

Review

Evidence based emergency nursing: Designing a research question and searching the literature

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ABSTRACT

The purpose of research is to discover new knowledge. All good research starts with a clear, answerable question that addresses an important and significant problem or phenomenon of interest. In this paper, emergency nurses and other clinicians will be provided with a practical guide to successfully developing a quality research question as the basis of quality research. In this paper, how to plan and prepare question development using the PICO Framework, develop a literature search strategy, and perform a search, extracting and analysing information will be detailed.

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1. Background

Good research starts with a clear, answerable research question that addresses an important problem or phenomenon of interest [3]. Research should also be guided by prevailing local, national and international priorities, organisational strategic goals and relevant professional standards. Formulating a specific and answerable research question is often challenging for the beginning researcher [3]. Observations of clinical practice, deep and considered reflection of personal and clinical experiences, and an inquiring mind are good foundations for well-developed research

questions [3]. In this paper, emergency nurses and other clinicians will be provided with a practical guide to successfully developing a quality research question as the basis of quality research. In this paper, how to plan and prepare question development using the PICO Framework, develop a literature search strategy, and perform a search, extracting and analysing information will be detailed.

It is common in the early stages of the research process for research questions to be broad in scope and consequently difficult to answer. Considerable care and time are spent refining the problem or phenomenon of interest to develop a research question that enables a rigorous and robust search of the literature using key terms [3]. Failure to develop a specific and answerable research question places the whole research process in jeopardy [5]. Key to the success of any research project is the setting of a clear, answerable research question that is informed by a comprehensive and systematic review of the literature, as described in this paper.

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2. Planning and preparation

Planning and preparation for developing a research question for quality outcomes should address four fundamental questions detailed in Table 1. All research, no matter how big or small, should begin with answering ‘The Fundamental Four’.

In a more formal sense, such questions are expressed in an array of systematic strategies for quality research, such as the PICO Framework.

2.1. Using the PICO Framework for question development

PICO is a well-known and widely used framework for developing robust and answerable research questions. The PICO Framework is also useful for framing quality assurance or evaluation projects. The PICO Framework consists of four components, which inform the development of a ‘PICO Question’:

- (P)roblem or (P)opulation
- (I)ntervention
- (C)omparison, and
- (O)utcome(s) [19].

The PICO Question supplements to the aim of the study or literature review and forces the researcher to express the question with

Table 1
The Fundamental Four for informing quality research.

1. What do we know?	<ul style="list-style-type: none"> • What has already been written about the topic / issue of interest? • Has the issue of interest already been investigated? –If so, by whom, when, and in what context? • Has the question already been answered?
2. What don't we know?	<ul style="list-style-type: none"> • Is this a new or emerging issue that has not been addressed previously? • Is there a gap in the research literature that makes this a new problem or issue? For example, has the problem or issue been investigated at a different time? In a different context?
3. What should we know?	<ul style="list-style-type: none"> • What is the specific gap that this study/literature review is going to address?
4. Why should we know it?	<ul style="list-style-type: none"> • Why is addressing that gap important? for patients? for families? for clinicians? for the broader health system?

Table 2
Examples of recently published reviews and PICO questions.

Aim	PICO question
<p>Example 1: Systematic Review: to examine the evidence related to spinal immobilisation in pre-hospital and emergency care settings [8]</p>	<p>P: victims with suspected spinal injury I: use of spinal immobilisation during pre-hospital or emergency care C: no immobilisation O: neurological outcome, prevention of movement, spinal positioning/alignment, comfort or pain, and complications</p>
<p>Example 2: Integrative Literature Review: to synthesise existing evidence on the impact of multidisciplinary simulation-based resuscitation team training on team performance, and patient and health service out-comes. [24]</p>	<p>P: teams who respond to in-hospital resuscitations I: teamwork training using simulation C: N/A O: impact of team training on team performance and efficiency of patientcare</p>

precision and specificity [13]. Examples of recently published reviews and their PICO questions are shown in Table 2.

As illustrated in example 2, not all PICO questions will have an intervention and a comparator. Some PICO questions compare an intervention with no intervention and other PICOs compare one or more interventions.

2.2. Developing a search strategy

The purpose of the literature search is to identify existing published research in the particular area of interest to assist the researcher to clarify and specify the research question, and to identify whether the research question has been answered. The search of the literature must be strategic and systematic, and informed by a documented strategy. Search strategies have two major considerations: search terms, and databases. The PICO Framework should also be used to develop the search terms that are informed by the PICO question, Medical Subject Headings (MeSH) and any other terms deemed to be relevant. The resulting PICO question should be written out in full and then the main terms defined and main topics identified, as is illustrated in Table 3.

Alternative terms and spellings must be considered, for example paediatric vs pediatric or epinephrine vs adrenaline. It may be appropriate to perform a scoping review using the main terms from the PICO question to get a sense of the breadth and depth of the literature, which will then inform the search strategy. Scoping reviews map the existing literature or evidence base related to the topic of interest but do not describe the findings in detail or take the quality of evidence into account as an initial priority [1]. It is also useful to look at the PICO question from seminal studies identified during the scoping search.

The study inclusion criteria should be described and typically only research papers should be included in a literature review, depending on the nature of the review being undertaken. Although review papers are not typically included in the literature review, they are a good source to cross reference to double check for studies that your search may have missed. The inclusion criteria should consider gender, age of participants, year(s) of publication and study type. For example, if a PICO question is related to antenatal care then gender would be limited to women. Age limits may be set for PICOs that specifically target children or the elderly. The year(s) of publication may be unlimited for PICOs where there is

Table 3
Defining main terms and topics from PICO question.

PICO	
<p>Example 1 [8] P: victims with suspected spinal injury I: use of spinal immobilisation during pre-hospital or emergency care C: no immobilisation O: neurological outcome, prevention of movement, spinal positioning/alignment, comfort or pain, and complications</p>	<p>Spinal injury: spinal cord injury, spine fracture Spinal immobilisation: manual in-line stabilisation head blocks, spinal boards, cervical collars Pre-hospital care or emergency care: emergency treatment, emergency care, first aid, emergency department Complications: respiratory compromise, raised intracranial pressure, pressure injuries Resuscitation: defined as acting on immediate and life threatening patient emergencies</p>
<p>Example 2 [24] P: teams who respond to in-hospital resuscitations I: teamwork training using simulation C: N/A O: impact of team training on team performance and efficiency of patient care</p>	<p>Teams: emergency medical services, trauma team, rapid response team, medical response team Patient care: length of stay, diagnostic error, delayed diagnosis, patient safety, decision making</p>

not a lot of published literature, or if there are sentinel studies of relevance, or the relevance of literature is limited to clinical practice or health system changes. For example, a PICO related to quality of current models emergency care of patients with mental health issues in Australia would be limited to papers published after mental health care was deinstitutionalised in the mid 1990s [11]. Exclusion criteria also need to be justified and detailed and papers may be excluded according to paper type (such as discussion papers or opinion pieces), language, participant characteristics, or year(s) of publication.

2.3. Performing the search

Once the search terms have been determined, an electronic Boolean Search of relevant databases is conducted. Databases commonly used include Cumulative Index for Nursing and Allied Health Literature (CINAHL), MEDLINE, PubMed and Embase. The Cochrane Library is also usually included as a major source of evidence-based systematic reviews. When first conducting a search it is prudent to meet with a librarian to understand how those search terms are entered into specific databases. These databases rely on the use of Boolean Operators, whereby keywords are entered using quotation marks to indicate a phrase rather than particular or single words. For example, entering “cervical collars” will provide results related to cervical collars but entering cervical collars without quotation will be interpreted by the databases as cervical and collars so will produce results related to things like cervical cancer. When entering multiple terms combiners and limiters such as “AND”, “OR” and “NOT” must be used. It is important to understand the difference between using “AND” or “OR”. Using the spinal immobilisation search as an example:

- entering “spinal immobilisation” OR “manual in-line stabilisation” OR “head blocks” OR “spinal boards” OR “cervical collars” into Google Scholar produced 6280 results including citations and patents.
- “spinal immobilisation” AND “manual in-line stabilisation” AND “head blocks” AND “spinal boards” AND “cervical collars” into Google Scholar produced two results including citations and patents [8].

All databases will allow you to ‘truncate’ terms to find different word endings, and expand your results. The truncation symbol is usually the asterisk (*), for example, nurs* will find nurses, nurse and nursing. The wildcard is usually a question mark symbol (?) that can be used to replace a single character in a word to find different spellings. For example, wom?n will bring up results for both woman and women. It is important that you save your search strategy as you will need this if you wish to publish your literature review or if your literature review is part of a research thesis [10]. Using reference manager software will enable efficient saving and sorting of references, and librarians can provide you with advice regarding the many programs available.

3. Getting and reporting your results

Once the search results are available, the next step is to review all of the titles and abstracts and remove duplicates. The remaining titles and abstracts are critiqued against the PICO question and the articles labelled as included, excluded or possibility. For articles labelled as include or possibility, the full text articles are retrieved and read in detail for critique against the PICO question. Ideally, at least two people should undertake title and abstract reviews independently. Discrepancies should be resolved by bringing the results together for discussion and debate or

involvement of a third person. It is important that the rationale for literature exclusion is noted in detail. At this point, additional searching may be undertaken by hand searching the reference lists of the full text papers for secondary sources, contacting experts and reverse searching authors that have cited papers in the full text list [6]. There are a number of studies demonstrating that manual searching provides greater search yields than searching the electronic databases alone [4,9,12]. At the end of this process, it is critical to have documented the literature search in a systematic fashion, such as PRISMA (Preferred Reporting Items for Systematic Reviews and meta-Analyses) [14] or other suitable frameworks (Fig. 1).

Most simple literature reviews will not require the last box regarding meta-analysis however meta-analyses may be used in more complex reviews. Systematic reviews and meta-analyses can be useful sources of information as they often provide a rigorous overview of the current state of research literature on a given topic. Systematic reviews and meta-analyses are also useful to inform the development of the PICO question and search terms by looking at the keywords and search strategy. They are also useful as a cross reference to check that your search identified all the key papers related to the PICO.

Once the inclusion/exclusion process is complete, the resulting papers are re-reviewed and the level, quality, relevance and strength of the evidence is critically appraised. There are a number of different methods by which to appraise the quality and strength of evidence

[2,7,16], Scottish Intercollegiate Guidelines Network (SIGN) [20]. Table 4 provides a summary of the factors that should be taken into account when critically appraising research studies and there are a number of checklists that can guide this process [18].

The levels of evidence by which papers are assessed are shown in Table 5. It is important to note that in many areas of health, including emergency care, it is difficult to achieve high-level evidence. As such, the focus should be on determining the highest available level of evidence. High-level evidence from randomised controlled trials does not necessarily mean that the recommendations from these studies are useful [16]. This is particularly true when the effects of the intervention or treatment were small and the outcome measures were surrogates, rather than actual clinical outcomes of importance. For example, return of spontaneous circulation is often used as an outcome in resuscitation research, however the clinically meaningful outcome that matters is survival to hospital discharge or beyond with intact neurological function [15]. Although it may be tempting to use surrogate outcomes, particularly when a study is of high quality, it is important to stay true to the outcomes of interest listed in the PICO question. The reason so many studies use surrogate outcomes is because it is easier, faster and often cheaper than using complex, hard clinical outcomes [21]. The use of surrogate outcomes introduces bias, decreases rigour and often do not accurately reflect the true effect of interventions, so their use should be discouraged when true endpoints are available [23].

There are many tools for assessing the quality of evidence. One simple method recommended by the National Health and Medical Research Council (Australia) [17] is to categorise studies by design (randomised, cohort, case control) or by important quality features (blinded versus unblinded).

For qualitative research, COREQ (Consolidated criteria for Reporting Qualitative research (COREQ), which is a 32 item checklist for reporting of qualitative studies can be used [22]. It is important that you keep careful records of your quality assessments as you will need to include which quality assessment method or tool was used and the outcomes of your quality assessments if you publish from this work.

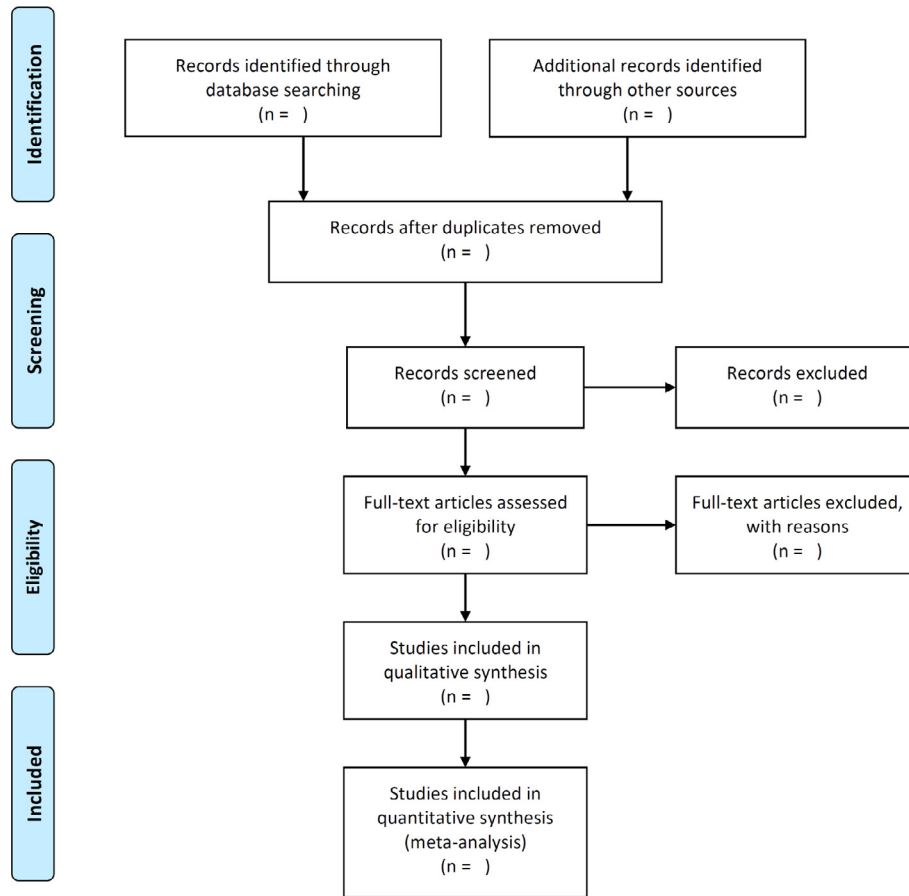


Fig. 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) [14].

Table 4
Level, quality, relevance and strength of the evidence [16] p 55).

Level of evidence	Study design used as an indicator of the degree to which bias has been eliminated by design (See Table 5)
Quality of evidence	The quality of the methods used by investigators to minimise bias in a study design
Relevance of evidence	A term encompassing the closeness of the study question to the clinical question, which is determined by the relevance of the outcome measures used and the applicability of study results to other treatments, settings and patients
Strength of evidence	The 'strength' of evidence relates to the magnitude and reliability of the treatment effect seen in clinical studies: strong effects are more likely to be real and more likely to be clinically important. Should take into account the effect size, confidence interval, p value, and the exclusion of clinically unimportant effects

Table 5
National Health and Medical Research Council (Australia) Levels of Evidence [16] p 56).

Level I	Evidence obtained from a systematic review of all relevant randomised controlled trials
Level II	Evidence from at least one properly designed randomised control trial
Level III-1	Evidence obtained from well-designed pseudorandomised controlled trials
Level III-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised, cohort studies, case control studies, or interrupted time series with a control group
Level III-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies or interrupted time series without a parallel control group
Level IV	Evidence obtained from case series, either post-test or pretest/post-test design without a control group

3.1. Publishing a literature review

Researchers have an ethical and professional obligation to publish their research. Often the first stage in a research study or clinical project is the literature review and consideration should be given to publication of the literature review and the results. However, most journals will not publish a simple summary of the literature. In order to publish a literature review, there needs to be clear evidence of a rigorous and structured process and the review must make an original contribution to knowledge. This is typically achieved by identifying a gap in the current body of knowledge in an original and evidenced-based way.

For novice researchers undertaking a literature review can be a great first step into the research paradigm and does not require ethical approval to undertake. In general a literature review paper will have the following sections but it is important to check the specific guidelines of your target journal:

- Introduction: will be relatively short, highlight what is known and what is not known, and set the scene for why it is important that this literature review be performed
- Aim: should be clearly stated and the aim should be highly specific can include the PICO question

- **Method:** should include details of the search strategy (search terms and data bases searched), inclusion and exclusion criteria, review process at title and abstract and full paper stages including number of reviewers, exclusions and reasons for exclusion, and the PRISMA diagram
- **Results:** should include the number of papers in the final review, results for each outcome of interest (number of studies, levels of evidence, major findings) +/- summary tables
- **Discussion:** discussion of results should occur in terms of the PICO question and what is known (should be aligned with the introduction)
- **Conclusion:** should contain a summary, recommendations and, or implications for practice, policy, future research or education.

4. Conclusion

The most important step when undertaking a literature review is to determine the relevance and importance of the research question, and to ensure that is clear and answerable. The PICO Framework provides a systematic process for developing a research question and potential terms for exploring available evidence. To understand the importance and relevance of available literature the researcher must locate, identify and analyse available literature using a systematic process that can facilitate level of evidence interpretation. Undertaking and publishing a literature review can inform and guide practice, education, policy, future research and service delivery. More specifically, the publishing of a literature review is important as it provides emergency nurses and other clinicians with a summary of evidence that can challenge, inform and or be used as evidence to argue for changing practice and health care delivery more broadly.

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