MNEMONICS

How helpful are mnemonics in the development of a research question?

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Review
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Abstract

Background The formulation of a research question is a vital first step in the research process and the significance of this is well reported in the literature; a well-structured question increases the outcome of useable findings. To aid the development of a research question, a number of frameworks in the form of mnemonics have been identified. It is suggested that the application of these mnemonics may result in confusion rather than provide helpful guidance.

Aim To present an overview of some of the mnemonically identified frameworks and consider how they may support the development of a research question.

Discussion The use of mnemonics can help to develop questions for empirical research or to identify published evidence. The oldest and most commonly cited mnemonic is PICO, which is most often discussed in association with quantitative approaches. Other mnemonics share similarities with PICO, although may be more aligned to particular research approaches. Along with a flexible approach to their use, the characteristics required to establish an effective research question may support the application of published mnemonics.

Conclusion The availability of frameworks in the form of mnemonics can help in the development of a research question, but their use and limitations must be fully understood. A flexible approach to their use is vital and this may also be helped by considering the characteristics of an effective research question.

Implications for practice When developing research questions, nurse researchers and nurses with a role in academic supervision should use the available mnemonics as a guide rather than rigidly adhering to them. They should also be aware of the characteristics of a good research question and advise students accordingly.

Keywords

mnemonics, nurse research, research frameworks, research question

Introduction

The literature unanimously supports the view that developing a focused research question is the first challenge presented to researchers, citing issues of clarity and conciseness as important considerations (Parahoo 2014, Tully 2014). Much published work has focused on supporting the development of a research question that is relevant to practice, and can be applied and translated into research (O'Brien and DeSisto 2013, Connelly 2015). Other authors have acknowledged the importance of the research question in searching the literature effectively (Meadows 2003, Macfarlane et al 2015).

A variety of tools and frameworks has emerged to support the development of research questions. However, although the literature recognises that these frameworks are there to help researchers, this paper aims to summarise them and consider how they can also impede the development of a research question.

Background

The identification of a research question is a key determinant in the production of useable findings (Hastings and Fisher 2014) and several considerations are crucial. Meadows (2003) emphasised reviewing the literature to find existing research, while Burns and Grove (2011) highlighted relevance, feasibility, focus and ethics. Lipowski (2008) stressed the value of making the research question interesting, suggesting that this may be achieved by making them

rooted in personal and practical experience, therefore making the subsequent findings more relevant and meaningful to practice.

Additionally, when undertaking empirical research, a methodology must be chosen. Quantitative designs focus on using predetermined measures to answer the research question, while qualitative designs are concerned with describing phenomena to gain greater understanding (Gray et al 2017).

Such diverse approaches to research suggest that an equally diverse approach to developing the research question may be required. Johnson and Hengstberger-Sims (2011) outlined some characteristics of a 'good' quantitative research question and state that it should comprise six components: the participants, clinical context, phenomenon of interest, intervention, comparison group and outcomes. Mantzoukas (2008) argued that a qualitative research question should reveal the area of interest in a succinct, focused and practicable manner; moreover, it may not conform to the traditional format of a question and may be presented in the form of a declarative statement.

The development of a research question is often a requirement in academic study and my experience of supervising students suggests it is a significant challenge. This may be because some students find the previously mentioned considerations difficult to grasp; they may also be novices at searching the literature, unfamiliar with research methods or even relatively inexperienced practitioners. Therefore, they are less well equipped in skills and knowledge.

Flemming (1998) discussed the need for the research question to be answerable, while Connelly (2015) and Tully (2014) acknowledged that novice researchers commonly propose questions that are too narrow or too broad. However, experienced practitioners and researchers may also find it difficult to frame a 'good' research question (Johnson and Hengstberger-Sims 2011).

Identified frameworks

Researchers have developed frameworks to help others develop research questions. These are largely represented as mnemonics and their application is demonstrated using hypothetical enquiries (Table 1).

PICO(T)/PICOT-D

PICO(T) is the framework most frequently cited in the literature; it is also the earliest to have been developed. Its origins lie in epidemiology, focusing largely on a patient-exposure approach for framing a problem that has emerged from practice and for identifying the relevant evidence (Oxman et al 1993). This was further modified by Richardson et al (1995) and the familiar PICO mnemonic appeared. Expanding on the relationship between the patient and exposure, Richardson et al (1995) identified intervention (I), comparison (C) and outcome (O); the patient/problem (P) is more frequently referred to as 'population' and the fifth dimension of time (T) has been included (Echevarria and Walker 2014, Medina McKeon and McKeon 2015). Given the increased availability of existing data to inform an evidence-based

TABLE 1. Identified frameworks

Mnemonic	Meaning	Origins	Sample (hypothetical) question/statement
PICO(T)	Patient/problem (P), intervention (I), comparison (C), outcome (O), (time) (T)	Oxman et al (1993) Richardson et al (1995)	A study comparing the healing rates (O) of two types of dressing (I) (C) used in diabetic patients with foot ulcers (P) over a six-week period (T)
PI/EO	Population (P), intervention/exposure (I/E), outcome (O)	Khan et al (2003)	How does compulsory academic supervision (I/E) affect the grades (O) of first-year nursing students (P)?
SPIDER	Sample (S), phenomenon of interest (PI), design (D), evaluation (E), research type (R)	Cooke et al (2012)	A qualitative study (R) using focus groups (D) exploring the experiences (E) of adolescent fathers (S) in the delivery room (PI)
PICOT-D	Population (P), intervention (I), comparison (C), outcome (O), time (T), digital (D)	Elias et al (2015)	In children with gastro-oesophageal reflux (P), how does current treatment (I) compare with a new treatment (C), when looking at pH levels (O) over a 24-hour period (T) using data recorded on the pH sensor (D)?

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approach to practice, Elias et al (2015) proposed a further expansion of the PICO(T) framework to include digital (D) to create PICOT-D.

Much of the published literature offers guidance on how to use PICO(T) to develop a research question, the context varying between identifying the relevant literature for a systematic review (Schardt et al 2007) and framing questions for empirical study (Riva et al 2012). With its concepts of intervention and comparison, PICO(T) is better suited to quantitative enquires (Miller and Forrest 2001, Moule and Goodman 2009).

SPIDER

Cooke et al (2012), while acknowledging the increasing use of inductive approaches, argued the need for a framework better suited to qualitative research. Theirs was SPIDER: sample (S), phenomenon of interest (P, I), design (D), evaluation (E) and research type (R). They reasoned that these changes to PICOT's mnemonic better reflect the nature and purpose of qualitative enquiries, while the addition of research type (R) may also make SPIDER appropriate for mixed-methods and quantitative search strategies. Nonetheless, SPIDER's use appears to be mainly confined to qualitative paradigms (Aveyard 2014).

PI/EO

Fineout-Overholt and Stillwell (2011) illustrated how PICOT can be used in qualitative research, although they stated that C and T may not always be appropriate. Khan et al (2003) also acknowledged qualitative approaches and suggested patient (P), intervention (I), outcome (O) as a framework that may be used. However, more recently, Khan et al (2011) moved away from using mnemonics when formulating questions for reviews, instead focusing on four aspects of a study: the population, the intervention (or exposure), the outcome and the design. While acknowledging the importance of structure, Khan et al (2011) advocated a more flexible approach to the development of questions.

Practical application

Developing a research question can be an intricate matter and using a framework can help to identify the scope and articulate a research question. Although almost exclusively limited to PICO, the literature contains examples of how frameworks may be applied (Miller and Forrest 2001, Aslam and Emmanuel 2010).

Even so, my experience suggests that rather than help in the creation of a research question, the use of mnemonics can instead result in confusion. Less experienced students have presented work in which they have attempted to inappropriately align their research questions with the selected framework's mnemonics. For example, in the case of PICO, they have misinterpreted its elements as vital components of all research questions, rather than guides to the development of a question. Such issues are not confined to inexperienced students – a recent attempt to identify a question for a systematic review of the literature resulted in some frustration, as even a flexible approach to the use of the mnemonics was ambiguous.

PICO is the longest established mnemonic, with a valued history in nursing (Elias et al 2015) yet its application to qualitative paradigms is less well recognised (Cooke et al 2012, Aveyard 2014). Additionally, PICO may not always be relevant – Carman et al (2013) drew on the example of experimental approaches (for which PICO is ideal) in the ED, where randomised controlled trials are seldom possible. Echevarria et al (2014) acknowledged these problems, highlighting the usefulness of Fineout-Overholt and Stillwell (2011)'s templates, which are structured around PICOT but consider the type of question and adapt PICOT accordingly. The issue is understanding the purpose and limitations of such frameworks in establishing the research question and using their components as a guide rather than an essential requirement.

In considering the value of these frameworks, it is useful to revisit the reasons for their inception. Oxman et al (1993) asserted that a driver in the development of frameworks was the ability to efficiently identify research relevant to practice. Similarly, frameworks have been developed in response to the need to have a focused and well-articulated research question (Doody and Bailey 2016); frameworks are also helpful in identifying relevant search terms (Cooke et al 2012).

Despite their varying terminologies, all the mnemonics considered in this paper appear to subscribe to these motives. Furthermore, if the characteristics of a 'good' research question (Johnson and Hengstberger-Sims 2011) are reconsidered – participants, clinical context, phenomenon of interest, intervention,

comparison group and outcomes – the frameworks in Table 1 are fitting.

Khan et al (2011) moved away from using mnemonics as an aid to developing research questions. This may be due to the perceived rigidity of such frameworks and the authors advised that even their own suggested structure, PI/EO, should not become a 'straitjacket', but should be adapted to meet the needs of the topic and approach. Misuse of mnemonics by less experienced researchers may also be a valid reason to discourage their use or if they are to be applied, advice about their use should include some cautionary notes.

As tempting as it is to summarise the existing frameworks in a new mnemonic, there are enough in the literature for researchers to refer to. What is important is that Johnson and Hengstberger-Sims' (2011) characteristics of a 'good' research question are considered, and whether the question is being developed to retrieve evidence or for an empirical study.

Conclusion

The literature consistently reminds researchers that the establishment of a clear and focused research question is crucial to the success or failure of any subsequent work. Assistance in this through frameworks is abundant.

This paper has identified some frameworks to help researchers and although these vary significantly depending on the context in which they will be used, they share fundamental elements consistent with Johnson and Hengstberger-Sims' (2011) characteristics of a 'good' research question. However, it is vital that if such frameworks are used to help develop a research question, their limitations are acknowledged and they guide rather than mandate behaviour. This may be especially pertinent to novice researchers.

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