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Abstract

Mixed methods research involves the use of qualitative and quantitative data in a single research project. It represents an alternative methodological approach, combining qualitative and quantitative research approaches, which enables nurse researchers to explore complex phenomena in detail. This article provides a practical overview of mixed methods research and its application in nursing, to guide the novice researcher considering a mixed methods research project.

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Abstract

At its most basic level, mixed methods research involves the use of both qualitative and quantitative data in a single project. It represents an alternative methodological approach to traditional qualitative or quantitative research approaches, facilitating nurse researchers to undertake detailed exploration of complex phenomenon. This paper provides a practical overview for nurses, of the application of mixed methods research to guide the beginning researcher in considering a mixed methods project.

Introduction

Health care systems internationally are becoming more complex, as a result of population aging, the rise in chronic and complex disease and finite health budgets. Social, political, environmental, cultural and economic forces combine to add layers of complexity to health care issues (Lavelle et al., 2013). As the system increases in complexity so do the research problems faced by health researchers (Glogowska, 2011). To adequately address such complexities, researchers are challenged to find ways of investigating that embrace the multidimensional nature of health issues (Andrew and Halcomb, 2006, Creswell and Plano Clark, 2011). This challenge has been a major driver for the substantial growth in interest around mixed methods research in recent years in the fields of social science, education and health (Bowers et al., 2013, Glogowska, 2011). Mixed methods research offers an alternative methodology for nursing researchers to use to address complex issues in a way that is more comprehensive than could be achieved by either purely qualitative or quantitative research (Andrew and Halcomb, 2012, Simons and Lathlean, 2010).

The paradigm wars that have historically permeated nursing enquiry and prevented the mixing of qualitative and quantitative research have now largely been silenced by researchers taking a pragmatic approach and implementing research methodologies which most appropriately answer their research questions (Glogowska, 2011, Maudsley, 2011, Simons and Lathlean, 2010, McEvoy and Richards, 2006). Indeed there has been a steady rise in the number of mixed methods manuscripts published in nursing journals in recent years (Lipscomb, 2008, Simons and Lathlean, 2010).

What is mixed methods research?

It is generally understood that, at the most basic level, quantitative research involves the collection and analysis of numerical data, whilst qualitative research considers narrative or experiential data (Hayes et al., 2013). For a fuller understanding of the scope of quantitative and qualitative research the reader should explore the positivistic (quantitative) and naturalistic (qualitative) paradigms in more detail. The term 'mixed methods research' is broadly accepted to refer to research that integrates both qualitative and quantitative data within a single study (Wisdom et al., 2012, Creswell and Plano Clark, 2011). A key aspect of the definition of mixed methods research is the 'mixing' of the qualitative and quantitative components within the study (Simons and Lathlean, 2010, Maudsley, 2011). 'Mixing' refers to the process whereby the qualitative and quantitative elements are interlinked to produce a fuller account of the research problem (Glogowska, 2011, Zhang and Creswell, 2013). This integration can occur at any stage(s) of the research process, but is vital to the rigor of the mixed methods research (Glogowska, 2011).

There remains some tension around the definitions of and differences between mixed and multi method research. However, there is a level of agreement that mixed methods research is subtly different to 'multi-method research' (Johnson et al., 2007). Where mixed methods research combines qualitative and quantitative research in a single study, multi-method research involves data collection using two methods from the same paradigm (e.g. interviews and focus groups, surveys and medical record audit)(Andrew and Halcomb, 2009). In combining qualitative and quantitative data collection, mixed methods research capitalises on the strengths of both qualitative and quantitative research, whilst ameliorating their weaknesses to provide an integrated comprehensive understanding of the topic under investigation (Scammon et al., 2013, Wisdom et al., 2012, Andrew and Halcomb, 2009). In contrast to multi-method research, which has only the advantage of collecting data using multiple methods, mixed methods research has the potential to combine qualitative and quantitative characteristics across the research process, from the philosophical underpinnings to the data collection, analysis and interpretation phases.

Eight Key Considerations

Mixed methods research is much more than just collecting qualitative and quantitative data within a single study. To ensure the rigor of the design the methodological approach to mixed methods research requires a number of issues to be considered in its application. Eight key considerations in planning and undertaking mixed methods research are presented here for the novice researcher, namely; 1) examine the rationale for using mixed methods; 2) explore the philosophical approach; 3) understand the various mixed method designs; 4) assess the skills required; 5) review project management considerations; 6) plan and justify the integration of qualitative and quantitative aspects; 7) ensure that rigour is demonstrated; 8) disseminate mixed methods research proudly.

1. Examine the rationale for using mixed methods

Research questions should reflect the rationale for undertaking mixed methods research and clearly demonstrate the qualitative and quantitative dimensions of the project (Lavelle et al., 2013). Just because you can collect both numerical and narrative data in relation to a single research problem, this does not mean that you should undertake a mixed methods study. When faced with a research question, the researcher needs to consider which methodological approach would be most appropriate to address their specific research questions. The decision to implement a mixed methods design should be based on the value that using both qualitative and quantitative methods of data collection has above the use of a single method in answering the research question (Creswell and Plano Clark, 2011, Scammon et al., 2013). Additionally, the feasibility of undertaking a mixed methods study should be considered in terms of balancing the benefits of the design against the increased resources and skills required (Halcomb and Andrew, 2009).

Research problems that are best suited to mixed methods designs are those in which multiple perspectives of the research problem will provide a more detailed understanding than could be gleaned from a single perspective (Andrew and Halcomb, 2012, Simons and Lathlean, 2010). For example, a study that only collected a macro picture of a health service using quantitative data collection may miss the factors that impact on individuals accessing the service. The addition of a qualitative component investigating the experiences of individuals accessing the

service would likely add significant depth to the understanding of the issues. An overview of some of the reasons for using mixed methods research designs is presented in Figure 1.

- *Corroboration* – using the results of one method to corroborate the findings of the other about a single phenomenon
- *Complementarity* – use one method to elaborate, illustrate, enhance or clarify the results from another.
 - a) Process – quantitative provides outcomes; qualitative the processes
 - b) Unexpected results – surprising results from one, other explains
 - c) Confirmation – quantitative tests qualitative generated hypotheses
- *Development* – use the results of one method to inform the other method.
 - a) Instrument development – qualitative employed to design a quantitative instrument, then instrument tested
 - b) Sampling – one approach facilitates sampling for the other approach
- *Initiation* – one method is used to uncover the paradoxes and contradictions in findings from the other method
- *Expansion* – the depth and breadth of the study is expanded by using different methods for various components of the research

Figure 1. Reasons for using mixed methods research

Adapted from: (Wisdom et al., 2012, Greene, 1989, Bryman, 2006)

2. Explore the philosophical approach

Broadly, a philosophical approach or worldview is the lens through which one sees the world. A range of philosophical approaches can be used to underpin mixed methods research (Mesel, 2013). Prior to using any philosophical approach, the researcher should explore the literature around this worldview to understand how it fits with both their own personal perceptions and the proposed project. Creswell and Plano Clark (2011) advocate four different stances on adopting worldviews in mixed methods research. Firstly, a single worldview can be selected to underpin the entire study. Commonly, this would either be pragmatism, a transformative (emancipatory) approach or, more recently, critical realism (Creswell and Plano Clark, 2011, Andrew and Halcomb, 2012, Maudsley, 2011, Walsh and Evans, 2014, Andrew and Halcomb, 2006). A pragmatic approach involves the researcher using “what works” in order to seek answers to the research question (Creswell and Plano Clark, 2011).

Pragmatism sees the research problem as being most important, valuing both the subjective and objective in order to reveal the answers (Creswell and Plano Clark, 2011, Feilzer, 2010, Andrew and Halcomb, 2006). In contrast, a transformative (emancipatory) approach seeks to recognise cultural differences and injustices throughout the entire research process (Creswell and Plano Clark, 2011, Mertens, 2003). Critical realism, on the other hand, accepts that reality can best be understood by investigating the multiple outlooks (Creswell and Plano Clark, 2011, McEvoy and Richards, 2006, Maudsley, 2011). Since critical realists undertake research to develop deeper levels of exploration and understanding, this worldview is well suited to mixed methods research (McEvoy and Richards, 2006).

Secondly, multiple worldviews can be used to underpin different aspects within mixed methods research based on how the researcher seeks to understand the social world (Creswell and Plano Clark, 2011). Employing this approach creates various tensions and oppositions that reflect the various ways of understanding the world.

Thirdly, multiple worldviews can be combined relating to the design of the mixed methods study (Creswell and Plano Clark, 2011). For example a sequential mixed methods study which commences with interviews followed by an online survey would commence the study with a naturalistic (qualitative) perspective and then move towards a positivist (quantitative) worldview. Finally, Creswell and Plano Clark (2011) assert that worldviews can be dependent upon the shared beliefs with a scholarly community. This perspective suggests that researchers within a given field have shared beliefs about meaningful research questions and appropriate procedures for answering these questions. Regardless of which philosophical stance is chosen for a mixed methods study, the study methods should be consistent with this philosophy and its tenets should underpin all aspects of the research process.

3. Understand the various mixed methods designs

There are various typologies of mixed methods designs reported in the literature. It is important that the researcher understands the underpinnings and implications of the various designs before embarking on the research. Table 1 provides an overview of the common mixed methods designs seen in nursing research and presents an

example of how each design has been employed in a recent published nursing study. As can be seen from Table 1, four main characteristics define mixed methods research designs (Creswell and Plano Clark, 2011). Firstly, the extent to which the qualitative and quantitative data will interact with each other or be kept independent. For example; will one data collection inform the other? or will the two datasets be collected independently of each other?

The second design characteristic is the implementation sequence of the data collection. In a simultaneous / concurrent design, both qualitative and quantitative data will be collected at the same time. This has the advantage of reducing the duration of the data collection, but the disadvantages of being resource intensive and not allowing either data collection to inform the other (Halcomb and Andrew, 2009). On the other hand, a sequential design involves qualitative and quantitative data being collected separately; with the findings from one type of data collection (e.g. interviews) providing a basis for the collection of a second set of data (e.g. survey). The disadvantage of sequential designs is that they take longer for data collection to be completed (Halcomb and Andrew, 2009).

Next, designs vary in the relative priority given to the qualitative and quantitative data. Exploratory studies usually privilege qualitative data as little is known. However, explanatory studies which seek complementarity often prioritise quantitative data (Andrew and Halcomb, 2006). Establishing the relative priority of each type of data prior to commencing the study is particularly important if contradictory results are found.

Finally, mixed methods designs vary in the point at which the qualitative and quantitative are integrated. Such integration can occur at any point in the research process. For example; various philosophical approaches can be used to underpin the study, research questions can include both qualitative (why?) and quantitative (how often?) questions. Data collection can combine open-ended questions which collect narrative data and rating scales, or data analysis can cross tabulate themes and participant demographics (Andrew et al., 2008).

Table 1 Mixed Methods Designs

Research Design	Process	Purpose	Level of Interaction	Priority	Example from Literature
Convergent parallel (concurrent)	Qual Quant	To obtain different but complementary data to answer a single research question	Data collected & analysed independently	Equal	Peters and Cotton (2013) collected both mailed surveys and undertook unstructured interviews with women with physical disability in order to gain a broad understanding of the barriers and facilitating factors associated with in accessing and experiencing breast and cervical cancer screening services.
Sequential explanatory	QUANT → qual	Qualitative data are collected to explain the quantitative findings	Quant data frames qualitative data collection	Quantitative dominant	Pfaff et al. (2014) used a mailed survey to measure perceived confidence in interprofessional collaboration amongst new graduate nurses. Following analysis of the survey data they conducted interviews with 16 new graduate nurses to explain and expand upon the quantitative findings.
Sequential exploratory	QUAL → quant	Quant data builds on qualitative findings to provide generalizability	Qualitative data frames quant data collection	Qualitative dominant	Hamshire, Willgoss and Wibberley (2013) conducted a series of interviews with nursing students to explore their experiences and expectations of their nursing course. These interview findings informed the development of an online survey that was administered to 1080 students across nine UK universities.
Embedded / Nested	Qual (quant) Or Quant (qual)	To obtain different data to answer a complementary research question	Embedded dataset provides answers to a complementary research question.	Can be either Qualitative or Quantitative dominant	Kinser et al. (2013) conducted a randomised controlled trial of an 8 week yoga intervention for women with major depression. Outcomes included depression severity, stress, anxiety and rumination. Qualitative interviews were embedded in the trial to explore the feasibility and acceptability of the intervention.

4. Assess the skills required

Mixed methods research is rarely a solo endeavour (Lavelle et al., 2013, Bowers et al., 2013). Building a team to undertake a mixed methods project needs to be carefully thought out (Creswell and Plano Clark, 2011). Halcomb and Andrew (2009) identify the need to consider the broad range of skills required to undertake mixed methods research when building a research team. Whilst there has been limited attention focussed on the optimal composition of mixed methods research teams or models of teamwork, it is clear that teams need to include individuals with both quantitative and qualitative skills and knowledge, as well as experience in conducting mixed methods research (Bowers et al., 2013).

The skills required may be a particular consideration when mixed methods designs are used by higher degree students (Halcomb and Andrew, 2009). Choosing to undertake a mixed methods piece of work as a higher degree project will require the student to gain a broader range of research skills than would be required for a project which utilized either qualitative or quantitative methods alone. When forming supervision panels for higher degree candidates undertaking mixed methods research, consideration should be given to ensuring that such panels have the range of skills required to support a mixed methods project (Halcomb and Andrew, 2009).

5. Review project management considerations

The process of developing mixed methods project plans needs to carefully consider the implications of the chosen design. The three key practical implications for project management are; resources / financial costs, time, and management of data (Halcomb and Andrew, 2009). The collection of two datasets rather than one clearly has implications for the resources required. Given the differences in qualitative and quantitative data collection, the range of resources required will also be greater than in either a purely qualitative or quantitative project. Clear justification for the use of mixed methods is likely required to substantiate the case for such resources from funding bodies.

Time can be a key issue in mixed methods research, particularly when the study is being conducted in fulfilment of a higher degree (Halcomb and Andrew, 2009). The

allocation of sufficient time is essential to the successful conduct of the project. For example; a sequential project needs to incorporate sufficient time for the collection and analysis of one data set before commencing the second data collection (Halcomb and Andrew, 2009). Failure to allocate this time may result in the second data collection not addressing key issues that arose from the first data set. Similarly, a concurrent project needs to have sufficient resources to support collection of two datasets at the same time (Halcomb and Andrew, 2009).

Collecting both qualitative and quantitative data will lead to a larger and more complex dataset than collected in a purely qualitative or quantitative project (Andrew and Halcomb, 2009). The complexity is also increased when qualitative and quantitative data are being integrated within the analysis phase. This has implications for the time required in data analysis, the range of skills required to manage the data and the resources required for data storage.

6. Plan and justify the integration of qualitative and quantitative aspects

Despite the importance of 'mixing' data within a mixed methods study, this stage in the research process has received relatively little attention in the literature (Andrew et al., 2008, Bryman, 2006, Zhang and Creswell, 2013). In their review of how mixing occurs in health services research, Zhang & Creswell (2013) identified three distinct procedures for mixing within the mixed methods literature, namely; integration, connection or embedding. Table 2 provides a definition of each procedure and an example from the recent literature.

It should be noted that these approaches are not mutually exclusive and some projects may combine methods of mixing within the design (Zhang and Creswell, 2013). A key consideration in planning mixed methods research is evaluating which of these models is appropriate for your investigation and building this into the research design prior to commencing the study. The strategies used for mixing should be clearly articulated within publications and research reports (Maudsley, 2011).

Table 2. Models of Mixing

Adapted from: (Zhang and Creswell, 2013)

Model of Mixing	Definition	Example
INTEGRATION	Qualitative and quantitative data are collected concurrently and analyzed separately. Integration occurs during the interpretation.	Rickard et al. (2011) conducted a study to explore the roles of research nurses and possible career pathways. Data were collected via a 104 item survey tool which combined three previously validated instruments and a series of semi-structured interviews. The qualitative and quantitative data were collected separately and only integrated during the reporting phase.
CONNECTION	One approach is built upon the findings of the other approach.	Meixner et al. (2013) surveyed providers of brain injury services within a region about the barriers to accessing crisis intervention services. A second phase of the study involved a series of focus groups that investigated the survey findings to reveal greater levels of understanding.
EMBEDDING	The analysis of one type of data is embedded within the other. Commonly this involves a small qualitative component nested within a quantitative study.	Zwar et al. (2010) conducted a cluster randomised controlled trial to test the uptake and effectiveness of a package of smoking cessation support provided primarily by the practice nurse. Qualitative interviews were conducted with patients, nurses and general practitioners who participated in the trial to evaluate the implementation, feasibility and acceptability of the intervention.

7. Ensure that rigour is demonstrated

Despite the increasing popularity of mixed methods research, methods of demonstrating rigour in studies that use mixed methods are still poorly defined. Whilst the use of mixed methods can be seen to enhance validity, it is still necessary for the researcher to be rigorous in their approach to the research (Lavelle et al., 2013). Creswell et al. (2011) advocate that mixed methods investigations should demonstrate rigour using the same criteria as would be used in a quantitative and qualitative investigation, as well as specific mixed methods criteria. Regardless of the specific tool or method used, the key to demonstrating rigour in mixed methods

research is in providing the reader with a clear audit trail and well considered and justified rationales for the decisions made throughout the research process (Lavelle et al., 2013).

8. Disseminate mixed methods research proudly

A key challenge for mixed methods researchers is disseminating their work (Glogowska, 2011). The increase in mixed methods publications has led to improved acceptance of papers describing this type of research. However, issues such as a lack of familiarity of reviewers with the methods, audience expectations, word limits of journals and the tension between publishing in a mixed methods or clinical journal still require careful consideration (Wisdom et al., 2012).

Two models of dissemination have been proposed in the literature for both publications and mixed methods theses (O'Cathain, 2009, Halcomb and Andrew, 2009). Namely, the segregated and the integrated models (O'Cathain, 2009). In the segregated model, qualitative and quantitative components of a study are held separate, devoting separate chapters or papers to each. Any integration between components occurs in the discussion of the report only or in a separate paper. In contrast, within the integrated model the findings from different methods interwoven within a series of papers or chapters each of which focused on one aspect of the research question or theme. The choice of presentation method needs to demonstrate congruence with the nature of the study being reported (Halcomb and Andrew, 2009).

In their review of mixed methods reports, Wisdom et al. (2012) identified that many publications reporting mixed methods research lacked sufficient detail of the methods used. To assist in improving the quality of mixed methods publications a number of frameworks have been developed to guide authors in writing mixed methods papers for publication. One such framework is the Good Reporting of a Mixed Methods Study (GRAMMS)(Figure 2)(O'Cathain et al., 2008). Use of this kind of framework can significantly improve the quality of reporting, however, authors need to also be cognisant of manuscript submission guidelines of the relevant journal.

- describe the justification for using a mixed methods approach to the research question;
- describe the design in terms of the purpose, priority, and sequence of methods;
- describe each method in terms of sampling, data collection and analysis;
- describe where integration has occurred, how it has occurred, and who has participated in it;
- describe any limitation of one method associated with the presence of the other method; and
- describe any insights gained from mixing or integrating methods.

Figure 2. Good Reporting of a Mixed Methods Study (O'Cathain et al., 2008)

Conclusion

Mixed methods research offers significant opportunities for researchers to gain a deeper understanding of complex health issues than would otherwise be possible via the use of either quantitative or qualitative data on its own. Researchers who use mixed methods, however, should carefully plan their research from a qualitative, quantitative and mixed methods perspective. The considerations outlined in this paper should be well thought through before the study commences. All phases of the research process need to logically flow and be clearly congruent. Additionally, reports and publications stemming from mixed methods research should explicitly detail the key methodological components of the project to provide transparency for the reader. Such publications have the potential to extend our current nursing knowledge and provide new understandings to inform the range of complex issues facing the nursing profession.

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