

So you want to do research?

1: an overview of the research process

Keith A Meadows

Relative to some other health-care professions, nursing has an immature research tradition and a limited body of research-based knowledge to draw on. Despite progress in recent years, the contribution of nursing to health-care research and development has not been maximized. While this may be due to self-imposed constraints, such as nurses perceiving research as something separate to their practice (Edwards et al, 2002) or insufficient professional confidence, institutional barriers have constrained both capacity and development (Thompson et al, 2001).

However, things are changing. *Making a Difference* (Department of Health (DH), 1999) – the national strategy for nursing, midwifery and health visiting – indicated a commitment to develop a strategy to influence the research and development (R and D) agenda, and to strengthen capacity to enable nursing, midwifery and health-visiting research. The Research Society of the Royal College of Nursing is proactively influencing the UK research policy agenda and is supporting the development of R and D, quality improvement and the development of an information agenda across every field of practice.

Research is important to the nursing profession because, over the past 15 years, policy and professional developments have increasingly placed pressure on nurses to be more accountable for their actions. The introduction of national service frameworks, the National Institute for Clinical Evidence (NICE) and the Commission for Health Improvement (CHI) means that evidence-based nursing practice is firmly established in professional and policy agendas. The question remains, however, whether nursing has the R and D capacity to enable thoughtful evidence-based practice. In a study on the use of research information in clinical decision-making, Thompson et al (2001) identified several barriers to nurses using research-based information in practice, one of which was a lack of research appreciation skills and confidence.

Other reasons why R and D is important to nursing are to answer specific clinical questions, to provide answers to wider clinical questions, to develop practitioners and managers with research awareness skills and to develop R and D leaders.

The aim of this article (the first of a series on designing and conducting a research project) is to provide students and practitioners with a brief introduction to the key phases of the research process. Each of these phases will be discussed in detail later in the series. This article focuses on:

- The difference between research and development
- Developing the research question
- Approaches to reviewing the literature
- An introduction to qualitative and quantitative research methodologies, including sampling, data collection methods and analysis
- Dissemination of research findings to different audiences.

What is 'research and development'?

The Oxford English Dictionary defines research as '...systematic investigation to establish information',

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ABSTRACT

Relative to some other health care professionals, nursing has an immature research tradition as well as a limited body of research-based knowledge to draw on. Nevertheless, research is important to the nursing profession which over the past 15 years has increasingly had pressure placed on it to be more accountable for its actions. Research is also important so as to answer specific and broader clinical questions. This article, the first in series of seven, is aimed to provide novice researchers with an overview of the research process, with a specific focus on developing the research question, undertaking a review of the literature, describing the different research methodologies, sample size, data collection methods and analysis. Different approaches for ensuring more effective dissemination of research findings to different audiences are also briefly discussed.

'The research question needs to be operationalized, i.e. framed so as to define exactly why, how, what and who is being studied. Without a tightly focused research question, it is difficult to interpret the results.'

while the Department of Health (DH) defines R and D as work:

- Which is designed to provide new knowledge
- Whose findings are potentially of value to those facing similar problems elsewhere
- Whose findings are planned to be open to critical examination and accessible to all that could benefit from them (DH, 2003).

Research is the process of identifying a question or questions, choosing and applying the most suitable method for collecting and analysing the information to answer the question and finally disseminating the findings for the benefit of others.

Development has been defined as '... the systematic evaluation of the application of the results of research in practice' (Aynsley-Green, 1998).

As an example, a nurse may have read a research paper on ways of reducing non-attendance at a diabetes outpatient clinic. The published results were encouraging and the methods were well described and straightforward to apply in his/her own clinic, so he/she decides to try this out. The first thing to do would be to get an accurate picture of the situation in the clinic – a baseline assessment. He/she would then apply the methods and then evaluate their impact on the non-attendance rate over a given time period. The nurse would then ask questions such as: is there a difference in the non-attendance rate from baseline? What are the benefits in terms of costs? What are the demands on resources? Do the benefits outweigh the costs?

The evaluation must be carried out using the right methods for collecting this kind of information. It requires careful planning to ensure all appropriate data are recorded at specific and relevant times in a manner to enable a full analysis to be carried out.

It is worth pointing out that this process of evaluation is not the same as audit, where findings are not representative of any other population other than that under study and which does not generate new knowledge.

An overview of the research process

The main phases of research are shown in *Figure 1*.

1. Identify the research question

Often, research questions develop over time and can originate from a number of different sources, including previous research, the literature and observation. For example, a nurse may have read in the research literature that a change in practice may lead to greater service uptake with a particular ethnic group. He/she wants to see if a similar practice change will result in a similar change among a different ethnic group.

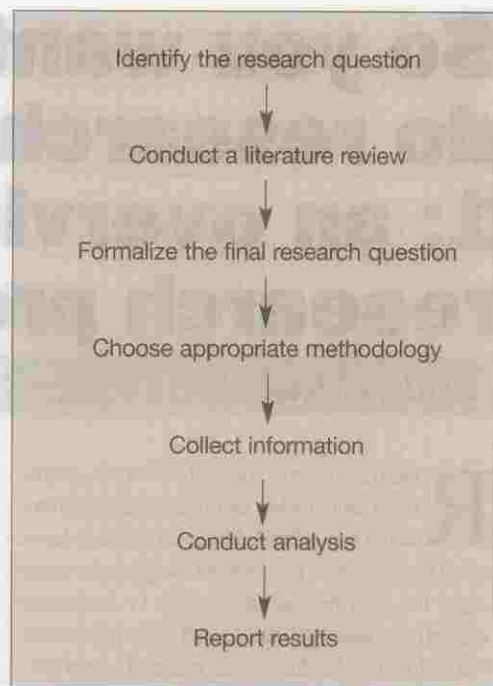


Figure 1. Key stages of a research project

Another situation may be that a nurse has observed, over time, that pregnancy termination rates are higher in a certain group of women compared to others and wants to know what the factors could be that lead to this observation.

These questions are the starting point, but they are not sufficiently specific to go out and collect information to answer them. The research question needs to be operationalized, i.e. framed so as to define exactly why, how, what and who is being studied. Without a tightly focused research question, it is difficult to interpret the results.

An investigation into the level of depression in a group of older patients, for example, would require careful definition of the type of illness, how it will be measured and what the rationale is for asking the research question, i.e. is it clinical or reactive depression and why? The manner of the illness may well dictate the measure used as this determines different aspects of the illness.

In relation to the pregnancy termination example above, there needs to be a specific definition of which women will be studied, e.g. women aged 20–30 years. Yet ethnicity or marital status may also be relevant to the outcomes of the study. The research question should be grounded wherever possible in the literature, be specific and explicit in what or who is being studied and why, so that the results have meaning (Robson, 2002).

An alternative to the research question is the research hypothesis. This differs from the research question in that it makes a prediction, starting with

the word 'that', e.g. 'that pregnancy termination rates in women aged 20–30 years is directly related to marital status'. As with a research question, a hypothesis has to be carefully framed and operationalized in order to test it. However, hypotheses tend to be embedded in a theory and, if the hypothesis is supported by the research, it goes some way in adding support to the theory (Gross, 1992).

2. Conduct a literature review

Reviewing the literature is an essential part of defining the research question or hypothesis. It can give background to the research by identifying what, if any, research has gone on before, what factors have been considered and the variables measured.

Existing literature forms the basis for research and can provide a context for interpreting findings as well as preventing unnecessary repetition of research. All formal grant applications require some form of literature review to provide the background to the proposed research.

Until quite recently, literature review involved laboriously tracking down book and journal references by hand. Now, however, there is a wide variety of electronic or internet-based resources that simplify the process of finding articles and other published material (Table 1). These may be accessible from home or through a library, free or on payment of a charge. They allow searches for relevant literature using specified years, keywords, authors or journals. Examining the reference lists of the literature identified is also strongly recommended to direct the researcher to further material and key authors in the area (NHS Centre for Reviews and Dissemination, 1996).

When the review stops providing any new material to that already identified, this usually suggests that the review has been comprehensive. However, the review should not be limited to published research material. The 'grey' literature, such as unpublished reports or work-in-progress, can also be important as can non-research-based literature and the popular media, which can highlight areas of concern, opinion and attitudes.

3. Formalize the final research question

Finally, the research question must be formalized so that what is to be measured and how, is made explicit. Using a hypothetical example, we could ask: 'Why is the pregnancy termination rate in single women aged between 25 and 35 attending the outpatients clinic, with moderate reactive depression as measured by the Beck Depression Inventory, significantly higher than married women aged 25 to 35 years with moderate reactive depression?'

Table 1. Online sources of bibliographic information

Medline	www.ncbi.nlm.nih.gov/PubMed/
CINAHL	www.cinahl.com
ENB	enb-search.ulcc.ac.uk/cgi-bin/hcdsearch
Psycline	www.psycline.org
ERIC	www.eric.ed.gov
Metacrawler	www.metacrawler.com/info.metac/dog/index.htm
JISC	www.jisc.ac.uk
Cochrane Database	www.update-software.com/Cochrane/default.htm
British Medical Journal	www.bmj.com
BIDS	www.bids.ac.uk/
OMNI	omni.ac.uk
EMBase	www.embase.com
Athens	www.athens.ac.uk

4. Choose appropriate methodology

Research methodologies can be generally classified as either qualitative or quantitative. Broadly speaking, quantitative methods seek to measure broad patterns of health and illness and identify specific problems or groups of particular ill health or behaviour, while qualitative methods help to develop an understanding of the experiences and behaviour underlying the quantitative findings (Nazroo and O'Connor, 2002). The choice as to which to use is heavily dependent on the nature of the research question/hypothesis and the kind of information required to answer it.

Qualitative method

Qualitative research seeks to provide explanations of behaviour and attitudes (Hoinville and Jowell, 1978). Furthermore, it enables the exploration of subtle variations, the particular language used to describe emotions and experience and the context of the situation. For example, qualitative research can address the limitations of population-based surveys of mental health, which use standardized research tools developed around western concepts of illness, by unmasking the cultural differences in the way experiences and behaviour are expressed (Kleinman, 1987).

Qualitative research is also implicated where there is a lack of prior research or theory or where a description and analysis of culture and behaviour from the perspective of those being studied, is needed (Bryman, 1988). For example, while there are numerous descriptive studies on homeless people (Partis, 2003), in terms of demography, little is known about what sustains and fosters a homeless person's hope. Partis (2003) carried out a qualitative study to explore

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this. Partis produced an emerging theory which provided a clearer understanding of the meaning of hope from the perspective of the homeless person.

Finally, qualitative research can also be a precursor to a quantitative study and is helpful for generating research questions.

These characteristics of qualitative research, and the need to draw wider inferences and generate conceptual frameworks which can be applied to the broader population, mean it is essential that samples of respondents for such research are selected to reflect a range of diversity, rather than represent the number of people with these characteristics (Nazroo and O'Connor, 2002). For example, in the exploration of the psychosocial impact of diabetes on daily living, people would be selected who show a range of characteristics which, from experience or research, have been shown to impinge on how they live with the illness. This would include respondents with a range and severity of problems, of different ages and duration of illness and living alone or in a relationship.

The common theoretical framework for qualitative research is the central concepts of Heideggerian phenomenology (Heidegger, 1962). This considers that an understanding of the individual cannot occur in isolation from the person's world and that each person's unique view of the world and their social reality is as valid and true as any other.

Quantitative method

Quantitative research, by contrast, uses standardized methods for collecting data, which is often in the form of a questionnaire. The information collected is then transformed into numbers to enable some form of statistical analysis to be carried out.

Quantitative research can be descriptive, analytical or experimental. Descriptive studies are carried out to determine, for example, the frequency of a disease, the kind of people suffering from it and to describe patterns such as the distribution of attributes and variables like sex, age, occupation and ethnicity. Descriptive studies seek to characterize people affected. They may involve observations made at one point in time – so-called cross-sectional studies – and longitudinal studies, in which observations are repeated in the same study group over a period of time (Menard, 1991).

Analytical studies go beyond the descriptive to provide explanations of the phenomena studied, e.g. to test specific hypotheses or determine why one particular group or person is affected while another is not (Robson, 2002).

Experimental studies explore the outcomes resulting from the manipulation or introduction of a

variable such as treatment (Robson, 2002), e.g. an investigation into the impact of psychosocial counselling over a given time period compared to no counselling, in the rehabilitation of patients after their first myocardial infarction. One approach might be to randomly allocate the patients to either the treatment group or the no-treatment group (control group) and measure whether there were any statistically significant differences in the psychosocial outcomes between the groups. It is however, worth pointing out that care should be taken under such experimental conditions as these, to ensure that a control group with a normal standard of care is provided because no counselling might not be an option in such circumstances.

5. Collect the information

Obviously, before analysing the data, it must be decided how it will be collected and who it will be collected from. Part of the process will include gaining ethical approval from the relevant research ethics committee. It is also worth mentioning that a requirement of all research ethics committees is that consent must be obtained from the individuals taking part in the research.

Qualitative approaches

The two commonest approaches to exploring the person's view of the world are through in-depth interviews and group discussions. In-depth interviews are conducted on a one-to-one basis by the researcher, generally with the aid of a topic guide, which is a list of areas or themes to be discussed in the interview. However, because the questioning is responsive to what the interviewee is saying, e.g. through the use of probing questions (e.g. 'could you tell me more about that?' or 'why do you feel that way?'), both the time spent on the different themes and the order in which they are addressed can vary between interviews.

To enable the interviewer to pay full attention to what is being said in the interview by the respondent, as well as noting non-verbal behaviour, interviews are often tape-recorded. This will provide a detailed account of the respondent's response and a verbatim transcript for future analysis.

Samples for qualitative research should be purposively selected to ensure coverage of the defining characteristics of the population under study, relevant to the research question, and to cover the full range of subgroups so as to identify, explore and explain variations in the nature of views and experiences between them. To ensure sufficient diversity of behaviour, attitudes and experiences, sample sizes should not generally be less than 20 participants.

The minimum size of the sample needed for a study can be dictated by the point of saturation – the point at which no new information about or insight into the phenomenon under study is obtained. It is impossible to predict in advance what the minimum sample size will be. However, the prolific nature of qualitative data, which can be related to the research question, the diversity of participants, and the range of themes explored, tends to produce a physical limitation on the maximum size of the sample.

Group discussions, also be called focus groups, generally comprise six to eight respondents (participants) and one or two moderators (facilitators). Respondents will be selected (non-randomly) to ensure that they are sufficiently similar to enable them to be open about their views and experiences, but also sufficiently different to assist discussion and ensure diversity in views. The task of the moderator(s) is to ask open questions of the group and to encourage respondents to discuss their attitudes and experiences. This discussion of attitudes and experiences can highlight both common experiences and differences in the group, as well as acting to stimulate further thought and interaction. Group discussions also enable the moderator to observe social interactions. A limitation of group discussions, however, is that they are less useful in obtaining personal accounts (Krueger and Casey, 2000). As with in-depth interviews, a topic guide listing the key areas and themes to be explored will be used and discussions may be audio recorded to provide verbatim transcripts for analysis.

Skill is required in moderating group discussions, e.g. in dealing with over-talkative and reticent members of the group. For a more detailed discussion on focus groups, see Morgan (1997) and Krueger and Casey (2000).

Quantitative approaches

Methods

Although clinical studies may use a variety of measurements of physical attributes or physiological processes, much nursing research collects quantitative information, often using a questionnaire. There are three main ways in which information can be obtained using questionnaires: self-completion, in which respondents fill in the answers by themselves; face-to-face interviews, where an interviewer asks the question in the presence of the interviewee and also records the respondent's answers; telephone interviews, in which the respondent is contacted by telephone and the interviewer asks questions and records answers.

Each of these methods has its strengths and weaknesses. Self-completion questionnaires can be sent

by post, enabling large samples to be reached, but response rates can be low. They are inappropriate for populations with high levels of illiteracy, and if sent by post need to be short and the questions asked need to be in simple language – the experience of many researchers suggests that long, complex questionnaires are often either not completed or incorrectly completed. Nevertheless, carefully designed self-completion questionnaires can provide useful and representative information. In addition, by offering respondents the opportunity to complete them in the privacy of their own home, they can overcome some of the barriers of embarrassment or shame in the collection of sensitive data.

Face-to-face interviews address a number of the limitations of the self-completion questionnaire; they can be used in populations with high levels of illiteracy and interviewers can provide clarification and deal with misunderstandings as well as ensure that information is collected. However, they often require training, cost more, there are risks of interviewer bias and the collection of sensitive data can be problematic. Compared to postal questionnaires, the size of the sample reached can be limited unless there is more than one interviewer.

Telephone surveys combine both the advantages and disadvantages of the self-completion questionnaire and face-to-face interview. They enable large samples to be reached, interviewers can provide clarification and address misunderstandings, and levels of literacy are not such a significant problem. Limitations include confidentiality, bias and the asking of sensitive questions. Telephone surveys may also have to be conducted in the evenings, when respondents can be reluctant to answer certain questions when other persons are present, and results can be biased because only respondents with a telephone are included in the sample.

Sample

The second main consideration is who the information will be collected from. In contrast to qualitative research, quantitative research results are drawn from a sample, which is representative of the total population of interest so that findings can be generalized, e.g. the smoking behaviour of all men aged 35–60 years in a given geographical area. An exhaustive survey would entail the completion of perhaps many thousands of questionnaires. To overcome this, sampling can be used to give the same information but from a smaller number of respondents.

There are a number of different sampling techniques available. The most commonly used is some form of random, or probability, sampling. A random sample is intended to be representative of the

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population about which you wish to make predictions or generalizations, to ensure the validity of any inferences that are drawn from the statistics. Using the example of smoking behaviour among men aged 35–60, there are a number of different sampling strategies to achieve this, e.g.:

- Simple random sampling, where selection is made by chance alone such as drawing numbers from a hat. This means every man aged 35–60 years in the defined geographical area has an equal chance of being selected.
- Systematic sampling, where selection is made according to some fixed interval, e.g. every fourth house.
- Cluster sampling, an example of what is called multi-stage sampling and which is appropriate when undertaking interviews in the field to minimize travel. To avoid travelling over a wide area, smaller areas can be sampled, then from these, sample the practices. The number of sampling stages is dependent on the study, but a limitation of this approach is that the precision of the sample is reduced.

Each of the sampling procedures have both strengths and limitations and before designing any study it is strongly recommended that a statistician be consulted. For more information on how to sample in surveys, please refer to Fink (1995a).

6. Conduct the analysis

Qualitative analysis

There are a number of approaches to the analysis of qualitative research data. Generally speaking, analysis comprises a number of stages involving content analysis of the transcripts leading to the summarizing and classifying of data in a thematic framework, which is grounded in the respondents' own accounts. Each transcript is analysed in a systematic way using a common methodological framework, so enhancing the reliability and validity of the interpreted findings. Validity is about how sure we are in measuring what we think we are measuring, while reliability is how reliable are our findings. Just because something is reliable does not mean it is valid however. We cannot have validity without reliability. For example a clock can always be reliably 10 minutes fast but it is invalid for telling the correct time.

Other approaches to the analysis of qualitative data are discussed in more detail in Bryman and Burgess (1994) and Miles and Huberman (1994).

The data obtained from qualitative research should never be subjected to statistical analysis or quantified; reporting of the findings from qualitative research should be based on the analysis of the

narrative of individual experiences. Samples for qualitative research have not been selected to be statistically representative of the population under study, but to identify, explore and explain variations in the nature of views and experiences (Nazroo and O'Connor, 2002). It is therefore methodologically unsound, for example, to state that 'x% of respondents experienced strain and worry resulting from caring for family members'. Instead, state that 'caring for family members was seen by some respondents to be a considerable strain and worry' (Fenton and Karlson, 2002). Such findings could then be supplemented with relevant quotes from the respondents.

Quantitative analysis

Analysis of data collected by quantitative research will usually involve some form of statistical analysis. Statistics is '...the mathematics of organizing and interpreting numerical information. The results of statistical analyses are descriptions, relationships, comparisons, and predictions' (Fink, 1995b).

Descriptive statistics provide information on the composition of the sample, e.g. how many were under the age of 35 years, or the percentage of men or women having a given treatment. Descriptive statistics also include describing the study sample in terms of the mean, mode and median values of, for example, age, duration of illness, income, attitudes and health status. (The mean is the average value, the mode is the most occurring value and the median is the value which divides the data in half – half the cases have a value less than the median and half the cases have a value greater than the median.) Descriptive statistics may also include measures of spread of data such as the standard deviation, which is the measure of spread around the mean, and range, which is the difference between the smallest and largest value of an observation.

Using statistics to examine relationships is to look for associations between and among variables. For example we might be looking at the strength of association between lung function and physical exercise or smoking behaviour. This relationship may be expressed as a correlation coefficient, which is expressed numerically as ranging between -1 to $+1$. For example, a correlation coefficient of 0.90 between psychosocial support and perceived wellbeing would be indication of a strong relationship between the two. A correlation of -0.90 would indicate an inverse relationship between the two variables, i.e. the lower the level of psychosocial support the higher the perceived wellbeing (Fink, 1995b).

Statistics can also be used to compare two groups on one or more factors or variables, e.g. to compare differences in wellbeing between men and women or dif-

ferent treatment regimens. Key to interpreting these comparisons is statistical significance – any differences found that are statistically meaningful and not due to chance alone (Fink, 1995b; Argyrous, 2000).

Finally, statistics can be used to predict outcome, e.g. which of the characteristics such as age, duration of illness, attitudes and treatment is linked with well-being (Meadows, 1996).

Choice of the methods of analysis to use will be dependent on the purpose of the analysis, the number and type of variable and type of data. For a more detailed explanation on how to analyse quantitative data, please refer to Fink (1995b).

7. Report results

Dissemination of research is essential if the findings are to be of benefit to others. Nurses must be open to critical examination by their peers and must promote service development based on sound evidence. Dissemination can also reduce the chances of unnecessary, and possibly costly, replication by others.

Leese et al (1996) identified four distinct audiences to whom the results of research in primary care are disseminated: policy makers; managers and health professionals; the academic and scientific community; users and representatives of primary care.

At the very least, every study should end with a report, comprising the background to the study, methods, results and discussion including the limitations of the study and conclusion, which should be lodged in a place to enable examination by others. A final report is, more often than not, a mandatory requirement of funding bodies. Dissemination should not, however, stop at a report where it can remain as unread as part of the 'grey' literature.

Consideration should be given to other types of output reflecting the needs of the target audience. Detailed articles in peer-reviewed journals, books and presentations at academic and scientific meetings are ways to reach the academic and scientific community, whereas executive summaries and general articles will often be sufficient for managers and health professionals. Local presentations to inform peers are also essential.

Conclusion

This first paper in a series of six has provided an overview of the key phases, as a backdrop to a more detailed account of each of the seven stages described here.

The second paper of the series will focus on the development of the research question. This will be followed in the series by an introduction to qualitative and quantitative research methods, questionnaire design and getting your research published. ■

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KEY POINTS

- Research is designed to provide new knowledge.
- It involves asking a question, choosing and applying appropriate methodology.
- Its findings should be widely disseminated.
- It should be of potential value in the provision of effective health care.

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