2019

Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: a systematic review protocol

Samuel Lapkin
University of Wollongong, slapkin@uow.edu.au

Ritin S. Fernandez
University of Wollongong, ritin@uow.edu.au

Laura Ellwood
St George Hospital

Ashish Diwan
University of New South Wales

Publication Details

Lapkin, S., Fernandez, R., Ellwood, L. & Diwan, A. (2019). Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: a systematic review protocol. The JBI Database of Systematic Reviews and Implementation Reports, 17 (7), 1334-1340.

Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: a systematic review protocol

Abstract

Objective: The objective of this review is to evaluate the measurement properties of multidimensional pain assessment tools for postoperative pain in adults. **Introduction:** Effective postoperative pain management increases patient safety and satisfaction, and reduces healthcare costs. The most commonly used postoperative pain assessment tools only evaluate pain intensity, which is only one aspect of the sensory dimension of pain. Pain is a subjective phenomenon, and variability exists among patients. Efforts are underway to incorporate multidimensional assessment tools for postoperative pain assessment in clinical practice. **Inclusion criteria:** Eligible studies will include postoperative patients aged 18 years and older from all surgical disciplines. Studies evaluating multidimensional assessment instruments for the measurement of postoperative pain during the first two weeks following surgery will be considered. Studies will include the following measurement properties of assessment tools as outcomes: reliability, validity and generalizability. **Methods:** MEDLINE, CINAHL, Embase, PsycINFO and Cochrane Trials (CENTRAL) will be searched, as well as ClinicalTrials.gov and multiple gray literature sources. There will be no limitations on publication date. Titles and abstracts will be screened by independent reviewers for inclusion. The full text of selected papers will be retrieved and assessed against the inclusion criteria. Two independent reviewers will assess papers for methodological quality using the COSMIN checklist, and papers with poor scores on relevant items will be excluded. Data will be extracted by two independent reviewers using a standardized data extraction tool. Statistical pooling will be performed, if possible.

Keywords

review, systematic, patients:, adult, postoperative, validity, protocol, used, reliability, tools, assessment, pain, multidimensional, generalizability

Publication Details

Lapkin, S., Fernandez, R., Ellwood, L. & Diwan, A. (2019). Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: a systematic review protocol. The JBI Database of Systematic Reviews and Implementation Reports, 17 (7), 1334-1340.

Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: A systematic review protocol of measurement properties

Samuel Lapkin[1, 2, 3,]
Ritin Fernandez[1, 2, 3]
Laura Ellwood[1, 2]
Ashish Diwan[4, 5]

1. Centre for Evidence Based Initiatives in Health Care: an Affiliate Centre of the Joanna Briggs Institute, NSW, Australia
2. Centre for Research in Nursing and Health, St George Hospital, Sydney, Australia
3. School of Nursing, University of Wollongong, Sydney, Australia
4. Spine Service, St George Private Hospital, Sydney, Australia
5. St George and Sutherland Clinical School, University of New South Wales, St George Hospital, Sydney, Australia

Corresponding author: Samuel Lapkin;
slapkin@uow.edu.au

Reliability, validity and generalizability of multidimensional pain assessment tools used in postoperative adult patients: A systematic review protocol of measurement properties

Introduction

Pain is a common occurrence among patients in the postoperative period.[1] While the prevalence rates of acute post-operative pain have not been accurately established, available data suggests that approximately 75 per cent of postoperative patients experience moderate to severe pain, resulting in unnecessary suffering and discomfort.[2] Pain in the postoperative period is mainly as a result of tissue damage or nociceptive pain, which subsequently manifests as an undesirable emotional and sensory experience.[2]

Poorly managed postoperative pain can significantly delay ambulation which is associated with potentially life threatening risks such as venous thromboembolism, severe respiratory illness and, long term chronic pain and disability.[1] Healthcare services are also negatively impacted as persistent pain can lengthen hospital stay, increase the number of unanticipated hospital readmission and the need for outpatient chronic pain management services.[3] Hence, effective postoperative pain management is imperative in increasing patient safety and satisfaction, and reducing costs to the health services.[1]

The experience of postoperative pain is a complex multidimensional phenomena which comprises of a range of physiological, psychological, sensory, cognitive, behavioral, and sociocultural dimensions.[1, 4] However, the most commonly used postoperative pain assessment tools are unidimensional and assess only pain intensity which is one aspect of the sensory dimension of pain.[5] Examples of these unidimensional tools include versions of the Numerical Rating Scale (NRS) and the Visual Analog Scale (VAS).[6-9] These tools rely on a score based on the patients' self-report of the existence of pain and its intensity. Whereas, pain is a subjective phenomenon and a large amount of inter-individual variability exists in patients' pain experiences. For example, patients may experience severe pain in the absence of physiologic or behavioral signs.[10] In addition, patients have also reported difficulties in describing complex nature of the experience of pain by only a single numbered value or a point on linear scale.[3]

As a result, evidence-based guidelines, expert consensus reports and position statements from health professional governing bodies have recommended comprehensive, multidimensional assessment as an integral component of effective pain management.[11-13] Hence, efforts are being made to incorporate multidimensional assessment tools for postoperative pain assessment in clinical practice. The most frequently used multidimensional pain assessment tools are the McGill Pain Questionnaire (MPQ)[4] and the Brief Pain Inventory (BPI).[14,15] The MPQ is used to measure the multidimensional aspects of pain including the physical and emotional characteristics of pain. The MPQ includes descriptive words to define pain, a diagram to indicate the exact location of the pain, a one to five score to represent overall present pain intensity (PPI) and a section that considers the individual context of the patient.[4] The BPI is used to measure the complex pain experienced by patient with

cancer. The BPI includes a sensory and a reactive dimension, which measures both pain intensity and the interference of pain with activities of daily living.[14]

Other, less commonly used multidimensional pain assessment tools include the Surgical Pain Scales (SPS),[16] the Pain Assessment in Advanced Dementia scale (PAINAD) and the Checklist of Nonverbal Pain Indicators (CNPI).[17,18] Despite the availability of several multidimensional tools there is no evidence to inform the selection of the most reliable and valid tool that can be used to accurately assess pain in postoperative adult patients.

A preliminary search in MEDLINE, CINAHL, JBI Database of Systematic Reviews and Implementation Reports and the Cochrane Database of Systematic Reviews was performed to identify completed and in-progress systematic reviews on multidimensional postoperative pain assessment tools when used to assess post-operative pain in hospitalized adult patients. The search identified five existing, quantitative systematic reviews investigating the psychometric properties of pain assessment tools.[19-23] However, there are a number of important limitations with the existing reviews. Three of the reviews focused only on the use of unidimensional pain assessment tools.[19-21] The fourth review was limited to pain assessment tools used in pediatric settings,[22] and the fifth review assessed multidimensional pain assessment tools only in elderly patients with dementia.[23] While these reviews report important findings for pediatric patients and patients with dementia, they do not provide evidence for the most psychometrically reliable and valid multidimensional pain assessment tool for adult postoperative patients. Therefore, there is a need to appraise the best available evidence in relation to the measurement properties of multidimensional pain assessment tool when used to assess postoperative pain in hospitalized adult patients.

Review objective

The objective of this review is to evaluate the measurement properties (reliability, validity and generalizability) of the multidimensional pain assessment tools that are used to assess postoperative pain in adults.

Methods

Inclusion Criteria

Participants

The review will consider studies that include postoperative patients aged 18 years and over from all surgical disciplines.

Instrument(s) or Construct

This review will consider multidimensional pain instruments used to measure postoperative pain during the first two weeks following surgery. The two week time frame has been chosen as it is widely considered to be the period when patients experience the most amount of postoperative pain.[24]

Outcomes

This review will consider studies that include the following measurement properties as outcomes:

- Reliability (internal consistency, test-retest reliability, inter-rater reliability and intra-rater reliability)
- Validity (content validity, face validity, construct validity, structural validity, cross-cultural validity, hypotheses testing, criterion validity, responsiveness, sensitivity to change)
- Generalizability (sample characteristics, setting(s), location, language, sampling methods, response rate)

As not every study will provide data for all the measurement properties, studies that report sufficient details pertaining to at least one outcome regarding reliability or validity will be considered.

Study Types

This review will consider only instrument development or instrument evaluation studies. Other types of studies (in which needs assessment instruments are merely used) will be used to contact their authors in search for unpublished psychometric studies or testing of the instrument.

Search Strategy

The search strategy will aim to find both published and unpublished studies. An initial limited search of MEDLINE and CINAHL has been undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe articles. This informed the development of a search strategy which will be tailored for each information source. A full search strategy for MEDLINE is detailed in Appendix I. The reference list of all studies selected for critical appraisal will be screened for additional studies.

The databases to be searched include: MEDLINE, CINAHL, EMBASE, PyscINFO and Cochrane Trials (CENTRAL). The trial register to be searched includes clinicaltrials.gov. The search for unpublished studies will include: Google Scholar, Dissertation Abstracts International, ProQuest Dissertations and Theses, ProQuest Researchgate (contact with relevant researchers), and MedNar. We will also identify relevant researchers during the literature research and contact them to obtain information about unpublished psychometric studies or instrument testing of relevant instrument.

Study Selection

Following the search, all identified citations will be collated and uploaded into EndNote version X8 and duplicates removed. Titles and abstracts will then be screened by two independent reviewers for assessment against the inclusion criteria for the review. Studies that may meet the inclusion criteria will be retrieved in full and their details imported into SUMARI. The full text of selected studies will be retrieved and assessed in detail against the inclusion criteria. Full text studies that do not meet the inclusion criteria will be excluded and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will undergo a process of critical appraisal. The results of the search will be reported in full in the final report and presented in a PRISMA flow diagram. Any

disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

Assessment of Methodological Quality

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using the COSMIN checklist. The COSMIN checklist is a standardized tool which is recommended to use in systematic reviews of measurement properties.[25] The checklist consists of a range of items that consider nine measurement properties namely internal consistency, reliability, measurement error, content validity, structural validity, hypotheses testing, cross-cultural validity, criterion validity and responsiveness. There are also four separate items that are used to assess the methodological quality for studies that applied classical test theory (CTT) and the item response theory (IRT). Studies with poor scores for all relevant items will be excluded from the review. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

Data Extraction

Data will be extracted from papers by two reviewers independently using the standardized data extraction tools from JBI-MAStARI and adapted to the specific elements of a psychometric review. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer. Authors of papers will be contacted to request missing or additional data where required.

Data Synthesis

The main aim of the data synthesis is to compare outcomes to provide recommendations on the most suitable instrument for research and clinical use. The pooled estimate and 95% confidence intervals for the measurement properties of indices used to measure multidimensional pain will, where possible, be performed using standard statistical techniques and JBI SUMARI. Heterogeneity will be assessed statistically using the standard chi-square and also explored using subgroup analyses based on the different study designs included in this review. Where statistical pooling is not possible, the findings about reliability, validity and generalizability will be compared and presented in narrative form including tables and figures to aid data presentation. A content comparison will give an overview of the content of each instrument and the similarities and differences on an item level. To judge the measurement properties of the different instruments the quality criteria from Terwee et al.[26] will be used, these criteria allow to judge: reliability, validity and generalizability in terms of positive rating, indeterminate rating, negative rating, no information available and doubtful design or method. The results of this appraisal will be presented in a narrative form.

Conflicts of Interest

R.F. who is an author on this paper is also a member of the JBISRIR editorial board.

S.L. who is an author on this paper is the current Chair of the JBI Psychometric Methodology Group

Acknowledgements

Nil.

References

1. Schug SA, Palmer GM, Scott DA, Halliwell R, Trinca J. Acute pain management: scientific evidence [Internet]. Australia: Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine; 2015 [cited 2018 Mar 1]. Available from: http://fpm.anzca.edu.au/documents/apmse4_2015_final

2. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: a clinical practice guideline from the American pain society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' committee on regional anesthesia, executive committee, and administrative council. J Pain. 2016; 17(2):131-57.

3.Coll AM, Ameen JR, Mead D. Postoperative pain assessment tools in day surgery: literature review. J Adv Nurs. 2004; 46(2):124-33.

4. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. Pain. 1975; 1(3):277-99.

5. Williams ACdC, Craig KD. Updating the definition of pain. Pain. 2016;157(11):2420-3.

6.Schiavenato M, Craig KD. Pain assessment as a social transaction: beyond the “gold standard”. Clin J Pain. 2010; 26(8):667-76.

7. van Dijk JF, van Wijck AJ, Kappen TH, Peelen LM, Kalkman CJ, Schuurmans MJ. Postoperative pain assessment based on numeric ratings is not the same for patients and professionals: a cross-sectional study. Int J Nurs Stud. 2012; 49(1):65-71.

8. Eriksson K, Wikström L, Årestedt K, Fridlund B, Broström A. Numeric rating scale: patients' perceptions of its use in postoperative pain assessments. Appl Nurs Res. 2014; 27(1):41-6.

9. Eid T, Bucknall T. Documenting and implementing evidence-based post-operative pain management in older patients with hip fractures. J Trauma Nurs. 2008; 12(2):90-8.

10. Lindberg MF, Miaskowski C, Rustøen T, Rosseland LA, Paul SM, Cooper BA, et al. The Impact of Demographic, Clinical, Symptom and Psychological Characteristics on the Trajectories of Acute Postoperative Pain After Total Knee Arthroplasty. Pain Med. 2017; 18(1):124-39.

11. Turk DC, Melzack R. Handbook of pain assessment: third edition [Internet]. USA: Guilford Press; 2011 [cited 2018 Mar 1]. Available from: https://www.guilford.com/books/Handbook-of-Pain-Assessment/Turk-Melzack/9781606239766/contents

12. Australian Commission on Safety and Quality in Health Care. Safety and quality improvement guide standard 8: Preventing and Managing Pressure Injuries [Internet]. 2012 Oct [cited 2018 Mar 1]; Sydney: ACSQHC. Available from: https://www.safetyandquality.gov.au/wp-content/uploads/2012/10/Standard8_Oct_2012_WEB.pdf

13. Jungquist CR, Vallerand AH, Sicoutris C, Kwon KN, Polomano RC. Assessing and Managing Acute Pain: A Call to Action. AJN Am J Nurs. 2017; 117(3):S4-S11.

14. Cleeland C, Ryan K. Pain assessment: global use of the Brief Pain Inventory. Ann Acad Med Singapore. 1994; 23(2):129-138.

15. Chen WH, Chan KS, Gan TJ, Chen C, Lakshminarayanan M, Revicki DA. Validation of the modified brief pain inventory-exploratory form in surgery patients. Health Outcomes Res Med. 2010; 1(1):e17-e28.
16. Barber MD. Validation of the Surgical Pain Scales in women undergoing pelvic reconstructive surgery. Female Pelvic Med Reconstr Surg. 2012; 18(4): 198–204.
17. Guo L-L, Li L, Liu Y-W, Herr K. Evaluation of two observational pain assessment scales during the anaesthesia recovery period in Chinese surgical older adults. J Clin Nurs. 2015;24(1-2):212-21.
18. DeWaters T, Faut-Callahan M, McCann JJ, Paice JA, Fogg L, Hollinger-Smith L, et al. Comparison of self-reported pain and the PAINAD Scale in hospitalized cognitively impaired and intact older adults after hip fracture surgery. Orthop Nurs. 2008; 27(1):21-8.
19. Bourdel N, Alves J, Pickering G, Ramilo I, Roman H, Canis M. Systematic review of endometriosis pain assessment: how to choose a scale? Hum Reprod Update. 2014; 21(1):136-52.
20. Hjermstad MJ, Fayers PM, Haugen DF, Caraceni A, Hanks GW, Loge JH, et al. Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. J Pain Symptom Manage. 2011; 41(6):1073-93.
21. Karcioglu O, Topacoglu H, Dikme O, Dikme O. A systematic review of the pain scales in adults: Which to use? Am J Emerg Med. 2018.
22. Stinson JN, Kavanagh T, Yamada J, Gill N, Stevens B. Systematic review of the psychometric properties, interpretability and feasibility of self-report pain intensity measures for use in clinical trials in children and adolescents. Pain. 2006; 125(1-2):143-57.
23. Zwakhalen SM, Hamers JP, Abu-Saad HH, Berger MP. Pain in elderly people with severe dementia: A systematic review of behavioural pain assessment tools. BMC Geriatr. 2006; 6(1):3.
24. Scully RE, Schoenfeld AJ, Jiang W, Lipsitz S, Chaudhary MA, Learn PA, et al. Defining optimal length of opioid pain medication prescription after common surgical procedures. JAMA surg. 2018; 153(1):37-43.
25.Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, et al. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res. 2010; 19(4):539-49.
26.Terwee CB, Mokkink LB, Knol DL, Ostelo RW, Bouter LM, de Vet HC. Rating the methodological quality in systematic reviews of studies on measurement properties: a scoring system for the COSMIN checklist. Qual Life Res. 2012; 21(4):651-7.
26. GRADEpro GD. GRADEpro GDT: GRADEpro Guideline Development Tool [Software]. McMaster University, 2015 (developed by Evidence Prime, Inc.). Available from gradepro.org.

Appendix I: Search Strategy

1.	surgical patient*.mp.
2.	"post operative".mp.
3.	postoperative.mp.
4.	Critical Care/ or "acute care".mp. or Inpatients/
5.	GYNECOLOGIC SURGICAL PROCEDURES/ or SURGICAL ONCOLOGY/ or SURGICAL PROCEDURES, OPERATIVE/ or DECOMPRESSION, SURGICAL/ or ROBOTIC SURGICAL PROCEDURES/ or ARTERIOVENOUS SHUNT, SURGICAL/ or ORAL SURGICAL PROCEDURES/ or UROLOGIC SURGICAL PROCEDURES/ or PORTACAVAL SHUNT, SURGICAL/ or ANASTOMOSIS, SURGICAL/ or ORTHOGNATHIC SURGICAL PROCEDURES/ or AMBULATORY SURGICAL PROCEDURES/ or MINIMALLY INVASIVE SURGICAL PROCEDURES/ or OPHTHALMOLOGIC SURGICAL PROCEDURES/ or PROPHYLACTIC SURGICAL PROCEDURES/ or VASCULAR SURGICAL PROCEDURES/ or REFRACTIVE SURGICAL PROCEDURES/ or CYTOREDUCTION SURGICAL PROCEDURES/ or THORACIC SURGICAL PROCEDURES/ or DIGESTIVE SYSTEM SURGICAL PROCEDURES/ or UROGENITAL SURGICAL PROCEDURES/ or NASAL SURGICAL PROCEDURES/ or MINOR SURGICAL PROCEDURES/ or OTORHINOLARYNGOLOGIC SURGICAL PROCEDURES/ or DERMATOLOGIC SURGICAL PROCEDURES/ or CARDIAC SURGICAL PROCEDURES/ or surgical.mp. or RECONSTRUCTIVE SURGICAL PROCEDURES/ or OTOLOGIC SURGICAL PROCEDURES/ or ELECTIVE SURGICAL PROCEDURES/ or UROLOGIC SURGICAL PROCEDURES, MALE/
6.	1 or 2 or 3 or 4 or 5
7.	Pain Measurement/
8.	"pain assessment".mp.
9.	(checklist* adj5 pain)
10.	pain scale*
11.	((rate OR rating) adj pain)
12.	(pain adj3 questionnaire*)
13.	pain and tool*
14.	"pain questionnaire".mp.
15.	"pain intensity".mp.
16.	exp Pain/di [Diagnosis]
17.	Pain Perception/
18.	7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17
19.	PSYCHOMETRICS/
20.	"internal consistency".mp.
21.	Reliability.mp.
22.	"measurement error".mp.

23.	"hypotheses testing".mp.
24.	responsiveness.mp.
25.	validity.mp.
26.	generalizability.mp.
27.	Reproducibility of Results/
28.	Dimensional Measurement Accuracy/
29.	Validation Studies/
30.	Sensitivity and Specificity/
31.	Data Accuracy/
32.	Scientific Experimental Error/
33.	19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32
34.	6 and 18 and 33