PART 2

# Conceptualizing a Research Study

# 4 Research Problems, Research Questions, and Hypotheses

## OVERVIEW OF RESEARCH PROBLEMS

Studies begin as problems that researchers want to solve or as questions they want to answer. This chapter discusses the formulation and development of research problems. We begin by clarifying some relevant terms.

### Basic Terminology

At the most general level, a researcher selects a **topic** or a phenomenon on which to focus. Examples of research topics are adolescent smoking, patient compliance, coping with disability, and pain management. Within each of these broad topics are many potential research problems. In this section, we illustrate various terms using the topic *side effects of chemotherapy.*

A **research problem** is an enigmatic, perplexing, or troubling condition. Both qualitative and quantitative researchers identify a research problem within a broad topic area of interest. The purpose of research is to "solve" the problem—or to contribute to its solution—by accumulating relevant information. A **problem statement** articulates the problem to be addressed and indicates the need for a study. Table 4-1 presents a problem statement related to the topic of side effects of chemotherapy.

**Research questions** are the specific queries researchers want to answer in addressing the research problem. Research questions guide the types of data to be collected in a study. Researchers who make specific predictions regarding answers to the research question pose **hypotheses** that are tested empirically.

Many reports include a **statement of purpose** (or purpose statement), which is the researcher's summary of the overall goal of a study. A researcher might also identify several **research aims** or **objectives**—the specific accomplishments the researcher hopes to achieve by conducting the study. The objectives include obtaining answers to research questions or testing research hypotheses but may also encompass some broader aims (e.g., developing recommendations for changes to nursing practice based on the study results).

These terms are not always consistently defined in research methods textbooks, and differences between the terms are often subtle. Table 4-1 illustrates the interrelationships among terms as we define them.

### Research Problems and Paradigms

Some research problems are better suited for studies using qualitative versus quantitative methods. Quantitative studies usually involve concepts that

**TABLE 4.1** Example of Terms Relating to Research Problems

| TERM | EXAMPLE |
|---|---|
| Topic/focus | Side effects of chemotherapy |
| Research problem | Nausea and vomiting are common side effects among patients on chemotherapy, and interventions to date have been only moderately successful in reducing these effects. New interventions that can reduce or prevent these side effects need to be identified. |
| Statement of purpose | The purpose of the study is to test an intervention to reduce chemotherapy-induced side effects—specifically, to compare the effectiveness of patient-controlled and nurse-administered antiemetic therapy for controlling nausea and vomiting in patients on chemotherapy. |
| Research question | What is the relative effectiveness of patient-controlled antiemetic therapy versus nurse-controlled antiemetic therapy with regard to (a) medication consumption and (b) control of nausea and vomiting in patients on chemotherapy? |
| Hypotheses | (1) Subjects receiving antiemetic therapy by a patient-controlled pump will report less nausea than subjects receiving the therapy by nurse administration; (2) subjects receiving antiemetic therapy by a patient-controlled pump will vomit less than subjects receiving the therapy by nurse administration; (3) subjects receiving antiemetic therapy by a patient-controlled pump will consume less medication than subjects receiving the therapy by nurse administration. |
| Aims/objectives | This study has as its aim the following objectives: (1) to develop and implement two alternative procedures for administering antiemetic therapy for patients receiving moderate emetogenic chemotherapy (patient controlled versus nurse controlled); (2) to test three hypotheses concerning the relative effectiveness of the alternative procedures on medication consumption and control of side effects; and (3) to use the findings to develop recommendations for possible changes to therapeutic procedures. |

are fairly well developed, about which there is an existing body of literature, and for which reliable methods of measurement have been developed. For example, a quantitative study might be undertaken to determine if postpartum depression is higher among women who are employed 6 months after delivery than among those who stay home with their babies. There are relatively accurate measures of postpartum depression that would yield quantitative information about the level of depression in a sample of employed and nonemployed postpartum women.

Qualitative studies are often undertaken because some aspect of a phenomenon is poorly understood, and the researcher wants to develop a rich, comprehensive, and context-bound understanding of it. Qualitative studies are usually initiated to heighten awareness and create a dialogue about a phenomenon. In the example of postpartum depression, qualitative methods would not be well suited to comparing levels of depression among the two groups of women, but they would be ideal for exploring, for example, the *meaning* of postpartum

depression among new mothers. Thus, the nature of the research question is closely allied to paradigms and research traditions within paradigms.

## SOURCES OF RESEARCH PROBLEMS

Students are sometimes puzzled about the origins of research problems. Where do ideas for research problems come from? How do researchers select topic areas and develop research questions? At the most basic level, research topics originate with researchers' interests. Because research is a time-consuming enterprise, curiosity about and interest in a topic are essential to a project's success. Explicit sources that might fuel researchers' curiosity include experience, the nursing literature, social issues, theories, and ideas from others.

### Experience and Clinical Fieldwork

The nurse's everyday clinical experience is a rich source of ideas for research problems. As you are performing your nursing functions, you are bound to find a wealth of research ideas if you are curious about why things are the way they are or about how things could be improved if something were to change. You may be well along the way to developing a research idea if you have ever asked the following kinds of questions: Why are things done this way? What information would help to solve this problem? What is the process by which this situation arose? What would happen if ... ? For beginning researchers in particular, clinical experience (or clinical coursework) is often the most compelling source for topics. Immediate problems that need a solution or that excite the curiosity are relevant and interesting and, thus, may generate more enthusiasm than abstract and distant problems inferred from a theory. Clinical fieldwork before a study may also help to identify clinical problems.

**TIP:** Personal experiences in clinical settings are a provocative source of research ideas. Here are some hints on how to proceed:

- Watch for recurring problems and see if you can discern a pattern in situations that lead to the problem.

  Example: Why do many patients complain of being tired after being transferred from a coronary care unit to a progressive care unit?
- Think about aspects of your work that are irksome, frustrating, or do not result in the intended outcome—then try to identify factors contributing to the problem that could be changed.

  Example: Why is suppertime so frustrating in a nursing home?
- Critically examine some decisions you make in performing your functions. Are these decisions based on tradition, or are they based on systematic evidence that supports their efficacy? Many practices in nursing that have become custom might be challenged.

  Example: What would happen if visiting hours in the intensive care unit were changed from 10 minutes every hour to the regularly scheduled hours existing in the rest of the hospital?

### Nursing Literature

Ideas for research projects often come from reading the nursing literature. Beginning nurse researchers can profit from regularly reading nursing journals, either clinical specialty journals or research journals such as *Nursing Research* or the *Western Journal of Nursing Research*. Nonresearch articles can be helpful in alerting researchers to clinical trends and issues of importance in clinical settings. Published research reports may suggest problem areas indirectly by stimulating the imagination and directly by specifying further areas in need of investigation.

**Example of a direct suggestion for further research:**

Stranahan (2001) studied the relationship between nurse practitioners' attitudes about spiritual care and their spiritual care practices. She made several recommendations for further research in her report, such as the following: "Studies should be conducted to determine reasons why nurse practitioners do not practice spiritual care in the primary care setting" (p. 87).

Inconsistencies in the findings reported in nursing literature sometimes generate ideas for

studies. For example, there are inconsistencies regarding which type of tactile stimulation or touch (e.g., gentle touch, stroking, rubbing) has the most beneficial physiologic and behavioral effects on preterm infants. Such discrepancies can lead to the design of a study to resolve the matter.

Researchers may also wonder whether a study similar to one reported in a journal article would yield comparable results if applied in a different setting or with a different population. Replications are needed to establish the validity and generalizability of previous findings.

In summary, a familiarity with existing research, or with problematic and controversial nursing issues that have yet to be understood and investigated systematically, is an important route to developing a research topic. Students who are actively seeking a problem to study will find it useful to read widely in areas of interest. In Chapter 5, we deal more extensively with the conduct of research literature reviews.

**TIP:** In a pinch, do not hesitate to replicate a study that is reported in the research literature. Replications are a valuable learning experience and can make important contributions if they corroborate (or even if they challenge) earlier findings.

## Social Issues

Sometimes, topics are suggested by more global contemporary social or political issues of relevance to the health care community. For example, the feminist movement has raised questions about such topics as sexual harassment, domestic violence, and gender equity in health care and in research. The civil rights movement has led to research on minority health problems, access to health care, and culturally sensitive interventions. Thus, an idea for a study may stem from a familiarity with social concerns or controversial social problems.

## Theory

The fourth major source of research problems lies in the theories and conceptual schemes that have been developed in nursing and related disciplines. To be useful in nursing practice, theories must be tested through research for their applicability to hospital units, clinics, classrooms, and other nursing environments.

When researchers decide to base a study on an existing theory, deductions from the theory must be developed. Essentially, researchers must ask the following questions: If this theory is correct, what kind of behavior would I expect to find in certain situations or under certain conditions? What kind of evidence would support this theory? This process, which is described more fully in Chapter 6, would eventually result in a specific problem that could be subjected to systematic investigation.

## Ideas From External Sources

External sources can sometimes provide the impetus for a research idea. In some cases, a research topic may be given as a direct suggestion. For example, a faculty member may give students a list of topics from which to choose or may actually assign a specific topic to be studied. Organizations that sponsor funded research, such as government agencies, often identify topics on which research proposals are encouraged. Ideas for research are also being noted on various websites on the internet (see, for example, Duffy, 2001).

Research ideas sometimes represent a response to priorities that are established within the nursing profession, examples of which were discussed in Chapter 1. Priorities for nursing research have been established by many nursing specialty practices. Priority lists can often serve as a useful starting point for exploring research topics.

Often, ideas for studies emerge as a result of a brainstorming session. By discussing possible research topics with peers, advisers or mentors, or researchers with advanced skills, ideas often become clarified and sharpened or enriched and more fully developed. Professional conferences often provide an excellent opportunity for such discussions.

## DEVELOPMENT AND REFINEMENT OF RESEARCH PROBLEMS

Unless a research problem is developed on the basis of theory or an explicit suggestion from an external source, the actual procedures for developing a research topic are difficult to describe. The process is rarely a smooth and orderly one; there are likely to be false starts, inspirations, and setbacks in the process of developing a research problem statement. The few suggestions offered here are not intended to imply that there are techniques for making this first step easy but rather to encourage beginning researchers to persevere in the absence of instant success.

### Selecting a Topic

The development of a research problem is a creative process that depends on imagination and ingenuity. In the early stages, when research ideas are being generated, it is wise not to be critical of them immediately. It is better to begin by relaxing and jotting down general areas of interest as they come to mind. At this point, it matters little if the terms used to remind you of your ideas are abstract or concrete, broad or specific, technical, or colloquial—the important point is to put some ideas on paper. Examples of some broad topics that may come to mind include nurse—patient communication, pain in patients with cancer, and postoperative loss of orientation.

After this first step, the ideas can be sorted in terms of interest, knowledge about the topics, and the perceived feasibility of turning the topics into a research project. When the most fruitful idea has been selected, the rest of the list should not be discarded; it may be necessary to return to it.

### Narrowing the Topic

Once researchers have identified a topic of interest, they need to ask questions that lead to a researchable problem. Examples of question stems that may help to focus an inquiry include the following:

- What is going on with ...?
- What is the process by which ...?
- What is the meaning of ...?
- Why do ...?
- When do ...?
- How do ...?
- What can be done to solve ...?
- What is the extent of ...?
- How intense are ...?
- What influences ...?
- What causes ...?
- What characteristics are associated with ...?
- What differences exist between ...?
- What are the consequences of ...?
- What is the relationship between ...?
- What factors contribute to ...?
- What conditions prevail before ...?
- How effective is ...?

Here again, early criticism of ideas is often counterproductive. Try not to jump to the conclusion that an idea sounds trivial or uninspired without giving it more careful consideration or without exploring it with advisers or colleagues.

Beginning researchers often develop problems that are too broad in scope or too complex and unwieldy for their level of methodologic expertise. The transformation of the general topic into a workable problem is typically accomplished in a number of uneven steps, involving a series of successive approximations. Each step should result in progress toward the goals of narrowing the scope of the problem and sharpening and defining the concepts.

As researchers move from general topics to more specific researchable problems, more than one potential problem area can emerge. Let us consider the following example. Suppose you were working on a medical unit and were puzzled by that fact that some patients always complained about having to wait for pain medication when certain nurses were assigned to them and, yet, these same patients offered no complaints with other nurses. The general problem area is discrepancy in complaints from patients regarding pain medications administered by different nurses. You might ask the following: What

accounts for this discrepancy? How can I improve the situation? Such questions are not actual research questions; they are too broad and vague. They may, however, lead you to ask other questions, such as the following: How do the two groups of nurses differ? What characteristics are unique to each group of nurses? What characteristics do the group of complaining patients share? At this point, you may observe that the ethnic background of the patients and nurses appears to be a relevant factor. This may direct you to a review of the literature for studies concerning ethnicity in relation to nursing care, or it may provoke you to discuss the observations with others. The result of these efforts may be several researchable questions, such as the following:

- What is the essence of patient complaints among patients of different ethnic backgrounds?
- What is the patient's experience of waiting for pain medication?
- How do complaints by patients of different ethnic backgrounds get expressed by patients and perceived by nurses?
- Is the ethnic background of nurses related to the frequency with which they dispense pain medication?
- Is the ethnic background of patients related to the frequency and intensity of complaints when waiting for pain medication?
- Does the number of patient complaints increase when patients are of dissimilar ethnic backgrounds as opposed to when they are of the same ethnic background as nurses?
- Do nurses' dispensing behaviors change as a function of the similarity between their own ethnic background and that of patients?

All these questions stem from the same general problem, yet each would be studied differently—for example, some suggest a qualitative approach and others suggest a quantitative one. A quantitative researcher might become curious about nurses' dispensing behaviors, based on some interesting evidence in the literature regarding ethnic differences. Both ethnicity and nurses' dispensing behaviors are variables that can be measured in a straightforward and reliable manner. A qualitative researcher who noticed differences in patient complaints would likely be more interested in understanding the *essence* of the complaints, the patients' *experience* of frustration, the *process* by which the problem got resolved, or the full *nature* of the nurse—patient interactions regarding the dispensing of medications. These are aspects of the research problem that would be difficult to quantify.

Researchers choose the final problem to be studied based on several factors, including its inherent interest to them and its compatibility with a paradigm of preference. In addition, tentative problems usually vary in their feasibility and worth. It is at this point that a critical evaluation of ideas is appropriate.

## Evaluating Research Problems

There are no rules for making a final selection of a research problem. Some criteria, however, should be kept in mind in the decision-making process. The four most important considerations are the significance, researchability, and feasibility of the problem, and its interest to the researcher.

### Significance of the Problem

A crucial factor in selecting a problem to be studied is its significance to nursing—especially to nursing practice. Evidence from the study should have the potential of contributing meaningfully to nursing knowledge. Researchers should pose the following kinds of questions: Is the problem an important one? Will patients, nurses, or the broader health care community or society benefit from the evidence that will be produced? Will the results lead to practical applications? Will the results have theoretical relevance? Will the findings challenge (or lend support to) untested assumptions? Will the study help to formulate or alter nursing practices or policies? If the answer to all these questions is "no," then the problem should be abandoned.

### Researchability of the Problem

Not all problems are amenable to study through scientific investigation. Problems or questions of a moral or ethical nature, although provocative, are

incapable of being researched. Take, for example, the following: Should assisted suicide be legalized? The answer to such a question is based on a person's values. There are no *right* or *wrong* answers, only points of view. The problem is suitable to debate, not to research. To be sure, it is possible to ask related questions that could be researched. For instance, each of the following questions could be investigated in a research project:

- What are nurses' attitudes toward assisted suicide?
- Do oncology nurses hold more favorable opinions of assisted suicide than other nurses?
- What moral dilemmas are perceived by nurses who might be involved in assisted suicide?
- What are the attitudes of terminally ill patients toward assisted suicide?
- Do terminally ill patients living with a high level of pain hold more favorable attitudes toward assisted suicide than those with less pain?
- How do family members experience the loss of a loved one through assisted suicide?

The findings from these hypothetical projects would have no bearing, of course, on whether assisted suicide should be legalized, but the information could be useful in developing a better understanding of the issues.

In quantitative studies, researchable problems are ones involving variables that can be precisely defined and measured. For example, suppose a researcher is trying to determine what effect early discharge has on patient well-being. *Well-being* is too vague a concept for a study. The researcher would have to sharpen and define the concept so that it could be observed and measured. That is, the researcher would have to establish criteria against which patients' progress toward well-being could be assessed.

When a new area of inquiry is being pursued, however, it may be impossible to define the concepts of interest in precise terms. In such cases, it may be appropriate to address the problem using in-depth qualitative research. The problem may then be stated in fairly broad terms to permit full exploration of the concept of interest.

## Feasibility of Addressing the Problem

A problem that is both significant and researchable may still be inappropriate if a study designed to address it is not feasible. The issue of feasibility encompasses various considerations. Not all of the following factors are relevant for every problem, but they should be kept in mind in making a final decision.

**Time and Timing.** Most studies have deadlines or at least goals for completion. Therefore, the problem must be one that can be adequately studied within the time allotted. This means that the scope of the problem should be sufficiently restricted that enough time will be available for the various steps and activities reviewed in Chapter 3. It is wise to be conservative in estimating time for various tasks because research activities often require more time to accomplish than anticipated. Qualitative studies may be especially time-consuming.

A related consideration is the timing of the project. Some of the research steps—especially data collection—may be more readily performed at certain times of the day, week, or year than at other times. For example, if the problem focused on patients with peptic ulcers, the research might be more easily conducted in the fall and spring because of the increase in the number of patients with peptic ulcers during these seasons. When the timing requirements of the tasks do not match the time available for their performance, the feasibility of the project may be jeopardized.

**Availability of Study Participants.** In any study involving humans, researchers need to consider whether individuals with the desired characteristics will be available and willing to cooperate. Securing people's cooperation may in some cases be easy (e.g., getting nursing students to complete a questionnaire in a classroom), but other situations may pose more difficulties. Some people may not have the time, others may have no interest in a study that has little personal benefit, and others may not feel well enough to participate. Fortunately, people usually *are* willing to cooperate if research demands are minimal. Researchers may need to exert extra effort in recruiting participants—or may

have to offer a monetary incentive—if the research is time-consuming or demanding.

An additional problem may be that of identifying and locating people with needed characteristics. For example, if we were interested in studying the coping strategies of people who had lost a family member through suicide, we would have to develop a plan for identifying prospective participants from this distinct and inconspicuous population.

**Cooperation of Others.** Often, it is insufficient to obtain the cooperation of prospective study participants alone. If the sample includes children, mentally incompetent people, or senile individuals, it would be necessary to secure the permission of parents or guardians, an issue discussed in the chapter on ethics (see Chapter 7). In institutional or organizational settings (e.g., hospitals), access to clients, members, personnel, or records usually requires administrative authorization. Many health care facilities require that any project be presented to a panel of reviewers for approval. As noted in Chapter 3, a critical requirement in many qualitative studies is gaining entrée into an appropriate community, setting, or group, and developing the trust of gatekeepers.

**Facilities and Equipment.** All studies have resource requirements, although in some cases, needs may be modest. It is prudent to consider what facilities and equipment will be needed and whether they will be available before embarking on a project to avoid disappointment and frustration. The following is a partial list of considerations:

- Will assistants be needed, and are such assistants available?
- If technical equipment and apparatus are needed, can they be secured, and are they functioning properly? Will audiotaping or videotaping equipment be required, and is it of sufficient sensitivity for the research conditions? Will laboratory facilities be required, and are they available?
- Will space be required, and can it be obtained?
- Will telephones, office equipment, or other supplies be required?
- Are duplicating or printing services available, and are they reliable?
- Will transportation needs pose any difficulties?

**Money.** Monetary requirements for research projects vary widely, ranging from $10 to $20 for small student projects to hundreds of thousands (or even millions) of dollars for large-scale, government-sponsored research. The investigator on a limited budget should think carefully about projected expenses before making the final selection of a problem. Some major categories of research-related expenditures are the following:

- Literature costs—computerized literature search and retrieval service charges, Internet access charges, reproduction costs, index cards, books and journals
- Personnel costs—payments to individuals hired to help with the data collection (e.g., for conducting interviews, coding, data entry, transcribing, word processing)
- Study participant costs—payment to participants as an incentive for their cooperation or to offset their own expenses (e.g., transportation or baby-sitting costs)
- Supplies—paper, envelopes, computer disks, postage, audiotapes, and so forth
- Printing and duplication costs—expenditures for printing forms, questionnaires, participant recruitment notices, and so on
- Equipment—laboratory apparatus, audio- or video-recorders, calculators, and the like
- Computer-related expenses (e.g., purchasing software)
- Laboratory fees for the analysis of biophysiologic data
- Transportation costs

**Experience of the Researcher.** The problem should be chosen from a field about which investigators have some prior knowledge or experience. Researchers have difficulty adequately developing a study on a topic that is totally new and unfamiliar—although clinical fieldwork before launching the study may make up for certain deficiencies. In addition to substantive knowledge, the issue of technical

expertise should not be overlooked. Beginning researchers with limited methodologic skills should avoid research problems that might require the development of sophisticated measuring instruments or that involve complex data analyses.

**Ethical Considerations.** A research problem may not be feasible because the investigation of the problem would pose unfair or unethical demands on participants. The ethical responsibilities of researchers should not be taken lightly. People engaged in research activities should be thoroughly knowledgeable about the rights of human or animal subjects. An overview of major ethical considerations concerning human study participants is presented in Chapter 7 and should be reviewed when considering the feasibility of a prospective project.

### Interest to the Researcher

Even if the tentative problem is researchable, significant, and feasible, there is one more criterion: the researcher's own interest in the problem. Genuine interest in and curiosity about the chosen research problem are critical prerequisites to a successful study. A great deal of time and energy are expended in a study; there is little sense devoting these personal resources to a project that does not generate enthusiasm.

**TIP:** Beginning researchers often seek out suggestions on topic areas, and such assistance may be helpful in getting started. Nevertheless, it is rarely wise to be talked into a topic toward which you are not personally inclined. If you do not find a problem attractive or stimulating during the beginning phases of a study—when opportunities for creativity and intellectual enjoyment are at their highest—then you are bound to regret your choice later.

## COMMUNICATING THE RESEARCH PROBLEM

It is clear that a study cannot progress without the choice of a problem; it is less clear, but nonetheless true, that the problem and research questions should be carefully stated in writing before proceeding with the design of the study or with field work. Putting one's ideas in writing is often sufficient to illuminate ambiguities and uncertainties. This section discusses the wording of problem statements, statements of purpose, and research questions, and the following major section discusses hypotheses.

### Problem Statements

A problem statement is an expression of the dilemma or disturbing situation that needs investigation for the purposes of providing understanding and direction. A problem statement identifies the nature of the problem that is being addressed in the study and, typically, its context and significance. In general, the problem statement should be broad enough to include central concerns, but narrow enough in scope to serve as a guide to study design.

**Example of a problem statement from a quantitative study:**

> Women account for an increasing percentage of adults with human immunodeficiency virus (HIV).... Most of these HIV-infected women are in their childbearing years. As a result, approximately 7,000 infants are exposed prenatally each year.... All infants exposed to HIV prenatally are at risk for developmental problems.... Little is known about the quality of parental caregiving for infants of mothers with HIV, because few studies have examined parenting in this vulnerable group.... The purpose of this report is to describe the development of infants of mothers with HIV and to determine the extent to which child characteristics, parental caregiver characteristics, family characteristics, and parenting quality influence development (Holditch-Davis, Miles, Burchinal, O'Donnell, McKinney, & Lim, 2001, pp. 5–6).

In this example, the general topic could be described as infant development among at-risk children. The investigators' more specific focus is on four factors that influence infant development among children exposed to HIV prenatally. The problem statement asserts the nature of the problem (these children are at risk of developmental problems) and indicates its breadth (7000 infants annually). It also provides a justification for conducting

a new study: the dearth of existing studies on parenting in this population.

The problem statement for a qualitative study similarly expresses the nature of the problem, its context, and its significance, as in the following example:

**Example of a problem statement from a qualitative study:**

> Members of cultural minority groups may find themselves surrounded by people whose values, beliefs, and interpretations differ from their own during hospitalization. This is often the case for Canada's aboriginal population, as many live in culturally distinct communities.... To promote healing among clients from minority cultural communities, it is important for nurses to understand the phenomenon of receiving care in an unfamiliar culture. This exploratory study examined how members of the Big Cove Mi'kmaq First Nation Community ... subjectively experienced being cared for in a nonaboriginal institution (Baker & Daigle, 2000, p. 8).

As in the previous example, these qualitative researchers clearly articulated the nature of the problem and the justification for a new study. Qualitative studies that are embedded in a particular research tradition usually incorporate terms and concepts in their problem statements that foreshadow their tradition of inquiry (Creswell, 1998). For example, the problem statement in a grounded theory study might refer to the need to generate a theory relating to social processes. A problem statement for a phenomenological study might note the need to know more about people's experiences (as in the preceding example) or the meanings they attribute to those experiences. And an ethnographer might indicate the desire to describe how cultural forces affect people's behavior.

Problem statements usually appear early in a research report and are often interwoven with a review of the literature, which provides context by documenting knowledge gaps.

## Statements of Purpose

Many researchers first articulate their research goals formally as a statement of purpose, worded in the declarative form. The statement captures—usually in one or two clear sentences—the essence of the study. The purpose statement establishes the general direction of the inquiry. The words *purpose* or *goal* usually appear in a purpose statement (e.g., The purpose of this study was..., or, The goal of this study was...), but sometimes the words *intent*, *aim*, or *objective* are used instead. Unfortunately, some research reports leave the statement of purpose implicit, placing an unnecessary burden on readers to make inferences about the goals.

In a quantitative study, a statement of purpose identifies the key study variables and their possible interrelationships, as well as the nature of the population of interest.

**Example of a statement of purpose from a quantitative study:**

"The purpose of this study was to determine whether viewing a video of an actual pediatric inhalation induction would reduce the level of parental anxiety" (Zuwala & Barber, 2001, p. 21).

This statement identifies the population of interest (parents whose child required inhalation induction), the independent variable (viewing a video of such an induction, versus not viewing the video), and the dependent variable (parental anxiety).

In qualitative studies, the statement of purpose indicates the nature of the inquiry, the key concept or phenomenon, and the group, community, or setting under study.

**Example of a statement of purpose from a qualitative study:**

Gallagher and Pierce (2002) designed their qualitative study for the following two purposes: "to gain the family caregivers' perspective of dealing with UI [urinary incontinence] for the care recipient who lives in a home setting, and to gain care recipients' perspective on the UI care given by family caregivers in the home setting" (p. 25).

This statement indicates that the central phenomenon of interest is perspectives on caregiving and that the groups under study are UI patients in home settings and the family caregivers caring for them. Often, the statement of purpose specifically mentions the underlying research tradition, if this is relevant.

**Example of a statement of purpose from a grounded theory study:**

The purpose is "to generate a grounded substantive theory of the process of forgiveness in patients with cancer" (Mickley and Cowles, 2001, p. 31).

The statement of purpose communicates more than just the nature of the problem. Through researchers' selection of verbs, a statement of purpose suggests the manner in which they sought to solve the problem, or the state of knowledge on the topic. That is, a study whose purpose is to *explore* or *describe* some phenomenon is likely to be an investigation of a little-researched topic, often involving a qualitative approach such as a phenomenology or ethnography. A statement of purpose for a qualitative study—especially a grounded theory study—may also use verbs such as *understand*, *discover*, *develop*, or *generate*. Creswell (1998) notes that the statements of purpose in qualitative studies often "encode" the tradition of inquiry not only through the researcher's choice of verbs but also through the use of certain terms or "buzz words" associated with those traditions, as follows:

- *Grounded theory*: Processes; social structures; social interactions
- *Phenomenological studies*: Experience; lived experience; meaning; essence
- *Ethnographic studies*: Culture; roles; myths; cultural behavior

Quantitative researchers also suggest the nature of the inquiry through their selection of verbs. A purpose statement indicating that the study purpose is to *test* or *determine* or *evaluate* the effectiveness of an intervention suggests an experimental design, for example. A study whose purpose is to *examine* or *assess* the relationship between two variables is more likely to refer to a nonexperimental quantitative design. In some cases, the verb is ambiguous: a purpose statement indicating that the researcher's intent is to *compare* could be referring to a comparison of alternative treatments (using an experimental approach) or a comparison of two preexisting groups (using a nonexperimental approach). In any event, verbs such as *test*, *evaluate*, and *compare* suggest an existing knowledge base, quantifiable variables, and designs with tight scientific controls.

Note that the choice of verbs in a statement of purpose should connote objectivity. A statement of purpose indicating that the intent of the study was to *prove*, *demonstrate*, or *show* something suggests a bias.

**TIP:** In wording your research questions or statement of purpose, look at published research reports for models. You may find, however, that some reports fail to state unambiguously the study purpose or specific research questions. Thus, in some studies, you may have to infer the research problem from several sources, such as the title of the report. In other reports, the purpose or questions are clearly stated but may be difficult to find. Researchers most often state their purpose or questions at the end of the introductory section of the report.

## Research Questions

Research questions are, in some cases, direct rewordings of statements of purpose, phrased interrogatively rather than declaratively, as in the following example:

- The purpose of this study is to assess the relationship between the dependency level of renal transplant recipients and their rate of recovery.
- What is the relationship between the dependency level of renal transplant recipients and their rate of recovery?

The question form has the advantage of simplicity and directness. Questions invite an answer and help to focus attention on the kinds of data that would have to be collected to provide that answer. Some research reports thus omit a statement of purpose and state only research questions. Other researchers use a set of research questions to clarify or lend greater specificity to the purpose statement.

**Example of research questions clarifying a statement of purpose:**

*Statement of Purpose*: The purpose of this study was to explore the relationship between method of pain management during labor and specific labor and birth outcomes.

*Research Questions*: (1) Are nonepidural and epidural methods of pain relief associated with augmentation during the first stage of labor? (2) Is the length of second stage labor associated with epidural and nonepidural methods of pain relief? (3) Are newborn Apgar scores at 1 minute and 5 minutes associated with method of pain relief? (4) Does epidural anesthesia affect maternal temperature? (Walker & O'Brien, 1999)

In this example, the statement of purpose provides a global message about the researchers' goal to *explore* relationships among several variables. The research questions identified the two methods of pain management (the independent variable) and the specific labor and birth outcomes of interest (the dependent variables).

### Research Questions in Quantitative Studies

In quantitative studies, research questions identify the key variables (especially the independent and dependent variables), the relationships among them, and the population under study. The variables are all measurable concepts, and the questions suggest quantification. For example, a descriptive research question might ask about the *frequency* or *prevalence* of variables, or their average values (What percentage of women breastfeed their infants? or What is the average interstitial fluid volume at 60 minutes after intravenous infiltration following treatment with cold applications?).

Most quantitative studies, however, ask questions about relationships between variables. In Chapter 2, we noted that researchers ask various questions about relationships. These can be illustrated with an example of women's emotional responses to miscarriage:

1. *Existence of relationship*: Is there a relationship between miscarriage and depression—that is, are there differences in depression levels of pregnant women who miscarry compared with those who do not?
2. *Direction of relationship*: Do women who miscarry exhibit higher (or lower) levels of depression than pregnant women who do not?
3. *Strength of relationship*: How strong is the risk of depression among women who miscarry?
4. *Nature of relationship*: Does having a miscarriage contribute to depression? Does depression contribute to a miscarriage? Or does some other factor influence both?
5. *Moderated relationship*: Are levels of depression among women who miscarry moderated by whether the woman has previously given birth? (i.e., Is the relationship between depression and miscarriage different for primiparas and multiparas?)
6. *Mediated relationship*: Does a miscarriage directly affect depression or does depression occur because the miscarriage had a negative effect on marital relations?

The last two research questions involve mediator and moderator variables, which are variables of interest to the researcher (i.e., that are not extraneous) and that affect the relationship between the independent and dependent variables. A **moderator variable** is a variable that affects the strength or direction of an association between the independent and dependent variable. The independent variable is said to *interact* with the moderator: the independent variable's relationship with the dependent variable is stronger or weaker for different values of the moderator variable (Bennett, 2000). In the preceding example, it might be that the risk of depression after a miscarriage is low among women who had previously given birth (i.e., when the moderating variable parity is greater than 0), but high among women who do not have children (i.e., when parity equals 0). When all women are considered together without taking parity into account, the relationship between experiencing a miscarriage (the independent variable) and levels of depression (the dependent variable) might appear moderate. Therefore, identifying parity as a key moderator is important in understanding *when* to expect a relationship between miscarriage and depression, and this understanding has clinical relevance.

Research questions that involve mediator variables concern the identification of causal pathways. A **mediator variable** is a variable that

intervenes between the independent and dependent variable and helps to explain why the relationship exists. In our hypothetical example, we are asking whether depression levels among women who have experienced a miscarriage are influenced by the negative effect of the miscarriage on marital relations. In research questions involving mediators, researchers are typically more interested in the mediators than in the independent variable, because the mediators are key explanatory mechanisms.

In summary, except for questions of a purely descriptive nature, research questions in quantitative research focus on unraveling relationships among variables.

**Example of a research question from a quantitative study:**

Watt-Watson, Garfinkel, Gallop, Stevens, and Streiner (2000) conducted a study about acute care nurses' empathy and its effects on patients. Their primary research question was about the existence and direction of a relationship:

*Do nurses with greater empathy have patients experiencing less pain and receiving adequate analgesia than those with less empathy?*

### Research Questions in Qualitative Studies

Researchers in the various qualitative traditions vary in their conceptualization of what types of questions are important. Grounded theory researchers are likely to ask *process* questions, phenomenologists tend to ask *meaning* questions, and ethnographers generally ask *descriptive* questions about cultures. The terms associated with the various traditions, discussed previously in connection with purpose statements, are likely to be incorporated into the research questions.

**Example of a research question from a phenomenological study:**

*What is the lived experience of caring for a family member with Alzheimer's disease at home?* (Butcher, Holkup, & Buckwalter, 2001)

It is important to note, however, that not all qualitative studies are rooted in a specific research tradition. Many researchers use naturalistic methods to describe or explore phenomena without focusing on cultures, meaning, or social processes.

**Example of a research question from a qualitative study:**

Wilson and Williams (2000) undertook a qualitative study that explored the potential effects of visualism (a prejudice in favor of the seen) on the perceived legitimacy of telephone work in community nursing. Among the specific research questions that guided their in-depth interviews with community nurses were the following:

*Is telephone consultation considered real work? Is it considered real communication? Can telephone consultation bring the community and its nursing services into close relationship?*

In qualitative studies, research questions sometimes evolve over the course of the study. The researcher begins with a *focus* that defines the general boundaries of the inquiry. However, the boundaries are not cast in stone; the boundaries "can be altered and, in the typical naturalistic inquiry, will be" (Lincoln & Guba, 1985, p. 228). The naturalist begins with a research question that provides a general starting point but does not prohibit discovery; qualitative researchers are often sufficiently flexible that the question can be modified as new information makes it relevant to do so.

## RESEARCH HYPOTHESES

A hypothesis is a prediction about the relationship between two or more variables. A hypothesis thus translates a quantitative research question into a precise prediction of expected outcomes. In qualitative studies, researchers do not begin with a hypothesis, in part because there is usually too little known about the topic to justify a hypothesis, and in part because qualitative researchers want the inquiry to be guided by participants' viewpoints rather than by their own. Thus, this discussion focuses on hypotheses used to guide quantitative inquiries (some of which are generated within qualitative studies).

## Function of Hypotheses in Quantitative Research

Research questions, as we have seen, are usually queries about relationships between variables. Hypotheses are proposed solutions or answers to these queries. For instance, the research question might ask: Does history of sexual abuse in childhood affect the development of irritable bowel syndrome in women? The researcher might predict the following: Women who were sexually abused in childhood have a higher incidence of irritable bowel syndrome than women who were not.

Hypotheses sometimes follow directly from a theoretical framework. Scientists reason from theories to hypotheses and test those hypotheses in the real world. The validity of a theory is never examined directly. Rather, it is through hypothesis testing that the worth of a theory can be evaluated. Let us take as an example the theory of reinforcement. This theory maintains that behavior that is positively reinforced (rewarded) tends to be learned or repeated. The theory itself is too abstract to be put to an empirical test, but if the theory is valid, it should be possible to make predictions about certain kinds of behavior. For example, the following hypotheses have been deduced from reinforcement theory:

- Elderly patients who are praised (reinforced) by nursing personnel for self-feeding require less assistance in feeding than patients who are not praised.
- Pediatric patients who are given a reward (e.g., a balloon or permission to watch television) when they cooperate during nursing procedures tend to be more obliging during those procedures than nonrewarded peers.

Both of these propositions can be put to a test in the real world. The theory gains support if the hypotheses are confirmed.

Not all hypotheses are derived from theory. Even in the absence of a theory, well-conceived hypotheses offer direction and suggest explanations. Perhaps an example will clarify this point. Suppose we hypothesized that nurses who have received a baccalaureate education are more likely to experience stress in their first nursing job than are nurses with a diploma-school education. We could justify our speculation based on theory (e.g., role conflict theory, cognitive dissonance theory), earlier studies, personal observations, or on the basis of some combination of these.

> The development of predictions in and of itself forces researchers to think logically, to exercise critical judgment, and to tie together earlier research findings.

Now let us suppose the preceding hypothesis is not confirmed by the evidence collected; that is, we find that baccalaureate and diploma nurses demonstrate comparable stress in their first job.

> The failure of data to support a prediction forces researchers to analyze theory or previous research critically, to carefully review the limitations of the study's methods, and to explore alternative explanations for the findings.

The use of hypotheses in quantitative studies tends to induce critical thinking and to facilitate understanding and interpretation of the data.

To illustrate further the utility of hypotheses, suppose we conducted the study guided only by the research question, Is there a relationship between nurses' basic preparation and the degree of stress experienced on the first job? The investigator without a hypothesis is, apparently, prepared to accept any results. The problem is that it is almost always possible to explain something superficially after the fact, no matter what the findings are. Hypotheses guard against superficiality and minimize the possibility that spurious results will be misconstrued.

## Characteristics of Testable Hypotheses

Testable research hypotheses state expected relationships between the independent variable (the presumed cause or antecedent) and the dependent variable (the presumed effect or outcome) within a population.

**Example of a research hypothesis:** Cardiac patients receiving an intervention involving "vicarious experience" through support

from former patients have (1) less anxiety; (2) higher self-efficacy expectation; and (3) higher self-reported activity than other patients (Parent & Fortin, 2000).

In this example, the independent variable is receipt versus nonreceipt of the intervention, and the dependent variables are anxiety, self-efficacy expectation, and activity. The hypothesis predicts better outcomes among patients who receive the intervention.

Unfortunately, researchers occasionally present hypotheses that fail to make a relational statement. For example, the following prediction is *not* an acceptable research hypothesis:

> Pregnant women who receive prenatal instruction regarding postpartum experiences are not likely to experience postpartum depression.

This statement expresses no anticipated relationship; in fact, there is only one variable (postpartum depression), and a relationship by definition requires at least two variables.

When a prediction does not express an anticipated relationship, it cannot be tested. In our example, how would we know whether the hypothesis was supported—what absolute standard could be used to decide whether to accept or reject the hypothesis? To illustrate the problem more concretely, suppose we asked a group of mothers who had been given instruction on postpartum experiences the following question 1 month after delivery: On the whole, how depressed have you been since you gave birth? Would you say (1) extremely depressed, (2) moderately depressed, (3) somewhat depressed, or (4) not at all depressed?

Based on responses to this question, how could we compare the actual outcome with the predicted outcome? Would *all* the women have to say they were "not at all depressed?" Would the prediction be supported if 51% of the women said they were "not at all depressed" *or* "somewhat depressed?" There is no adequate way of testing the accuracy of the prediction.

A test is simple, however, if we modify the prediction to the following: Pregnant women who receive prenatal instruction are less likely to experience postpartum depression than those with no prenatal instruction. Here, the dependent variable is the women's depression, and the independent variable is their receipt versus nonreceipt of prenatal instruction. The relational aspect of the prediction is embodied in the phrase *less than*. If a hypothesis lacks a phrase such as *more than*, *less than*, *greater than*, *different from*, *related to*, *associated with*, or something similar, it is not amenable to testing in a quantitative study. To test this revised hypothesis, we could ask two groups of women with different prenatal instruction experiences to respond to the question on depression and then compare the groups' responses. The absolute degree of depression of either group would not be at issue.

Hypotheses, ideally, should be based on sound, justifiable rationales. The most defensible hypotheses follow from previous research findings or are deduced from a theory. When a relatively new area is being investigated, the researcher may have to turn to logical reasoning or personal experience to justify the predictions. There are, however, few problems for which research evidence is totally lacking.

## The Derivation of Hypotheses

Many students ask the question, How do I go about developing hypotheses? Two basic processes—induction and deduction—constitute the intellectual machinery involved in deriving hypotheses.

An **inductive hypothesis** is a generalization based on observed relationships. Researchers observe certain patterns, trends, or associations among phenomena and then use the observations as a basis for predictions. Related literature should be examined to learn what is already known on a topic, but an important source for inductive hypotheses is personal experiences, combined with intuition and critical analysis. For example, a nurse might notice that presurgical patients who ask a lot of questions relating to pain or who express many pain-related apprehensions have a more difficult time in learning appropriate postoperative procedures. The nurse could then formulate a hypothesis, such as the following, that could be tested through more rigorous

procedures: Patients who are stressed by fears of pain will have more difficulty in deep breathing and coughing after their surgery than patients who are not stressed. Qualitative studies are an important source of inspiration for inductive hypotheses.

**Example of deriving an inductive hypothesis:** In Beck's (1998) qualitative study of postpartum-onset panic disorder, one of her findings was a theme relating to self-esteem: "As a result of recurring panic attacks, negative changes in women's lifestyles ensued—lowering their self-esteem and leaving them to bear the burden of disappointing not only themselves but also their families" (p. 134). A hypothesis that can be derived from this qualitative finding might be as follows: Women who experience postpartum onset panic disorder have lower self-esteem than women who do not experience this disorder.

The other mechanism for deriving hypotheses is through deduction. Theories of how phenomena behave and interrelate cannot be tested directly. Through deductive reasoning, a researcher can develop hypotheses based on general theoretical principles. Inductive hypotheses begin with specific observations and move toward generalizations; **deductive hypotheses** have as a starting point theories that are applied to particular situations. The following syllogism illustrates the reasoning process involved:

- All human beings have red and white blood cells.
- John Doe is a human being.
- Therefore, John Doe has red and white blood cells.

In this simple example, the hypothesis is that John Doe does, in fact, have red and white blood cells, a deduction that could be verified.

Theories thus can serve as a valuable point of departure for hypothesis development. Researchers must ask: If this theory is valid, what are the implications for a phenomenon of interest? In other words, researchers deduce that if the general theory is true, then certain outcomes or consequences can be expected. Specific predictions derived from general principles must then be subjected to testing through the collection of empirical data. If these data are congruent with hypothesized outcomes, then the theory is strengthened.

The advancement of nursing knowledge depends on both inductive and deductive hypotheses. Ideally, a cyclical process is set in motion wherein observations are made (e.g., in a qualitative study); inductive hypotheses are formulated; systematic and controlled observations are made to test the hypotheses; theoretical systems are developed on the basis of the results; deductive hypotheses are formulated from the theory; new data are gathered; theories are modified, and so forth. Researchers need to be organizers of concepts (think inductively), logicians (think deductively), and, above all, critics and skeptics of resulting formulations, constantly demanding evidence.

## Wording of Hypotheses

A good hypothesis is worded in simple, clear, and concise language. Although it is cumbersome to include conceptual or operational definitions of terms directly in the hypothesis statement, it should be specific enough so that readers understand what the variables are and whom researchers will be studying.

### Simple Versus Complex Hypotheses

For the purpose of this book, we define a **simple hypothesis** as a hypothesis that expresses an expected relationship between *one* independent and *one* dependent variable. A **complex hypothesis** is a prediction of a relationship between two (or more) independent variables and/or two (or more) dependent variables. Complex hypotheses sometimes are referred to as **multivariate hypotheses** because they involve multiple variables.

We give some concrete examples of both types of hypotheses, but let us first explain the differences in abstract terms. Simple hypotheses state a relationship between a single independent variable, which we will call *X*, and a single dependent variable, which we will label *Y*. *Y* is the predicted effect, outcome, or consequence of *X*, which is the presumed cause, antecedent, or precondition. The nature of this relationship is presented in Figure 4-1A. The

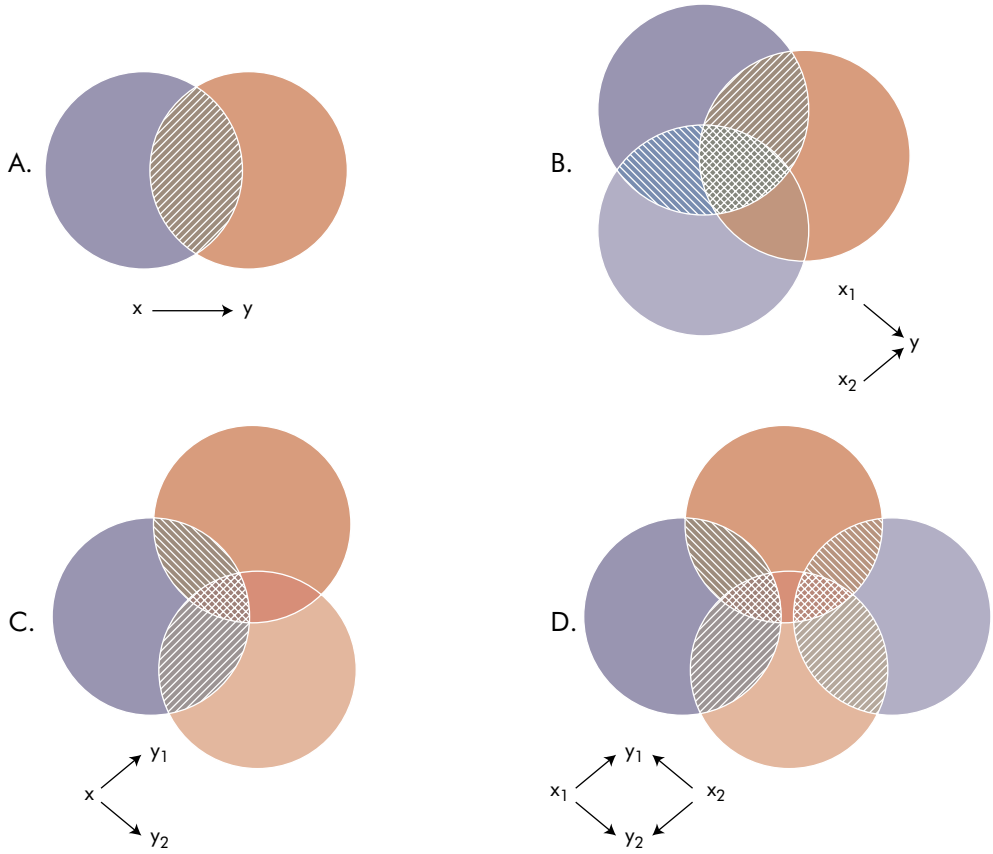


**FIGURE 4.1** Schematic representation of various hypothetical relationships.

hatched area of the circles, which represent variables *X* and *Y*, signifies the strength of the relationship between them. If there were a one-to-one correspondence between variables *X* and *Y*, the two circles would completely overlap, and the entire area would be hatched. If the variables were totally unrelated, the circles would not overlap at all.

**Example of a simple hypothesis:** Patients receiving a warmed solution for body cavity irrigation during surgical procedures [*X*] will maintain a higher core body temperature [*Y*] than patients receiving a room temperature solution (Kelly, Doughty, Hasselbeck, & Vacchiano, 2000).

Most phenomena are the result not of one variable but of a complex array of variables. A person's weight, for example, is affected simultaneously by such factors as the person's height, diet, bone structure, activity level, and metabolism. If *Y* in Figure 4-1A was weight, and *X* was a person's caloric intake, we would not be able to explain or understand individual variation in weight completely. For example, knowing that Dave Harper's daily caloric intake averaged 2500 calories would not allow us a perfect prediction of his weight. Knowledge of other factors, such as his height, would improve the accuracy with which his weight could be predicted.

Figure 4-1B presents a schematic representation of the effect of two independent variables on one dependent variable. The complex hypothesis would state the nature of the relationship between *Y* on the one hand and $X_1$ and $X_2$ on the other. To

pursue the preceding example, the hypothesis might be: Taller people ($X_1$) and people with higher caloric intake ($X_2$) weigh more ($Y$) than shorter people and those with lower caloric intake. As the figure shows, a larger proportion of the area of $Y$ is hatched when there are two independent variables than when there is only one. This means that caloric intake *and* height do a better job in helping us explaining variations in weight ($Y$) than caloric intake alone. Complex hypotheses have the advantage of allowing researchers to capture some of the complexity of the real world. It is not always possible to design a study with complex hypotheses. Practical considerations (e.g., researchers' technical skills and resources) may make it difficult to test complex hypotheses. An important goal of research, however, is to explain the dependent variable as thoroughly as possible, and two or more independent variables are typically more successful than one alone.

**Example of a complex hypothesis—multiple independent variables:**
Among breast cancer survivors, emotional well-being [$Y$] is influenced by the women's self-esteem [$X_1$], their resourcefulness [$X_2$] and their degree of social support [$X_3$] (Dirksen, 2000).

Just as a phenomenon can result from more than one independent variable, so a single independent variable can have an effect on, or be antecedent to, more than one phenomenon. Figure 4-1C illustrates this type of relationship. A number of studies have found, for example, that cigarette smoking (the independent variable, $X$), can lead to both lung cancer ($Y_1$) and coronary disorders ($Y_2$). This type of complex hypothesis is common in studies that try to assess the impact of a nursing intervention on a variety of criterion measures of patient well-being.

**Example of a complex hypothesis—multiple dependent variables:**
The implementation of an evidence-based protocol for urinary incontinence [$X$] will result in decreased frequency of urinary incontinence episodes ($Y_1$), decreased urine loss per episode [$Y_2$], and decreased avoidance of activities [$Y_3$] among women in ambulatory care settings (Sampselle et al., 2000).

Finally, a more complex type of hypothesis, which links two or more independent variables to two or more dependent variables, is shown in Figure 4-1D. An example might be a hypothesis that smoking *and* the consumption of alcohol during pregnancy might lead to lower birth weights *and* lower Apgar scores in infants.

Hypotheses are also complex if mediator or moderator variables are included in the prediction. For example, it might be hypothesized that the effect of caloric intake ($X$) on weight ($Y$) is moderated by gender ($Z$)—that is, the relationship between height and weight is different for men and women.

**Example of a complex hypothesis with mediator:**
The quality of life of a family [$Y$] during the survivor phase after cancer diagnosis is affected by family resources [$X_1$] and illness survival stressors such as fear of recurrence [$X_2$], *through* the mediating variable, the family meaning of the illness [$Z$] (Mellon & Northouse, 2001).

In general, hypotheses should be worded in the present tense. Researchers make predictions about relationships that exist in the population, and not just about a relationship that will be revealed in a particular sample. Hypotheses can be stated in various ways as long as the researcher specifies or implies the relationship to be tested. Here are examples:

1. Older patients are more at risk of experiencing a fall than younger patients.
2. There is a relationship between the age of a patient and the risk of falling.
3. The older the patient, the greater the risk that she or he will fall.
4. Older patients differ from younger ones with respect to their risk of falling.
5. Younger patients tend to be less at risk of a fall than older patients.
6. The risk of falling increases with the age of the patient.

Other variations are also possible. The important point to remember is that the hypothesis must specify the independent variable (here, patients' age) and the dependent variables (here, risk of falling) and the anticipated relationship between them.

### Directional Versus Nondirectional Hypotheses

Sometimes hypotheses are described as being either directional or nondirectional. A **directional hypothesis** is one that specifies not only the existence but the expected direction of the relationship between variables. In the six versions of the hypothesis in the preceding list, versions 1, 3, 5, and 6 are directional because there is an explicit prediction that older patients are at greater risk of falling than younger ones.

A **nondirectional hypothesis**, by contrast, does not stipulate the direction of the relationship. Versions 2 and 4 in the example illustrate the wording of nondirectional hypotheses. These hypotheses state the prediction that a patient's age and the risk of falling are related; they do not stipulate, however, whether the researcher thinks that *older* patients or *younger* ones are at greater risk.

Hypotheses derived from theory are almost always directional because theories explain phenomena, thus providing a rationale for expecting variables to be related in certain ways. Existing studies also offer a basis for directional hypotheses. When there is no theory or related research, when the findings of related studies are contradictory, or when researchers' own experience leads to ambivalence, nondirectional hypotheses may be appropriate. Some people argue, in fact, that nondirectional hypotheses are preferable because they connote a degree of impartiality. Directional hypotheses, it is said, imply that researchers are intellectually committed to certain outcomes, and such a commitment might lead to bias. This argument fails to recognize that researchers typically *do* have hunches about outcomes, whether they state those expectations explicitly or not. We prefer directional hypotheses—when there is a reasonable basis for them—because they clarify the study's framework and demonstrate that researchers have thought critically about the phenomena under study. Directional hypotheses may also permit a more sensitive statistical test through the use of a *one-tailed test*—a rather fine point that is discussed in Chapter 20.

### Research Versus Null Hypotheses

Hypotheses are sometimes classified as being either research hypotheses or null hypotheses. **Research hypotheses** (also referred to as *substantive*, *declarative*, or *scientific* hypotheses) are statements of expected relationships between variables. All the hypotheses presented thus far are research hypotheses that indicate researchers' actual expectations.

The logic of statistical inference operates on principles that are somewhat confusing to many beginning students. This logic requires that hypotheses be expressed such that *no* relationship is expected. **Null hypotheses** (or **statistical hypotheses**) state that there is no relationship between the independent and dependent variables. The null form of the hypothesis used in our preceding examples would be a statement such as: "Patients' age is unrelated to their risk of falling" or "Older patients are just as likely as younger patients to fall." The null hypothesis might be compared with the assumption of innocence of an accused criminal in our system of justice: the variables are assumed to be "innocent" of any relationship until they can be shown "guilty" through appropriate statistical procedures. The null hypothesis represents the formal statement of this assumption of innocence.

**TIP:** If you formulate hypotheses, avoid stating them in null form. When statistical tests are performed, the underlying null hypothesis is assumed without being explicitly stated. Stating hypotheses in the null form gives an amateurish impression.

## Hypothesis Testing

Hypotheses are formally tested through statistical procedures; researchers seek to determine through statistics whether their hypotheses have a high

probability of being correct. However, hypotheses are never *proved* through hypothesis testing; rather, they are *accepted* or *supported*. Findings are always tentative. Certainly, if the same results are replicated in numerous investigations, then greater confidence can be placed in the conclusions. Hypotheses come to be increasingly supported with mounting evidence.

Let us look more closely at why this is so. Suppose we hypothesized that height and weight are related. We predict that, on average, tall people weigh more than short people. We then obtain height and weight measurements from a sample and analyze the data. Now suppose we happened by chance to choose a sample that consisted of short, heavy people, and tall, thin people. Our results might indicate that there is no relationship between a person's height and weight. Would we then be justified in stating that this study *proved* or *demonstrated* that height and weight in humans are unrelated?

As another example, suppose we hypothesized that tall nurses are more effective than short ones. This hypothesis is used here only to illustrate a point because, in reality, we would expect no relationship between height and a nurse's job performance. Now suppose that, by chance again, we drew a sample of nurses in which tall nurses received better job evaluations than short ones. Could we conclude definitively that height is related to a nurse's performance? These two examples illustrate the difficulty of using observations from a sample to generalize to a population. Other issues, such as the accuracy of the measures, the effects of uncontrolled extraneous variables, and the validity of underlying assumptions prevent researchers from concluding with finality that hypotheses are proved.

**TIP:** If a researcher uses any statistical tests (as is true in most quantitative studies), it means that there are underlying hypotheses—regardless of whether the researcher explicitly states them—because statistical tests are designed to test hypotheses. In planning a quantitative study of your own, do not be afraid to make a prediction, that is, to state a hypothesis.

## RESEARCH EXAMPLES

This section describes how the research problem and research questions were communicated in two nursing studies, one quantitative and one qualitative.

### Research Example of a Quantitative Study

Van Servellen, Aguirre, Sarna, and Brecht (2002) studied emotional distress in HIV-infected men and women. The researchers noted that, despite the fact that AIDS rates have been dropping for men but increasing for women, few studies have described the health experiences of HIV-infected women or compared them with those of men. This situation was viewed as especially troubling because of certain evidence indicating that, once HIV infected, women may be at greater risk than men for illness-related morbidity and adverse outcomes.

As stated by the researchers, the purpose of their study was "to describe and compare patterns of emotional distress in men and women with symptomatic HIV seeking care in community-based treatment centers" (p. 50). The researchers went on to note that understanding gender differences and similarities in relation to sociodemographic characteristics, health status, and stress-resistant resources could "provide important information in designing gender-specific programs to improve quality of life and reduce emotional distress in clients affected by HIV" (p. 50).

The conceptual framework for the study was attribution theory, which offers explanations of links between life stressors and emotional distress. This framework guided the development of the four study hypotheses, which were as follows:

> Hypothesis 1: Sociodemographic vulnerability (less than high school education, etc.) will be associated with emotional distress in both men and women.
>
> Hypothesis 2: Poor physical and functional health status will be associated with emotional distress in both men and women.
>
> Hypothesis 3: Optimism and social support will be associated with positive mental health outcomes ... in both men and women.
>
> Hypothesis 4: Women will have higher levels of emotional distress than men (pp. 53–54).

Data for the study were collected from 82 men and 44 women with HIV disease in Los Angeles. The results indicated that women had greater disruptions in physical and psychosocial well-being than men, consistent with the fourth hypothesis. Physical health and optimism were the primary predictors of emotional distress in both men and women, supporting hypotheses 2 and 3. However, the first hypothesis was not supported in this low-income sample: there were no significant relationships between any sociodemographic vulnerability indicators and the subjects' level of anxiety or depression.

### Research Example of a Qualitative Study

Beery, Sommers, and Hall (2002) studied the experiences of women with permanent cardiac pacemakers. The researchers stated that biotechnical devices such as pacemakers are increasingly being implanted into people to manage an array of disorders, yet relatively little research has examined the emotional impact of such an experience. They further noted that women may have distinctive responses to implanted devices because of cultural messages about the masculinity of technology, but little was known about women's unique responses to permanent cardiac pacemakers.

The purpose of Beery and colleagues' study was to explore women's responses to pacemaker implementation, using in-depth interviews to solicit the women's life stories. The researchers identified two specific research questions for their study: "What is the experience of women living with permanent cardiac pacemakers?" and "How do women incorporate permanent cardiac pacemakers into their lives and bodies?" (p. 8).

A sample of 11 women who were patients at the cardiology service of a large hospital participated in the study. During interviews, the women were asked a series of questions regarding life events that led up to, and occurred during and after, their pacemaker's implantation. Each woman participated in two interviews. An example of the questions asked in the initial interview is: "What has living with a pacemaker been like for you?" (p. 12). In the follow-up interviews, more specific questions were asked, such as, "How often do you think about the pacemaker?" and "When might you be reminded of it?" (p. 12).

The researchers' analysis revealed eight themes that emerged from the interview data: relinquishing care, owning the pacemaker, experiencing fears and resistance, imaging their body, normalizing, positioning as caregivers, finding resilience, and sensing omnipotence.

## SUMMARY POINTS

- A **research problem** is a perplexing or enigmatic situation that a researcher wants to address through disciplined inquiry.
- Researchers usually identify a broad **topic,** narrow the scope of the problem, and then identify questions consistent with a paradigm of choice.
- The most common sources of ideas for nursing research problems are experience, relevant literature, social issues, theory, and external sources.
- Various criteria should be considered in assessing the value of a research problem. The problem should be clinically significant; researchable (questions of a moral or ethical nature are inappropriate); feasible; and of personal interest.
- Feasibility involves the issues of time, cooperation of study participants and other people, availability of facilities and equipment, researcher experience, and ethical considerations.
- Researchers communicate their aims in research reports as problem statements, statements of purpose, research questions, or hypotheses. The **problem statement** articulates the nature, context, and significance of a problem to be studied.
- A **statement of purpose** summarizes the overall study goal; in both qualitative and quantitative studies, the purpose statement identifies the key concepts (variables) and the study group or population.
- Purpose statements often communicate, through the use of verbs and other key terms, the underlying research tradition of qualitative studies, or whether study is experimental or nonexperimental in quantitative ones.
- A **research question** is the specific query researchers want to answer in addressing the research problem. In quantitative studies, research questions usually are about the existence, nature, strength, and direction of relationships.
- Some research questions are about **moderating variables** that affect the strength or direction of

a relationship between the independent and dependent variables; others are about **mediating variables** that intervene between the independent and dependent variable and help to explain why the relationship exists.

- In quantitative studies, a **hypothesis** is a statement of predicted relationships between two or more variables. A testable hypothesis states the anticipated association between one or more independent and one or more dependent variables.
- **Simple hypotheses** express a predicted relationship between one independent variable and one dependent variable, whereas **complex hypotheses** state an anticipated relationship between two or more independent variables and two or more dependent variables (or state predictions about mediating or moderating variables).
- **Directional hypotheses** predict the direction of a relationship; **nondirectional hypotheses** predict the existence of relationships, not their direction.
- **Research hypotheses** predict the existence of relationships; **statistical** or **null hypotheses** express the absence of a relationship.
- Hypotheses are never proved or disproved in an ultimate sense—they are accepted or rejected, supported or not supported by the data.

## STUDY ACTIVITIES

Chapter 4 of the *Study Guide to Accompany Nursing Research: Principles and Methods, 7th edition*, offers various exercises and study suggestions for reinforcing the concepts presented in this chapter. In addition, the following study questions can be addressed:

1. Think of a frustrating experience you have had as a nursing student or as a practicing nurse. Identify the problem area. Ask yourself a series of questions until you have one that you think is researchable. Evaluate the problem in terms of the evaluation criteria discussed in this chapter.
2. Examine the following five problem statements. Are they researchable problems as stated? Why or why not? If a problem statement is not researchable, modify it in such a way that the problem could be studied scientifically.
   a. What are the factors affecting the attrition rate of nursing students?
   b. What is the relationship between atmospheric humidity and heart rate in humans?
   c. Should nurses be responsible for inserting nasogastric tubes?
   d. How effective are walk-in clinics?
   e. What is the best approach for conducting patient interviews?
3. Examine a recent issue of a nursing research journal. Find an article that does not present a formal, well-articulated statement of purpose. Write a statement of purpose (or research questions) for that study.
4. Below are four hypotheses. For each hypothesis: (1) identify the independent and dependent variables; (2) indicate whether the hypothesis is simple or complex, and directional or nondirectional; and (3) state the hypotheses in null form.
   a. Patients who are not told their diagnoses report more subjective feelings of stress than do patients who are told their diagnosis.
   b. Patients receiving intravenous therapy report greater nighttime sleep pattern disturbances than patients not receiving intravenous therapy.
   c. Patients with roommates call for a nurse less often than patients without roommates.
   d. Women who have participated in Lamaze classes request pain medication during labor less often than women who have not taken these classes.

## SUGGESTED READINGS

### Methodologic References

Bennett, J. A. (2000). Mediator and moderator variables in nursing research: Conceptual and statistical differences. *Research in Nursing & Health, 23*, 415–420.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage.

Duffy, M. (2001). Getting qualitative research ideas and help on-line. In P. L. Munhall (Ed.), *Nursing Research: A qualitative perspective* (3rd ed., pp. 639–645). Sudbury, MA: Jones & Bartlett.

Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of behavioral research* (4th ed.). Orlando, FL: Harcourt College Publishers.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage.

Martin, P. A. (1994). The utility of the research problem statement. *Applied Nursing Research, 7*, 47–49.

## Studies Cited in Chapter 4

Baker, C., & Daigle, M. C. (2000). Cross-cultural hospital care as experienced by Mi'kmaq clients. *Western Journal of Nursing Research, 22,* 8–28.

Beck, C. T. (1998). Postpartum onset panic disorder. *Image: Journal of Nursing Scholarship, 30*, 131–135.

Beery, T. A., Sommers, M. S., & Hall, J. (2002). Focused life stories of women with cardiac pacemakers. *Western Journal of Nursing Research, 24*, 7–27.

Butcher, H. K., Holkup, P. A., & Buckwalter, K. C. (2001). The experience of caring for a family member with Alzheimer's disease. *Western Journal of Nursing Research, 23*, 33–55.

Dirksen, S. R. (2000). Predicting well-being among breast cancer survivors. *Journal of Advanced Nursing, 32*, 937–943.

Gallagher, M., & Pierce, L. L. (2002). Caregivers' and care recipients' perceptions of dealing with urinary incontinence. *Rehabilitation Nursing, 27*, 25–31.

Holditch-Davis, D., Miles, M. S., Burchinal, M., O'Donnell, K., McKinney, R., & Lim, W. (2001). Parental caregiving and developmental outcomes of infants of mothers with HIV. *Nursing Research, 50*, 5–14.

Kelly, J. A., Doughty, J. K., Hasselbeck, A. N., & Vacchiano, C. (2000). The effect of arthroscopic irrigation fluid warming on body temperature. *Journal of Perianesthesia Nursing, 15,* 245–252.

Mellon, S., & Northouse, L. L. (2001). Family survivorship and quality of life following a cancer diagnosis. *Research in Nursing & Health, 24*, 446–459.

Mickley, J. R., & Cowles, K. (2001). Ameliorating the tension: The use of forgiveness for healing. *Oncology Nursing Forum, 28*, 31–37.

Parent, N., & Fortin, F. (2000). A randomized, controlled trial of vicarious experience through peer support for male first-time cardiac surgery patients. *Heart & Lung, 29*, 389–400.

Sampselle, C. M., Wyman, J., Thomas, K., Newman, D. K., Gray, M., Dougherty, M., & Burns, P. A. (2000). Continence for women: A test of AWHONN's evidence-based protocol in clinical practice. *Journal of Obstetric, Gynecologic, and Neonatal Nursing, 29,* 18–26.

Stranahan, S. (2001). Spiritual perception, attitudes about spiritual care, and spiritual care practices among nurse practitioners. *Western Journal of Nursing Research, 23*, 90–104.

van Servellen, G., Aguirre, M., Sarna, L., & Brecht, M. (2002). Differential predictors of emotional distress in HIV-infected men and women. *Western Journal of Nursing Research, 24*, 49–72.

Walker, N. C., & O'Brien, B. (1999). The relationship between method of pain management during labor and birth outcomes. *Clinical Nursing Research, 8*, 119–134.

Watt-Watson, J., Garfinkel, P., Gallop, R., Stevens, B., & Streiner, D. (2000). The impact of nurses' empathic responses on patients' pain management in acute care. *Nursing Research, 49*, 191–200.

Wilson, K., & Williams, W. A. (2000). Visualism in community nursing: Implications for telephone work with service users. *Qualitative Health Research, 10*, 507–520.

Zuwala R., & Barber K.R. (2001). Reducing anxiety in parents before and during pediatric anesthesia induction. *AANA Journal, 69*, 21–25.