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Post-anaesthetic discharge scoring criteria: key findings from a systematic review

Nicole Margaret Phillips PhD MNS GDipAdvNur(Ed) DipAppSc(Nurs) BN RN,1 Maryann Street PhD BSc(Hons) GradDipDrugEval&PharmSci,1,2 Bridie Kent PhD BSc(Hons) RN,3 Emily Haesler BN PGradDipAdvNsg1 and Mary Cadeddu BSc(Psych)1

1School of Nursing and Midwifery, Deakin University, and 2Eastern Health-Deakin University Nursing & Midwifery Research Centre, Melbourne, Victoria, Australia; and 3School of Nursing and Midwifery, Plymouth University, Plymouth, UK

Abstract

Background Patient safety depends on nurses’ clinical judgment. In post-anaesthetic care, objective scoring systems are commonly used to help nurses assess when a patient is ready to go back to the ward or be discharged home after day surgery. Although there are several criteria used to assess patient readiness for discharge from the post-anaesthetic care unit, evaluation of the validity and reliability of these criteria is scarce.

Aims This article presents key findings from a systematic review conducted to identify the essential components of an effective and feasible scoring system to assess patients following surgical anaesthesia for discharge from the post-anaesthetic care unit.

Methods The protocol for the systematic review of quantitative studies investigating assessment criteria for discharge of adult patients from the post-anaesthetic care unit was approved by the Joanna Briggs Institute and conducted consistent with the methodology of the Institute. Twelve databases and grey literature, such as conference proceedings, were searched for published studies between 1970 and 2010. Two reviewers independently assessed study eligibility for inclusion. Reference lists of included studies were appraised.

Results Eight studies met the inclusion criteria; only one was a randomised controlled trial. Variables identified as essential when assessing a patient’s readiness for discharge from the post-anaesthetic care unit were conscious state, blood pressure, nausea and vomiting, and pain. Assessment of psychomotor and cognitive recovery and other vital signs were also identified as relevant variables to consider.

Conclusions There was limited high-quality research regarding criteria to assess patient readiness for discharge from the post-anaesthetic unit. The key recommendations, with moderate to high risk of bias, include that assessment of specific variables (pain, conscious state, blood pressure, and nausea and vomiting) should be made before patient discharge. These key findings have informed a subsequent study to reach international consensus on effective assessment criteria and a project to test the clinical reliability of a tool for use by nurses in assessing patient readiness for discharge from post-anaesthetic care.

Key words: discharge assessment, nursing assessment, post-anaesthetic care unit, systematic review.
rapid recognition of and response to clinical deterioration, and conducted staff education, including in perioperative care. Our team has undertaken research aimed to improve patient outcomes following surgery through the development of evidence-based nursing assessment criteria for safe and timely discharge of patients from the post-anaesthetic care unit (PACU), given the potential for patient risk in this setting. These risks include excessive bleeding, hypotension, uncontrolled pain, nausea and vomiting, hypoxia, altered conscious state and death.

Most PACUs have discharge criteria, and many use a tool to assess patients, such as the modified Aldrete Score. Although commonly used, the Aldrete tool has not been validated. This paper describes the key findings from a systematic review to establish the evidence for criteria to be included in a discharge scoring tool for assessing patient readiness for discharge. Other components of the program of research are (i) a Delphi consensus study, involving nurses and anaesthetists with many years' experience in post-anaesthetic care, as to which criteria should be included when assessing readiness for discharge from the PACU; and (ii) an audit of adverse events immediately after surgery and anaesthesia in one health service in Victoria to establish the nature and frequency of commonly occurring complications.

PACUs (also referred to as recovery rooms) were introduced in 1923 and since then have been the predominant setting for patient recovery immediately after surgery. Intensive patient observation immediately following administration of a general anaesthetic is considered mandatory, as this is a critical time in patient recovery. Accurate nursing assessment is important because a patient's condition can deteriorate quickly in PACU, and the time spent in PACU is recognised internationally as a time of increased risk to patient safety. It has been common practice to set a minimum duration for the patient to remain in PACU; however, length of PACU stay is dependent on a number of factors, including the surgical procedure, the type of anaesthetic, the patient's preoperative health status and the stability of vital signs postoperatively.

To assist the identification of deteriorating vital signs, much work has been conducted to develop universally acceptable and objective tools to reduce adverse events in ward-based patients, however, their relevance to patient assessment in PACU has not been established.

Although several scoring systems have been proposed for patient assessment following surgery, to date no consensus has been reached in regard to what variables these instruments should include. Aldrete's scoring system has been used internationally since the 1970s, and in 1995, new versions of the scale were proposed due to the new practice of discharging patients to home following ‘day procedure’ surgery. Due to its ease of use, the modified Aldrete Score has been adopted as a standard postoperative assessment in many PACUs internationally.

Worldwide, we have seen the development and implementation of guidelines for the management of patients in perioperative care. However, these are focused mainly on the role of anaesthetists, while the responsibility for the assessment of patient readiness for discharge from PACU is often delegated to nurses. Furthermore, the validity and reliability of the criteria used for assessing a patient for discharge have not been researched. In regard to safe discharge for patients from PACU, no systematic review of the literature had been conducted prior to the researchers' systematic review.

Aims
The aim of this article is to present the key findings of a systematic review identifying the essential components of an effective and feasible scoring system to assess patients following surgical anaesthesia. How the findings from the systematic review have informed a subsequent program of research to enhance patient safety through timely and appropriate discharge from the PACU is also outlined.

Methods
An initial limited search of CINAHL and MEDLINE was conducted, to identify relevant key words contained in titles and abstracts. MeSH headings and subject descriptor terms were used for each database. An extensive search was then conducted using those terms and synonyms in 12 different databases: AMED, BioMed Central, British Nursing Index, CINAHL, the Cochrane Central Register of Controlled Trials, EMBASE, MEDLINE, PsycINFO, SCOPUS and Web of Science. Discharge scores to determine readiness for discharge from the PACU environment were first introduced in the early 1970s. The review therefore considered studies published in English between January 1970 and June 2010. The reference lists of included studies were also appraised for titles relevant to the review.

Each study was assessed by the primary reviewer based on the information contained in the title and the abstract, while the relevance of references was assessed on title only. Where a record appeared to be relevant to the review, its full text was retrieved and appraised for inclusion. Two reviewers independently screened all abstracts, and each study was carefully examined for adherence to the inclusion criteria. Methodological validity was assessed independently by the two reviewers using the critical appraisal instruments developed by the Joanna Briggs Institute (JBI) (Appendix 1). A meta-analysis could not be conducted, as there was only one randomised controlled trial (RCT) included.

Studies evaluating variables suitable for assessment of adult patient readiness for discharge from the PACU environment were of interest. Studies considered eligible were those evaluating predetermined discharge criteria (individual or grouped in a discharge tool): vital signs, oxygen saturation, level of consciousness, blood loss, pain, and existing tools for discharge assessment. Other outcomes of interest were nausea and vomiting, medication administration (e.g. anti-emetics, analgesics), time spent in PACU, delay in discharge from PACU and adverse events related to early discharge from PACU. Of the 2443 abstracts captured by the search strategy, 2435 were excluded during screening and eight were included in the systematic review (Fig. 1).
Results

Eight studies were included in the systematic review. These were representative of international perspectives on discharge from PACU. Four were observational studies of moderate to high risk of bias. All were conducted using convenience samples of PACU patients; the assessment tools were generally not validated, and analysis was often limited. Only one study was a RCT;24 it focused on the use of a discharge tool with the aim of defining criteria for bypassing PACU. Another two observational studies25,26 and one retrospective records analysis27 offered useful data for the development of a PACU assessment tool. The studies included in the review investigated a wide range of variables. However, the most common were pain, conscious state, vital signs, and nausea and vomiting. Details regarding the studies are given in Table 1.

Studies investigating tools for the assessment of readiness for discharge from PACU

A Canadian study compared a fast-track group with a routine recovery group.28 The aim was to determine the time and cost savings of discharging patients directly from the operating theatre to a day surgery unit. This unblinded RCT assessed adult patients scheduled for gynaecologic laparoscopy, hysteroscopy or arthroscopy. Patients were randomly allocated to either the fast-track group (n = 110) or usual PACU care (n = 97). In both groups, patients were assessed with the fast-track tool once awake in the operating theatre. If those in the fast-track group met the discharge criteria within 10 min, they were directly discharged to the day surgery unit, rather than to PACU. Results showed significant time savings for patients assessed within the operating theatre, as the PACU stay could be bypassed. This was particularly noticeable for those patients undergoing hysteroscopy (savings of 43 min, \( P < 0.05 \)) and arthroscopy (35 min, \( P < 0.05 \)). However, this time reduction was not associated with a reduction of adverse events such as pain or nausea. Also, neither nursing time nor financial costs improved as a result of the use of the fast-track discharge system. In terms of assessment of patient readiness for discharge, the fast-track discharge system and the routine PACU discharge tool were equally effective.

Chung et al.22 conducted a descriptive trial in a Canadian university teaching hospital. The aim was to validate and subsequently implement a new objective discharge checklist. The Post-Anaesthetic Discharge Scoring System (PADSS) was a substitute for the existing clinical discharge criteria (CDC). The PADSS tool consisted of five categories of discharge criteria: vital signs; activity and mental status; pain, nausea and/or vomiting; surgical bleeding; and intake and
<table>
<thead>
<tr>
<th>Study</th>
<th>Assessment tool</th>
<th>Comparison tool</th>
<th>Type of study</th>
<th>Number of participants</th>
<th>Type of surgery</th>
<th>Time to meet criteria</th>
<th>Findings</th>
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</table>
| Song et al., 2004 | Fast track assessment tool to bypass PACU | Discharge from operating theatre to PACU | Randomised controlled trial | 110 (fast track group), 97 (traditional discharge) | Day surgery; gynaecologic laparoscopy, hysterectomy or arthroscopy | N/A; screening tool administered in operating theatre | • 97% of patients met fast-track criteria.  
• Average time saving in recovery was 17 min. |
| Chung et al., 1995 | Post-Anaesthetic Discharge Scoring System | Clinical discharge criteria (subjective checklist) | Observational | 247 | Day surgery, short procedure (dilation and curettage); day surgery, long procedure (arthroscopy and laparoscopy) | Short-procedure patients: mean 115 min (range 10 to 210 min); long-procedure patients, mean 125 min (range 0 to 385 min) | • Average time in PACU not significantly different.  
• Times may have been shorter if other causes for delay had been avoided. |
| Brown et al., 2008 | Discharge criteria | Discharge by anaesthetist | Observational | 631 (anaesthetist discharge), 567 (discharge criteria) | Day surgery; procedures under epidural or spinal anaesthetic | 66.3 ± 30 min | • Significant 24% reduction (P = 0.0) in time spent in PACU.  
• Significant reduction (P = 0.0) in delayed discharge due to waiting for nurse escort.  
• Significant reduction (P = 0.008) in multiple causes for discharge delay.  
• Significant decrease (P = 0.008) in delayed discharge due to waiting for nurse escort.  
• Significant reduction (P = 0.008) in delayed discharge due to other reasons. |
| Feliciano et al., 2008 | Postoperative urinary retention | N/A | Retrospective record analysis | 112 | Procedures under spinal anaesthetic | N/A; record analysis | • 44% of patients experienced POUR.  
• Only predictive factor was bladder volume ≥500 ml on admission to PACU.  
• Primary cause for delay was inability to meet criteria for oxygen saturation (at least 90%). |
| Gartner et al., 2010 | Danish Society of Anaesthesiology and Intensive Care Medicine assessment | N/A | Observational | 116 | Breast cancer surgery | 40 ± 46 min | • Pain and mental alertness were not at preoperative levels by 120 min.  
• Cognitive function, mobility and educational factors were at or superior to preoperative levels within 120 min.  
• Nausea and vomiting peaked at 90 min following surgery.  
• 8% of patients considered to have delayed discharge due to anaesthetist assessment.  
• 20% of patients had delayed discharge when other causes were included (e.g. awaiting escort).  
• Anaesthetic, type of surgery, amount of blood loss and intraoperative fluid replacement were predictive factors for length of stay.  
• Mean time to discharge by Aldrete criteria was 26 min.  
• On admission to PACU, 97% of patients met Aldrete criteria but psychomotor function was significantly impaired (P < 0.0001) on all four tests.  
• Impairment remained significant (P < 0.0001) on all four tests at discharge from PACU. |
| Stephenson, 1990 | Tool with 17 different subjective patient assessments | N/A | Observational | 33 | Day surgery; orthopaedic procedures | N/A; recovery to preoperative status was observed up to and following discharge. | • Primary cause for delay was inability to meet criteria for oxygen saturation (at least 90%). |
| Waddle et al., 1998 | Medically appropriate length of stay | Discharge by anaesthetist | Observational | 340 | Procedures excluding thoracic surgery, neurosurgery, ophthalmology and ENT | 71 ± 37 min | • Primary cause for delay was inability to meet criteria for oxygen saturation (at least 90%). |
| Willey et al., 2002 | Manual dexterity test, letter cancellation test, critical tracking test, multichoice reaction time | Aldrete criteria | Observational | 31 | Day procedure; endoscopy under sedation | N/A; recovery to preoperative status was observed for and not reached | • Primary cause for delay was inability to meet criteria for oxygen saturation (at least 90%). |

ENT, ear, nose and throat; N/A, not applicable; PACU, post-anaesthetic care unit.
output. A total of 247 patients were selected and allocated to two groups: those who had a dilation and curettage (a short procedure) and others who had longer minor ambulatory surgical procedures. All patients were assessed to determine their eligibility for discharge using both tools: the CDC, used by PACU staff, and the PADSS, used by independent researchers. There was no significant difference in time to meet the discharge criteria between the two tools for either group of patients.

An observational study21 conducted in a US tertiary-care teaching hospital compared a traditional discharge group (TDG) with a discharge criteria group (DCG) in adults undergoing general anaesthesia who were scheduled for an overnight hospital stay postoperatively. The study involved 631 patients in the TDG being discharged by anaesthetists after a previous alert by nursing staff on their readiness and 567 patients in the DCG being discharged after assessment using the discharge criteria tool. The checklist included the following variables: activity, respiration, pulse, blood pressure, oxygen saturation, consciousness/mental status, pain score, urine output, nausea or vomiting, and laboratory results. The discharge of patients in the DCG was characterised by a substantial and significant (24%, \( P < 0.001 \)) reduction in time spent in PACU. In terms of the variables assessed, the two groups of patients did not report significant differences.

A Danish study23 aimed to understand causes of discharge delay in patients experiencing surgery for breast cancer. The discharge tool used was the Danish Society of Anaesthesiology and Intensive Care Medicine (DASAIM) assessment tool. Forty minutes was the average time for patients to meet the discharge criteria required by the DASAIM tool, which consisted of assessment of post-anaesthetic nausea and vomiting, sedation levels, vital signs, pain and oxygen saturation. The mean time to discharge from the PACU was approximately 110 min. The primary reason for discharge delay was the patients’ inability to meet the required level of oxygen saturation (at least 90%). No explanation was found for the low oxygen saturation levels of patients in this study despite investigation of the following factors: (i) use of Patent Blue (an injectable substance for visualisation of the lymph nodes reported to cause false low oxygen saturation levels); (ii) respiration rate on arrival at the PACU; and (iii) the use of intraoperative long-acting opioids.

As a result of their investigation, Gartner and colleagues concluded that the criteria for oxygen saturation level should be reconsidered. However, the relationship between discharging patients with low oxygen saturation levels (less than 90%) and postoperative complications remains uncertain, as adverse events following discharge were not reported in the study.

A sample of 340 post-surgical patients was studied by Waddle et al.15 in a US tertiary-level hospital. The study was a comparative analysis of a PACU discharge protocol based on the anaesthetist’s assessment compared with a medically appropriate discharge tool based on formal assessment. Outcomes investigated were the length of PACU stay and the predictive factors for delayed discharge, including surgery type, comorbidity and anaesthetic type. In terms of discharge readiness, level of consciousness, vital signs, agitation, arrhythmias, and nausea and vomiting were considered. However, the criteria used in the formal protocol for determining readiness for discharge were not fully reported in the study, while those used by the anaesthetists were not reported at all. In regard to the length of PACU stay, the study highlighted the significance of implementing a formal assessment of readiness for discharge. Time to discharge with the medicinally appropriate discharge tool was 24 min less than that determined by the anaesthetist’s assessment. In addition, one-fifth of the patients included in the sample were classified by the researcher as having a delayed discharge, of which a considerable number were due to waiting for the anaesthetist’s assessment. These considerations led the researcher to conclude that to reduce the length of PACU stay, it would be necessary to adopt a formal discharge readiness evaluation.

**Studies assessing the relevance of specific variables for determining readiness for discharge from PACU**

A study conducted in the UK addressed recovery of adult patients after orthopaedic day surgery.25 The study was conducted on a sample of 33 individuals. Seventeen variables were considered, including nausea and vomiting, appetite, thirst, alertness, pain, coordination, dizziness, headache, energy levels, temperature, feeling of wellness, interest levels, clarity and speed of thought, excitability, feeling of trouble, and happiness. The study failed to report specific values for all of the variables investigated. Results showed a general tendency for the Likert values (0–10, 0 being optimal) for mental state (alertness and energy) to increase at 30 min and then return to baseline at 120 min. By contrast, the mean reported level of pain increased postoperatively at both time intervals, due to a lack of analgesia administration. Nausea and vomiting peaked at 90 min. The author reported that values for excitability, feeling of trouble, and happiness were found to be significantly lower than those assessed prior to the surgery. The author suggested the criteria essential for the assessment of patient readiness for discharge were mental state (alert and responsive), mobility consistent with preoperative level and type of surgery, lack of dizziness, pain being under control (analgesia provided), ability to retain orally taken fluids, information provision, and social support.

In 2002, the use of psychomotor tests in the assessment of patient recovery from sedation was investigated in an observational study.26 Four different psychomotor tests were administered on 31 patients undergoing endoscopy: (i) a manual dexterity test for the assessment of fine motor skills; (ii) a letter cancellation test (LCT), evaluating concentration and perception; (iii) a multiple choice reaction time test for the assessment of complex reaction time; and (iv) a critical tracking test, a computer-based assessment of psychomotor coordination. Patients presented normal functional status levels and reported comorbidities such as anxiety and depression. The tests were administered prior to the endoscopy and every 15 min from admission to PACU until
discharge. In order to be discharged, patients were also required to meet modified Aldrete criteria, to independently ambulate and to hold a simple conversation. Patients' recovery level was analysed both at the time of meeting the discharge criteria and at the time of PACU discharge. Results showed significant psychomotor impairment even for the 97% of patients who met the discharge criteria on admission to PACU. At discharge, while recovery was improved, the psychomotor impairment remained significantly higher than baseline. The study highlighted limitations for the modified Aldrete criteria in the assessment of significant psychomotor impairment and showed that this tool would be more appropriate for discharging to a monitored care ward rather than directly to home. The researchers emphasised the importance of adding the assessment of ambulation and conversation for an improved recovery for discharge. Also, it was suggested that the LCT be included in the assessment of readiness for patient discharge following sedation due to its simplicity of use and its benefits in terms of patient safety.

The final included study investigating specific variables for patient discharge from PACU was conducted in Wales in a US military hospital with a sample of 112 patients undergoing surgery under spinal anaesthesia.27 This was the only study in the review that involved spinal anaesthesia. The focus was exclusively the incidence of postoperative urinary retention (POUR), defined as a bladder volume of at least 500 mL and inability to void for at least 30 min.27 Although 44% of the sample experienced POUR, no significant relationship was found between this identified adverse event and patient characteristics such as age, gender, type or duration of surgery and amount of intraoperative fluids administered. Based on the assumption that POUR was a common adverse event for patients undergoing spinal anaesthesia, the aim of the study was to include POUR in the assessment of readiness for PACU discharge. However, the study was not sufficiently powered to provide evidence on the effectiveness of considering POUR as a discharge criterion in the PACU environment.27

**Discussion**

The review20 examined the evidence for the essential variables to be included in an effective scoring system to assess patient readiness for discharge from PACU. The studies varied in type of surgery, anaesthesia and destination after discharge from PACU. The most commonly investigated variables were pain, conscious state, vital signs, and nausea and vomiting. There was consensus for includes pain, nausea and vomiting, and conscious state. Patients reported that pain was the worst aspect of the entire operative process, and thus this variable needs to be carefully assessed.25 Nausea and vomiting have been shown to occur in many patients despite prophylactic anti-emetic administration, resulting in longer duration of PACU stay.26 Although one of the most commonly assessed variables, nausea and vomiting was shown to peak at 90 min post-surgery25 and was commonly a significant issue after PACU discharge.28 In regard to conscious state, while this criterion was frequently assessed, there was no agreement with regard to its specific measurement or the value of including it in assessment criteria.15,21–24

Other criteria proposed in the studies were the patient's demonstration of appropriate responsiveness or meeting preoperative status,21 the patient's being orientated and/or having a steady gait,22 and consciousness based on level of arousal.23 Psychometric tests were investigated;25,26 however, their inclusion in the assessment of patient readiness for discharge from PACU may not justify the additional time and resources required.29

In regard to vital signs, there was discrepancy between the studies with regard to the values to be considered when determining PACU discharge readiness. Five studies15,21–24 reported different combinations of vital signs, with blood pressure the only universally accepted variable. With the exception of Chung et al.,22 all these studies included oxygen saturation, which in one study25 was the criterion that resulted in the most discharge delays. Consequently, Gartner et al.23 proposed that discharge with oxygen being administered via nasal prongs may be appropriate. Only one study15 included temperature in the assessment of patient readiness, without conclusive evidence of its value. Some of the assessment tools21,23,24 indicated specific values for each of the variables to be assessed, but only one study23 reported values that were independent of baseline measures.

Urinary output and oral fluid intake were included in some discharge assessments, especially those including ambulatory surgery patients. In one study,22 patients were required to have voided and/or to have taken fluids orally before discharge. Brown et al.21 determined patient readiness to include clear and adequate urine output, and oliguria delayed discharge. Another study focused on postoperative urinary retention27 and reported an incidence of 44% following spinal anaesthesia. However, the impact of including urinary output and oral fluid retention on PACU discharge and length of stay is uncertain due to a lack of standard urinary output assessment in discharge criteria tools. For ambulatory surgery patients, it has been suggested that discharge criteria be modified so that the abilities to tolerate oral fluid intake and pass urine are not mandatory for all patients.29

Determining overall readiness for PACU discharge was also explored. Three of the five studies using a discharge tool were based on scoring systems,22–24 where patients needed to achieve full recovery in most of the variables assessed. These systems appeared more flexible than Brown's 10-item tool.21 In regard to patient safety when discharge was determined using assessment tools, patients assessed with the use of a fast-track scoring system did not report significantly higher levels of postoperative pain or nausea24 than those patients who received additional discharge assessments. Furthermore, there were fewer patients with unstable vital signs compared with patients assessed without the use of discharge criteria. It was concluded from the findings of one study15 that a formalised assessment for discharge readiness should be implemented by nurses, as there were time savings compared with waiting for an anaesthetic review. This has important implications for healthcare settings from a cost perspective.

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The findings of the systematic review informed a subsequent Delphi consensus study conducted by the researchers. In addition, a retrospective audit of the nature and frequency of adverse events immediately following surgery has been undertaken by the team at a Victorian health service. These studies have informed a current research project that tests the clinical reliability of a tool for use by nurses in assessing patient readiness for discharge from post-anesthetic care, linked to a cost-benefit analysis. It is anticipated that the outcomes will also contribute to improved documentation and patient handover practices among PACU nurses. This research program enables critical evaluation of existing guidelines and practices, with the potential to enhance nurses’ clinical decision-making and thus improve patient safety.

Conclusion

Pain, conscious state, nausea and vomiting should be assessed for PACU discharge (JBI evidence level 2). While vital signs were reported to be important to safe patient discharge, there was no agreement on the specific vital signs included in the tools, apart from blood pressure (JBI evidence level 2). The only validated PACU discharge tool, the DASAIM assessment,[23] considered assessment of blood pressure, pulse, respiration rate and oxygen saturation as essential. Urinary output, oral fluid intake and psychomotor testing were also investigated; however, the value of including these remains doubtful and requires further investigation. The synthesised evidence suggests there is limited consensus on criteria for PACU discharge assessment. Further research should investigate the validity and reliability of assessment variables in PACU discharge tools, the implementation of validated PACU discharge criteria for assessment of patient readiness for discharge, and the relationship between PACU discharge assessment and patient safety.

References

Appendix I
Joanna Briggs Institute critical appraisal forms

JBI Critical Appraisal Checklist for Randomised Control/Pseudo-randomised Trial

Reviewer: _______________________________ Date: __________________
Author: _______________________________ Year: ________ Record No: ________

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<tbody>
<tr>
<td>1</td>
<td>Was assignment to treatment groups truly random?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>2</td>
<td>Were participants blinded to treatment allocation?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>3</td>
<td>Was allocation to treatment groups concealed from the allocator?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>4</td>
<td>Were the outcomes of people who withdrew described and included in the analysis?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<td>5</td>
<td>Were those assessing outcomes blind to the treatment allocation?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>6</td>
<td>Were the control and treatment groups comparable at entry?</td>
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<td>No</td>
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<tr>
<td>7</td>
<td>Were groups treated identically other than for the named interventions?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>8</td>
<td>Were outcomes measured in the same way for all groups?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<tr>
<td>9</td>
<td>Were outcomes measured in a reliable way?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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<td>10</td>
<td>Was appropriate statistical analysis used?</td>
<td>Yes</td>
<td>No</td>
<td>Unclear</td>
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Overall appraisal: Include □ Exclude □ Seek further info. □

Comments (including reason for exclusion):
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# JBI Critical Appraisal Checklist for Comparable Cohort/Case Control

**Reviewer:** ________________  
**Date:** ________________  
**Author:** ________________  
**Year:** ______  
**Record No:** ______

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unclear</th>
<th>N/A</th>
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<tbody>
<tr>
<td>1</td>
<td>Is the sample representative of patients in the population as a whole?</td>
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<td>2</td>
<td>Are the patients at a similar point in the course of their condition/illness?</td>
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<td>3</td>
<td>Has bias been minimised in relation to selection of cases and of controls?</td>
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<td>4</td>
<td>Are confounding factors identified and strategies to deal with them stated?</td>
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<td>5</td>
<td>Are outcomes assessed using objective criteria?</td>
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<td>6</td>
<td>Was follow up carried out over a sufficient time period?</td>
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<tr>
<td>7</td>
<td>Were the outcomes of people who withdrew described and included in the analysis?</td>
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<tr>
<td>8</td>
<td>Were outcomes measured in a reliable way?</td>
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<tr>
<td>9</td>
<td>Was appropriate statistical analysis used?</td>
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**Overall appraisal:**  
**Include** ☐  
**Exclude** ☐  
**Seek further info.** ☐

**Comments (including reason for exclusion):**

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# JBI Critical Appraisal Checklist for Descriptive/Case Series

**Reviewer:** ________________________________  **Date:** ________________________________

**Author:** ________________________________  **Year:** ________  **Record No:** ________

1. Was the study based on a random or pseudorandom sample?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

2. Were the criteria for inclusion in the sample clearly defined?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

3. Were confounding factors identified and strategies to deal with them stated?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

4. Were outcomes assessed using objective criteria?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

5. If comparisons are being made, were there sufficient descriptions of the groups?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

6. Was follow up carried out over a sufficient time period?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

7. Were the outcomes of people who withdrew described and included in the analysis?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

8. Were outcomes measured in a reliable way?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

9. Was appropriate statistical analysis used?  
   ![Yes][1]  ![No][2]  ![Unclear][3]  ![N/A][4]

**Overall appraisal:**  Include ☐  Exclude ☐  Seek further info. ☐

**Comments (including reason for exclusion):**

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