Discussion paper

Author

Cory J Williams
MHlthMgmt, GradDIpOHS, RN, CHIA
Queensland University of Technology,
Royal Brisbane and Women's Hospital

Innovative solutions for surgical education: A digital approach to health literacy and learning style assessment

Abstract

Introduction: The perioperative journey is filled with anxiety for patients, often exacerbated by poor communication and inadequate understanding of pre-operative information. Ineffective perioperative practices can lead to adverse outcomes, including poor health outcomes, increased surgery cancellations, extended hospital stays and higher health care costs. Addressing patients' health literacy levels and learning preferences is crucial for developing effective educational resources.

Discussion: This paper takes the stance that health literacy and learning needs are essential components of pre-operative assessment and workup. To achieve this, validated instruments and decision support tools must be integrated into the pre-operative workflow to assess and plan patient-centred pre-operative education. This paper proposes a digital tool to assess and measure health literacy and learning preferences, aiming to tailor educational interventions for surgical patients. By incorporating validated health literacy assessments alongside learning style questionnaires, clinicians can be provided with reputable recommendations for personalising patient education. Effective patient education, aligned with individual learning styles, enhances comprehension and engagement, ultimately allowing for improved surgical outcomes and reduced health care costs.

Conclusion: Integrating digital tools for health literacy and learning style assessment in surgical education has the potential to significantly improve patient outcomes and optimise resource utilisation. This patient-centric approach ensures personalised, effective education thus enhancing patient care and potentially reducing overall health care costs. Policymakers and health care providers should invest in the potential of these types of digital tools to promote equitable and effective health care delivery. Further research is needed to explore the development of such tools and evaluate the long-term benefits and scalability of personalised education in diverse settings.

Keywords: surgery, health literacy, learning preferences, e-health, digital

Introduction

The perioperative journey is complex, and navigating this journey can be an anxiety-provoking experience for patients. A large component of the anxiety felt by patients commences in the pre-operative period, as a result of poor communication from health care workers and a patient's inability to understand or recall information[1]. Poor pre-operative preparation can contribute to avoidable patient-initiated surgery cancellations and delayed treatment, which significantly affect a patient's physical and psychological wellbeing including undiagnosed medical issues, higher analgaesic requirements and prolonged hospital

stays[2,3]. Ineffective perioperative practices can lead to adverse outcomes, which globally afflict approximately 25 per cent of surgical patients, with serious post-operative complications affecting 15 per cent and rates of readmission within 30 days ranging from 5 to 15 per cent[4,5]. As well as compromising patient wellbeing, the consequences of ineffective perioperative practices inflict considerable financial strain upon the health care system. For the benefit of both patients and health care systems, innovative pathways are required to ensure patients are adequately educated regarding their surgical procedure and understand the intricacies of the surgery journey.

Patient education is the term given to processes, involving various planned educational methods, that aim to enable patients to develop and maintain abilities to optimally manage their lives with their disease[6]. Patient education is crucial for improving health outcomes and enabling patients to engage in self-management, modify lifestyle behaviours and participate in decision-making[6,7]. Despite its importance, patient education often suffers from time constraints and a one-size-fits-all approach, leading to poor compliance and increased surgical cancellations[2]. Compounding this, traditional approaches to patient education often fail to address the diverse health literacy levels and learning preferences of patients[1,8]. Understanding patient health literacy levels and learning preferences is essential for developing effective educational resources.

Health literacy, the ability to understand and make decisions based on health information, significantly impacts surgical outcomes. Low levels of health literacy are strongly associated with extended lengths of stay, complications and reduced adherence to pre-operative instructions[9]. Although there is an abundance of information available for educating patients, the resources provided often reflect the choices and learning styles of health care providers rather than those of the patients[10]. Considering a patient's preferred learning styles – visual, auditory, or kinaesthetic – can enhance the effectiveness of educational materials. Findings from our recent study assessing the pre-operative preparation, health literacy, learning preferences and knowledge resource needs of Australian elective surgery patients, highlighted significant deficits in traditional surgical education methods, including inadequate consideration of health literacy levels and learning preferences[11]. A large proportion of the population surveyed (38%) were categorised as having either marginal or limited health literacy, which is consistent with globally reported data[9,11,12].

Digital tools offer numerous advantages in surgical education, including the ability to provide timely, validated information and facilitate patient engagement in self-managed care[13,14]. Given this, it is appropriate to suggest that digital methods for early assessment of patient health literacy levels and learning style preference prior to education provision should be further explored by health care providers. Findings from our previous study support this suggestion with a significant proportion of participants (46%) indicating they would prefer to receive digital pre-operative education[11]. Additionally, nearly all participants (92%) had access to a smartphone, and the majority (64%) reported feeling confident in using applications[11].

Although the context for this paper is surgery, there is no doubting the widespread health literacy and poor health education provision across all facets of the health care industry. Building upon our previous research, this paper proposes a concept for a digital tool for assessing patient health literacy and learning style preference and makes recommendations for clinicians about education provision.

Discussion

Proposed solution concept

This paper proposes that a digital tool for assessing and measuring health literacy, learning preferences and knowledge needs while collecting patient feedback and qualitative data before patient–clinician interactions is required to optimise patient education. This digital solution would enable clinicians to tailor educational interventions, enhancing patient understanding, engagement and health outcomes.

To achieve this and ensure clinical accuracy, the digital solution would need to incorporate one, or a combination of, validated health literacy and learning style preference assessment tools. Regarding health literacy, examples include the Test of Functional Health Literacy in Adults (TOFHLA), the Rapid Estimate of Adult Literacy in Medicine (REALM), and the Newest Vital Sign (NVS)[15–17]. These standardised questionnaires evaluate patients' comprehension of medical instructions, medication labels and health information, while categorising literacy levels into low, medium and high. Regarding learning style preference assessment, example validated tools include the VARK (visual, aural, read/write or kinaesthetic) questionnaire, Kolb's learning style inventory, and the Honey and Mumford learning

styles questionnaire[18–20]. These assessments identify patients' preferred learning style as either visual, auditory, kinaesthetic or a combination of styles.

For clinicians, the digital solution would need to provide a dashboard with personalised reports displaying detailed patient profiles, health literacy levels and learning styles with recommended educational suggestions. The solution would comprise an educational resource library tailored to different literacy levels and learning styles, based upon academically validated information.

In terms of design, it is essential that a codesign approach with end-users is used to ensure the digital solution is a user-friendly interface with clear instructions, easy to navigate and ensures equitable access through such features as multilingual support, text-to-speech and adjustable font sizes[11,21]. Due to the ever-changing nature of perioperative care, the ability to update education information and incorporate other learning style theories ensures the tailored approach to patient education remains relevant. Successful implementation of such a solution is dependent on integration with existing electronic health record (EHR) systems, comprehensive training for clinicians, cybersecurity requirements and navigating organisational issues including political, cultural and financial factors[22,23].

Design brief for a digital health solution

Figure 1 is an example digital health solution. Based on our previously published study, a digital health solution would integrate the validated instruments Brief Health Literacy Screening (BHLS) tool and the Learning Channel Preference Checklist (LCPC)[24,25]. The BHLS tool is a validated tool, comprising four questions, that asks individuals to read and interpret common medical terms and concepts, and evaluates an individual's level of health literacy as limited, marginal or adequate[24]. The LCPC consists of a scoring system in which responses to questions are tallied and categorised by learning style (visual, aural and kinaesthetic)[25].

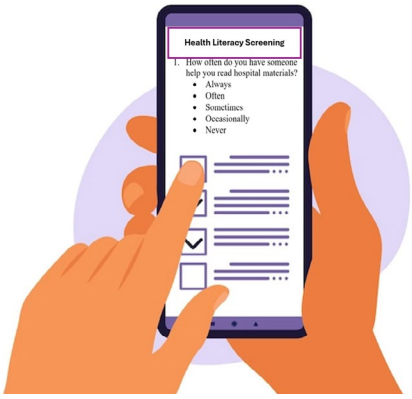

Figure 1: Example of a digital tool – survey for patients

Patients would be provided with the BHLS tool and LCPC to complete prior to their consultation, ensuring that their health literacy levels and learning style preferences are assessed in advance. The results from these assessments would be available to clinicians before the consultation, along with prompts for recommended communication methods and styles drawn from the solution's database, which is informed by extensive academic literature (see Figure 2). This approach aims to tailor the educational and communication strategies to each patient's needs, thereby enhancing patient comprehension, engagement and overall health outcomes.

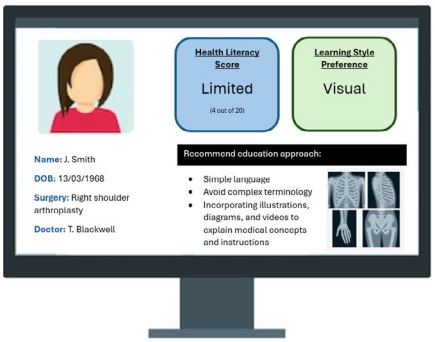

Figure 2: Hypothetical example digital tool – Clinician dashboard

A limited and marginal health literacy reading would recommend clinicians focus on providing repeated oral instructions and visual aids to overcome health literacy difficulties. Clinicians would be provided with examples of and advised to use simple language, avoiding complex terminology, and incorporating illustrations, diagrams and videos to explain medical concepts and instructions[26,27]. Repeating key instructions and confirming understanding through teach-back methods, as well as hands-on demonstrations, can enhance comprehension[28]. It is essential to provide materials written at an appropriate reading level, combining written instructions with verbal explanations and visual aids[29]. Offering additional support through one-on-one explanations or small group sessions can be beneficial.

For patients with adequate health literacy, providing comprehensive written materials, including pamphlets, booklets and online resources, caters to their informational needs and capacity[30]. Offering digital resources, such as websites, apps and online support groups, along with interactive educational sessions like workshops or webinars, can deepen their understanding and engagement[31].

Based on the patient's preference, the digital solution would recommend a learning style to clinicians and provide examples of the appropriate communications methods. Visual learners benefit from diagrams, charts, videos and written instructions. Effective methods include infographics, clear headings, bullet points, colour-coded information, visual demonstrations and recommending websites or apps with visual content[32]. Auditory learners prefer listening and verbal communication. Key strategies include verbal explanations, recommending podcasts, engaging in group discussions, repeating key points and encouraging questions with detailed verbal answers[33,34]. Kinaesthetic learners need hands-on activities. Effective techniques include demonstrations, practice sessions, physical models, activity-based learning and encouraging movement or gestures during explanations[35,36]. Ultimately, the digital solution would be able to provide any clinician with a foundation point for providing effective, relevant and appropriate education materials and enhanced communication to any patient.

To enhance the effectiveness of the digital solution, artificial intelligence (AI) could be integrated to personalise and optimise patient education and communication strategies. AI tools including natural language processing (NLP) and learning algorithms could analyse assessment data to generate tailored profiles, recommending appropriate educational materials and communication methods[37]. AI-powered chatbots and virtual assistants could provide real-time, personalised support, ensuring information is accessible and comprehensible[38]. AI could also monitor patient engagement and adapt content accordingly, offering clinicians support in decision-making and predictive insights to refine their communication approaches[39]. This integration of AI would aim to improve not only patient comprehension and engagement but also patient health outcomes through personalised educational interventions.

Importance to health care

A digital solution assessing health literacy and learning styles offers key benefits for patients, clinicians and the health care system through enhancing patient outcomes, optimising resources and increasing satisfaction and engagement. Personalised education improves patient comprehension, self-management and adherence to medical advice[40]. For health care workers, the digital solution could enhance communication and ensure an efficient use of time and resources as well as boosting patient engagement and satisfaction by tailoring educational approaches to patients. For the health care system, the improved communication and improved health outcomes can reduce readmissions, emergency visits, resource allocations and overall costs.

Despite this knowledge being known for decades, there is a lack of uptake. Effective stakeholder engagement and a co-design approach are crucial to address issues like funding and technology integration, and to align interventions with user needs[41]. Prioritising e-health interventions, despite budget constraints and resistance to change, is essential for optimising health care delivery and advancing outdated one-size-fits-all, traditional perioperative care models[2,21].

Recommendations

Policymakers should integrate health literacy and learning style assessments into health care quality standards to promote equitable and effective health care delivery. Given that assessment of patient health literacy and learning style preference prior to patient–clinician interaction is largely unexplored, this paper recommends that health care providers and policymakers should integrate digital assessment tools into pre-operative education programs. Health care institutions should develop repositories of educational resources catering to various health literacy levels and learning styles. Digital platforms can facilitate access to these resources, ensuring they are available in formats tailored to visual, aural and kinaesthetic learning styles. Further research should assess the long-term benefits of personalised education to patient adherence to instructions and health outcomes as well as health care costs. Studies should also explore the feasibility and scalability of these assessments in diverse settings.

Conclusion

In summary, integrating digital tools to assess health literacy and learning style preferences in surgical education offers a transformative approach to enhance patient outcomes. This paper highlights the deficiencies of traditional methods and the benefits of tailored, patient-centric education. By using validated instruments for health literacy and learning style evaluations, health care providers can deliver personalised, effective educational interventions, improving patient understanding, engagement and adherence to instructions. This digital approach not only enhances patient care but can also optimise

resource utilisation and reduce health care costs. Policymakers and health care institutions should prioritise the development and adoption of such digital tools to promote equitable and effective health care delivery. Further research should explore the long-term benefits and scalability of personalised education in diverse settings.

Declaration of conflicting interests

The authors have declared no competing interests with respect to the research, authorship and publication of this article.

References

1. Dimitriadis PA, Iyer S, Evgeniou E. The challenge of cancellations on the day of surgery [Internet]. Int J Surg. 2013[cited 2023 Aug 24];11:10. DOI: 10.1016/j.ijsu.2013.09.002
2. Abate SM, Chekole YA, Minaye SY, Basu B. Global prevalence and reasons for case cancellation on the intended day of surgery: A systematic review and meta-analysis [Internet]. Int J Surg Open. 2020[cited 2023 Aug 24];26:55–63. DOI: 10.1016/j.ijso.2020.08.006
3. Queensland Health. Operating theatre efficiency: Guideline [Internet]. Brisbane: State of Queensland (Queensland Health); 2017 [cited 2023 Aug 24]. Available from: www.health.qld.gov.au/__data/assets/pdf_file/0022/640138/qh-gdl-443.pdf.
4. Dobson GP. Trauma of major surgery: A global problem that is not going away [Internet]. Int J Surg. 2020[cited 2023 Aug 24];81:47–54. DOI: 10.1016/j.ijsu.2020. 07.017
5. de Jager E, McKenna C, Bartlett L, Gunnarsson R, Ho Y-H. Postoperative adverse events inconsistently improved by the World Health Organization surgical safety checklist: A systematic literature review of 25 studies [Internet]. World J Surg. 2016[cited 2023 Aug 24];40(8):1842–58. DOI: 10.1007/s00268-016-3519-9
6. Roussel S, Frenay M. (2019). Links between perceptions and practices in patient education: A systematic review [Internet]. Health Educ Behav. 2019[cited 2023 Aug 24];46(6):1001–11. DOI: 10.1177/1090198119868273
7. Crawford T, Roger P, Candlin S. The interactional consequences of 'empowering discourse' in intercultural patient education [Internet]. Patient Educ Couns. 2017[cited 2023 Aug 24];100(3):495500. DOI: 10.1016/j.pec.2016.09.017
8. Grocott M, Plumb J, Edwards M, FecherJones I, Levett D. Re-designing the pathway to surgery: Better care and added value [Internet]. Periop Med (Lond.). 2017[cited 2023 Aug 24];6:9. DOI: 10.1186/s13741-0170065-4
9. Roy M, Corkum JP, Urbach DR, Novak CB, von Schroeder HP, McCabe SJ et al. Health literacy among surgical patients: A systematic review and meta-analysis [Internet]. World J Surg. 2019[cited 2023 Aug 24]);43(1):96–106. DOI: 10.1007/s00268018-4754-z
10. Atlas A, Milanese S, Grimmer K, Barras S, Stephens JH. Sources of information used by patients prior to elective surgery: A scoping review [Internet]. BMJ Open. 2019[cited 2023 Aug 24];9(8):e023080–. DOI: 10.1136/bmjopen-2018-023080
11. Williams CJ, Duff J, Tannagan C. Australian elective surgery patients' pre-operative preparation, health literacy, learning preferences and knowledge resource needs: A cross-sectional survey [Internet]. Journal of Perioperative Nursing. 2024[cited 2023 Aug 24];37(1):3–11. DOI: 10.26550/2209-1092.1283
12. Chang ME, Baker SJ, Dos Santos Marques IC, Liwo AN, Chung SK, Richman JS et al. Health literacy in surgery [Internet]. Health Lit Res Pract. 2020[cited 2023 Aug 24];4(1):e46–e65. DOI: 10.3928/24748307-20191121-01
13. van der Meij E, Anema JR, Otten RH, Huirne JA, Schaafsma FG. The effect of perioperative e-health interventions on the postoperative course: A systematic review of randomised and non-randomised controlled trials [Internet]. PloS one. 2016[cited 2023 Aug 24];11(7):e0158612. DOI: 10.1371/journal.pone.0158612
14. Wicks P, Stamford J, Grootenhuis MA, Haverman L, Ahmed S. Innovations in e-health [Internet]. Qual Life Res. 2014[cited 2023 Aug 24];23(1):195–203. DOI: 10.1007/s11136-013-0458x
15. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: A new instrument for measuring patients' literacy skills [Internet]. J Gen Intern Med. 1995[cited 2023 Aug 24];10(10):537–41. DOI: 10.1007/BF02640361
16. Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphy PW et al. Rapid estimate of adult literacy in medicine: A shortened screening instrument. Fam Med. 1993;25(6): 391–5.
17. Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP et al. Quick assessment of literacy in primary care: The newest vital sign [Internet]. Ann Fam Med. 2005[cited 2023 Aug 24];3(6):514–22. DOI: 10.1370/afm.405
18. Fleming ND, Mills C. Not another inventory, rather a catalyst for reflection [Internet]. To Improve the Academy. 1992[cited 2023 Aug 24];11(1):137–55. DOI: 10.1002/j.2334-4822.1992.tb00213.x
19. Kolb AY, Kolb DA. Learning styles and learning spaces: Enhancing experiential learning in higher education [Internet]. Academy of Management Learning and Education. 2005[cited 2023 Aug 24];4(2):193–212. DOI: 10.5465/AMLE.2005.17268566
20. Honey P, Mumford A. The manual of learning styles. Berkshire: Peter Honey Publications; 1992.
21. Maurer M, Mangrum R, Hilliard-Boone T, Amolegbe A, Carman KL, Forsythe Let al. Understanding the influence and impact of stakeholder engagement in patient-centered outcomes research: A qualitative study [Internet]. J Gen Intern Med. 2022[cited 2023 Aug 24];37(Suppl 1):6–13. DOI: 10.1007/s11606-021-07104-w
22. Sidamo NB, Hussen S, Shibiru T, Girma M, Shegaze M, Mersha Aet al. Exploring barriers to effective implementation of public health measures for prevention and control of COVID-19 pandemic in Gamo Zone of Southern Ethiopia: Using a modified Tanahashi model [Internet]. Risk Manag Healthc Policy. 2021[cited 2023 Aug 24];14:1219–32. DOI: 10.2147/RMHP.S297114
23. Iyamu I, Gómez-Ramírez O, Xu AX, Chang HJ, Watt S, Mckee G et al. Challenges in the development of digital public health interventions and mapped solutions: Findings from a scoping review [Internet]. Digit Health. 2022[cited 2023 Aug 24];8:20552076221102255. DOI: 10.1177/20552076221102255
24. Louis A, Arora V, Press V. Evaluating the brief health literacy screen [Internet]. J Gen Intern Med. 2014[cited 2023 Aug 24];29(1):21. DOI: 10.1007/s11606-013-2655-2
25. O'Brien L. Learning channel preference checklist. Rockville: Specific Diagnostic Services; 1990
26. Baker DW, Parker RM, Williams MV, Clark WS. Health literacy and the risk of hospital admission [Internet]. J Gen Intern Med. 1998[cited 2023 Aug 24];13(12):791–8. DOI: 10.1046/j.1525-1497.1998.00242.x

27. Houts PS, Doak CC, Doak L G, Loscalzo MJ. The role of pictures in improving health communication: A review of research on attention, comprehension, recall and adherence [Internet]. Patient education and counselling. 2006[cited 2023 Aug 24];61(2):173–90. DOI: 10.1016/j.pec.2005.05.004
28. Schillinger D, Piette J, Grumbach K, Wang F, Wilson C, Daher C et al. Closing the loop: Physician communication with diabetic patients who have low health literacy [Internet]. Arch Intern Med. 2003[cited 2023 Aug 24];163(1):83–90. DOI: 10.1001/archinte.163.1.83
29. Davis TC, Wolf MS, Bass PF, Middlebrooks M, Kennen E, Baker DW et al. Low literacy impairs comprehension of prescription drug warning labels [Internet]. J Gen Intern Med. 2006[cited 2023 Aug 24];21(8):847–51. DOI: 10.1111/j.1525-1497.2006.00529.x
30. Institute of Medicine, Committee on Health Literacy. Nielsen-Bohlman L, Panzer AM, Kindig DA, editors. Health literacy: A prescription to end confusion [Internet]. Washington: National Academies Press; 2004 [cited 2023 Aug 24]. DOI: 10.17226/10883
31. Norman CD, Skinner HA. eHealth literacy: Essential skills for consumer health in a networked world [Internet]. J Med Internet Res. 2006[cited 2023 Aug 24];8(2):e9. DOI: 10.2196/jmir.8.2.e9.
32. Clark RC, Mayer RE. E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. Hoboken: John Wiley & Sons; 2011
33. McCarthy J, Anderson L. Active Learning techniques versus traditional teaching styles: Two experiments from history and political science [Internet]. Innov High Educ. 2000[cited 2023 Aug 24];24 (4):279–94. DOI: 10.1023/B:IHIE.0000047415.48495.05
34. Brown PC, Roediger HL. McDaniel MA. Make it stick: The science of successful learning [Internet]. Cambridge, Mass.: The Belknap Press of Harvard University Press; 2014 [cited 2023 Aug 24]. Available from: www.hup.harvard.edu/file/feeds/PDF/9780674729018_sample.pdf
35. Bonwell CC, Eison JA. Active learning: Creating excitement in the classroom. ASHE-ERIC Higher Education Report No. 1. 1991 [Internet]. Washington: Association for the Study of Higher Education.; ERIC Clearinghouse on Higher Education; 1991 [cited 2023 Aug 24]. Available from: https://files.eric.ed.gov/fulltext/ED336049.pdf
36. Jensen E. Teaching with the brain in mind. Alexandria: Association for Supervision & Curriculum Development; 2005.
37. Alqahtani T, Badreldin HA, Alrashed M, Alshaya AI, Alghamdi SS, Bin Saleh Ket al. The emergent role of artificial intelligence, natural learning processing, and large language models in higher education and research [Internet]. Res Social Admin Pharm. 2023[cited 2023 Aug 24];19(8):1236–42. DOI: 10.1016/j.sapharm.2023.05.016
38. Sun G, Zhou YH. AI in healthcare: Navigating opportunities and challenges in digital communication [Internet]. Front Digit Health. 2023[cited 2023 Aug 24];5:1291132. DOI: 10.3389/fdgth.2023.1291132
39. Yelne S, Chaudhary M, Dod K, Sayyad A, Sharma R. Harnessing the power of AI: A comprehensive review of its impact and challenges in nursing science and healthcare [Internet]. Cureus. 2023[cited 2023 Aug 24];15(11):e49252. DOI: 10.7759/cureus.49252
40. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: An updated systematic review [Internet]. Ann Intern Med. 2011[cited 2023 Aug 24];155(2):97–107. DOI: 10.7326/0003-4819-155-2-201107190-00005
41. Sousa VEC, Lopez KD. Towards usable e-health: A systematic review of usability questionnaires [Internet]. Appl Clin Inform. 2017[cited 2023 Aug 24];8(2):470–90. DOI: 10.4338/ACI-2016-10-R-0170