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An introduction to mixed methods research for nephrology nurses

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Abstract

Mixed methods research is the use of qualitative and quantitative methods in the same study to gain a more rounded and holistic understanding of the phenomena under investigation. This type of research approach is gaining popularity in the nursing literature as a way to understand the complexity of nursing care and as a means to enhance evidence-based practice. This paper introduces nephrology nurses to mixed methods research, its terminology and application to nephrology nursing. Five common mixed methods designs will be described highlighting the purposes, strengths and weaknesses of each design. Examples of mixed methods research will be given to illustrate the wide application of mixed methods research to nursing and its usefulness in nephrology nursing research.

Keywords

Mixed methods research, nephrology, renal, nursing.

Introduction

Nephrology nursing is characterised by the frequency, intensity, complexity and duration of interaction with individuals who have chronic kidney disease (CKD). These characteristics mean that conducting research using either quantitative or qualitative methods alone may not capture the complexity or effectiveness of care provided by nephrology nurses. Mixed methods research is becoming widely accepted as an emerging research approach (Teddle *et al.*, 2003, 2011) which combines both quantitative and qualitative methods in the one study. Mixed methods research is increasingly being used by nurse researchers to examine a range of problems. For instance, mixed methods has been used to explore a patient's perspective on pain management (Carr, 2008), nurse job satisfaction (Curtis, 2007), quality of dying (Goodridge *et al.*, 2009), parents' understanding of health information (Lehna *et al.*, 2008) and simulated health teaching (Sinclair *et al.*, 2009). Lipscomb (2008) notes a steady, linear rise in the number of manuscripts being submitted for publication in nursing journals in which research was conducted using mixed methods techniques. The purpose of this article is to describe what mixed methods research is, the differing design types and how this research design has been used by nephrology nurses. In addition, we suggest some examples of where and how nephrology nurse researchers could use mixed methods to guide future research. The aim is to encourage nephrology nurses to examine and expand their options for research.

What is mixed methods research?

Mixed methods research is defined as the use of both quantitative and qualitative methods in the same research project (Wilkins *et al.*, 2008) where quantitative methods include the collection, analysis and interpretation of data in numerical forms and qualitative methods consist of the collection, analysis and interpretation of narrative forms of data (Polit, 2010). Johnson *et al.* (2007) expanded on this definition by stating that:

Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches for the broad purposes of breadth and depth of understanding and collaboration (p. 123).

Mixed methods research seeks to build on the strengths (Rauscher *et al.*, 2009) and reduce the weaknesses (Plainkas *et al.*, 2011) of both qualitative and quantitative approaches to draw inferences which can lead to an increased understanding of the topic being researched. Mixed methods research differs from traditional triangulation where both methods are used to determine the degree to which the findings are reinforcing or irreconcilable (Wilkins *et al.*, 2008).

What are the different designs of mixed methods research?

A range of design types are used to describe mixed methods research. Each design varies according to the implementation,

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priority and integration of the data collected (Cameron, 2009). Firstly, implementation describes the order and timing of data collection. Qualitative and quantitative data can be collected in a linear fashion which is termed sequential (for example, qualitative data is collected first and then this is followed by a quantitative phase or vice versa) while data collected at the same time is termed concurrent. Secondly, priority reflects the relative importance of each method within the research design. Wilkins and Woodgate (2008, p. 26) suggest that “priority is given to the method that has the strengths that are most important to the study goals, research questions and audience of the study”. In some studies the quantitative phase may have a higher priority than the qualitative or vice versa. Lastly, the point of data integration can also vary in mixed methods research. Depending on the research question/s, integration can occur during the data collection, analysis and/or interpretation phases of the research. Integration can also occur during the discussion section of a report or journal article (Kroll *et al.*, 2009). Figure 1 outlines the common mixed methods research designs.

Mixed methods research designs

Research designs aid the researcher to plan, conduct and implement their research in a systematic way (Teddlie *et al.*, 2009). Each design is driven by the needs of the research question (Kroll *et al.*, 2009) and differs in its purpose, strengths and weakness. What follows is a description of common mixed

method research designs along with research examples to guide nurses on how mixed methods research can be applied to the nephrology nursing setting. These examples have been sourced following a literature search of CINAHL and EBSCO databases using the terms “nephrology” or “renal” and “mixed methods”; the search was restricted to recent examples of research (that is, published between January 2007 and December 2011) and published in English. Five studies were identified that related directly to nephrology nursing and used a mixed method design. A summary of these studies is included in Appendix 1.

Sequential explanatory design

The sequential explanatory design consists of the collection and analysis of quantitative data followed by the collection and analysis of qualitative data (Creswell, 2009; Creswell *et al.*, 2003). Priority is given to the quantitative phase and the two methods are usually integrated at the interpretation phase of the study (Creswell *et al.*, 2003). The sequential explanatory design is used to seek explanation of the results of the quantitative phase (Creswell *et al.*, 2003). Using the sequential explanatory design, the researcher first constructs and conducts a study involving quantitative methods and analyses the data. These quantitative results are then carefully scrutinised to identify areas that warrant further investigation. These results might be unexpected results or unexplained differences between groups. A second phase involving qualitative methods follows to clarify the results

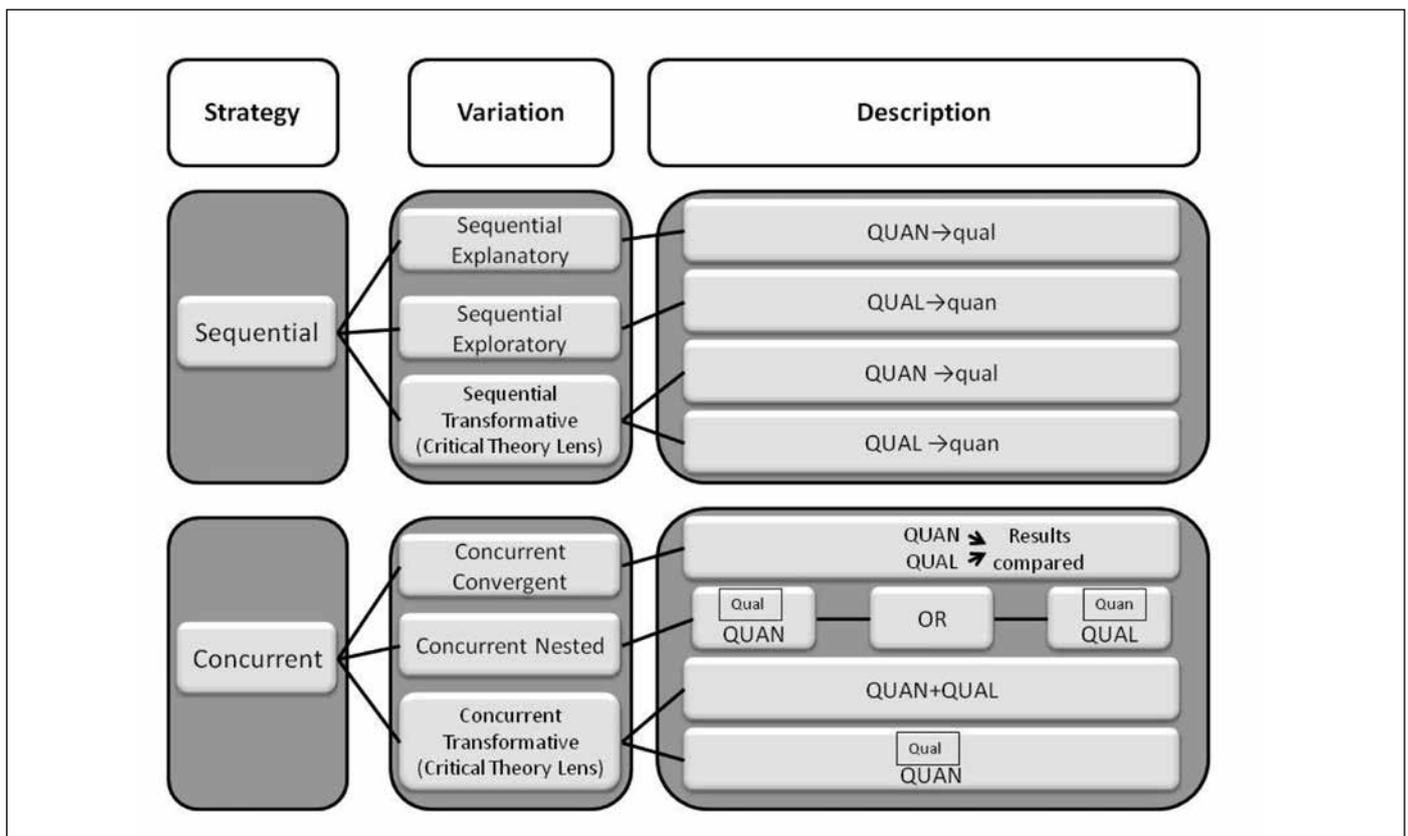


Figure 1. Comparison of mixed methods designs. The priority of either or both the qualitative or quantitative phase in the research process is denoted by capital letters. Adapted from Hanson *et al.*, (2005).

from the quantitative phase (Doyle *et al.*, 2009). Creswell *et al.* (2003) describes a variant of this design by having a quantitative phase followed by a more dominant, qualitative phase where the quantitative phase may be used to identify participants and produce purposeful sampling for the qualitative phase.

The strength of the sequential explanatory design is that it is relatively straightforward and is considered the easiest of the mixed methods designs to implement (Doyle *et al.*, 2009). The main weakness is the length of time required to complete both phases of the study, particularly if both phases are given equal priority (Creswell *et al.*, 2003; Doyle *et al.*, 2009).

Exemplars of the use of sequential explanatory design in nephrology nursing are limited but this design has been used to explore the rationale behind the choice of dialysis modality for pre-dialysis and dialysis patients and their caregivers (Morton *et al.*, 2011). The first phase (quantitative) involved the ranking of dialysis modality characteristics by pre-dialysis patients, dialysis patients and caregivers that were most important when making choices about dialysis preference (for example, survival, convenience, flexibility). The second phase consisted of focus groups where the rankings were discussed to gain a greater insight into the preferences. Results from both phases were integrated during analysis, providing an explanation of the meaning of the rankings. The results included participant quotations which bring a human perspective to the impersonalised ranks. The results from this study can be used to inform education material and future planning of dialysis services to match the preferences of patients and their caregivers (Morton *et al.*, 2011).

Sequential exploratory design

The sequential exploratory design consists of the collection and analysis of qualitative data followed by the collection and analysis of quantitative data (Creswell, 2009; Creswell *et al.*, 2003). Priority is given to the qualitative phase and the two methods are usually integrated at the interpretation phase of the study. The sequential exploratory mixed method design is used when exploration of a phenomenon is needed particularly to generate items for inclusion in a questionnaire that will be tested in the quantitative phase (Doyle *et al.*, 2009; Hanson *et al.*, 2005). The sequential exploratory design has similar strengths and weakness to the sequential explanatory design; these are ease of use (strength) and the length of time required to complete both phases (weakness).

The sequential exploratory design has been used in nephrology nursing by Pai *et al.* (2010) to examine strategies that families use to manage immunosuppressive medication in adolescent renal transplant recipients. The first phase consisted of semi-structured interviews to investigate barriers to medication adherence. The second phase involved monitoring electronic medication bottles and collecting data on adherence. Results

from both phases were integrated during analysis with thematic areas being identified. Although there is limited reporting of the results from the quantitative phase in the article, Pai *et al.* (2010, p. 14) noted that the qualitative phase provided a “rich foundation” for the proceeding quantitative phase.

Lopez-Vargas *et al.* (2011) is another example of a sequential exploratory design used to explore the barriers to timely arteriovenous fistula (AVF) creation in patients with end-stage kidney disease in Australia and New Zealand. The first qualitative phase consisted of semi-structured, open-ended interviews, informal interviews and centre visits with nephrologists, vascular access coordinators and surgeons to identify barriers and enablers to AVF creation. The second phase collected data on the pre-dialysis clinical pathway related to AVF creation (for example, referral time to surgeon, pre-dialysis education events and so on). Results from both phases were analysed separately and integrated during the discussion phase. Perceived and real barriers to AVF placement were identified. Barriers such as late referral to the nephrologist, patient non-attendance at appointments and refusal to consent to AVF were recognised. Enablers that were identified included designated clinics, weekly meetings, awareness of the importance of the need for an AVF and formalised pre-dialysis care pathways. The authors note that their study differs from previous research in that a sequential, exploratory design enabled the meaning behind low AVF rates among dialysis patients to be revealed during the qualitative phase. Lopez-Vargas *et al.* (2011) do, however, highlight that this study could have been more robust through the inclusion of patient interviews to identify patient-based barriers that could be included in further research on this topic. For clinicians, the strength of this design is that patient-centred strategies to improve AVF rates could be developed.

Concurrent convergent designs

Concurrent convergent designs consist of a single study containing both qualitative and quantitative data collection with the analysis conducted separately but at the same time (Kroll *et al.*, 2009). Ideally the priority should be equal but priority can be given to either method (Creswell, 2009). The findings are integrated by combining both sets of results into one overall result and then the results are interpreted (Gelo *et al.*, 2008). The purpose of this design is to validate findings generated by each method through evidence produced by the other. This design is considered the most well-known mixed method design (Creswell *et al.*, 2003). It is useful for comparing and contrasting of quantitative results with the qualitative findings, or to validate or expand quantitative results with qualitative data (Gelo *et al.*, 2008). Creswell *et al.* (2003) suggest that the major strength of this approach is its familiarity with researchers, a shorter data collection time than sequential designs and that results can be easily validated and substantiated. Weaknesses of this design include the difficulty involved with collecting data on the same

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phenomena at the same time with two separate methods and difficulty comparing results using two different methods and addressing discrepancies that may arise in the results (Creswell, 2009; Creswell *et al.*, 2003).

A concurrent convergent design in nephrology nursing was completed by Artsanthia *et al.*, (2011) to examine the palliative care needs of people living with end-stage kidney disease in Thailand. Collection of data for both phases was conducted at the same time with a quantitative questionnaire being conducted at the end of the focus group interviews. Results were integrated together during the discussion phase using the questionnaire results to reinforce the interview results. The overall aim of the study was to develop a composite consensus of themes exploring the patients palliative care needs. These themes included; tremendous suffering, economic consequences, inadequate community support and concern for the future.

Concurrent embedded designs

Concurrent embedded (Creswell, 2009) or nested (Creswell *et al.*, 2003; Kroll *et al.*, 2009) designs consist of both qualitative and quantitative data being collected at the same time. It is characterised by having one dominant method, whereas the other method provides a secondary or supportive role by being embedded or nested within the dominant method. The dominant methods seeks to answer the main research question while the embedded method may attempt to answer a secondary research question derived from the main research question (Plano Clark *et al.*, 2008).

Most embedded designs require data to be collected using two methods which are then mixed during the analysis phase (Kroll *et al.*, 2009). It is considered a useful design for gaining a broader perspective on a phenomenon (Creswell *et al.*, 2003). Morse (1991), for example, suggests that a qualitative design could be embedded with some quantitative data to enrich the description of the participants. The advantages of this design is the relative short time frame for data collection as both phases are completed at the same time, and that the research can gain perspectives from the differing types of data collected (Creswell, 2009). The challenges associated with this design include the difficulty in integrating results when two methods are used to answer different research questions. This type of mixed methods research is rarely used (Creswell *et al.*, 2007) and therefore there are limited examples of the use of the method available in the literature.

Only one study using a concurrent embedded design pertaining to nephrology nursing was found in the literature. This study explored the unmet palliative care needs of people in the final stages of chronic illness (Fitzsimons *et al.*, 2007) with a quantitative questionnaire being embedded in a dominant qualitative study. Focus groups were conducted with the multidisciplinary team and semi-structured, open-ended

interviews were conducted with patients with end-stage renal, cardiac and respiratory failure to explore palliative care needs. At the end of the interview two pre-existing questionnaires were given to patients to assess their functional and emotional status. This study can be considered embedded because the qualitative and quantitative methods used were answering different research questions: unmet palliative care needs (qualitative) and functional/emotional status (quantitative). In this study data was analysed and reported separately with limited integration during the findings section. The ability to generalise the results from this study are, however, limited due to the small sample size of the quantitative phase, with only 18 patients completing the survey. Nine themes were derived mostly from the qualitative data. The themes revealed by this research approach included deteriorating health status, decreased independence, social isolation, family burden, limited resources available, poor access to community services, acceptance, depression and concerns about the future.

Transformative mixed method designs

Using a sequential or concurrent mixed method design, research can be conducted within a transformative framework or lens. A transformative framework is an overarching philosophical framework for addressing issues such as culture, power, diversity and social justice with the desired outcome of social change for minority groups (Mertens *et al.*, 2010). The transformative framework is introduced at the beginning of the research (research question stage) and directs the research design that explores the problem being investigated. Using a transformative framework in conjunction with a mixed methods design, research can then be conducted sequentially or concurrently in the styles mentioned previously but is driven by an ideology such as critical theory, advocacy, participatory research or a theoretical framework (Creswell *et al.*, 2003). Hanson *et al.* (2005) suggest that a transformative mixed methods design allows the researcher to better advocate for participants or to better understand a process that is changing.

No example of a transformative mixed method design could be found that relates to nephrology nursing, although a proposed study outlined by Abad-Corpa *et al.* (2010) will illustrate this type of design and be of interest to nephrology nurses. The sequential transformative design is used to generate change in oncology-haematology nursing through a participatory action process. The aim of the study is to create change in the work environment through the implementation of evidence-based clinical practice (EBCP) to improve nurse-sensitive outcomes. The nurse-sensitive outcomes include improved psycho-social adjustment of patients, improved patient satisfaction with nursing care, increased symptom control and decreased incidence of adverse events (Abad-Corpa *et al.*, 2010). In this longitudinal study over a three-year period, two research phases will be completed. The qualitative phase using a participatory action research process will be undertaken consisting of

groups meeting with nurses to assess their attitude to the implementation of EBCP. The quantitative phase will then assess the impact of the implemented EBCP on nurse-sensitive outcomes. Qualitative data will be analysed through content analysis while the quantitative phase will be analysed using descriptive and inferential statistics. No mention is made of how the data will be integrated or the benefits of using the transformative sequential design over other mixed methods designs. To date, the results from this research have not been published.

How are inferences made in mixed methods research?

Once data has been collected in mixed methods research the process of analysis and integration occurs. Data can be analysed at the end of each phase (for example, sequential designs) or at the same time (for example, concurrent designs). Creswell and Plano Clark (2007) state that “data analysis in mixed methods research consists of analysing the quantitative data using quantitative methods and the qualitative data using qualitative methods” (p. 128). Therefore, the quantitative phase is analysed through descriptive and inferential statistical techniques. Descriptive statistics organise and summarise data to enhance meaning while inferential statistics seek to make predictions or judgements about the sample obtained and assign probability to the predictions (Onwuegbuzie *et al.*, 2010). Interpretive data obtained through qualitative procedures such as interviews, journals, photographs, video and transcripts can be analysed through a number of techniques including content analysis and thematic analysis. When data from both phases have been analysed and the results integrated, inferences are then made (Teddlie *et al.*, 2009). Inferences are “a conclusion or interpretation in response to a research question, made on the basis of the results of the data analysis” (Teddlie *et al.*, 2009, p. 336). In order to obtain quality inferences, an appropriate research design should have been implemented that adequately addresses the research question (Creswell, 2009).

What are the advantages and disadvantages of using mixed methods research in nursing?

Mixed methods research is, according to Twin (2003), particularly useful for nursing research for two reasons. Firstly, when research is needed to assess the impact and outcome of nursing interventions, and secondly, when research is needed to understand health behaviours so that appropriate nursing interventions can be developed. Andrew and Halcomb (2009) highlight that while randomised controlled trials are the gold standard for evidence-based practice, mixed methods can provide a broader approach that can take into account the values and perceptions of the clinical context or community context in which the research is conducted. The versatility of mixed methods research designs allows the researcher to investigate complex health problems within their clinical context

particularly in the area of chronic conditions (Andrew *et al.*, 2009).

Nurse researchers also need to be aware of the weaknesses of mixed methods research including the increased time to conduct two phases of research, the resources and cost required to complete the multiple phases of mixed methods research and the requirement for the researcher to have skills in both qualitative and quantitative research methods (Teddlie *et al.*, 2011). Burke and Onwuegbuzie (2004) also identify that the lack of common vernacular among mixed method proponents is problematic for novice nurse researchers. For example, nursing research articles use inconsistent terms when describing the same design (such as concurrent nested or concurrent embedded).

Implications for renal nursing

The primary purpose of this article is to introduce mixed methods research to nephrology nurses. Mixed methods research is identified as an emerging way to conduct research by combining qualitative and quantitative methods. Five major mixed methods research designs have been described along with examples relevant to nephrology nursing. Mixed methods research offers the nephrology nurse a way to conduct research that can provide a broader understanding of the complex nature of chronic kidney disease and the specialised care that nephrology nurses provide. Examples of how mixed methods designs could be used to explore more fully the complex nature of renal patient care and the work of nephrology nurses include the investigation of adherence among dialysis patients by integrating the level of adherence (quantitative) along with the explanation for non-adherence (qualitative); exploring the palliative care needs of patients withdrawing from renal replacement therapy; and using a sequential transformative approach to create change within the nephrology nursing work environment.

As mixed methods research continues to grow in acceptance and more researchers become aware of the knowledge that can be obtained through this method, it is an opportune time for nephrology nurses to explore mixed methods research and develop a unique body of knowledge addressing the complexity of nephrology nursing.

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Appendix 1. Nephrology nursing mixed methods research.

Author	Title	Study aim	Mixed-methods design	Methods used	Analysis	Integration point	Result
Pai, Ingerski, Perazzo, Ramey, Bonner & Goebel (2010)	Preparing for transition? The allocation of oral medication regimen tasks in adolescents with renal transplantation	Examine strategies that families use to manage the post-transplant oral medication regimen of adolescents with renal transplants.	Sequential exploratory	1. Qualitative – semi-structured interviews	1. Thematic analysis	Following analysis of both phases, there is limited mention of the quantitative results.	Four themes were identified: (1) type of medication regimen; (2) allocation of responsibility; (3) monitoring of adherence; and (4) transferring of responsibility from the adult to the adolescent.
				2. Quantitative – dosage adherence and chart review	2. Bivariate correlations		
Morton, Tong, Webster, Snelling & Howard (2011)	Characteristics of dialysis important to patients and family caregivers: a mixed methods approach	To rank the most important characteristics of dialysis on which patients and caregivers make decisions about treatment.	Sequential explanatory	1. Quantitative – individual and group rankings of dialysis characteristics	1. Rankings of dialysis characteristics	Integration occurs following analysis of both phases. Descriptions of each characteristic are given along with quotations used by the participants which is used to explain the rankings	Survival, convenience and dialysis-free days were important for patients while caregivers found convenience, respite and ability to travel important. Patients made the choice depending on access to transplantation.
				2. Qualitative – focus groups	2. Narrative analysis		
Lopez-Vargas <i>et al.</i> (2011)	Barriers to timely arteriovenous fistula creation: a study of providers and patients	1. To systematically study barriers and enablers to implementation of the guidelines. 2. To use this knowledge to design and apply interventions to facilitate adherence to the guidelines.	Sequential exploratory	1. Qualitative – face-to-face group meetings, informal interviews with medical staff	1. Not stated	Following analysis of both phases.	Comparisons were made between unit characteristics (number of nephrologist, established pre-dialysis program etc) and AVF creation rates. Barriers identified included lack of formal policies for patient referral, long wait times for surgical review and lack of patient database for management purposes.
				2. Quantitative – patient data and dialysis unit characteristics	2. Descriptive and inferential statistics		
Artsanathia, Mawn, Chaiphibakarisri <i>et al.</i> (2011)	Exploring the palliative care needs of people living in Thailand with end-stage renal disease	Undertake a needs assessment for the development of a home-based palliative care model.	Concurrent convergent	1. Qualitative – focus groups and interviews with patients and family members	1. Thematic analysis	During the discussion phase.	Four themes were identified: (1) tremendous suffering; (2) economic consequences; (3) inadequate community support; and (4) concern for the future. Themes discussed were supported with the results of the quantitative survey.
				2. Quantitative – Edmonton Symptom Assessment Scale	2. Descriptive statistics		
Fitzsimon, Mullan, Wilson <i>et al.</i> (2007)	The challenge of patients' unmet palliative care needs in the final stages of chronic illness	To explore the palliative care needs of patients with a non-cancer diagnosis from the perspective of the patient, caregiver and clinical team.	Concurrent embedded	1. Quantitative – SF36 Quality of Life survey and Hospital Anxiety and Depression questionnaire	1. Descriptive statistics	Results reported separately with minimal integration during the analysis phase.	Nine themes were identified: (1) Deteriorating health status; (2) decreased independence; (3) social isolation; (4) family burden; (5) limited resources available; (6) poor access to community services; (7) acceptance; (8) depression; and (9) concerns about the future.
				2. Nested qualitative – interviews and focus groups	2. Thematic analysis		