, 39 websites (67%) mentioned information about prosthetics and mobility aids, 29 websites (50%) discussed psychological and quality of life implications, 24 websites (41%) described the surgical procedure, 19 websites (33%) mentioned surgical risks/complications, and only 15 websites (26%) indicated alternatives to major LEA.

Correlations. Pearson correlation coefficients were used to assess the relationships between website quality (DISCERN score), transparency (JAMA benchmark score), content coverage, and readability indices (eg, Flesch-Kincaid Grade Level, SMOG). DISCERN and JAMA scores showed a weak positive correlation ($r = 0.20$). DISCERN was moderately positively correlated with content score ($r = 0.50$), whereas correlations between DISCERN and both readability indexes were weak ($r = 0.10$ for both). JAMA scores were negatively correlated with content ($r = -0.20$), and both readability scores ($r = -0.20$). Content scores correlated weakly with both Flesch-Kincaid ($r = 0.10$) and SMOG ($r = 0.10$). Finally, Flesch-Kincaid and SMOG readability measures were strongly correlated ($r = 1.0$) (Fig 4).

Subgroup analysis. The readability of online materials varied across subgroups with "foot amputation surgery" having the lowest average Flesch-Kincaid Grade Level (8.9), compared with "diabetic leg amputation" with the highest (12.2). Quality assessment using DISCERN criteria also differed between subgroups. The highest DISCERN average was observed for "below-knee amputations" (53.5 ± 9.5), with the lowest for "above-knee amputations" (42.4 ± 13.8). Transparency as measured by JAMA Benchmarks was uniformly low. The highest JAMA scores were seen in "diabetic leg amputation" (2.1), whereas "amputation for peripheral arterial disease" demonstrated the lowest score (0.5). Content scores were highest in "vascular surgery leg amputation" (4.6), and lowest in "diabetic leg amputation" (2.5). Overall, these findings suggest that while some subgroups (ex:

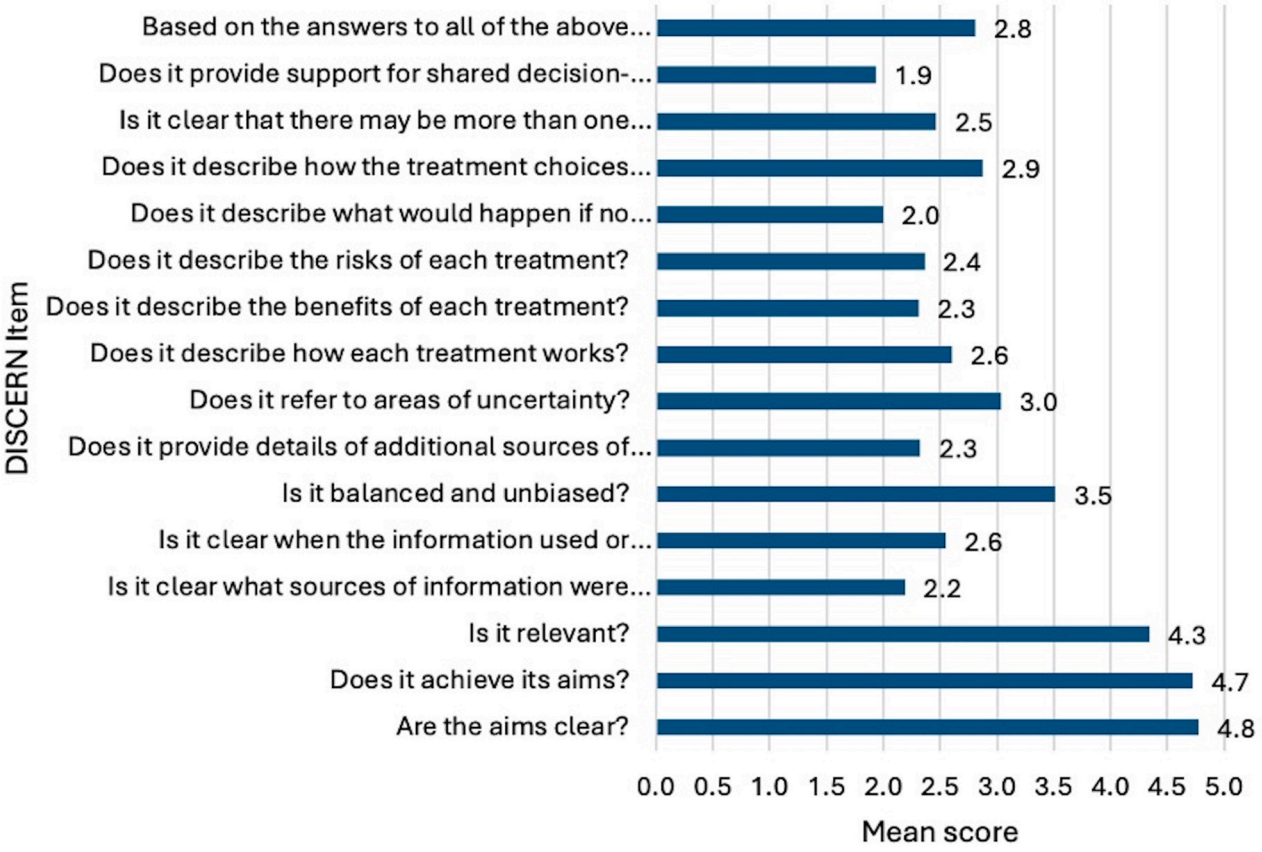


Fig 3. Mean DISCERN quality score by individual item across websites.

	DISCERN	JAMA	Content	FKGL	SMOG
DISCERN	1.0	0.2	0.5	0.1	0.1
JAMA	0.2	1.0	-0.2	-0.2	-0.2
Content	0.5	-0.2	1.0	0.1	0.1
FKGL	0.1	-0.2	0.1	1.0	1.0
SMOG	0.1	-0.2	0.1	1.0	1.0

Fig 4. Correlation coefficients between readability, quality, transparency, and content scores. *Content*, Content score; *DISCERN*, DISCERN Instrument score; *FKGL*, Flesch-Kincaid Grade Level; *JAMA*, JAMA Benchmark Score; *SMOG*, SMOG Index Score.

"below-knee amputation" and "vascular surgery leg amputation") provide higher quality and content, readability remains at a level that may limit patient accessibility. In contrast "diabetic leg amputation" was the hardest to read and provided the least content (Table II).

DISCUSSION

This study provides a comprehensive audit of the state of online patient education available on Google search engine and in the English language relating to major LEA due to vascular disease. This study assessed readability, transparency, quality, and content. Specifically, our findings demonstrate that these resources are often written above the sixth-grade level recommended by the American Medical Association,[33] thereby limiting accessibility and resulting in patient-facing resources that may be difficult to apply in decision-making. There is a lack of transparency concerning authorship and currency, leading to uncertainty about bias and relevancy of materials. Furthermore, average quality was limited, rated "fair" on the DISCERN scale, indicating low reliability. Key clinical content, specifically when it comes to alternative treatments, surgical risks, and explanations of procedures are often missing. Although brevity

Table II. Analysis of readability, quality, transparency, and content by search term

Search term	No. websites	Mean FKGL score	DISCERN, mean ± SD	Mean JB score	Mean content score
Leg amputation	20	9.9	47.7 ± 8.8	1.6	4.1
Below-knee amputation	5	11.6	53.6 ± 9.5	1.2	4.2
Above-knee amputation	9	11.1	42.4 ± 13.8	1.6	3.1
Amputation for poor circulation	9	11.4	46.1 ± 5.2	2.0	3.1
Amputation for peripheral artery disease	4	11.9	46.0 ± 5.2	0.5	3.0
Vascular surgery leg amputation	7	11.2	50.9 ± 11.9	1.0	4.6
Diabetic leg amputation	10	12.2	47.1 ± 2.9	2.1	2.5
Foot amputation surgery	16	8.9	48.9 ± 6.3	1.8	3.9

Content, Content score; *DISCERN*, DISCERN Instrument score; *FKGL*, Flesch-Kincaid Grade Level; *JB*, JAMA Benchmark Criteria; *SD*, standard deviation.
FKGL is reported as United States grade level. DISCERN is reported as a score from 15-80. Jama Benchmark is reported as a score from 0-4. Content score is reported as a score from 0-7.

and visual clarity are important components of patient education, our findings that many websites lacked essential content information suggest that brevity should not come at the expense of completeness. Additionally, we found that quality and readability are not correlated, suggesting that even when sites are of superior quality, patients may not be able to understand them.

Our findings are consistent with prior research assessing online patient materials across vascular and other surgical specialties. Studies pertaining to abdominal aortic aneurysm repair demonstrate readability averages of grade level 12 across all websites, with more complex endovascular repair exceeding the 13th grade level.[14] Similarly, an analysis looking into the quality of education materials pertaining to breast cancer demonstrated "fair" quality when assessed by DISCERN criteria.[16] Furthermore, when assessing YouTube videos as a source of patient information for vascular surgery, the quality of materials has been shown to be low.[34] Notably, a recent study found that the Society for Vascular Surgery (SVS) patient education materials had a mean readability score of near 10th grade.[35] Our study builds on this growing body of evidence highlighting the readability and quality challenges patients face when in need of life-altering and urgent major LEA. However, recent studies have demonstrated that artificial intelligence models with appropriate prompts are able to significantly improve the readability of patient education materials, achieving near sixth grade level without compromising on quality, thereby providing a scalable strategy for future developers to ensure readability.[36,37]

The limited transparency of online patient education materials also mirrors previous studies. A study evaluating eye cancer-related materials demonstrated the majority of materials reporting zero to one JAMA criteria. Similarly patient-related urticaria material reported on average only 2.4 of 4 JAMA Benchmark criteria.[18] Together, these undermine accountability and the ability for patients to trust online patient education sources. Major LEA may be particularly deficient in this regard, with 33% mentioning authorship and 26% providing references.

The consequences of these deficiencies are significant. Patients undergoing major LEAs face not only significant physical challenges, but also social, psychological, and quality of life barriers.[38] Despite this, only 50% of studies in our analysis discussed psychological and quality of life implications, and 26% indicated alternatives to major LEA. This scarcity of information may hinder patients' abilities to fully understand the implications of their surgery and participate in shared decision-making.[39] Subgroup analysis further highlights this disparity. Websites searched through "below-knee amputation" had the highest DISCERN quality, whereas "above-knee amputation" had the lowest. This suggests patients' access to quality information may heavily depend on their search terms, which are often arbitrary. Additionally, "diabetic leg amputation" had the highest Flesch-Kincaid Grade Level and lowest content scores, despite the diabetic population representing many patients with major LEA, once again suggesting some patient groups may be limited to quality information due to uncontrollable reasons.

This study has several strengths, including the use of multiple validated readability indices, transparency criteria, and quality instruments. However, several limitations should be acknowledged. First, only English websites were retrieved, potentially excluding non-English-speaking populations in context of vulnerability such as immigrants, refugees, and Indigenous communities for whom English is not a first language. Second, our content analysis was not assessed using a validated tool. Only written material was assessed, not videos/podcasts, which are increasingly popular. Additionally, the subgroup analysis should be interpreted descriptively

as it lacks power, given how few websites were retrieved for certain terms. Finally, by restricting inclusion to websites describing major LEA in the context of vascular disease, we did not formally evaluate online information related to other indications for major LEA such as trauma or malignancy.

CONCLUSIONS

Future work should involve co-designing educational resources with patients and their caregivers to ensure maximal understandability, readability, relevance, usefulness, and successful implementation into shared decision-making. More specifically, clinicians and organizations developing patient education websites should adopt explicit readability targets, such as sixth-grade level using validated indices (eg, Flesch-Kincaid Grade Level), and implement standardized checklists to ensure inclusion of key content elements aligned with informed consent principles. Professional societies, vascular surgery associations, and hospitals should prioritize developing standardized patient-centered educational materials that are reliable and accessible. Some existing online materials are copyrighted or proprietary, so large societies should coordinate efforts on creating open-access toolkits that institutions can adapt to their local needs, while maintaining readability and quality. Furthermore, professional societies such as the SVS should consider formal partnerships with educational specialists and patient partners to review and improve patient-facing online content. Involving these individuals will help to align perceived usefulness and quality with actual needs and understandability on websites such as the SVS's. Following implementation, ongoing audits and implementation studies should evaluate not only readability and quality metrics but also patient satisfaction and practical utility. In doing so, there is an opportunity to address the urgent need for better patient communication regarding major LEA and improving patient outcomes.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the authors used OpenAI in order to improve language and grammar. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

AUTHOR CONTRIBUTIONS

Conception and design: BL, VB, LD
Analysis and interpretation: VL, KE, VB, LD
Data collection: BL, KE
Writing the article: VL, KE, VB, LD
Critical revision of the article: VL, VB, LD
Final approval of the article: VL, KE, VB, LD
Statistical analysis: BL
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Overall responsibility: LD

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REFERENCES

1. Liu W, Cui C. Global and national burden of peripheral arterial disease from 1990 to 2021: a systematic analysis of global burden of disease study 2021. *Front Cardiovasc Med*. 2025;12:1–12.
2. Nowygrod R, Egorova N, Greco G, et al. Trends, complications, and mortality in peripheral vascular surgery. *J Vasc Surg*. 2006;43:205–216.
3. Schober TL, Abrahamsen C. Patient perspectives on major lower limb amputation - a qualitative systematic review. *Int J Orthop Trauma Nurs*. 2022;46:100958.
4. Deng L, Du C, Liu L, et al. Forecasting the Global Burden of Peripheral Artery Disease from 2021 to 2050: a population-based study. *Res Wash DC*. 2025;8:0702.
5. Ong KL, Stafford LK, McLaughlin SA, et al. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2023;402:203–234.
6. Oktay LA, Abuelgasim E, Abdelwahed A, et al. Factors affecting engagement in web-based health care patient information: narrative review of the literature. *J Med Internet Res*. 2021;23:e19896.
7. Diaz JA, Sciamanna CN, Evangelou E, Stamp MJ, Ferguson T. Brief report: what types of internet guidance do patients want from their physicians? *J Gen Intern Med*. 2005;20:683–685.
8. Minervini G, Marrapodi MM, Cicciù M. Online bruxism-related information: can people understand what they read? A cross-sectional study. *J Oral Rehabil*. 2023;50:1211–1216.
9. Cotugna N, Vickery CE, Carpenter-Haefele KM. Evaluation of literacy level of patient education pages in health-related journals. *J Community Health*. 2005;30:213–219. https://doi.org/10.1007/s10900-004-1959-x
10. Bakerjian D. Personal health literacy [Internet]; 2023. Accessed December 12, 2025. https://psnet.ahrq.gov/primer/personal-health-literacy
11. Eltorai AEM, Ghanian S, Adams CA, Born CT, Daniels AH. Readability of patient education materials on the American Association for surgery of trauma website. *Arch Trauma Res*. 2014;3:e18161.
12. Avra TD, Le M, Hernandez S, Thure K, Ulloa JG. Readability assessment of online peripheral artery disease education materials. *J Vasc Surg*. 2022;76:1728–1732.
13. Keogh CJ, McHugh SM, Clarke Moloney M, et al. Assessing the quality of online information for patients with carotid disease. *Int J Surg Lond Engl*. 2014;12:205–208.
14. Scott BB, Johnson AR, Doval AF, Tran BN, Lee BT. Readability and understandability analysis of online materials related to abdominal aortic aneurysm repair. *Vasc Endovascular Surg*. 2020;54:111–117.
15. Naveen Shankar A. The basics in research methodology: the clinical audit. *J Clin Diagn Res*. 2011;5:679–682.
16. Valencia EA, Cortina CS, Cobb AN, Chaudhary LN, Kelly T, Kong AL. Evaluating the accuracy, quality, and readability of online breast cancer information. *Ann Surg Open Perspect Surg Hist Educ Clin Approaches*. 2024;5:e465.
17. Ballegooie C van, Wen J. Assessment of online patient education material for eye cancers: a cross-sectional study. *PLOS Glob Public Health*. 2023;3:e0001967.
18. Saed Aldien A, Moussa S, Hassan AS, Ben-Shoshan M, Cutumisu M, Netchiporouk E. Evaluating online educational resources on urticaria for skin of colour: a cross-sectional review. *J Cutan Med Surg*. 2025;24. https://doi.org/10.1177/12034754251347626
19. Ngo S, Asirvatham R, Baird GL, Sarraju A, Maron DJ, Rodriguez F. Readability and reliability of online patient education materials about statins. *Am J Prev Cardiol*. 2023;16:100594. https://doi.org/10.1016/j.ajpc.2023.100594

20. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169:467–473.
21. Askin N. Providing access to multilingual patient education materials. *J Consum Health Internet*. 2017 22;21:305–312.
22. Sebopelo LA, Bourcier AJ, Dada OE, Adegboyega G, Nteranya DS, Kanmounye US. Retrospective review of google trends to gauge the popularity of global surgery worldwide: a cross-sectional study. *Ann Med Surg 2012*. 2021;71:102950. https://doi.org/10.1016/j.amsu.2021.102950
23. Lee DM, Grose E, Cross K. Internet-based patient education materials regarding diabetic foot ulcers: readability and quality assessment. *JMIR Diabetes*. 2022;7:e27221.
24. Casciato D, Bykowski A, Joseph N, Mendicino R. Readability, understandability, and actionability of online limb preservation patient education materials. *J Foot Ankle Surg*. 2023;62:727–730.
25. Hughes CD, Tran BNN, Rinkinen J, Lee BT, Iorio ML. Readability, suitability, and complexity of online resources for lower extremity reconstruction. *Ann Plast Surg*. 2019;82:2–6.
26. Blended Search Results Study. iProspect website: iProspect [Internet]; 2008. https://www.researchgate.net/profile/Alieda-Blandford/publication/276454791_Google_Public_Libraries_and_the_Deep_Web/links/574f2ff108aebb9880441df5/Google-Public-Libraries-and-the-Deep-Web.pdf
27. van Netten JJ, Bus SA, Apelqvist J, et al. Definitions and criteria for diabetes-related foot disease (IWGDF 2023 update). *Diabetes Metab Res Rev*. 2024;40:e3654.
28. Okuhara T, Furukawa E, Okada H, Yokota R, Kiuchi T. Readability of written information for patients across 30 years: a systematic review of systematic reviews. *Patient Educ Couns*. 2025;135:108656.
29. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the internet: caveant Lector et Viewor—let the reader and viewer beware. *JAMA*. 1997;277:1244–1245.
30. DISCERN [Internet]. Accessed December 12, 2025. https://www.ndph.ox.ac.uk/research/research-groups/applied-health-research-unit-ahru/discern/discern
31. CMPA [Internet]. Consent: a guide for Canadian physicians. Accessed December 12, 2025. https://www.cmpa-acpm.ca/en/advice-publications/handbooks/consent-a-guide-for-canadian-physicians
32. Schwarze ML, Arnold RM, Clapp JT, Kruser JM. Better conversations for better informed consent: talking with surgical patients. *Hastings Cent Rep*. 2024;54:11–14.
33. [Internet] Health literacy : a manual for clinicians : part of an educational program about health literacy - National Library of Medicine Institution.. Accessed December 12, 2025. https://catalog.nlm.nih.gov/discovery/fulldisplay/alma9916836283406676/01NLM_INST:01NLM_INST
34. [Internet] YouTube as a source of patient and trainee education in vascular surgery: a systematic review - PubMed.. Accessed December 12, 2025. https://pubmed-ncbi-nlm-nih-gov.proxy3.library.mcgill.ca/38414727/
35. Mahajan A, Podugu P, Kara AM, Marrero A, Cadena R, Falls-Beddies G. Readability of Society for Vascular Surgery patient education flyers does not meet national standards. *JVS Vasc Insights*. 2025:3. https://doi.org/10.1016/j.jvsvi.2025.100269
36. Lou J, Tjaden BL, Ghanem Y, et al. Use of artificial intelligence to improve the readability of patient education materials in vascular surgery. *J Vasc Surg*. 2025;81:e53–e54.
37. Kufta AY, Djalilian AR. Enhancing patient education with AI: a readability analysis of AI-Generated versus American Academy of Ophthalmology online patient education materials. *J Clin Med*. 2025;14:6968.
38. Cruz Silva J, Constâncio Oliveira V, Lima P, Correia M, Moreira M, Anacleto G. Change in domains that influence quality of life after major lower limb amputation in patients with peripheral arterial disease. *Ann Vasc Surg*. 2021;75:179–188.
39. US Preventive Services Task Force, Davidson KW, Mangione CM, Barry MJ, et al. Collaboration and shared decision-making between patients and Clinicians in preventive health care decisions and US preventive services task force recommendations. *JAMA*. 2022;327:1171–1176.

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Supplementary Table I. Readability indexes formulas

Readability index	Formula
Flesch Reading Ease Score	206.835 − 1.015 × (total words/total sentences) − 84.6 × (total syllables/total words)
Flesch-Kincaid Grade Level	0.39 × (total words/total sentences) + 11.8 × (total syllables/total words) − 15.59
SMOG	1.0430 × square root (total polysyllables × (30 ÷ total sentences)) + 3.1291
Coleman Liau	0.0588 × (letters ÷ words) × 100 − 0.296 × (sentences ÷ words) × 100 − 15.8
Gunning Fog	0.4 × ((total words ÷ total sentences) + 100 × total complex words ÷ total words)
Automated readability index	4.71 (characters/words) + 0.5 (words/sentences) − 21.43

Supplementary Table II. Included website URLs

URL
1. https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/amputation
2. https://medlineplus.gov/ency/article/007365.htm
3. https://www.healthlinkbc.ca/healthwise/leg-amputation
4. https://www.footcaremd.org/foot-and-ankle-treatments/injections—other-treatments/below-knee-amputation
5. https://my.clevelandclinic.org/health/procedures/21599-amputation
6. https://www.nhs.uk/tests-and-treatments/amputation/
7. https://www.stjoes.ca/patients-visitors/patient-education/k-o/PD%207688%20Leg%20amputation%20and%20your%20recovery%20January%202012.pdf
8. https://www.webmd.com/a-to-z-guides/definition-amputation
9. https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=ug3834
10. https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/amputation/amputation-recovery-and-rehabilitation
11. https://www.bradfordhospitals.nhs.uk/wp-content/uploads/2022/07/179682-WYVAS-LEG-AMPUTATION-Booklet.pdf
12. https://www.mountsinai.org/health-library/discharge-instructions/leg-amputation-discharge
13. https://www.interiorhealth.ca/sites/default/files/2021-11/826395%20-%20Life%20after%20lower%20limb%20amputation.pdf
14. https://www.saintlukeskc.org/health-library/understanding-leg-amputation-surgery-medical-condition
15. https://www.hamiltonhealthsciences.ca/wp-content/uploads/2019/08/AmputeeLegAndPeripheralVascularDisease-trh.pdf
16. https://www.ottobock.com/en-ca/resources/living-with-an-amputation/after-the-leg-amputation
17. https://pamhealth.com/resources/life-after-amputation-what-to-expect-for-the-new-amputee/
18. https://www.footdoc.org/faqs/how-diabetes-can-lead-to-foot-and-leg-amputation.cfm
19. https://www.ossur.com/en-ca/prosthetics/information/leg-amputation
20. https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=zu2057
21. https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=zu2061
22. https://www.choosept.com/guide/physical-therapy-guide-below-knee-amputation
23. https://www.bremerprosthetics.com/learn/below-knee-vs-forefoot-amputation-which-is-better-for-mobility
24. https://www.physio-pedia.com/Principles_of_Amputation
25. https://www.physio.co.uk/what-we-treat/amputees/above-knee-amputation/
26. https://primecareprosthetics.com/blog/what-you-should-know-before-getting-an-above-knee-prosthetic-leg
27. https://www.drugs.com/cg/above-the-knee-amputation.html
28. https://www.hamiltonhealthsciences.ca/wp-content/uploads/2019/08/AmputationKneeRightLeg-th.pdf
29. https://seriousinjury.shoosmiths.com/personal-injury/amputation-compensation-claims/guides/guide-lower-limb-leg-amputation-compensation-claims
30. https://amputee-coalition.org/wp-content/uploads/Above-Knee-Amputation-2025.pdf
31. https://www.hopitalottawa.on.ca/en/documents/2017/01/cp41b-english-jan-2016.pdf/
32. https://www.mayoclinic.org/diseases-conditions/diabetes/in-depth/amputation-and-diabetes/art-20048262
33. https://www.urmc.rochester.edu/encyclopedia/content?contenttypeid=92&contentid=p08292
34. https://coastalvascular.net/leg-amputation-can-avoided-pad-patients/
35. https://primecareprosthetics.com/blog/what-causes-amputation-causes-symptoms-and-risk-factors-of-limb-loss
36. https://hillvascular.com/why-you-should-see-a-vascular-surgeon-before-leg-amputation-due-to-insufficient-blood-flow/
37. https://www.healthline.com/health/diabetes/diabetes-amputation
38. https://primecareprosthetics.com/conditions/peripheral-artery-disease
39. https://www.hamiltonhealthsciences.ca/wp-content/uploads/2019/08/AmputeeLegAndPeripheralVascularDisease-trh.pdf
40. https://www.physio-pedia.com/Pathology_Leading_to_Amputation
41. https://vascular.org/your-vascular-health/your-care-journey/treatments/amputation
42. https://mft.nhs.uk/mri/services/vascular-surgery/vascular-and-endovascular-surgery/amputation/
43. https://www.iowaclinic.com/specialties/heart-vascular/vascular-surgery/vascular-surgery-treatments/amputation/
44. https://anzsvs.org.au/patient-information/amputation/
45. https://www.cdc.gov/diabetes/diabetes-complications/recovering-from-a-diabetes-related-amputation.html
46. https://www.medicalnewstoday.com/articles/324875

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Supplementary Table II. Continued.

URL
47. https://www.cdc.gov/diabetes/diabetes-complications/diabetes-related-amputations-and-mental-health.html
48. https://www.physio-pedia.com/The_Diabetic_Amputee
49. https://www.healthhub.sg/live-healthy/road-to-recovery
50. https://www.azuravascularcare.com/infopad/diabetic-foot-amputation-stats/
51. https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=zu2079
52. https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=zu2075
53. https://www.mountsinai.org/health-library/surgery/leg-or-foot-amputation
54. https://www.bchsys.org/en/patients-and-visitors/resources/About-Your-Surgery/DOCN_Foot-Amputation.pdf
55. https://www.commonspirit.org/conditions-treatments/foot-amputation-surgery
56. https://healthy.kaiserpermanente.org/health-wellness/health-encyclopedia/he.foot-amputation-what-to-expect-at-home.zu2075
57. https://balancehealth.com/services/foot-amputation/university-foot-and-ankle-institute/
58. https://www.mountsinai.org/health-library/discharge-instructions/foot-amputation-discharge