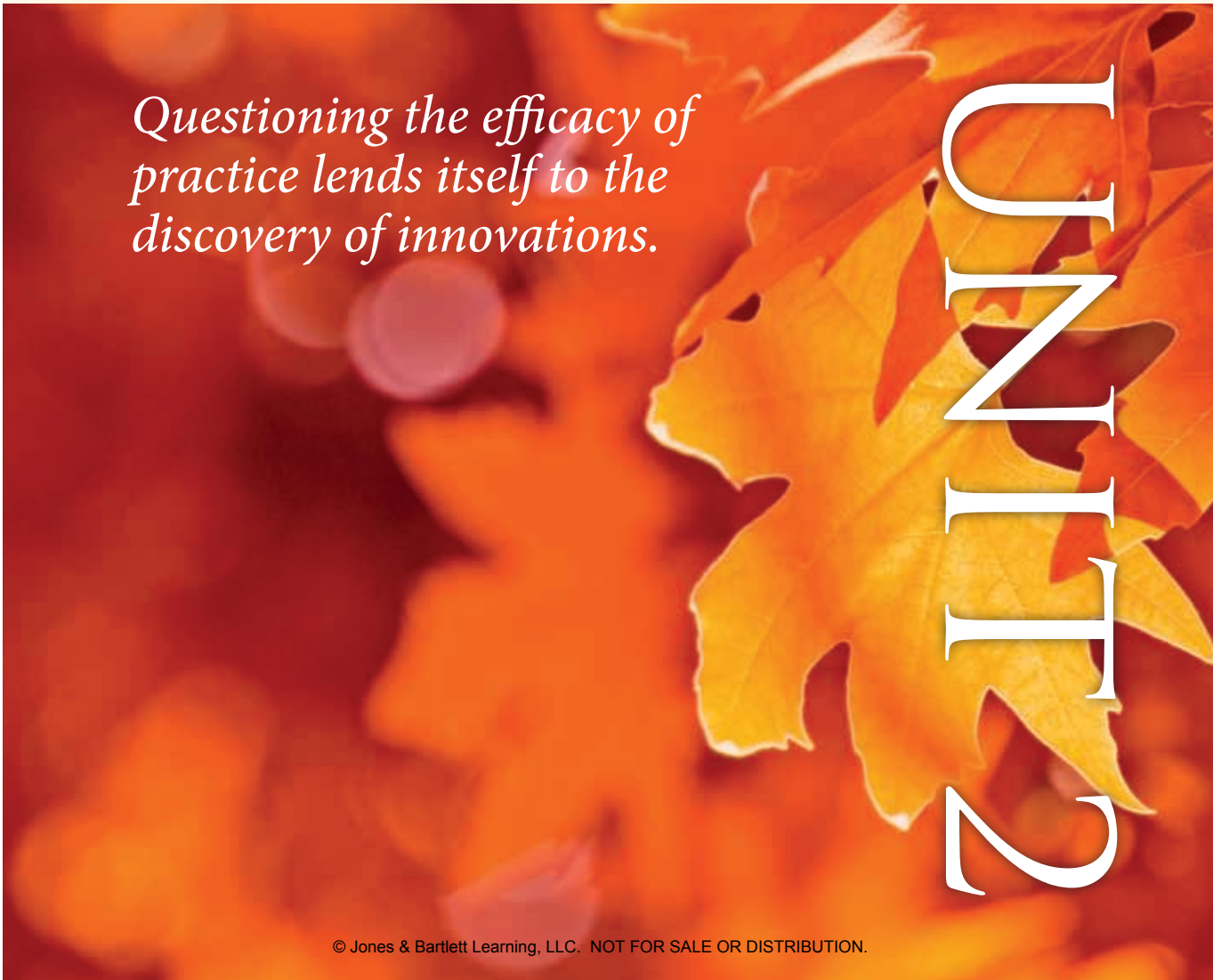
Acquisition of Knowledge



Questioning the efficacy of practice lends itself to the discovery of innovations.

UNIT 2

CHAPTER OBJECTIVES

At the end of this chapter, you will be able to:

- Discuss ways research problems are identified
- Describe relationships among the purpose statement, the research problems, and the research question
- Differentiate among associative, causal, simple, complex, directional, nondirectional, null, and research hypotheses
- Use criteria to appraise research questions
- Identify independent and dependent variables
- Compare the purposes of research questions and evidence-based practice questions
- Describe the PICO method
- Discuss ethical issues associated with the development of research and EBP questions

KEY TERMS

associative relationship
case studies
causal relationship
complex hypothesis
confounding variable
covary
dependent variable
directional hypothesis
empirical testing
extraneous variable
generalize
hypotheses
hypothesis testing
independent variable
nondirectional hypothesis
null hypothesis
PICO model
pilot
problem statement
purpose statement
replication
research hypothesis
research problem
research question
research topic
simple hypothesis
statistical hypothesis
systematic reviews

CHAPTER 3

Identifying Research Questions

Susie Adams

3.1 How Clinical Problems Guide Research Questions

At the end of this section you will be able to:

- Discuss ways research problems are identified
- Describe relationships among the purpose statement, the research problems, and the research question.

The primary goals for conducting nursing research are to generate new knowledge that has wide application to promote positive health outcomes for a particular patient population, enhance the overall quality and cost-effectiveness of care, improve the healthcare delivery system, and validate the credibility of the nursing profession through EBP. Determining what problems to study, framing research questions, and developing research hypotheses are often the most challenging aspects of the research process. Where does one begin?

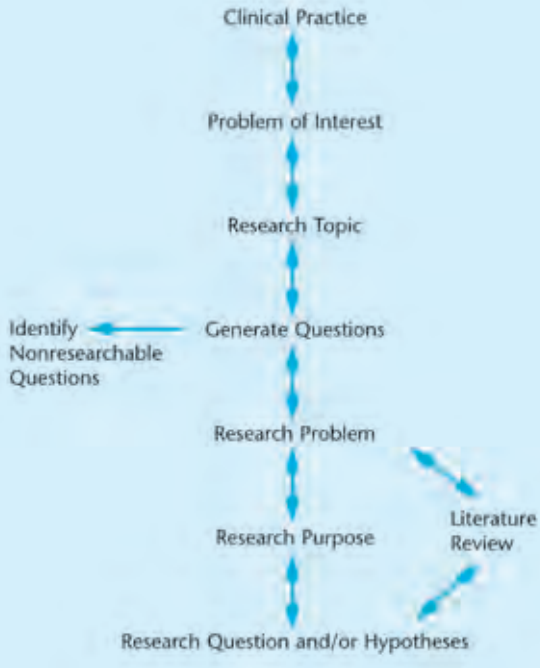
Identifying Nursing Research Problems

There are an infinite number of nursing problems that merit investigation. The challenge is to narrow the focus of problems so they are clinically relevant and can be answered through empirical testing. Figure 3-1 shows the logical flow for narrowing a nursing research problem. A ***research problem*** is an

FYI

Using research to fill a gap in knowledge that requires a solution can improve clinical outcomes and promote health across the lifespan. Research problems are identified through a variety of sources: personal clinical experience, professional literature, current nursing theories, previous research, and national initiatives.

FIGURE 3-1 Narrowing the Research Question



area of concern when there is a gap in knowledge that requires a solution that can be described, explained, or predicted to improve nursing practice (Norwood, 2000). Research problems are identified through a variety of sources: personal clinical experience, professional literature, current nursing theories, previous research, and national initiatives. Nursing, like all healthcare professions, is constantly seeking ways to improve clinical outcomes and promote health across the lifespan.

Clinical Experience

Experience most often leads nurses to question whether there is a better approach to a clinical procedure or situation. Clinical curiosity and a desire to improve patient care can be the most important motivators to begin further inquiry that ultimately shapes research studies. Discussions with nursing colleagues regarding their clinical experiences and practice approaches can identify mutual clinical problems. Such discussions may stimulate shared interest for inquiry into best practice approaches for a specific clinical problem.

KEY TERM

Research problem: Gap in knowledge that requires a solution

Professional Literature

Consulting the professional literature is another way to identify research problems. Journal clubs provide an approach to investigate clinical problems identified at the practice level. Internet search engines such Google Scholar (http://scholar.google.com/), PubMed (http://www.pubmedcentral.nih.gov/), and PsycINFO (http:// www.apa.org/ psycinfo/) provide access to scholarly literature across many disciplines and sources including books, abstracts, articles, and dissertations. Refinement of Internet search skills to extract relevant professional literature can be learned through online tutorials, formal classes, and assisted by public or university research librarians. Reading, sharing, and discussing clinical articles from professional journals typically lead to further inquiry into the clinical research literature.

Previous Research

Identifying and reading research articles on particular clinical problems helps nurses to understand the current knowledge about the topic. Reading research articles also reveals gaps about what is known or has not been tested or adequately evaluated. For example, there is a gap when nurses are not using a new clinical approach or intervention yielding better clinical results than the traditional intervention. A gap would also exist if there have been only one or two ***case studies*** reported in the literature. A gap may become apparent when the study design, method, measures, and outcomes apply to a small or limited sample. Traditionally, new interventions are tested with a small number of subjects in ***pilot*** studies before testing with larger samples. These types of studies begin to fill knowledge gaps. Testing whether this same intervention will result in a positive outcome in a more culturally diverse population, different age group, or different geographic sample merits investigation. This type of research is called ***replication*** studies. Finding that multiple studies have obtained similar positive results increases the extent to which one can ***generalize*** or apply findings to a wider population.

With the proliferation of professional journals across disciplines, it is no longer feasible to read all the published information on any given healthcare topic. A search of the literature about a narrowly focused clinical problem may yield dozens of relevant articles. Articles presenting a synthesis of several articles about a clinical topic, called ***systematic reviews***, usually make gaps in the literature more apparent.

Current Nursing Theories

During the past 60 years, a variety of nursing theories have been developed to guide practice and predict nursing outcomes. Peplau's (1952) interpersonal

KEY TERMS

Case studies: A description of a single or novel event

Pilot: A small study to test a new intervention before testing with larger samples

Replication: Repeated studies to obtain similar results

Generalize: Applying findings from a sample to a wider population

Systematic reviews: A rigorous and systematic synthesis of research findings about a clinical problem

relations theory, Orem's (2001) self-care deficit model, Roy's (1970) adaptation model, and Rogers's (1980) unitary man model are all examples of nursing theories that can generate nursing studies to test whether a given theory can predict outcomes. Developing studies that empirically test a specific nursing theory is challenging, and most nursing theories or models have few studies that validate major theoretical concepts. For example, Peplau's (1952) interpersonal relations theory has been widely cited in clinical papers; yet, only a few studies actually explore and test nurse–patient relationship factors derived from this theory (Forchuk, 1994; Forchuk, 1995; Forchuk & Reynolds, 2001). These types of studies are more likely to be initiated by experienced researchers who are well versed in theory construction and the measurement of concepts. However, beginning researchers may have opportunities to participate as a member of a research team engaged in testing a nursing theory. Novice researchers can gain valuable conceptual knowledge and pragmatic research skills and perhaps be equipped to develop their own programs of research to further test nursing theory.

National Initiatives

A number of U.S. government agencies routinely identify major health problems and establish national research priorities. These include the U.S. Surgeon General's Office (http://surgeongeneral.gov/) and the National Institutes of Health (NIH, http://www.nih.gov/) and their member institutes (http://www.nih.gov/icd/), such as the National Institute of Nursing Research (NINR, http://www.ninr.nih.gov/) and the National Institute of Mental Health (NIMH, http://www.nimh.nih.gov/). National research agendas identify areas of health concerns with significant implications for the general public, such as childhood obesity, oral health in children, health disparities in minority populations, cardiovascular disease in women, and disease prevention. These agencies identify areas with high priority for federal research funding to evaluate both prevention and intervention healthcare strategies. Nursing research studies derived from such national research agendas typically have greater opportunities for federal funding.

Narrowing the Problem of Interest

A clinical problem of interest is sometimes called the ***research topic***. Because clinical problems tend to be quite broad in scope, it is essential to narrow the scope to design studies that are manageable. When narrowing clinical problems, it is important to consider several factors. Having a strong interest and passion for a clinical problem is vital because even a pilot study requires the investment of considerable time and effort. Sustained motivation is needed to see a study through to completion. The problem selected for study needs to be

KEY TERM

Research topic: A clinical problem of interest

of clinical significance so it adds to the body of nursing knowledge. Consideration should be given to whether the problem affects a large number of people; if the outcomes will improve the care or quality of life for individuals, families, or groups; and if findings will be applicable in a practice environment. Additional considerations include feasibility in terms of time, research expertise, available resources, access to subjects, and ethical considerations for research subjects. When developing research questions about clinical problems, one must consider if the problem can be answered by the research process of empirical testing. Some questions are inherently philosophical in nature and cannot be answered by a research study. Questions that pose a moral choice are questions for philosophical inquiry and public policy deliberation. For example, stem cell research is a current clinical topic that may offer new solutions to a broad range of genetically linked disorders. The question, "Should stem cell research be limited to current strains, and should access to fetal stem cells be prohibited?" poses an ethical and philosophical question. However, reframing the question, "What are the attitudes of patients with Parkinson's disease and their family members toward research that could involve stem cells injected into brain tissue to generate myelinated neurons to reduce Parkinsonian tremors?" is empirically testable. Research questions must always be framed in a manner that can be empirically tested within ethical boundaries.

Even when questions can be framed for empirical testing, one must further consider if the question can be answered by existing knowledge or through basic problem-solving skills. For example, "Can stem cells be safely transplanted via injection into human bone marrow to treat leukemia?" is an EBP question that can be answered through consulting current literature (Laughlin & Lazarus, 2003). At an earlier time, this posed a researchable question, but that question has subsequently been answered. It is critical to investigate current literature because it would be a waste of resources to conduct research when knowledge already exists. Some questions may be answered through basic problem solving. For example, the question, "What is the best method to reduce fall risks among elderly clients served by a home healthcare agency?" could be addressed through a continuous quality improvement process. Initial and periodic fall risk assessments could be developed and compared with ongoing monitoring to track falls. Questions included in the fall risk assessment might be modified as data are obtained about client medications, cognitive function, and home conditions associated with falls and how to reduce these risks.

Problem Solving, Nursing Process, and Research Process

It is helpful to recognize the similarities and differences among the problem-solving process, nursing process, and research process. All three use abstract,

critical thinking, and complex reasoning to identify new information, discover relationships, and make predictions about phenomena (Burns & Grove, 2001). All involve the scientific method of observation, data collection, problem identification, implementation of a solution, and evaluation of results. These processes are iterative, that is, continual refinement of knowledge occurs as the process is repeated.

Primary differences among the problem-solving process, nursing process, and research process are in their foci, purposes, and outcomes (Burns & Grove, 2001). The focus of the problem-solving process is on a specific goal in a particular setting for the purpose of generating the best solution to achieve the goal. The focus of the nursing process is on a specific patient care problem using assessment, nursing diagnosis, planning, implementation, and evaluation. The goal of the nursing process is to plan and direct care for a particular patient, family, or group of patients. The outcome is the improvement of health for a particular patient or family. In contrast, the research process has a broad focus drawing on knowledge from nursing and other disciplines. Rigorous application of scientific methods is used, and findings are disseminated through presentations and publications. The purpose of the research process is to generate new knowledge that has wide application to promote positive health outcomes for a particular patient population, enhance the overall quality and cost-effectiveness of care, and improve the healthcare delivery system.

Developing Problem Statements

Problem statements are derived from a research problem that has been identified as a situation that is unsatisfactory and requires further description, explanation, or a solution (Norwood, 2000). The ***problem statement*** formally identifies what problem is being addressed in the study. A problem statement must include the scope of the research problem, the specific population of interest, the independent and dependent variables, and the goal or question the study intends to answer (Gillis & Jackson, 2002). Additionally, the problem statement should implicitly or explicitly indicate that the proposed study is ethical, feasible, and of significant interest to nursing (Nieswiadomy, 2008). Table 3-1 contains criteria nurses can use to evaluate problem statements. The research purpose and research questions logically flow from problem statements. The ***purpose statement*** is derived from the problem statement and indicates the aim of the study. The ***research question*** flows from the problem statement and study purpose, and often it is the interrogatory form of the problem statement. Examples illustrating the differences among the problem statement, the purpose of a study, and the research question are presented in Box 3-1.

KEY TERMS

Problem statement: Describes the problem addressed in the study

Purpose statement: A statement indicating the aim of the study

Research question: An interrogatory statement describing the variables and population of the research study

TABLE 3-1 Criteria for Evaluating Problem Statements

1. Problem (or purpose) statement is clear and concise.
2. Problem statement is written as a declarative statement or a formal question (interrogatory).
3. Population of interest is clearly described.
4. Independent and dependent variables are identified.
5. Empirical data can be derived for the variables in the population of interest.
6. Indication that study is ethical.
7. Indication that study is feasible.
8. Indication that study is clinically significant and relevant to nursing practice.

Some researchers use the problem statement and research question interchangeably. The difference is the use of a declarative or an interrogatory sentence. The research problem when stated in the interrogative form is called the research question. Other researchers will frame the problem statement in a broader manner that generates several research questions, as in the example

BOX 3-1

Examples of Problem Statements, Purpose Statements, and Research Questions

Problem Statement: The use of alcohol by college freshmen contributes to alcohol-related injuries and emergency department visits at a state university.

Purpose Statement: To determine if brief screening and nursing intervention for alcohol use during freshmen orientation reduces self-reported alcohol use, alcohol-related injuries, and emergency department visits among college freshmen at a state university.

Research Question 1: Is there a difference in self-reported alcohol use between college freshmen who receive brief screening and nursing intervention for alcohol use during fall orientation and the previous class of freshmen students who did not receive brief screening and nursing intervention?

Research Question 2: Is there a difference in alcohol-related injuries and emergency department visits between college freshmen who receive brief screening and nursing intervention for alcohol use during fall orientation and the previous class of freshmen students who did not receive brief screening and nursing intervention?

TEST YOUR KNOWLEDGE 3-1

1. Researchable problems are identified through:
   a. current nursing theories
   b. personal clinical experiences
   c. philosophical questions
   d. national initiatives
2. A nurse is reading an article and reads the following statement: This study aims to examine the effect of guided imagery on postoperative pain in adults. This is an example of a:
   a. problem statement
   b. research question
   c. purpose statement
   d. hypothesis

How did you do? 1. a, b, d; 2. c

in Box 3-1. Not all research studies will include both a formal problem statement and a research question, but the research question can be implied from the problem statement.

3.2 Developing Hypotheses

At the end of this section, you will be able to:

- Differentiate among associative, causal, simple, complex, directional, nondirectional, null, and research hypotheses
- Use criteria to appraise research questions
- Identify independent and dependent variables

KEY TERM

Hypotheses: Formal statements of the expected or predicted relationship between two or more variables

Study ***hypotheses*** are formal statements regarding the expected or predicted relationship between two or more variables in a specific population. They are derived from either the problem statement or the research question. Some studies will not have formally stated hypotheses; yet, they can be implied from the research question. Hypotheses include independent and dependent variables that are directly linked to the problem statement and research question;

TABLE 3-2 Criteria for Evaluating Hypotheses and Research Questions

1. Does the study have an explicit hypothesis (or hypotheses)? Or does the study present a research question(s)?
2. Hypotheses are written in concise, present tense, declarative statements that are directly linked to the study problem.
3. For studies with an identified theoretical framework, each hypothesis is derived from the framework.
4. Each hypothesis clearly identifies the population and at least two variables that can be measured and empirically tested.
5. Each hypothesis will state one directional relationship between two variables, or a rationale will be stated for a nondirectional hypothesis.
6. For studies that present research questions (rather than hypotheses), the research questions are concise, clear, and specific.
7. Studies with research questions meet similar criteria to studies testing hypotheses with a clearly identified population, measurable variables, and theoretical framework.

predict the relationship between the independent and dependent variables in a specific population; and define the variables in a manner that empirical data can be gathered to test the predicted relationship between variables. Additionally, hypotheses need to be ethical, feasible, and relevant to nursing research practice. Criteria to evaluate hypotheses are outlined in Table 3-2.

Types of Hypotheses

Hypotheses can be categorized in four broad ways: 1) associative versus causal, 2) simple versus complex, 3) nondirectional versus nondirectional, and 4) null versus research. Hypotheses can fit into more than one category. For example, a researcher can state a simple, directional research hypothesis. Sometimes multiple independent and dependent variables can be included in a hypothesis.

Associative Versus Causal Hypotheses

Relationships identified in hypotheses are either associative or causal. Variables that have an ***associative relationship*** (Figure 3-2A) occur or exist together in the real world such that when one variable changes, the other variable changes. In an associative relationship, the two variables may change, or ***covary***. When two variables covary in the same direction, a positive (Figure 3-2B) correlation results. For example, as people age, measures of blood pressure increase

KEY TERMS

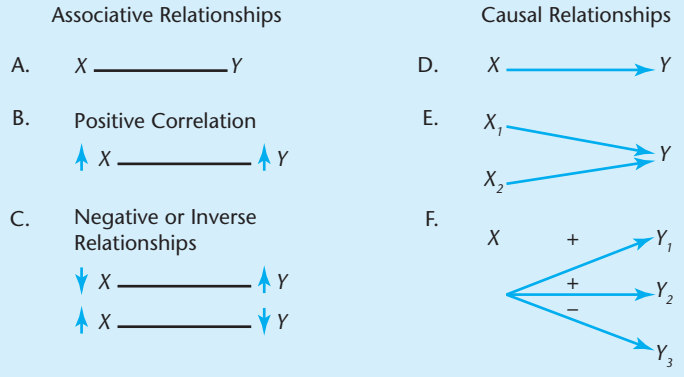
Associative relationship: When one variable changes, the other variable changes

Covary: When change in one variable is associated with change in another variable

FYI

Hypotheses can be categorized in four broad ways: 1) associative versus causal, 2) simple versus complex, 3) nondirectional versus directional, and 4) null versus research; though they can fit into more than one category. Hypotheses need to be ethical, feasible, and relevant to nursing research practice.

FIGURE 3-2 Associative and Causal Relationships



normally. There is a positive correlation between age and blood pressure. When variables vary in opposite directions, they are known as negative or inverse relationships (Figure 3-2C). The degree to which variables change may or may not be equal or proportional. This is different from a ***causal relationship*** in which one variable, the independent variable, is thought to cause or determine the presence of the other variable, the dependent variable (Figure 3-2D). One must be cautious not to misinterpret an associative relationship as one that is causal because association does not equal causation.

KEY TERMS

Causal relationship: When one variable determines the presence or change in another variable

Simple hypothesis: A hypothesis describing the relationship between two variables

Complex hypothesis: Describes the relationships among three or more variables

Simple Versus Complex Hypotheses

A ***simple hypothesis*** states or describes the relationship, associative or causal, between two variables. A simple associative hypothesis would state that variable *X* is related to variable *Y* (Figure 3-2A). A simple causal hypothesis would state that one independent variable is causally related to one dependent variable (Figure 3-2D). A ***complex hypothesis*** predicts the relationships, either associative or causal, among three or more variables. For example, multiple independent variables may act in a causal relationship to produce one or more dependent variables (Figure 3-2E). One independent variable may act in a causal fashion to produce multiple dependent variables (Figure 3-2F). Similar statements and illustrations could be made for associative relationships among three or more variables.

Nondirectional Versus Directional Hypotheses

Sometimes researchers have hunches about the direction that variables may take. Other times they may not. A ***nondirectional hypothesis*** is one that states that a relationship exists between two variables, but it does not predict the direction or nature of the relationship (Figure 3-2A). When no clear direction between the variables has been identified in clinical practice, natural observation of phenomena, relevant nursing theories, or in existing clinical or research literature, then no clear prediction can be hypothesized. Nondirectional hypotheses are commonly used in exploratory and descriptive studies. Common nondirectional descriptors include terms such as associated, correlated, or related. When a nondirectional hypothesis is used, a rationale is included in the problem statement explaining why a directional relationship cannot be predicted between the variables. By contrast, a ***directional hypothesis*** states the nature or direction of the relationship between two or more variables (Figure 3-2B-F). This type of hypothesis is based on nursing theories, observed phenomena, clinical experience, and existing clinical and research literature. Directional hypotheses are used to predict relationships between two or more variables. Common directional descriptors include terms such as increase, decrease, less, more, smaller, and greater. Directional hypotheses can also be categorized as associative or causal, simple or complex.

Null Hypotheses Versus Research Hypotheses

The fourth category of hypothesis includes the ***null hypothesis*** (H_0), which is also commonly called the ***statistical hypothesis***. The null hypothesis states that there is no relationship between two variables, and statistical testing is used to either accept or reject this statement. Conversely, the ***research hypothesis*** (H_1) states that there is a relationship that exists between two or more vari-

KEY TERMS

Nondirectional hypothesis: Statement of the relationship between two variables that does not predict the direction of the relationship

Directional hypothesis: Describes the direction of a relationship between two or more variables

Null hypothesis: A hypothesis stating that there is no relationship between the variables

Statistical hypothesis: No relationship among the variables; null hypothesis

Research hypothesis: Indicates that a relationship between two or more variables exists

CRITICAL THINKING EXERCISE 3-1

A common problem in the newborn nursery is that infants undergoing circumcision show decreases in body temperatures following the procedure. A nurse researcher is interested in studying the effect of a warming tray on the body temperature of infants undergoing circumcisions. Write a research question, associative hypothesis, directional hypothesis, and null hypothesis that would be appropriate for this study.

TABLE 3-3 Examples of Hypotheses for the Research Question: What is the relationship between self-esteem and adherence to a diabetic diet in adolescents with Type I diabetes?

Type of Hypothesis	Hypothesis Statement
Associative	There is a relationship between the amount of self-esteem and adherence to a diabetic diet in adolescents with Type I diabetes.
Causal	Increased amounts of self-esteem increase adherence to a diabetic diet in adolescents with Type I diabetes.
Simple	Increased amounts of self-esteem increase adherence to a diabetic diet in adolescents with Type I diabetes.
Complex	Increased amounts of self-esteem increase adherence to diabetic diet and insulin administration in adolescents with Type I diabetes.
Directional	Increased amounts of self-esteem increase adherence to a diabetic diet in adolescents with Type I diabetes.
Nondirectional	There is an association between the amount of self-esteem and adherence to a diabetic diet in adolescents with Type I diabetes.
Null	There is no relationship between the amount of self-esteem and adherence to a diabetic diet in adolescents with Type I diabetes.
Research	Increased amounts of self-esteem increase adherence to a diabetic diet in adolescents with Type I diabetes.

KEY TERM

Hypothesis or empirical testing: Objectively measurable data gathered through the five senses to confirm or refute a hypothesis

ables. These relationships can be described and categorized as associative or causal, simple or complex, nondirectional or directional. ***Hypothesis testing*** or ***empirical testing*** involves the collection of objectively measurable data that are gathered through the five senses to confirm or refute a hypothesis. Table 3-3 offers examples of how hypotheses can be worded.

What Is a Variable?

To understand hypothesis testing, it is important to understand the nature of variables. Variables may be phenomena that can be directly measured, such as pulse rate, blood pressure, respiratory rate, red blood cell count, antibody titer, thyroid stimulating hormone, or salivary cortisol level. Variables may

TEST YOUR KNOWLEDGE 3-2

Indicate which of the following terms best describes hypotheses 1–3 below:

a. associative
b. causal
c. simple
d. complex
e. directional
f. nondirectional
g. null
h. research
i. research question

1. Age, number of medical diagnoses, and number of medications affect the incidence of falls in older adults.
2. There is no relationship between seatbelt use and head injury in auto accidents.
3. Does consuming one glass of red wine daily reduce the incidence of heart disease in middle-aged men?
4. In the following hypothesis, scores on the Beck Depression Inventory will be lower in women who take yoga classes than in women who do not, the independent variable is:
   a. score on Beck Depression Inventory
   b. yoga ability
   c. women
   d. type of participation in yoga

How did you do? 1. a, d, f, h; 2. c, g; 3. i; 4. d

also be qualities, properties, or characteristics of people, groups, or objects, for example, socio-demographic characteristics, intelligence, social support, and self-esteem. Because these qualities, properties, and characteristics are not directly observable, they are measured indirectly using questionnaires and scales. Variables may also be derived from abstract concepts such as depression, anxiety, grieving, and quality of life, which require some indirect type of measurement. There is an entire body of research dedicated to the development and testing of variables used to measure such abstract concepts. The Beck

KEY TERMS

Independent variable: Variable that influences the dependent variable or outcome

Dependent variable: Influenced by the independent variable

Confounding or extraneous variable: Factors that interfere with the relationship between the independent and dependent variables

Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the Hamilton Anxiety Scale (Hamilton, 1959), and the Holmes and Rahe Social Readjustment Rating Scale (Holmes & Rahe, 1967) are several examples of ways to measure variables associated with abstract concepts.

Regardless of whether a variable is one that can be directly measured or requires some form of indirect measurement, variables are also categorized as independent, dependent, and confounding variables. The ***independent variable***, commonly labeled the *X* variable, is the variable that influences the dependent variable or outcome. In experimental studies it is the intervention or treatment that is manipulated by the researcher. The ***dependent variable***, commonly labeled the *Y* variable, is the variable or outcome that is influenced by the independent variable.

Confounding variables, or ***extraneous variables***, commonly labeled *Z*, are factors that interfere with the relationship between the independent and dependent variables. Sometimes a confounding factor is known before a study begins; other times the confounding factor is identified while the study is being conducted or after the study is completed. If the confounding variable is known in advance, the researcher may try to use strategies to minimize or eliminate the effect of these variables. Another way to control for confounding variables is to use specific statistical tests. For example, in a study examining birth outcomes between women who receive prenatal care from midwives to women receiving care from a physician, the number of cigarettes smoked per day during pregnancy is an example of a confounding variable. Because smoking during pregnancy is known to reduce infant birth weights, either excluding mothers who smoke from the study or using statistical tests to control for this confounding variable would be needed.

3.3 Formulating EBP Questions

At the end of this section, you will be able to:

- Compare the purposes of research questions and EBP questions
- Describe the PICO method

While research and EBP both involve questions, their purposes are quite different. The primary purpose of nursing research is to generate new knowledge, and the purpose of EBP is to make decisions about patient care based on the

best current evidence gathered from a systematic problem-solving approach. EBP incorporates a systematic search for evidence and a critical appraisal of the findings with clinical expertise and the patient's and family's values and preferences to provide the best patient care (Melnyk & Fineout-Overholt, 2005). Clinical curiosity motivates nurses and other healthcare providers to identify choices available for a particular patient to determine the best course of treatment. Given the burgeoning amount of new healthcare products, drugs, procedures, alternative medicine approaches, and the emerging information on risks, benefits, and efficacy of these products, procedures, and interventions, healthcare providers will be continually required to judiciously find the right evidence to make informed treatment care decisions in a time-efficient manner. In EBP, questions are generated in a manner slightly different from research questions. One widely used model in EBP is the ***PICO model***. Clinical questions for specific patient problems are identified so that healthcare providers can find clinically relevant information using Internet search engines and databases (Higgins & Green, 2009). The acronym, PICO, stands for the following four components:

P = Patient population or patient condition of interest
I = Intervention of interest
C = Comparison of interest
O = Outcome of interest

The patient population or patient condition needs to be carefully delineated so that the search for evidence yields relevant information and prevents retrieval of too broad or off-target information. When retrieving information, it is important to keep in mind that findings may not be generalizable to a specific patient. For example, a teaching strategy that is successful with children may not be successful with adolescents.

In the PICO model, the intervention of interest requires similar delineation to yield focused, relevant information. When conducting a literature search, consider the main intervention or treatment, diagnostic test, procedure, or exposure. Also consider any factors that may influence the prognosis such as age, gender, ethnicity, coexisting conditions, and exposures to risk factors such as cigarette smoke, asbestos, or other toxins.

The comparison of interest can be a comparison with another intervention or treatment. The intervention of interest can also be compared to the standard of care. It is best to select the main alternative to the proposed intervention. For example, is the issue about trying to decide whether to implement a new treatment for sacral decubital ulcers in immobile elderly nursing home patients? An

FYI

Nurses must consider patient preferences when making practice decisions, as well as take limited resources into consideration by selecting questions that are broad in scope and that can be completed. Priority should be given to studies that have the potential to generate significant contributions to patient outcomes.

KEY TERM

PICO model: Patient population, intervention of interest, comparison of interest, and outcome of interest used to formulate EBP

BOX 3-2

Resource for Developing EBP Questions Using PICO Model

The University of Wisconsin-Madison Ebling Library for the Health Sciences website provides a resource for developing a PICO question (http://ebling.library.wisc.edu/portals/ebhc/pico.cfm). Be sure to check out the link to the PICO and Search Query Worksheet.

FYI

The primary purpose of nursing research is to generate new knowledge, and the purpose of EBP is to make decisions about patient care based on the best current evidence gathered from a systematic problem-solving approach.

approach to answer this question would be to compare the patient outcomes with the new treatment and the usual standard of care.

The outcome of interest is the desired accomplishment, measurement, or improvement as a result of the selected intervention or treatment approach. It is important to identify clear outcome measures to evaluate the efficacy of the intervention with the identified comparison. In the previous example, the outcome of decubital healing could be determined by measuring diameter and depth of ulcer, type and amount of drainage, formation of new tissue, and ulcer closure. Specifying the desired outcome measures further refines the literature search. Once the components of the PICO question have been identified, a statement can be written. **Box 3-2** includes a resource for developing EBP questions using the PICO model.

TEST YOUR KNOWLEDGE 3-3

True/False

1. There are no differences between research questions and EBP questions.
2. The PICO model is useful when considering EBP questions.
3. The standard of care or alternate interventions can be used as comparisons of interest in the PICO model.

How did you do? 1. F; 2. T; 3. T

CRITICAL THINKING EXERCISE 3-2

Consider how you would describe a group of patients similar to your specific patient. Include important patient characteristics, primary problem or disease, and any coexisting conditions. If age, gender, race, ethnicity, or other characteristics are relevant to the diagnosis or treatment, then those factors also need to be included.

3.4 Keeping It Ethical

At the end of this section, you will be able to:

- Discuss ethical issues associated with the development of research and EBP questions

Although there are not very many ethical issues involved with the development of research and EBP questions, the issues that exist are important. First and foremost, nurses must be certain that research questions posed can be answered while respecting the rights of human subjects. For example, it would be unethical to leave wounds untreated to determine how much time it takes for a stage four ulcer to develop because the intervention is less than the standard of

TEST YOUR KNOWLEDGE 3-4

1. Ethical issues associated with the development of research questions include:
   a. limited resources
   b. respecting human rights
   c. interests of the researcher
   d. patient preferences

How did you do? 1. a, b, c, d

care. Nurses must also keep in mind that EBP is not based solely on evidence. Regardless of answers that are found to questions, nurses must consider patient preferences when making practice decisions.

Researchers must also be aware that resources are limited. Problems that are broad in scope should be selected. Priority should be given to studies that have the potential to generate significant contributions to patient outcomes. It is also important to address questions that can be seen through to completion. Selecting problems that are of interest makes it easier for one to invest the time, energy, and resources necessary to finish a study.

Nurses need to recognize the difference between ethical questions and researchable questions. Although ethical questions do not lend themselves to research methods, discussion about them can make important contributions to nursing knowledge.

RAPID REVIEW

- Identifying clinical practice and research questions is a critical skill for nurses and healthcare providers.
- A research problem is an area of concern when there is a gap in knowledge. These are identified through personal clinical experience, professional literature, current practice theories, previous research, and national initiatives.
- To narrow the problem of interest, it is best to select a problem that is of interest, can be answered by empirical testing, has not already been answered, or cannot be answered through basic problem-solving skills.
- Problem statements identify what the study is about, while purpose statements indicate why the study is being conducted.
- Research questions are interrogatory statements that flow from the problem statement.
- Hypotheses are formal statements regarding the expected or predicted relationships between two or more variables in a specific population. Hypotheses can be associative, causal, simple, complex, nondirectional, directional, null, and research.
- Variables can be measured directly or indirectly.

APPLY WHAT YOU HAVE LEARNED

So that you can better understand EBP, throughout the remainder of the book you will be guided through a series of exercises designed to involve you in the EBP process. The clinical problem used in this exercise is medication errors. You will find a variety of evidence on the companion website for your convenience. As you progress through the process, you will critique the evidence and decide what best practice to recommend. You will also design a policy and evaluate outcomes. By actively engaging in this exercise, you will be well prepared to be a leader who successfully moves evidence to the point of care.

Imagine you are assigned to a committee in your facility. The committee has been charged with determining best practices for reducing medication errors. To become familiar with the magnitude of this problem, visit the report brief, "Preventing Medical Errors," published by the Institute of Medicine (2006, see http://www.iom.edu/~/media/Files/Report%20Files/2006/Preventing-Medication-Errors-Quality-Chasm-Series/medicationerrorsnew.ashx). After reading the report, formulate possible PICO questions for the committee.

- The independent variable, *X*, influences the dependent variable, *Y*, or outcome. In experimental studies, the intervention is the independent variable.
- The dependent variable is the outcome that is influenced by the independent variable.
- Confounding or extraneous variables, *Z*, are factors that interfere with relationships between independent and dependent variables.
- The purpose of research questions is to generate new knowledge, while the purpose of EBP questions is to make decisions about patient care.
- The PICO model is commonly used to formulate EBP questions. PICO stands for patient population, intervention of interest, comparison of interest, and outcome of interest.
- Ethical considerations associated with research questions involve formulating questions that are answered by studies that respect the rights of human subjects, are feasible, and address questions of interest.

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