



Induction, deduction and abduction

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Researchers often refer to the type of 'reasoning' that they have used to support their analysis and reach conclusions within their study. For example, Krick and colleagues completed a study that supported the development of an outcome framework for measuring the effectiveness of digital nursing technologies.¹ They reported completing the analysis through combining 'an inductive and deductive approach' (p1), but what do these terms mean? How can these methods of reasoning support nursing practice, and guide the development and appraisal of research evidence?

This article will explore inductive and deductive reasoning and their place in nursing research. We will also explore a third approach to reasoning—abductive reasoning—which is arguably less well-known than induction and deduction, but just as prevalent and important in nursing practice and nursing research.

Inductive reasoning

Induction, or inductive reasoning, involves the identification of cues and the collection of data to develop general theories or hypotheses. For this reason, inductive reasoning is often described as being 'bottom-up' reasoning. In the paper by Krick and colleagues mentioned previously, the inductive element of their work was taking findings from individual studies in a scoping review and using these to 'inductively derive' a first draft of their digital nursing outcomes framework.¹

Inductive reasoning is often linked with qualitative research, where data and observations from individual participants are coded and analysed, and—collectively—help form a general theory regarding the phenomenon being studied.² So, for example, Alteren and colleagues carried out a qualitative study of nurses' strategies for coping with interruptions during medication administration. The authors interviewed 19 Norwegian nurses, analysing the content of these interviews to identify 'meaning units' which they used to reach a level of understanding of nurses' experiences. This bottom-up process of analysing interview data, identifying meaning units and building these into a coherent understanding was described by the authors as being based on inductive reasoning.³

It is easy to see how this study—and many other qualitative pieces of nursing research—frame themselves as having used inductive reasoning, with data from individuals building piece-by-piece into a general theory or overview of a phenomenon. However, the inductive nature of qualitative research is not universally accepted. Bergdahl and Berterö, discuss the 'myth' of inductive reasoning in qualitative research.⁴ Though they agree that inductive methods require using direct observations or experiments to develop a general theory, they suggest that this is not what qualitative researchers do. Instead, they argue that the codes and themes developed during qualitative research are not tested scientifically, so do not represent true inductive reasoning. Instead,

the generation of theory in qualitative research—they argue—requires a 'creative leap' which is well beyond the scope of an inductive approach.⁴

Deductive reasoning

In their critique of induction in qualitative research, Bergdahl and Berterö argue that qualitative researchers should be more open to a deductive approach.⁴ At a superficial level, deductive reasoning can be viewed as the opposite to induction, with specific conclusions drawn from general theories. So, with inductive reasoning often conceptualised as 'bottom-up', deductive reasoning can be viewed as 'top-down'.

Some researchers have applied deductive reasoning within qualitative research as advocated by Bergdahl and Berterö, often by analysing qualitative data in the context of existing theory. A 2022 study by Andersson and colleagues explored critical care nurses' experiences of working during the first phase of the COVID-19 pandemic. However, rather than starting their analysis of qualitative interviews with a 'blank canvas' (as would be the case in a study using inductive reasoning), the authors applied an existing person-centred practice framework as a lens through which the data could be better understood and interpreted.⁵

Often, we see deductive reasoning linked to the hypothesis-testing nature of quantitative nursing research. A typical example is from Chang and colleagues, who completed a randomised controlled trial (RCT) in which the impact of a simulation-based mobile app on student learning was evaluated.⁶ The authors developed a set of hypotheses (the 'general theory' that forms the foundation of deductive reasoning) related to student learning and satisfaction and then tested whether these were supported through analysis of outcomes in the intervention (mobile app) and control (usual paper-based learning) groups. Through analysis of findings, the authors demonstrated the use of a deductive approach to confirm a theory-based hypothesis.⁶

Abductive reasoning

The two approaches discussed so far—induction and deduction—would seem to provide the foundation for much of what nurse researchers seek to do. Induction allows us to build theory from data, and deduction allows us to test theory and hypotheses. However, there is a third approach to reasoning—abduction—which is under-represented in the nursing evidence base, despite its importance to both research and practice.⁷

With abduction, we generate new ideas from, and recognise meaning in, the information that is available to us.⁸ The key point here is that we 'generate' new ideas, rather than test or verify them in the way that we should when using inductive or deductive reasoning. Abductive reasoning therefore plays an important part in both quantitative and qualitative research.

Table 1 Summary of inductive, deductive and abductive reasoning

Inductive	Deductive	Abductive
<i>Key feature</i>		
Specific observations to general inferences	General rule to a specific conclusion or inference	Begins with incomplete observations towards the likeliest explanation
<i>Theory use</i>		
Existing theories, models and frameworks are generally not used	General rules and premises are often drawn from theories, models or frameworks	Theory-based premises may or may not be used
<i>Type of research methodology</i>		
Primarily used in qualitative and mixed methods	Common in qualitative, quantitative and mixed methods	Mainly used in mixed methods and qualitative research
<i>Primary outcome</i>		
Hypothesis-generating Theory development	Hypothesis-testing Theory testing	Generating novel insights Developing most plausible inferences about data

From a quantitative perspective, it is often abductive reasoning that we use to first develop the hypothesis or theory that we can then test deductively. A set of observations about an element of nursing practice may lead us—through abductive reasoning—to develop a hypothesis that best explains what we have seen. We can then apply the hypothetico-deductive approach to test this, as with the RCT by Chang and colleagues described earlier.

In qualitative research, abduction may offer the solution to the ‘myth’ of inductive reasoning proposed by Bergdahl and Berterö. The ‘creative leap’ that they state qualitative researchers must make to turn their data into general theories,⁴ aligns well with the moment of discovery often associated with abductive reasoning.

Though abductive reasoning is a critical part of nursing practice and research, there is ongoing discussion about how effective it is when used as the only form of reasoning. Given the importance of producing research that supports evidence-based nursing care, it could be argued that suppositions based on abduction alone require testing by inductive and deductive methods before they can be generalised and implemented with confidence.⁷

This will depend to an extent on what we look to do with the insights provided by abductive reasoning: we would not, for example, introduce a new nursing intervention based only on the ‘best fit’ hypothesis of abduction. We would want to robustly test this hypothesis through deductive and inductive methods to ensure that practice was evidence-based. However, where abduction leads us towards understanding the experiences of those in our care, or of nurses themselves, it may be that—even without inductive or deductive substantiation—these insights can offer valuable guidance.

Conclusion

In this paper, we have explored three approaches to reasoning—inductive, deductive and abductive—and how they can be applied in nursing research. The main characteristics of these approaches are summarised in table 1. The key message for nurse researchers is that each approach has an important part to play in the generation, testing and implementation of new knowledge. In many cases, the research process will require nurses to

deploy all three approaches, so an understanding of each is an important part of any nurse’s knowledge base.

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