3 Key Concepts and Steps in Quantitative and Qualitative Research

Learning Objectives

On completing this chapter, you will be able to:

- Define new terms presented in the chapter and distinguish terms associated with quantitative and qualitative research
- Distinguish experimental and nonexperimental research
- Identify the three main disciplinary traditions for qualitative nursing research
- Describe the flow and sequence of activities in quantitative and qualitative research and discuss why they differ

Key Terms

- Cause-and-effect (causal) relationship
- Clinical trial
- Concept
- Conceptual definition
- Construct
- Data
- Dependent variable
- Emergent design
- Ethnography
- Experimental research
- Gaining entrée
- Grounded theory
- Hypothesis
- Independent variable
- Informant
- Intervention protocol
- Literature review
- Nonexperimental research
- Observational study
- Operational definition
- Outcome variable
- Phenomenology
- Population
- Qualitative data
- Quantitative data
- Relationship
- Research design
- Sample
- Saturation
- Statistical analysis
- Study participant
- Subject
- Theme
- Theory
- Variable

THE BUILDING BLOCKS OF RESEARCH

Research, like any discipline, has its own language—its own *jargon*—and that jargon can sometimes be intimidating. We readily admit that the jargon is abundant and can be confusing. Some research jargon used in nursing research has its roots in the social sciences but, sometimes, different terms are used in medical research. Also, some terms are used by both quantitative and qualitative researchers, but others are used mainly by one or the other group. Please bear with us as we cover key terms that you will likely encounter in the research literature.

TABLE 3.1 Key Terms in Quantitative and Qualitative Research

Concept	Quantitative Term	Qualitative Term
Person contributing information	Subject Study participant —	— Study participant Informant, key inform
Person undertaking the study	Researcher Investigator	Researcher Investigator
That which is being investigated	— Concepts Constructs Variables	Phenomena Concepts — —
Information gathered	Data (numerical values)	Data (narrative descr
Connections between concepts	Relationships (cause-and-effect, associative)	Patterns of associatio
Logical reasoning processes	Deductive reasoning	Inductive reasoning

The Faces and Places of Research

When researchers answer a question through disciplined research, they are doin (or an *investigation*). Studies with humans involve two sets of people: those wh research and those who provide the information. In a quantitative study, the peop studied are called **subjects** or **study participants**, as shown in Table 3.1. In a q study, the people cooperating in the study are called study participants or **info** The person who conducts the research is the *researcher* or *investigator*. Studies a undertaken by a research team rather than by a single researcher.

HOW-TO-TELL TIP How can you tell if an article appearing in a nursing jour *study*? In journals that specialize in research (e.g., the journal *Nursing Research*) articles are original research reports, but in specialty journals, there is usually a research and nonresearch articles. Sometimes you can tell by the title, but som you cannot. You can tell, however, by looking at the major headings of an ar there is no heading called "Method" or "Research Design" (the section that de what a researcher *did*) and no heading called "Findings" or "Results" (the secti describes what a researcher *learned*), then it is probably not a study.

Research can be undertaken in a variety of *settings* (the types of place where tion is gathered), like in hospitals, homes, or other community settings. A *site* is th location for the research—it could be an entire community (e.g., a Haitian neighb Miami) or an institution (e.g., a clinic in Seattle). Researchers sometimes do *multi* because the use of multiple sites offers a larger and often more diverse group of pa

Concepts, Constructs, and Theories

Research involves real-world problems, but studies are conceptualized in abstract example, *pain*, *fatigue*, and *obesity* are abstractions of human characteristics. Thes tions are called *phenomena* (especially in qualitative studies) or **concepts**.

Researchers sometimes use the term **construct**, which also refers to an abstra often one that is deliberately invented (or constructed). For example, *self-care* in Ore of health maintenance is a construct. The terms *construct* and *concept* are somet interchangeably, but a construct often refers to a more complex abstraction than a

A **theory** is an explanation of some aspect of reality. In a theory, concepts are knitted together into a coherent system to describe or explain some aspect of the world. Theories play a role in both quantitative and qualitative research. In a quantitative study, researchers often start with a theory and, using deductive reasoning, make predictions about how phenomena would behave in the real world *if the theory were valid*. The specific predictions are then tested. In qualitative studies, theory often is the *product* of the research: The investigators use information from study participants inductively to develop a theory rooted in the participants' experiences.

TIP The reasoning process of *deduction* is associated with quantitative research, and *induction* is associated with qualitative research. The supplement for Chapter 3 on thePoint® website explains and illustrates the distinction.

Variables

In quantitative studies, concepts are usually called **variables**. A variable, as the name implies, is something that varies. Weight, anxiety, and fatigue are all variables—they vary from one person to another. Most human characteristics are variables. If everyone weighed 150 pounds, weight would not be a variable; it would be a *constant*. But it is precisely because people and conditions *do* vary that most research is conducted. Quantitative researchers seek to understand how or why things vary and to learn how differences in one variable relate to differences in another. For example, in lung cancer research, lung cancer is a variable because not everybody has this disease. Researchers have studied factors that might be linked to lung cancer, such as cigarette smoking. Smoking is also a variable because not everyone smokes. A variable, then, is any quality of a person, group, or situation that varies or takes on different values. Variables are the central building blocks of quantitative studies.

TIP Every study focuses on one or more phenomena, concepts, or variables, but these terms per se are not necessarily used in research reports. For example, a report might say, "The purpose of this study is to examine the effect of nurses' workload on hand hygiene compliance." Although the researcher did not explicitly label anything a variable, the variables under study are *workload* and *hand hygiene compliance*. Key concepts or variables are often indicated in the study title.

Characteristics of Variables

Variables are often inherent human traits, such as age or weight, but sometimes researchers *create* a variable. For example, if a researcher tests the effectiveness of patient-controlled analgesia compared to intramuscular analgesia in relieving pain after surgery, some patients would be given one type of analgesia, and some would receive the other. In the context of this study, method of pain management is a variable because different patients are given different analgesic methods.

Some variables take on a wide range of values that can be represented on a continuum (e.g., a person's age or weight). Other variables take on only a few values; sometimes such variables convey quantitative information (e.g., number of children), but others simply involve placing people into categories (e.g., male, female, other; or blood type A, B, AB, or O).

Dependent and Independent Variables

As noted in Chapter 1, many studies seek to understand causes of phenomena. Does a nursing intervention *cause* improvements in patient outcomes? Does smoking *cause* lung cancer?

The presumed cause is the **independent variable**, and the presumed effect is the **dependent** or **outcome variable**. The dependent variable is the outcome that researchers want to understand, explain, or predict. In terms of the PICO scheme discussed in Chapter 2, the dependent variable corresponds to the "O" (outcome). The independent variable corresponds to the "I" (the intervention, influence, or exposure), plus the "C" (the comparison).

TIP In searching for evidence, a nurse might want to learn about the effects of an intervention or influence (I), compared to *any* alternative, on a designated outcome. In a cause-probing study, however, researchers always specify what the comparative intervention or influence (the "C") is.

The terms *independent variable* and *dependent variable* also can be used to indicate *direction of influence* rather than cause and effect. For example, suppose we compared levels of depression among men and women diagnosed with pancreatic cancer and found men to be more depressed. We could not conclude that depression was *caused* by gender. Yet the direction of influence clearly runs from gender to depression: It makes no sense to suggest that patient's depression influenced their gender. In this situation, it is appropriate to consider depression as the outcome variable and gender as the independent variable.

TIP Few research reports explicitly label variables as dependent and independent. Moreover, variables (especially independent variables) are sometimes not fully spelled out. Take the following research question: What is the effect of exercise on heart rate? In this example, heart rate is the dependent variable. Exercise, however, is not in itself a variable. Rather, exercise versus something else (e.g., no exercise) is a variable; "something else" is implied rather than stated in the research question.

Many outcomes have multiple causes or influences. If we were studying factors that influence people's body mass index, the independent variables might be height, physical activity, and diet. And, two or more outcome variables may be of interest. For example, a researcher may compare two alternative dietary interventions in terms of participants' weight, lipid profile, and self-esteem. It is common to design studies with multiple independent and dependent variables.

Variables are not *inherently* dependent or independent. A dependent variable in one study could be an independent variable in another. For example, a study might examine the effect of an exercise intervention (the independent variable) on osteoporosis (the dependent variable) to answer a therapy question. Another study might investigate the effect of osteoporosis (the independent variable) on bone fracture incidence (the dependent variable) to address a prognosis question. In short, whether a variable is independent or dependent is a function of the role that it plays in a particular study.

Example of independent and dependent variables

Research question (Etiology/Harm question): Among heart failure patients, is reduced gray matter volume (as measured through magnetic resonance imagery) associated with poorer performance in instrumental activities of daily living? (Alosco et al., 2016).

Independent variable: Volume of gray matter in the brain

Dependent variable: Performance in instrumental activities of daily living

Conceptual and Operational Definitions

The concepts of interest to researchers are abstractions, and researchers' worldviews shape how those concepts are defined. A **conceptual definition** is the theoretical meaning of a concept. Researchers need to conceptually define even seemingly straightforward terms.

A classic example is the concept of *caring*. Morse and colleagues (1990) examined how researchers and theorists defined *caring* and identified five categories of conceptual definitions: as a human trait, a moral imperative, an affect, an interpersonal relationship, and a therapeutic intervention. Researchers undertaking studies of caring need to clarify how they conceptualized it.

In qualitative studies, conceptual definitions of key phenomena may be a major end product, reflecting an intent to have the meaning of concepts defined by those being studied. In quantitative studies, however, researchers must define concepts at the outset because they must decide how the variables will be measured. An **operational definition** indicates what the researchers specifically must do to measure the concept and collect needed information.

Readers of research articles may not agree with how researchers conceptualized and operationalized variables. However, definitional precision is important in communicating what concepts mean within the context of the study.

Example of conceptual and operational definitions

Stoddard and colleagues (2015) studied the relationship between young adolescents' hopeful future expectations on the one hand and bullying on the other. The researchers defined bullying conceptually as "intentional aggressive behaviors that are repetitive and impose a power imbalance between students who bully and students who are victimized" (p. 422). They operationalized bullying behavior by asking a set of 12 questions. One question asked how often in the past month did the study participant "say things about another student to make others laugh?" (p. 426). Participants were asked to respond on a scale from 0 (*never*) to 5 (*five or more times*).

Data

Research **data** (singular, datum) are the pieces of information gathered in a study. In quantitative studies, researchers identify and define their variables and then collect relevant data from subjects. The actual *values* of the study variables constitute the data. Quantitative researchers collect primarily **quantitative data**—information in numeric form. For example, if we conducted a quantitative study in which a key variable was *depression*, we would need to measure how depressed participants were. We might ask, "Thinking about the past week, how depressed would you say you have been on a scale from 0 to 10, where 0 means 'not at all' and 10 means 'the most possible'?" Box 3.1 presents quantitative data for three fictitious people. The subjects provided a number along the 0 to 10 continuum corresponding to their degree of depression—9 for subject 1 (a high level of depression), 0 for subject 2 (no depression), and 4 for subject 3 (little depression).

In qualitative studies, researchers collect primarily **qualitative data**, that is, narrative descriptions. Narrative data can be obtained by conversing with participants, by making notes about their behavior in naturalistic settings, or by obtaining narrative records, such as diaries. Suppose we were studying depression qualitatively. Box 3.2 presents qualitative data for three participants responding conversationally to the question "Tell me about how

Box 3.1 Example of Quantitative Data

Question: Thinking about the past week, how depressed would you say you have been on a scale from 0 to 10, where 0 means "not at all" and 10 means "the most possible"?

Data:
9 (Subject 1)
0 (Subject 2)
4 (Subject 3)

Variables can be related to one another in different ways, including **cause-and-effect (or causal) relationships**. Within the positivist paradigm, natural phenomena are assumed to have antecedent causes that are discoverable. For example, we might speculate that there is a causal relationship between caloric intake and weight: All else being equal, eating more calories causes greater weight. As noted in Chapter 1, many quantitative studies are *cause-probing*—they seek to illuminate the causes of phenomena.

Example of a study of causal relationships

Bench and colleagues (2015) studied whether a critical care discharge information pack for patients and their families would result in improved psychological well-being (anxiety and depression) 5 days and 28 days after discharge.

Not all relationships can be interpreted as causal. There is a relationship, for example, between a person's pulmonary artery and tympanic temperatures: People with high readings on one tend to have high readings on the other. We cannot say, however, that pulmonary artery temperature *caused* tympanic temperature or vice versa. This type of relationship is sometimes referred to as an *associative* (or *functional*) *relationship* rather than a causal one.

Example of a study of associative relationships

Goh and colleagues (2016) studied factors associated with patients' degree of satisfaction with nursing care. They found significant differences in satisfaction in different ethnic subgroups.

Qualitative researchers are not concerned with quantifying relationships or in testing and confirming causal relationships. Rather, qualitative researchers may seek patterns of association as a way of illuminating the underlying meaning and dimensionality of phenomena of interest. Patterns of interconnected concepts are identified as a means of understanding the whole.

Example of a qualitative study of patterns

Brooten and colleagues (2016) studied rituals of White, Black, and Hispanic parents after the intensive care unit (ICU) death of an infant or child. They reported that the grieving parents' experiences differed on two important factors: (1) whether or not the parents were recent immigrants to the United States with language barriers and (2) level of family support systems.

MAJOR CLASSES OF QUANTITATIVE AND QUALITATIVE RESEARCH

Researchers usually work within a paradigm that is consistent with their worldview and that gives rise to the types of question that excite their curiosity. In this section, we briefly describe broad categories of quantitative and qualitative research.

Quantitative Research: Experimental and Nonexperimental Studies

A basic distinction in quantitative studies is between experimental and nonexperimental research. In **experimental research**, researchers actively introduce an intervention or treatment—most often, to address therapy questions. In **nonexperimental research**, on the other hand, researchers are bystanders—they collect data without introducing treatments (most often, to address etiology, prognosis, or diagnosis questions). For example,

Box 3.2 Example of Qualitative Data

Question: Tell me about how you've been feeling lately—have you felt sad or depressed at all, or have you generally been in good spirits?

Data: "Well, actually, I've been pretty depressed lately, to tell you the truth. I wake up each morning and I can't seem to think of anything to look forward to. I mope around the house all day, kind of in despair. I just can't seem to shake the blues and I've begun to think I need to go see a shrink." (Participant 1)

"I can't remember ever feeling better in my life. I just got promoted to a new job that makes me feel like I can really get ahead in my company. And I've just gotten engaged to a really great guy who is very special." (Participant 2)

"I've had a few ups and downs the past week but basically things are on a pretty even keel. I don't have too many complaints." (Participant 3)

you've been feeling lately—have you felt sad or depressed at all, or have you generally been in good spirits?" Here, the data consist of rich narrative descriptions of participants' emotional state. In reports on qualitative studies, researchers include excerpts from their narrative data to support their interpretations.

Relationships

Researchers usually study phenomena in relation to other phenomena—they examine relationships. A **relationship** is a connection between phenomena; for example, researchers repeatedly have found that there is a *relationship* between frequency of turning bedridden patients and the incidence of pressure ulcers. Quantitative and qualitative studies examine relationships in different ways.

In quantitative studies, researchers are interested in the relationship between independent variables and outcomes. Relationships are often explicitly expressed in quantitative terms, such as *more than* or *less than*. For example, consider a person's weight as our outcome variable. What variables are related to (associated with) a person's weight? Some possibilities include height, caloric intake, and exercise. For each independent variable, we can make a prediction about its relationship to the outcome:

Height: Tall people will weigh more than short people.
Caloric intake: People with high caloric intake will be heavier than those with low caloric intake.
Exercise: The lower the amount of exercise, the greater will be the person's weight.

Each statement expresses a predicted relationship between weight (the outcome) and a measurable independent variable. Most quantitative research is conducted to assess whether relationships exist among variables and to measure how strong the relationship is.

TIP Relationships are expressed in two basic forms. First, relationships can be expressed as "if more of Variable X, then more of (or less of) Variable Y." For example, there is a relationship between height and weight: With greater height, there tends to be greater weight, i.e., tall people tend to weigh more than short people. The second form involves relationships expressed as group differences. For example, there is a relationship between gender and height: Men tend to be taller than women.

if a researcher gave bran flakes to one group of subjects and prune juice to another to evaluate which method facilitated elimination more effectively, the study would be experimental because the researcher intervened. If, on the other hand, a researcher compared elimination patterns of two groups whose regular eating patterns differed, the study would be nonexperimental because there is no intervention. In medical and epidemiological research, experimental studies usually are called **clinical trials**, and nonexperimental inquiries are called **observational studies**.

Experimental studies are explicitly designed to test causal relationships—to test whether an intervention *caused* changes in the outcome. Sometimes, nonexperimental studies also explore causal relationships, but causal inferences in nonexperimental research are tricky and less conclusive, for reasons we explain in a later chapter.

Example of experimental research

In their experimental study, Demirel and Guler (2015) tested the efficacy of uterine stimulation and nipple stimulation on birth duration and the incidence of synthetic induction among women giving birth by vaginal delivery. Some study participants received nipple stimulation, others received uterine stimulation, and some received neither.

In this example, the researchers intervened by designating that some women would receive one of two interventions and that others would receive no special intervention. In other words, the researcher *controlled* the independent variable, which in this case was the stimulation interventions.

Example of nonexperimental research

Lai and colleagues (2015) compared women who had vaginal births and those who had cesarean births in terms of postpartum fatigue and maternal–infant attachment. Women with a cesarean delivery had higher fatigue, which in turn was associated with weaker maternal–infant attachment.

In this nonexperimental study to address a prognosis question, the researchers did not intervene in any way. They were interested in a similar population as in the previous example (women giving birth), but their intent was to explore relationships among existing conditions rather than to test a potential solution to a problem.

Qualitative Research: Disciplinary Traditions

Many qualitative nursing studies are rooted in research traditions that originated in anthropology, sociology, and psychology. Three such traditions are briefly described here. Chapter 11 provides a fuller discussion of these and other traditions and the methods associated with them.

The **grounded theory** tradition seeks to describe and understand key social psychological processes. Grounded theory was developed in the 1960s by two sociologists, Glaser and Strauss (1967). The focus of most grounded theory studies is on a developing social experience—the social and psychological phases that characterize a particular event or episode. A major component of grounded theory is the discovery of a *core variable* that is central in explaining what is going on in that social scene. Grounded theory researchers strive to generate explanations of phenomena that are grounded in reality.

Example of a grounded theory study

Keogh and colleagues (2015) used grounded theory methods to understand how mental health service users transitioned home from a hospital stay. The researchers found that the core variable was the patients' management of preconceived expectations.

Phenomenology is concerned with the lived experiences of humans. Phenomenology is an approach to thinking about what life experiences of people are like and what they mean. The phenomenological researcher asks the questions: What is the *essence* of this phenomenon as experienced by these people? or What is the meaning of the phenomenon to those who experience it?

Example of a phenomenological study

Tornøe and colleagues (2015) used a phenomenological approach in their study of nurses' experiences with spiritual and existential care for dying patients in a general hospital.

Ethnography, the primary research tradition in anthropology, provides a framework for studying the patterns and lifeways of a defined cultural group in a holistic fashion. Ethnographers typically engage in extensive *fieldwork*, often participating to the extent possible in the life of the culture under study. Ethnographers strive to learn from members of a cultural group, to understand their worldview, and to describe their customs and norms.

Example of an ethnographic study

Sandvoll and colleagues (2015) used ethnographic methods to explore how nursing home staff members managed unpleasant resident behaviors in two public nursing homes in Norway.

MAJOR STEPS IN A QUANTITATIVE STUDY

In quantitative studies, researchers move from the beginning point of a study (posing a question) to the end point (obtaining an answer) in a reasonably linear sequence of steps that is broadly similar across studies (Fig. 3.1). This section describes that flow, and the next section describes how qualitative studies differ.

Phase 1: The Conceptual Phase

The early steps in a quantitative study typically involve activities with a strong conceptual element. During this phase, researchers call on such skills as creativity, deductive reasoning, and a grounding in research evidence on the topic of interest.

Step 1: Formulating and Delimiting the Problem

Quantitative researchers begin by identifying an interesting research problem and formulating *research questions*. The research questions identify what the study variables are. In developing questions, nurse researchers must attend to substantive issues (Is this problem important?), theoretical issues (Is there a conceptual framework for this problem?), clinical issues (Will findings be useful in clinical practice?), methodologic issues (How can this question be answered to yield high-quality evidence?), and ethical issues (Can this question be addressed in an ethical manner?).

Step 2: Reviewing the Related Literature

Quantitative research is conducted within the context of previous knowledge. Quantitative researchers typically strive to understand what is already known about a topic by undertaking a thorough **literature review** before any data are collected.

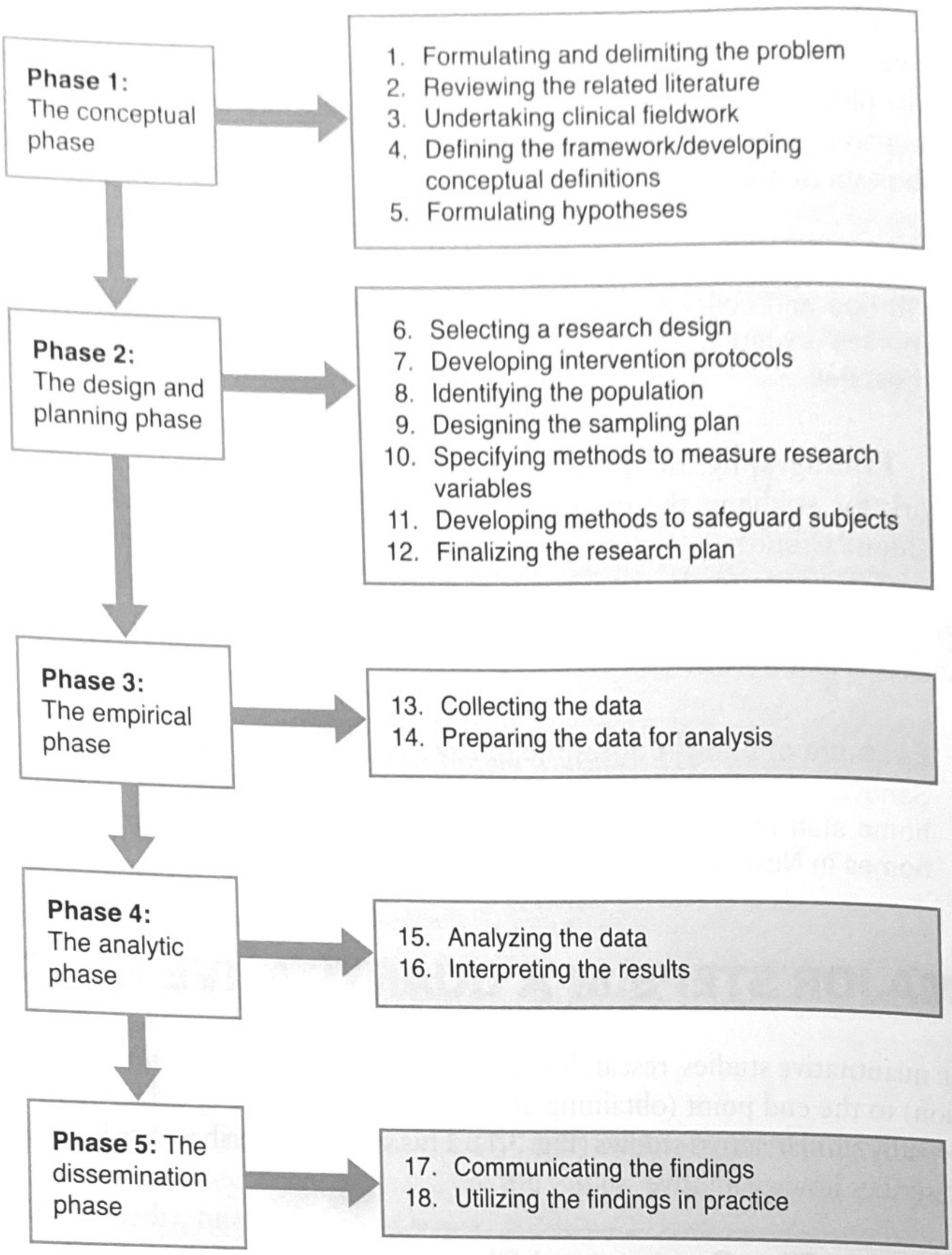


Figure 3.1 Flow of steps in a quantitative study.

Step 3: Undertaking Clinical Fieldwork

Researchers embarking on a clinical study often benefit from spending time in relevant clinical settings (in the *field*), discussing the topic with clinicians and observing current practices. Such clinical fieldwork can provide perspectives on clinicians' and clients' viewpoints.

Step 4: Defining the Framework and Developing Conceptual Definitions

When quantitative research is performed within the context of a theoretical framework, the findings may have broader significance and utility. Even when the research question is not embedded in a theory, researchers should have a conceptual rationale and a clear vision of the concepts under study.

Step 5: Formulating Hypotheses

Hypotheses state researchers' expectations about relationships between study variables. Hypotheses are predictions of the relationships researchers expect to observe in the study data. The research question identifies the concepts of interest and asks how the concepts

might be related; a hypothesis is the predicted answer. Most quantitative studies are designed to test hypotheses through statistical analysis.

Phase 2: The Design and Planning Phase

In the second major phase of a quantitative study, researchers decide on the methods they will use to address the research question. Researchers make many methodologic decisions that have crucial implications for the quality of the study evidence.

Step 6: Selecting a Research Design

The **research design** is the overall plan for obtaining answers to the research questions. Quantitative designs tend to be structured and controlled, with the goal of minimizing bias. Research designs also indicate how often data will be collected and what types of comparisons will be made. The research design is the architectural backbone of the study.

Step 7: Developing Protocols for the Intervention

In experimental research, researchers create the independent variable, which means that participants are exposed to different treatments. An **intervention protocol** for the study must be developed, specifying exactly what the intervention will entail (e.g., who will administer it, over how long a period the treatment will last, and so on) *and* what the alternative condition will be. In nonexperimental research, this step is not necessary.

Step 8: Identifying the Population

Quantitative researchers need to specify what characteristics study participants should possess—that is, they must identify the population to be studied. A **population** is *all* the individuals or objects with common, defining characteristics (the "P" component in PICO questions).

Step 9: Designing the Sampling Plan

Researchers typically collect data from a **sample**, which is a subset of the population. The researcher's *sampling plan* specifies how the sample will be selected and how many subjects there will be. The goal is to have a sample that adequately reflects the population's traits.

Step 10: Specifying Methods to Measure Variables

Quantitative researchers must find methods to measure the research variables accurately. A variety of quantitative data collection approaches exist; the primary methods are *self-reports* (e.g., interviews and questionnaires), *observations* (e.g., watching and recording people's behavior), and *biophysiologic measurements*. The task of measuring research variables and developing a *data collection plan* is complex and challenging.

Step 11: Developing Methods to Safeguard Human/Animal Rights

Most nursing research involves human subjects, although some involve animals. In either case, procedures need to be developed to ensure that the study adheres to ethical principles.

Step 12: Reviewing and Finalizing the Research Plan

Before collecting data, researchers often undertake assessments to ensure that procedures will work smoothly. For example, they may evaluate the *readability* of written materials to see if participants with low reading skills can comprehend them. Researchers usually have their research plan critiqued by reviewers to obtain clinical or methodologic feedback. Researchers seeking financial support submit a *proposal* to a funding source, and reviewers usually suggest improvements.

Phase 3: The Empirical Phase

The third phase of quantitative studies involves collecting the research data. This phase is often the most time-consuming part of the study. Data collection may require months of work.

Step 13: Collecting the Data

The actual collection of data in a quantitative study often proceeds according to a preestablished plan. The plan typically spells out procedures for training data collection staff, for actually collecting data (e.g., where and when the data will be gathered), and for recording information.

Step 14: Preparing the Data for Analysis

Data collected in a quantitative study must be prepared for analysis. For example, one preliminary step is *coding*, which involves translating verbal data into numeric form (e.g., coding gender information as "1" for females, "2" for males, and "3" for other).

Phase 4: The Analytic Phase

Quantitative data must be subjected to analysis and interpretation, which occur in the fourth major phase of a project.

Step 15: Analyzing the Data

To answer research questions and test hypotheses, researchers analyze their data in a systematic fashion. Quantitative data are analyzed through **statistical analyses**, which include some simple procedures (e.g., computing an average) as well as more complex, sophisticated methods.

Step 16: Interpreting the Results

Interpretation involves making sense of study results and examining their implications. Researchers attempt to explain the findings in light of prior evidence, theory, and clinical experience and in light of the adequacy of the methods they used in the study. Interpretation also involves coming to conclusions about the *clinical significance* of the new evidence.

Phase 5: The Dissemination Phase

In the analytic phase, researchers come full circle: The questions posed at the outset are answered. The researchers' job is not completed, however, until study results are disseminated.

Step 17: Communicating the Findings

A study cannot contribute evidence to nursing practice if the results are not communicated. Another—and often final—task of a research project is the preparation of a *research report* that can be shared with others. We discuss research reports in the next chapter.

Step 18: Putting the Evidence Into Practice

Ideally, the concluding step of a high-quality study is to plan for its use in practice settings. Although nurse researchers may not implement a plan for using research findings, they can contribute to the process by developing recommendations on how the evidence could be used in practice, by ensuring that adequate information has been provided for a meta-analysis, and by pursuing opportunities to disseminate the findings to practicing nurses.

ACTIVITIES IN A QUALITATIVE STUDY

Quantitative research involves a fairly linear progression of tasks—researchers plan what steps to take and then follow those steps. In qualitative studies, by contrast, the progression is closer to a circle than to a straight line. Qualitative researchers continually examine and interpret data and make decisions about how to proceed based on what has been discovered (Fig. 3.2).

Because qualitative researchers have a flexible approach, we cannot show the flow of activities precisely—the flow varies from one study to another, and researchers themselves may not know in advance how the study will unfold. We provide a general sense

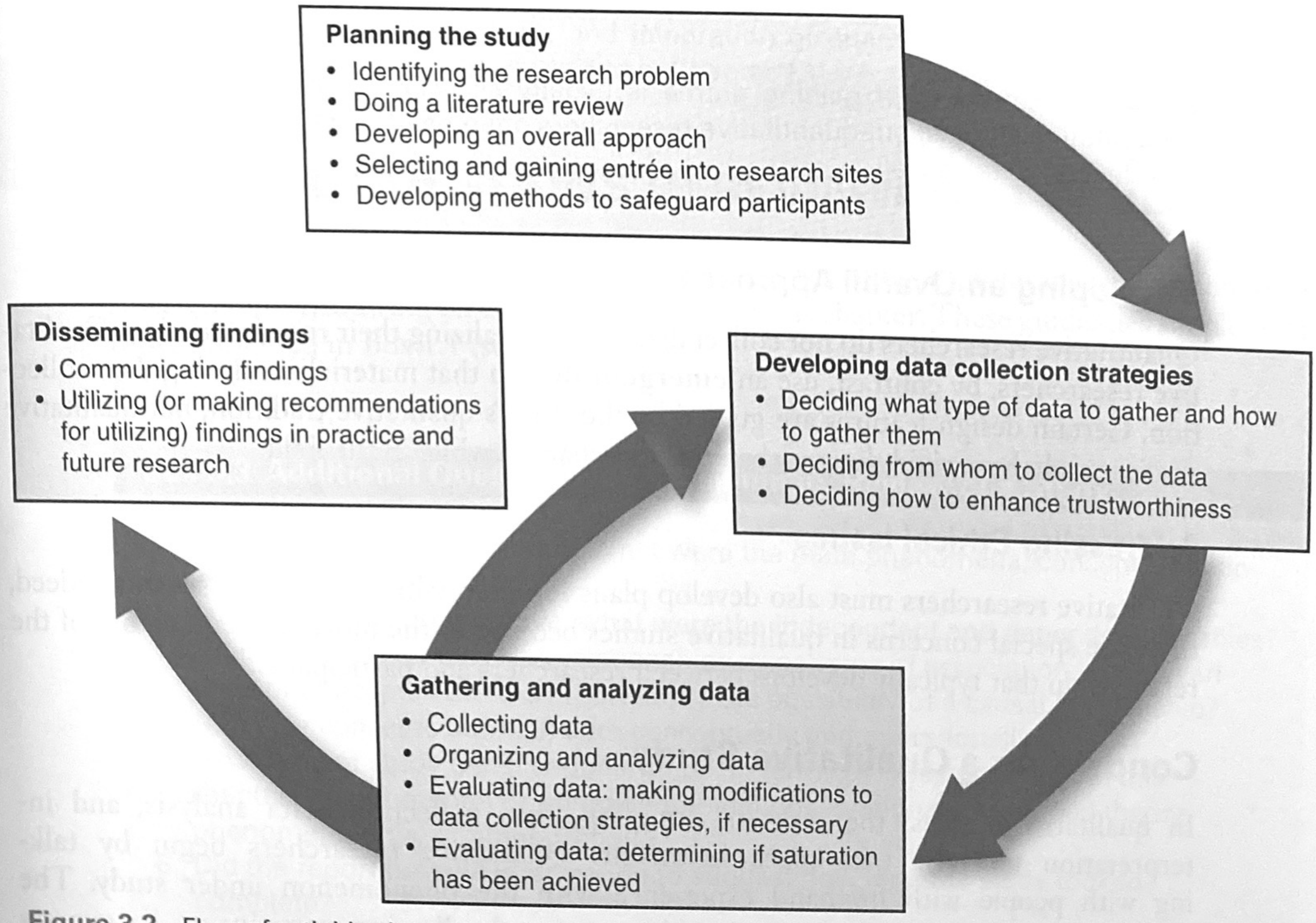


Figure 3.2 Flow of activities in a qualitative study.

of qualitative studies by describing major activities and indicating when they might be performed.

Conceptualizing and Planning a Qualitative Study

Identifying the Research Problem

Qualitative researchers usually begin with a broad topic, often focusing on an aspect about which little is known. Qualitative researchers often proceed with a fairly broad initial question that allows the focus to be sharpened and delineated more clearly once the study is underway.

Doing a Literature Review

Some qualitative researchers avoid consulting the literature before collecting data. They worry that prior studies might influence the conceptualization of the phenomenon under study, which they believe should be based on participants' viewpoints rather than on prior findings. Others believe that researchers should conduct at least a brief literature review at the outset. In any case, qualitative researchers typically find a relatively small body of relevant previous work because of the type of questions they ask.

Selecting and Gaining Entrée Into Research Sites

Before going into the field, qualitative researchers must identify an appropriate site. For example, if the topic is the health beliefs of the urban poor, an inner-city neighborhood with a concentration of low-income residents must be identified. In some cases, researchers may have access to the selected site, but in others, they need to **gain entrée** into it. Gaining entrée typically involves negotiations with *gatekeepers* who have the authority to permit entry into their world.

TIP The process of gaining entrée is usually associated with doing fieldwork in qualitative studies, but quantitative researchers often need to gain entrée into sites for collecting data as well.

Developing an Overall Approach

Quantitative researchers do not collect data before finalizing their research design. Qualitative researchers, by contrast, use an **emergent design** that materializes during data collection. Certain design features are guided by the study's qualitative tradition, but qualitative studies rarely have rigid designs that prohibit changes while in the field.

Addressing Ethical Issues

Qualitative researchers must also develop plans for addressing ethical issues—and, indeed, there are special concerns in qualitative studies because of the more intimate nature of the relationship that typically develops between researchers and participants.

Conducting a Qualitative Study

In qualitative studies, the tasks of sampling, data collection, data analysis, and interpretation typically take place iteratively. Qualitative researchers begin by talking with people with firsthand experience with the phenomenon under study. The discussions and observations are loosely structured, allowing participants to express

a full range of beliefs, feelings, and behaviors. Analysis and interpretation are ongoing activities that guide choices about "next steps."

The process of data analysis involves clustering together related narrative information into a coherent scheme. Through inductive reasoning, researchers identify **themes** and categories, which are used to build a rich description or theory of the phenomenon. Data gathering becomes increasingly purposeful: As conceptualizations develop, researchers seek participants who can confirm and enrich theoretical understandings as well as participants who can potentially challenge them.

Quantitative researchers decide in advance how many subjects to include in the study, but qualitative researchers' sampling decisions are guided by the data. Many qualitative researchers use the principle of **saturation**, which occurs when participants' accounts about their experiences become redundant, such that no new information can be gleaned by further data collection.

Quantitative researchers seek to collect high-quality data by measuring their variables with instruments that have been demonstrated to be accurate and valid. Qualitative researchers, by contrast, *are* the main data collection instrument and must take steps to demonstrate the *trustworthiness* of the data. The central feature of these efforts is to confirm that the findings accurately reflect the viewpoints of participants rather than researchers' perceptions. One confirmatory activity, for example, involves going back to participants, sharing preliminary interpretations with them, and asking them to evaluate whether the researcher's thematic analysis is consistent with their experiences.

Qualitative nursing researchers also strive to share their findings at conferences and in journal articles. Qualitative studies help to shape nurses' perceptions of a problem, their conceptualizations of potential solutions, and their understanding of patients' concerns and experiences.

TIP An emerging trend is for researchers to design *mixed methods (MM) studies* that involve the collection, analysis, and integration of quantitative and qualitative data. *Mixed methods research* is discussed in Chapter 13.

GENERAL QUESTIONS IN REVIEWING A STUDY

Box 3.3 presents some further suggestions for performing a preliminary overview of a research report, drawing on concepts explained in this chapter. These guidelines supplement those presented in Box 1.1 (see Chapter 1).

Box 3.3 Additional Questions for a Preliminary Review of a Study

1. What was the study all about? What were the main phenomena, concepts, or constructs under investigation?
2. If the study was quantitative, what were the independent and dependent variables?
3. Did the researcher examine relationships or patterns of association among variables or concepts? Did the report imply the possibility of a causal relationship?
4. Were key concepts defined, both conceptually and operationally?
5. What type of study does it appear to be, in terms of types described in this chapter—experimental or nonexperimental/observational? Grounded theory, phenomenologic, or ethnographic?
6. Did the report provide information to suggest how long the study took to complete?

4 Reading and Critiquing Research Articles

Learning Objectives

On completing this chapter, you will be able to:

- Identify and describe the major sections in a research journal article
- Characterize the style used in quantitative and qualitative research reports
- Read a research article and broadly grasp its "story"
- Describe aspects of a research critique
- Understand the many challenges researchers face and identify some tools for addressi methodologic challenges
- Define new terms in the chapter

Key Terms

- Abstract
- Bias
- Blinding
- Confounding variable
- Credibility
- Critique
- Findings
- IMRAD format
- Inference
- Journal article
- Level of significance
- *p*
- Placebo
- Randomness
- Reflexivity
- Reliability
- Research control
- Scientific merit
- Statistical significance
- Statistical test
- Transferability
- Triangulation
- Trustworthiness
- Validity

Evidence from nursing studies is communicated through research reports that describe wh was studied, how it was studied, and what was found. Research reports are often daunting readers without research training. This chapter aims to make research reports more acce sible and also provides some guidance regarding critiques of research reports.

TYPES OF RESEARCH REPORTS

Nurses are most likely to encounter research evidence in journals or at professional confe ences. Research **journal articles** are descriptions of studies published in professional jou nals. Competition for journal space is keen, so research articles are brief—generally only to 20 double-spaced pages. This means that researchers must condense a lot of informatio about the study into a short report.

Usually, manuscripts are reviewed by two or more *peer reviewers* (other researchers) wh make recommendations about acceptance of or revisions to the manuscript. Reviews ar

usually *blind*—reviewers are not told researchers' names, and authors are not told reviewers' names. Consumers thus have some assurance that journal articles have been vetted by other impartial nurse researchers. Nevertheless, publication does not mean that the findings can be uncritically accepted. Research method courses help nurses to evaluate the quality of evidence reported in journal articles.

At conferences, research findings are presented as oral presentations or poster sessions. In an *oral presentation*, researchers are typically allotted 10 to 20 minutes to describe key features of their study to an audience. In *poster sessions*, many researchers simultaneously present visual displays summarizing their studies, and conference attendees walk around the room looking at the displays. Conferences offer an opportunity for dialogue: Attendees can ask questions to help them better understand what the findings mean; moreover, they can offer the researchers suggestions relating to clinical implications of the study. Thus, professional conferences are a valuable forum for clinical audiences.

THE CONTENT OF RESEARCH JOURNAL ARTICLES

Many research articles follow an organization called the **IMRAD format**. This format organizes content into four main sections—**I**ntroduction, **M**ethod, **R**esults, **a**nd **D**iscussion. The paper is preceded by a title and an abstract and concludes with references.

The Title and Abstract

Research reports have titles that succinctly convey key information. In qualitative studies, the title normally includes the central phenomenon and group under investigation. In quantitative studies, the title communicates key variables and the population (in other words, PICO components).

The **abstract** is a brief description of the study placed at the beginning of the article. The abstract answers questions like the following: What were the research questions? What methods were used to address those questions? What were the findings? and What are the implications for nursing practice? Readers can review an abstract to judge whether to read the full report.

The Introduction

The introduction to a research article acquaints readers with the research problem and its context. This section usually describes the following:

- The central phenomena, concepts, or variables under study
- The study purpose and research questions or hypotheses
- A review of the related literature
- The theoretical or conceptual framework
- The significance of and need for the study

Thus, the introduction lets readers know the problem the researcher sought to address.

Example of an introductory material

"Little is known about how the back-to-school transition following cancer treatment influences adolescents' developing self-identity and social relationships." Data from the adolescent's perspective are particularly limited . . . The purpose of this study was to describe how the return to school affects adolescents' beliefs about themselves, their self-identity, and their social relationships (Choquette et al., 2015).

In this paragraph, the researchers described the central concept of interest (experiences of adolescents returning to school after cancer treatment), the need for the study (the fact that little is known about the experience directly from adolescents), and the study purpose.

TIP The introduction section of most reports is not specifically labeled "Introduction." The report's introduction immediately follows the abstract.

The Method Section

The method section describes the methods used to answer the research questions. In a quantitative study, the method section usually describes the following, which may be presented in labeled subsections:

- The research design
- The sampling plan
- Methods of measuring variables and collecting data
- Study procedures, including procedures to protect human rights
- Data analysis methods

Qualitative researchers discuss many of the same issues but with different emphases. For example, a qualitative study often provides more information about the research setting and the context of the study. Reports of qualitative studies also describe the researchers' efforts to enhance the integrity of the study.

The Results Section

The results section presents the **findings** that were obtained by analyzing the study data. The text presents a narrative summary of key findings, often accompanied by more detailed tables. Virtually all results sections contain descriptive information, including a description of the participants (e.g., average age, percent male, female, and other).

In quantitative studies, the results section also reports the following information relating to statistical tests performed:

- *The names of statistical tests used.* Researchers test their hypotheses and assess the probability that the results are right using **statistical tests**. For example, if the researcher finds that the average birth weight of drug-exposed infants in the sample is lower than the birth weight of infants not exposed to drugs, how probable is it that the same would be true for other infants not in the sample? A statistical test helps answer the question, Is the relationship between prenatal drug exposure and infant birth weight *real*, and would it likely be observed with a new sample from the same population? Statistical tests are based on common principles; you do not have to know the names of all statistical tests to comprehend the findings.
- *The value of the calculated statistic.* Computers are used to calculate a numeric value for the particular statistical test used. The value allows researchers to reach conclusions about their hypotheses. The *actual* value of the statistic, however, is not inherently meaningful and need not concern you.
- *Statistical significance.* A critical piece of information is whether the statistical tests were significant (not to be confused with clinically important). If a researcher reports that the results are **statistically significant**, it means the findings are probably true and replicable with a new sample. Research reports also indicate the **level of significance**, which is an index of how *probable* it is that the findings are reliable. For example, if a report indicates that a finding was significant at the .05 probability level (symbolized as p), this means that only 5 times out of 100 ($5 \div 100 = .05$) would the obtained result be spurious. In other

words, 95 times out of 100, similar results would be obtained with a new sample. Readers can thus have a high degree of confidence—but not total assurance—that the results are accurate.

Example from the results section of a quantitative study

Park and coresearchers (2015) tested the effects of a 16-session Patient-Centered Environment Program (PCEP) on a variety of outcomes for home-dwelling patients with dementia. Here is a sentence adapted from the reported results: "Findings showed that agitation ($t = 2.91$, $p < .02$) and pain ($t = 4.51$, $p < .002$) improved after receiving the PCEP" (p. 40).

In this example, the researchers indicated that both agitation and pain were *significantly* improved following receipt of the PCEP intervention. The changes in agitation and pain were not likely to have been haphazard and probably would be replicated with a new sample. These findings are very reliable. For example, with regard to pain reduction, it was found that an improvement of the magnitude obtained would occur just as a "fluke" less than 2 times in 1,000 ($p < .002$). Note that to comprehend this finding, you do not need to understand what a *t* statistic is, nor do you need to concern yourself with the actual value of the *t* statistic, 4.51.

TIP Results are *more* reliable if the *p* value is *smaller*. For example, there is a higher probability that the results are accurate when $p = .01$ (1 in 100 chance of a spurious result) than when $p = .05$ (5 in 100 chances of a spurious result). Researchers sometimes report an exact probability (e.g., $p = .03$) or a probability below conventional thresholds (e.g., $p < .05$—less than 5 in 100).

In qualitative reports, researchers often organize findings according to the major themes, processes, or categories that were identified in the data. The results section of qualitative reports sometimes has several subsections, the headings of which correspond to the researcher's labels for the themes. Excerpts from the *raw data* (the actual words of participants) are presented to support and provide a rich description of the thematic analysis. The results section of qualitative studies may also present the researcher's emerging theory about the phenomenon under study.

Example from the results section of a qualitative study

Larimer and colleagues (2015) studied the experiences, challenges, and coping behaviors of young adults with pacemakers or implantable cardioverter defibrillators. Participants described four categories of challenges, one of which was labeled "Limited support." Here is an excerpt illustrating that category: "If I go to pediatric doctors, their waiting rooms have blocks and pink elephants. But in cardiopulmonary rehab, I'm the youngest by 60 years. It feels like I'm in a no man's land, stuck in the middle" (p. 3).

The Discussion Section

In the discussion, the researcher presents conclusions about the meaning and implications of the findings, i.e., what the results mean, why things turned out the way they did, how the findings fit with other evidence, and how the results can be used in practice. The discussion in both quantitative and qualitative reports may include the following elements:

- An interpretation of the results
- Clinical and research implications
- Study limitations and ramifications for the believability of the results

Researchers are in the best position to point out deficiencies in their studies. A dis
sion section that presents the researcher's grasp of study limitations demonstrates to r
ers that the authors were aware of the limitations and probably took them into accou
interpreting the findings.

References

Research articles conclude with a list of the books and articles that were referenced. If
are interested in additional reading on a topic, the reference list of a recent study is a g
place to begin.

THE STYLE OF RESEARCH JOURNAL ARTICLES

Research reports tell a story. However, the style in which many research journal articles
written—especially for quantitative studies—makes it difficult for some readers to und
stand or become interested in the story.

Why Are Research Articles So Hard to Read?

To unaccustomed audiences, research reports may seem bewildering. Four factors contr
ute to this impression:

1. *Compactness.* Journal space is limited, so authors compress a lot of information into a sm
space. Interesting, personalized aspects of the investigation cannot be reported, and
qualitative studies, only a handful of supporting quotes can be included.
2. *Jargon.* The authors of research articles use research terms that may seem esoteric.
3. *Objectivity.* Quantitative researchers tend to avoid any impression of subjectivity, so th
tell their research stories in a way that makes them sound impersonal. Most quan
tative research articles are written in the passive voice, which tends to make the ar
cles less inviting and lively. Qualitative reports, by contrast, are often written in a mo
conversational style.
4. *Statistical information.* In quantitative reports, numbers and statistical symbols may
timidate readers who do not have statistical training.

A goal of this textbook is to assist you in understanding the content of research repo
and in overcoming anxieties about jargon and statistical information.

HOW-TO-TELL TIP How can you tell if the voice is active or passive? In the active
voice, the article would say what the researchers *did* (e.g., "We used a mercury sphyg
momanometer to measure blood pressure"). In the passive voice, the article indicates
what *was done*, without indicating who did it, although it is implied that the research
ers were the agents (e.g., "A mercury sphygmomanometer *was used* to measure blood
pressure").

Tips on Reading Research Articles

As you progress through this book, you will acquire skills for evaluating research articles, b
the skills involved in critical appraisal take time to develop. The first step is to comprehe
research articles. Here are some hints on digesting research reports.

- Grow accustomed to the style of research articles by reading them frequently, ev
though you may not yet understand the technical points.
- Read journal articles slowly. It may be useful to skim the article first to get the maj
points and then read the article more carefully a second time.

- On the second reading, train yourself to become an *active* reader. Reading actively means that you constantly monitor yourself to verify that you understand what you are reading. If you have difficulty, you can ask someone for help. In most cases, that "someone" will be your instructor, but also consider contacting the researchers themselves.
- Keep this textbook with you as a reference when you read articles so that you can look up unfamiliar terms in the glossary or index.
- Try not to get bogged down in (or scared away by) statistical information. Try to grasp the gist of the story without letting symbols and numbers frustrate you.

CRITIQUING RESEARCH REPORTS

A critical reading of a research article involves a careful appraisal of the researcher's major conceptual and methodologic decisions. It will be difficult to criticize these decisions at this point, but your skills will improve as you progress through this book.

What Is a Research Critique?

A research **critique** is an objective assessment of a study's strengths and limitations. Critiques usually conclude with the reviewer's summary of the study's merits, recommendations regarding the value of the evidence, and suggestions about improving the study or the report.

Research critiques of individual studies are prepared for various reasons, and they vary in scope. Peer reviewers who are asked to prepare a written critique for a journal considering publication of a manuscript may evaluate the strengths and weaknesses in terms of substantive issues (Was the research problem significant to nursing?), theoretical issues (Were the conceptual underpinnings sound?), methodologic decisions (Were the methods rigorous, yielding believable evidence?), interpretive (Did the researcher reach defensible conclusions?), ethics (Were participants' rights protected?), and style (Is the report clear, grammatical, and well organized?). In short, peer reviewers do a comprehensive review to provide feedback to the researchers and to journal editors about the merit of both the study and the report and typically offer suggestions for revisions.

Critiques designed to inform evidence-based nursing practice are seldom comprehensive. For example, it is of little consequence to evidence-based practice (EBP) that an article is ungrammatical. A critique of the clinical utility of a study focuses on whether the evidence is accurate, believable, and clinically relevant. These narrower critiques focus more squarely on appraising the research methods and the findings themselves.

Students taking a research methods course also may be asked to critique a study. Such critiques are often intended to cultivate critical thinking and to induce students to apply newly acquired skills in research methods.

Critiquing Support in This Textbook

We provide several types of support for research critiques. First, detailed critiquing suggestions relating to chapter content are included at the end of most chapters. Second, it is always illuminating to have a good model, so we prepared critiques of two studies. The two studies in their entirety and the critiques are in Appendices C and D.

Third, we offer a set of key critiquing guidelines for quantitative and qualitative reports in this chapter, in Tables 4.1 and 4.2, respectively. The questions in the guidelines concern the rigor with which the researchers dealt with critical research challenges, some of which we outline in the next section.

TIP For those undertaking a comprehensive critique, we offer more inclusive critiquing guidelines in the Supplement to this chapter on thePoint® website.

TABLE 4.1 Guide to a Focused Critique of Evidence Quality in a Quantitative Research Report

Aspect of the Report	Critiquing Questions	Detailed Critiquing Guidelines
Method Research design	• Was the most rigorous possible design used, given the purpose of the research? • Were appropriate comparisons made to enhance interpretability of the findings? • Was the number of data collection points appropriate? • Did the design minimize biases and threats to the validity of the study (e.g., was blinding used, was attrition minimized)?	Box 9.1, page 155
Population and sample	• Was the population identified and described? Was the sample described in sufficient detail? • Was the best possible sampling design used to enhance the sample's representativeness? Were sample biases minimized? • Was the sample size adequate? Was a power analysis used to estimate sample size needs?	Box 10.1, page 167
Data collection and measurement	• Were key variables operationalized using the best possible method (e.g., interviews, observations, and so on)? • Are the specific instruments adequately described, and were they good choices, given the study purpose and study population? • Did the report provide evidence that the data collection methods yielded data that were high on reliability and validity?	Box 10.2, page 178
Procedures	• If there was an intervention, was it adequately described, and was it properly implemented? Did most participants allocated to the intervention group actually receive it? • Were data collected in a manner that minimized bias? Were the staff who collected data appropriately trained?	Box 9.1, page 155
Results Data analysis	• Were appropriate statistical methods used? • Was the most powerful analytic method used? (e.g., did the analysis control for confounding variables)? • Were Type I and Type II errors avoided or minimized?	Box 14.1, page 254
Findings and interpretation	• Was information about statistical significance presented? • Was information about effect size and precision of estimates (confidence intervals) presented? • Was the clinical significance of the findings discussed?	Box 15.1, page 272
Summary assessment	• Despite limitations, do the study findings appear to be valid—do you have confidence in the *truth* value of the results? • Does the study contribute any meaningful evidence that can be used in nursing practice or that is useful to the nursing discipline?	

TABLE 4.2 Guide to a Focused Critique of Evidence Quality in a Qualitative Research Report

Aspect of the Report	Critiquing Questions	Detailed Critiquing Guidelines
Method Research design and research tradition	• Is the identified research tradition (if any) congruent with the methods used to collect and analyze data? • Was an adequate amount of time spent in the field or with study participants? • Was there evidence of reflexivity in the design?	Box 11.1, page 193
Sample and setting	• Was the group or population of interest adequately described? Were the setting and sample described in sufficient detail? • Was the best possible method of sampling used to enhance information richness? • Was the sample size adequate? Was saturation achieved?	Box 12.1, page 203
Data collection	• Were the methods of gathering data appropriate? Were data gathered through two or more methods to achieve triangulation? • Did the researcher ask the right questions or make the right observations? • Was there a sufficient amount of data? Were they of sufficient depth and richness?	Box 12.2, page 208
Procedures	• Do data collection and recording procedures appear appropriate? • Were data collected in a manner that minimized bias? Were the people who collected data appropriately trained?	Box 12.2, page 208
Enhancement of trustworthiness	• Did the researchers use strategies to enhance the trustworthiness/integrity of the study, and were those strategies adequate? • Do the researchers' clinical and methodologic qualifications and experience enhance confidence in the findings and their interpretation?	Box 17.1, page 305
Results Data analysis	• Was the data analysis strategy compatible with the research tradition and with the nature and type of data gathered? • Did the analysis yield an appropriate "product" (e.g., a theory, taxonomy, thematic pattern)? • Did the analytic procedures suggest the possibility of biases?	Box 16.2, page 290
Findings	• Were the findings effectively summarized, with good use of excerpts from the data and with strong supporting arguments? • Did the themes adequately capture the meaning of the data? Does it appear that the researcher satisfactorily conceptualized the themes or patterns in the data? • Did the analysis yield an insightful, provocative, authentic, and meaningful picture of the phenomenon under investigation?	Box 16.2, page 290
Summary assessment	• Do the study findings appear to be trustworthy—do you have confidence in the *truth* value of the results? • Does the study contribute any meaningful evidence that can be used in nursing practice or that is useful to the nursing discipline?	

The second columns of Tables 4.1 and 4.2 list some key critiquing questions, and the third column cross-references the more detailed guidelines in the various chapters of the book. We know that most of the critiquing questions are too difficult for you to answer at this point, but your methodologic and critiquing skills will develop as you progress through this book.

The question wording in these guidelines calls for a yes or no answer (although it may well be that the answer sometimes will be "Yes, *but* . . . "). In all cases, the desirable answer is *yes*, that is, a *no* suggests a possible limitation and a *yes* suggests a strength. Therefore, the more *yeses* a study gets, the stronger it is likely to be. Cumulatively, then, these guidelines can suggest a global assessment: A report with 10 *yeses* is likely to be superior to one with only two. However, these guidelines are not intended to yield a formal quality "score."

We acknowledge that our critiquing guidelines have shortcomings. In particular, they are generic even though critiquing cannot use a one-size-fits-all list of questions. Important critiquing questions that are relevant to certain studies (e.g., those that have a Therapy purpose) do not fit into a set of general questions for all quantitative studies. Thus, you need to use some judgment about whether the guidelines are sufficiently comprehensive for the type of study you are critiquing. We also note that there are questions in these guidelines for which there are no totally objective answers. Even experts sometimes disagree about methodological strategies.

TIP Just as a careful clinician seeks research evidence that certain practices are or are not effective, you as a reader should demand evidence that the researchers' methodological decisions were sound.

Critiquing With Key Research Challenges in Mind

In critiquing a study, it is useful to be aware of the challenges that confront researchers. For example, they face ethical challenges (e.g., Can the study achieve its goals without infringing on human rights?), practical challenges (Will I be able to recruit enough participants?), and methodologic challenges (Will the methods I use yield results that can be trusted?). Most of this book provides guidance relating to the last question, and this section highlights key methodologic challenges. This section offers us an opportunity to introduce important terms and concepts that are relevant in a critique. The worth of a study's evidence for nursing practice often relies on how well researchers deal with these challenges.

Inference

Inference is an integral part of doing and critiquing research. An **inference** is a conclusion drawn from the study evidence using logical reasoning and taking into account the methods used to generate that evidence.

Inference is necessary because researchers use proxies that "stand in" for things that are fundamentally of interest. A sample of participants is a proxy for an entire population. A control group that does not receive an intervention is a proxy for what would happen to the *same* people if they simultaneously received *and* did not receive an intervention.

Researchers face the challenge of using methods that yield good and persuasive evidence in support of inferences that they wish to make. Readers must draw their own inferences based on a critique of methodological decisions.

Reliability, Validity, and Trustworthiness

Researchers want their inferences to correspond to the *truth*. Research cannot contribute evidence to guide clinical practice if the findings are inaccurate, biased, or fail to represent the experiences of the target group.

Quantitative researchers use several criteria to assess the quality of a study, sometimes referred to as its **scientific merit**. Two especially important criteria are reliability and validity. **Reliability** refers to the accuracy and consistency of information obtained in a study. The term is most often associated with the methods used to measure variables. For example, if a thermometer measured Alan's temperature as 98.1°F 1 minute and as 102.5°F the next minute, the thermometer would be unreliable.

Validity is a more complex concept that broadly concerns the *soundness* of the study's evidence. Like reliability, validity is an important criterion for evaluating methods to measure variables. In this context, the validity question is whether the methods are really measuring the concepts that they purport to measure. Is a paper-and-pencil measure of depression *really* measuring depression? Or is it measuring something else, such as loneliness or stress? Researchers strive for solid conceptual definitions of research variables and valid methods to operationalize them.

Another aspect of validity concerns the quality of evidence about the relationship between the independent variable and the dependent variable. Did a nursing intervention *really* bring about improvements in patients' outcomes—or were other factors responsible for patients' progress? Researchers make numerous methodologic decisions that can influence this type of study validity.

Qualitative researchers use different criteria and terminology in evaluating a study's integrity. In general, qualitative researchers discuss methods of enhancing the **trustworthiness** of the study's data and findings (Lincoln & Guba, 1985). Trustworthiness encompasses several different dimensions—credibility, transferability, confirmability, dependability, and authenticity—which are described in Chapter 17.

Credibility is an especially important aspect of trustworthiness. Credibility is achieved to the extent that the research methods inspire confidence that the results are truthful and accurate. Credibility in a qualitative study can be enhanced in several ways, but one strategy merits early discussion because it has implications for the design of all studies, including quantitative ones. **Triangulation** is the use of multiple sources or referents to draw conclusions about what constitutes the truth. In a quantitative study, this might mean having two ways to measure an outcome, to assess whether results are consistent. In a qualitative study, triangulation might involve efforts to understand the complexity of a phenomenon by using multiple data collection methods to converge on the truth (e.g., having in-depth discussions with participants as well as watching their behavior in natural settings). Nurse researchers are also beginning to triangulate across paradigms—that is, to integrate both quantitative and qualitative data in a single study to enhance the validity of the conclusions. We discuss such *mixed methods* research in Chapter 13.

Example of triangulation

Montreuil and colleagues (2015) explored helpful nursing care from the perspective of children with suicide risk factors and their parents. The researchers triangulated data from observations of the children, debriefing sessions with the children, and interviews with their parents.

Nurse researchers need to design their studies in such a way that threats to the reliability, validity, and trustworthiness of their studies are minimized, and users of research must evaluate the extent to which they were successful.

TIP In reading and critiquing research articles, it is appropriate to have a "show me" attitude—that is, to expect researchers to build and present a solid case for the merit of their inferences. They do this by providing evidence that the findings are reliable and valid or trustworthy.

Bias

Bias can threaten a study's validity and trustworthiness. A **bias** is a distortion or influence that results in an error in inference. Bias can be caused by various factors, including study participants' lack of candor, researchers' preconceptions, or faulty methods of collecting data.

Some bias is haphazard and affects only small segments of the data. As an example, a few study participants might provide inaccurate information because they were tired at the time of data collection. *Systematic bias* results when the bias is consistent or uniform. For example, if a scale consistently measured people's weight as being 2 pounds heavier than their true weight, there would be systematic bias in the data on weight. Rigorous research methods aim to eliminate or minimize bias.

Researchers adopt a variety of strategies to address bias. Triangulation is one such approach, the idea being that multiple sources of information or points of view offer avenues to identify biases. In quantitative research, methods to combat bias often entail research control.

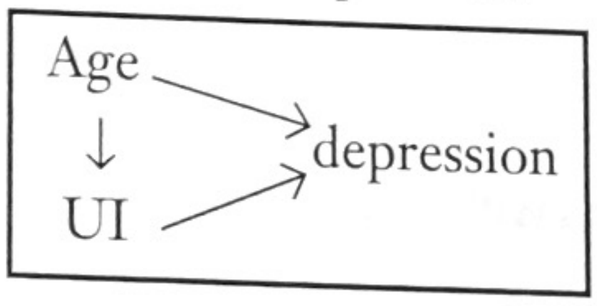
Research Control

A central feature of most quantitative studies is that they involve efforts to control aspects of the research. **Research control** usually involves holding constant influences on the outcome variable so that the true relationship between the independent and outcome variables can be understood. In other words, research control attempts to eliminate contaminating factors that might cloud the relationship between the variables that are of central interest.

Contaminating factors, often called **confounding** (or *extraneous*) **variables**, can best be illustrated with an example. Suppose we were studying whether urinary incontinence (UI) leads to depression. Prior evidence suggests that this is the case, but previous studies have not clarified whether it is UI per se or other factors that contribute to risk of depression. The question is whether UI itself (the independent variable) contributes to higher levels of depression or whether there are other factors that can account for the relationship between UI and depression. We need to design a study to control other determinants of the outcome—determinants that are also related to the independent variable, UI.

One confounding variable here is age. Levels of depression tend to be higher in older people, and people with UI tend to be older than those without this problem. In other words, perhaps age is the *real* cause of higher depression in people with UI. If age is not controlled, then any observed relationship between UI and depression could be caused by UI, or by age.

Three possible explanations might be portrayed schematically as follows:

1. UI→depression
2. Age→UI→depression
3. 

The arrows symbolize a causal mechanism or influence. In model 1, UI directly affects depression, independently of other factors. In model 2, UI is a *mediating variable*—the effect of age on depression is *mediated* by UI. According to this representation, age affects depression *through* the effect that age has on UI. In model 3, both age and UI have separate effects on depression, and age also increases the risk of UI. Some research is specifically designed to test paths of mediation and multiple causations, but in the present example, age is extraneous to the research question. We want to design a study that tests the first explanation. Age must be controlled if our goal is to explore the validity of model 1, which posits that, no matter what a person's age, having UI makes a person more vulnerable to depression.

How can we impose such control? There are a number of ways, as we discuss in Chapter 9, but the general principle underlying each alternative is that the confounding variable must be *held constant*. The confounding variable must somehow be handled so that, in the context of the study, it is not related to the independent variable or the outcome. As an example, let us say we wanted to compare the average scores on a depression scale for those with and without UI. We would want to design a study in such a way that the ages of those in the UI and non-UI groups are comparable, even though, in general, the groups are not comparable in terms of age.

By exercising control over age, we would be taking a step toward understanding the relationship between UI and depression. The world is complex, and many variables are interrelated in complicated ways. The value of evidence in quantitative studies is often related to how well researchers control confounding influences.

Research rooted in the constructivist paradigm does not impose controls. With their emphasis on holism and individual human experience, qualitative researchers typically believe that imposing controls removes some of the meaning of reality.

Bias Reduction: Randomness and Blinding

For quantitative researchers, a powerful tool for eliminating bias involves **randomness**—having certain features of the study established by chance rather than by researcher preference. When people are selected *at random* to participate in a study, for example, each person in the initial pool has an equal chance of being selected. This in turn means that there are no systematic biases in the makeup of the sample. Men and women have an equal chance of being selected, for example. Similarly, if participants are allocated *at random* to groups that will be compared (e.g., a special intervention and "usual care" group), then there is no systematic biases in the groups' composition. Randomness is a compelling method of controlling confounding variables and reducing bias.

Another bias-reducing strategy is called **blinding** (or *masking*), which is used in some quantitative studies to prevent biases stemming from people's awareness. Blinding involves concealing information from participants, data collectors, or care providers to enhance objectivity. For example, if study participants are aware of whether they are getting an experimental drug or a sham drug (a **placebo**), then their outcomes could be influenced by their expectations of the new drug's efficacy. Blinding involves disguising or withholding information about participants' status in the study (e.g., whether they are in a certain group) or about the study hypotheses.

Example of randomness and blinding

Da Silva and colleagues (2015) studied the effect of foot reflexology on tissue integrity and impairment of the feet among people with type 2 diabetes mellitus. Their sample of 45 people with diabetes was randomly assigned to one of two groups—one group received guidelines on foot care plus 12 sessions of foot reflexology, and the other group received the guidelines only. The person who assessed foot impairment was blinded to which group the participants were in.

Qualitative researchers do not consider randomness or blinding desirable tools for understanding phenomena. A researcher's judgment is viewed as an indispensable vehicle for uncovering the complexities of the phenomena of interest.

Reflexivity

Qualitative researchers are also interested in discovering the truth about human experience. Qualitative researchers often rely on reflexivity to guard against personal bias. **Reflexivity** is the process of reflecting critically on the self and of analyzing and noting personal values

that could affect data collection and interpretation. Qualitative researchers are trained explore these issues, to be reflective about decisions made during the inquiry, and to reco their thoughts in personal diaries and memos.

Example of reflexivity

Sanon and colleagues (2016) examined the role of transnationalism (maintenance of relationships and activities that transcend borders across countries) among Haitian immigrants in terms of hypertension self-management. By means of reflexivity, the primary researcher "considered her historical, social, and political context and position as they influenced her reflections, and the meanings she ascribed to the participants' accounts" (p. 150). The researcher also reflected on the inequality in power relationship between the participants and herself.

TIP Reflexivity can be a useful tool in quantitative as well as qualitative research—self-awareness and introspection can enhance the quality of any study.

Generalizability and Transferability

Nurses increasingly rely on evidence from disciplined research as a guide in their clinic practice. EBP is based on the assumption that study findings are not unique to the peopl places, or circumstances of the original research.

As noted in Chapter 1, *generalizability* is the criterion used in quantitative studies to a sess the extent to which the findings can be applied to other groups and settings. How d researchers enhance the generalizability of a study? First and foremost, they must desig studies strong in reliability and validity. There is little point in wondering whether resul are generalizable if they are not accurate or valid. In selecting participants, researchers mu also give thought to the types of people to whom results might be generalized—and the select subjects accordingly. If a study is intended to have implications for male and fema patients, then men and women should be included as participants.

Qualitative researchers do not specifically aim for generalizability, but they d want to generate knowledge that might be useful in other situations. Lincoln and Gub (1985), in their influential book on naturalistic inquiry, discuss the concept of **transfe ability**, the extent to which qualitative findings can be transferred to other settings, another aspect of trustworthiness. An important mechanism for promoting transferabi ity is the amount of rich descriptive information qualitative researchers provide abou study contexts.

RESEARCH EXAMPLES WITH CRITICAL THINKING EXERCISES

Abstracts for a quantitative and a qualitative nursing study are presented in the fo lowing sections. Read the abstracts for Examples 1 and 2 and then answer the critic thinking questions that follow. Examples 1 and 2 are featured on the interactive *Critic Thinking Activity* on thePoint® website. The critical thinking questions for Examples and 4 are based on the studies that appear in their entirety in Appendices A and B this book. Our comments for these exercises are in the Student Resources section o thePoint®.