

Evidence-Based Practice

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Introduction

Evidence-based practice (EBP), also called evidence-based medicine or evidence-based nursing, is a term commonly used in professional literature and in health care institutions. Sackett et al¹ define EBP as integration of the best research, clinical expertise, and patient values. EBP is a rigorous methodology in which all the research data for a particular problem or issue are analyzed and synthesized into an integrative review, sometimes referred to as a meta-analysis. The Sackett et al definition also accounts for patient values and clinician expertise, both of which might overrule the findings of an integrative review. It is important for all health care providers to understand EBP.¹

Evidence-based health care is the conscientious use of current best evidence in making decisions about the care of individual patients or the delivery of health services. Current best evidence is up-to-date information from relevant, valid research about the effects of different forms of health care, the potential for harm from exposure to particular agents, the accuracy of diagnostic tests, and the predictive power of prognostic factors.²

Evidence-based clinical practice is an approach to decision making in which the clinician uses the best evidence available, in consultation with the patient, to decide on the option that best suits that patient.³ EBP is a way for health care providers to examine nursing practices, analyze alternative and contradictory data, and make sound decisions supported by the best available research evidence. This systematic approach increases the likelihood that patients will receive the best care possible.

Incentives for Evidence-Based Practice

Individuals seeking medical care with a health care practitioner believe that the care they receive is based on proven science. But in some cases, the reality is that the care is based on the practitioner's usual patterns, which may be based on anecdotal evidence or recommendations from a colleague. Information from colleagues may be credible, but without evidence to support anecdotal recommendations, one runs the risk of using outdated or ineffective interventions. In fact, most care is still based on anecdotal evidence.⁴ Nursing practice and medical practice are in a constant state of change, and it may be difficult to maintain a current, adequate level of knowledge related to clinical care. As professionals, we must continue to challenge the norm,

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question our historical practice, and find new therapies to improve care while reducing unnecessary costs. Economic pressures brought about by health care reform, the acceleration of consumer expectations following the release of publicly reported clinical outcomes, and the emergence of national not-for-profit organizations have ignited interest by health care providers to ensure that care delivery is based on scientific evidence that is patient focused, interdisciplinary, and cost-effective.⁴

Health Care Policy

Health care reform has increased professional and public awareness of the need to provide improved care at a lower cost, and the expectations are that health care changes will be based on evidence. In 2010, the Patient Protection and Affordable Care Act (PPACA) and the Health Care and Education Reconciliation Act (HCERA) were signed into law. The laws include numerous health-related provisions to take effect over a 4-year period. Provisions of health care reform include expanding Medicaid eligibility, subsidizing insurance premiums, providing incentives for businesses to provide health care benefits, prohibiting denial of coverage or claims based on preexisting conditions, establishing health insurance exchanges, and support for medical research. This legislation represents the broadest US health care overhaul since the 1965 creation of the Medicare and Medicaid programs.^{5,6}

As part of ongoing health care reform, PPACA and HCERA will hold providers (hospitals and other health care organizations) and payers (insurance companies) more accountable for the quality of care. Health care reform requires that a more integrated and continuous level of care be provided to cancer survivors and that the care be evaluated for efficacy. Many health care providers will be evaluating their readiness to provide an integrated delivery system that focuses on a continuum of care to ensure that the appropriate health care information is shared and used. Through greater use of electronic health care records (EHRs), which often include decision-support applications, providers will be required to follow established protocols that are evidence based and patient focused, while still allowing for critical analysis by the health care practitioner. Outcome measures will be more easily tracked and trended, which will allow for an improved mechanism to determine whether treatment is productive, efficacious, and collaborative. This information will provide a foundation to stimulate the growth of knowledge and provide health care researchers with a plethora of data and information to determine effectiveness of care.⁵

Health Care Consumers

Consumer expectations for high-quality patient care and services have increased dramatically over the past decade. Public reporting of health care provider and hospital quality data is easily accessible and is promoted by health care consumer watchdog

groups. Educated consumers are requesting data to assist with making informed, reliable decisions. Just as consumers look for methods to procure value in products and services they purchase, they seek organizations and individual providers with demonstrated consistent quality performance in delivering health care. The Institute of Medicine report published in 2001 about quality medical care⁷ prompted community response. Through investigation, health care leaders found that most of the care provided to patients was grounded in tradition (information passed from one generation to the next) rather than science. Care was often individualized by practices of the clinician rather than by needs of the patient. A new paradigm was needed, based on empirical evidence that translates into practice. Health care practitioners and leaders are searching for solutions to these concerns by using evidence to address patient needs.⁸

What is Evidence?

Well-executed science sometimes produces evidence that a given hypothesis is nothing more than a myth. We often think we know the answer to a question, whereas science proves something very different. As professionals, we must continue to search for appropriate evidence to ensure that the care we provide is safe and efficient.

Evidence is information that supports or undermines a proposition, a hypothesis in science, a diagnosis in medicine, or a fact or point in a legal investigation. In health care, evidence is best gathered using the scientific method, a systematic process that attempts to determine cause-and-effect relationships. The components of the scientific method include asking a question, conducting a literature review, developing a hypothesis, collecting and analyzing data, drawing a conclusion, and communicating results.⁹

Types of Evidence

Health care practitioners most commonly employ anecdotal, testimonial, and statistical evidence. **Anecdotal evidence** is typically derived from the experience of one or more persons and isn't usually considered scientifically valid. Anecdotal evidence can provide insights into solving an issue and may often be the initial step into developing a research question. Practitioners should be careful to avoid the temptation to assimilate this evidence as fact because further analysis is commonly required to transfer this information to practice. One example of anecdotal evidence later disproved was the use of chlorhexidine oral rinse to prevent oral mucositis. This type of rinse was subsequently found to be ineffective and possibly harmful to mucous membranes and is no longer recommended.¹⁰

Testimonial evidence is considered more reliable than anecdotal because it is derived from an expert in a particular field of practice. Nurses frequently seek advice and

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guidance from their more experienced colleagues and use this information when making clinical decisions. However, this testimonial evidence may not be transferable to large groups of individuals or different clinical settings.

Statistical evidence is considered the most substantial type of evidence because its foundation is built from a scientific and mathematical approach. Nurses and other health care practitioners must be astute when interpreting statistical data, as findings greatly hinge on the type of statistical analysis used and can imply an answer or a conclusion that isn't necessarily fact.⁹

Levels of Evidence

The lowest level of evidence can be obtained through **expert opinion** or **consensus**. Although these opinions are considered the lowest level, they're the most widely used. Publication of expert opinion or consensus can occur relatively quickly and inexpensively, compared with the time and expense of conducting a randomized, controlled clinical trial, performing data analysis, and preparing an abstract or paper for publication. Respected authorities in clinical practice are usually experienced practitioners who openly share their opinions with other providers and influence the manner in which care is directed and delivered. Patients often rely on experts in oncology and seek multiple opinions from a variety of practitioners so that they can make informed decisions about the direction of their care. Opinions add substantial value if they're based on medical science; however, many are based on long-held beliefs, not fact, which could negatively affect a patient's clinical outcome or prevent further research. An educational tool commonly used in health care is a **case study**. An in-depth analysis of medical, social, psychological, and spiritual factors is completed to best understand a person's health status as it pertains to the clinical presentation. This comprehensive inquiry is an opportunity to become well-versed in a particular disease state and translate these findings to other clinical situations.⁹

Nonexperimental research is typically done to describe, compare, or explore a particular area of interest. An important concept here is that there's no manipulation of variables and no intervention with patients on behalf of the investigator. This practice is commonly used to gain a better understanding of how independent variables might produce an overall outcome. Variables considered in an investigation of non-small cell lung cancer (NSCLC) might include family history, environmental exposure to toxins such as cigarette smoke, age, and gender. Correlation of the variables then determines if these causes (independent variables) have an effect (dependent variable) on the incidence of NSCLC.

Nonrandom evidence gathering is referred to as a **quasi-experimental design**. This design does have a control group and an experimental group; however, because it is

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not random, it may not easily translate to other populations. For instance, if an investigator is attempting to determine whether African American men are more likely to develop prostate cancer than other groups and studies only subjects from a particular geographic area, the gathered information might not be applicable to the entire African American male population.⁹

When evaluating the efficacy of new treatments, the generally accepted gold standard is the **randomized controlled trial (RCT)** because it includes both a randomized experimental group and a control group.¹¹ RCTs are commonly used in oncology and the pharmaceutical industry to determine the effectiveness of medication therapy or to compare a new treatment against established therapy. The RCT follows the scientific method of inquiry and is more often transferable to a larger population. The gathering and analyzing of findings from all research studies conducted on a particular subject, known as a meta-analysis, has become the gold standard in developing and implementing evidenced-based care. The meta-analysis results in a classification system termed **levels of evidence**, which indicates our level of certainty that the identified evidence is a true measure of the intervention's benefits.¹² Hadorn and colleagues¹² outlined an evidence classification system for rating the quality of evidence used to create federal health care policy and research clinical guidelines. The Hadorn method employs only 3 levels¹²:

- *Level A* = well-conducted RCT with 100 patients or more (including multicenter and meta-analyses); well-conducted RCT with fewer than 100 patients (1 or more institutions and meta-analysis; well-conducted study)
- *Level B* = well-conducted case-control study, poorly controlled or uncontrolled (including RCT with 1 or more major or 3 or more minor methodologic flaws), observation studies with high potential for bias (case series with comparison to historical controls), case series or case reports, conflicting evidence with more support.
- *Level C* = expert opinion

The levels of evidence were further refined and expanded by Sackett and colleagues in 2000¹:

- 1A = systematic review of randomized controlled trials (RCTs)
- 1B = RCTs with narrow confidence interval
- 1C = all or none case series
- 2A = systematic review cohort studies
- 2B = cohort study/low quality RCT
- 2C = outcomes research
- 3A = systematic review of case-controlled studies
- 3B = case-controlled study

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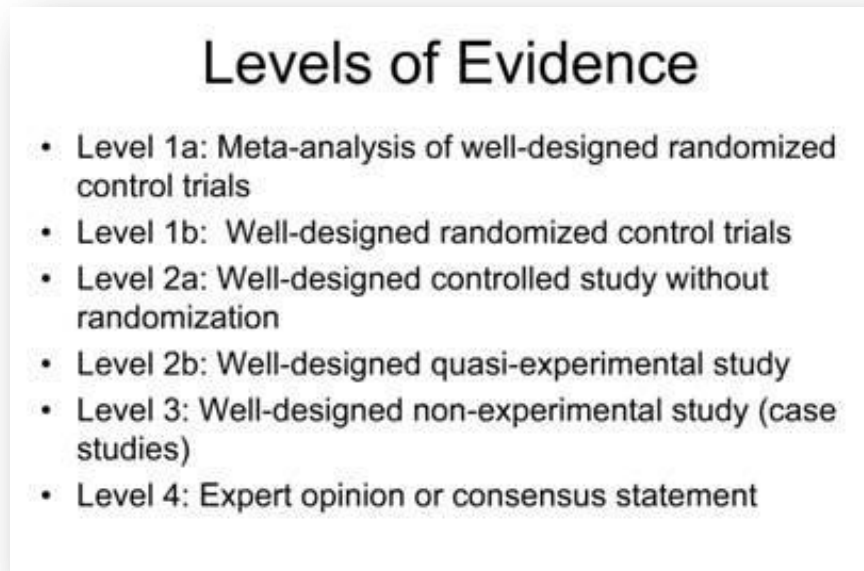
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- 4 = case series, poor cohort case controlled
- 5 = expert opinion

Currently accepted levels of evidence as used by most of the major research institutions and systematic reviews are shown in Figure 1.

Figure 1. Levels of Evidence



Based on information from Normand and McNeil.⁹

Avoiding Bias

Well-designed RCTs make every effort to avoid bias, which can skew findings and result in inaccurate recommendations. There are many different types of biases described in the research literature. The most common categories of bias that can affect the validity of research include the following¹³:

1. *Selection bias*, which may result in the subjects in the sample being unrepresentative of the population of interest or which compares 2 groups that are fundamentally different. Selection bias can occur if an investigator chooses, for example, only patients with good performance status to participate in a trial of a drug for patients with advanced disease.
2. *Measurement bias*, which includes issues related to how the outcome of interest was measured. This may include recall or memory bias or lack of

verification of data. Intervention outcome measurement that depends only on recall (eg, adherence) may introduce bias into the study.

3. *Intervention (exposure) bias*, which involves differences in how the treatment or intervention was carried out, or how subjects were exposed to the factor of interest. If patients are not given identical exposure to the intervention, bias may occur. For example, intervention bias could occur if patients with upper extremity lymphedema were given exercises but no specific instructions on how and when to carry them out, and no structured diary or upper arm measurement form for reporting the outcome.

Using Evidence to Guide Practice

Systematic Reviews

A systematic review is a high-level overview of primary research on a particular research question that tries to identify, select, synthesize, and appraise all high-quality research evidence relevant to that question in order to answer it.^{4,9,12} Examples of systematic reviews regularly used in oncology include the *Cochrane Reviews*, the Oncology Nursing Society (ONS) Putting Evidence into Practice[®] (PEP) publications, and National Comprehensive Cancer Network (NCCN) Clinical Practice Guidelines in Oncology (NCCN Guidelines[™]).

Cochrane Reviews

Cochrane Reviews are systematic reviews of primary research in human health care and health policy. They investigate the effects of interventions for prevention, treatment, and rehabilitation in a wide variety of health and disease states, including oncology and symptom management. Each systematic review addresses a clearly formulated clinical question; for example, *Can taking low-dose aspirin on a daily basis reduce the risk of colorectal cancer?* All the existing primary research on a topic that meets certain criteria is searched and collated, and then assessed using stringent guidelines (Figure 2) to establish whether or not there is conclusive evidence about a specific treatment¹⁴ (Figure 3).

Figure 2. Cochrane Review Procedures¹⁴

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- **Studies categorized for strength of evidence**
 - **Databases identified**
 - **Inclusion criteria specified**
 - **Specific keywords**
 - **Interrater reliability**
-

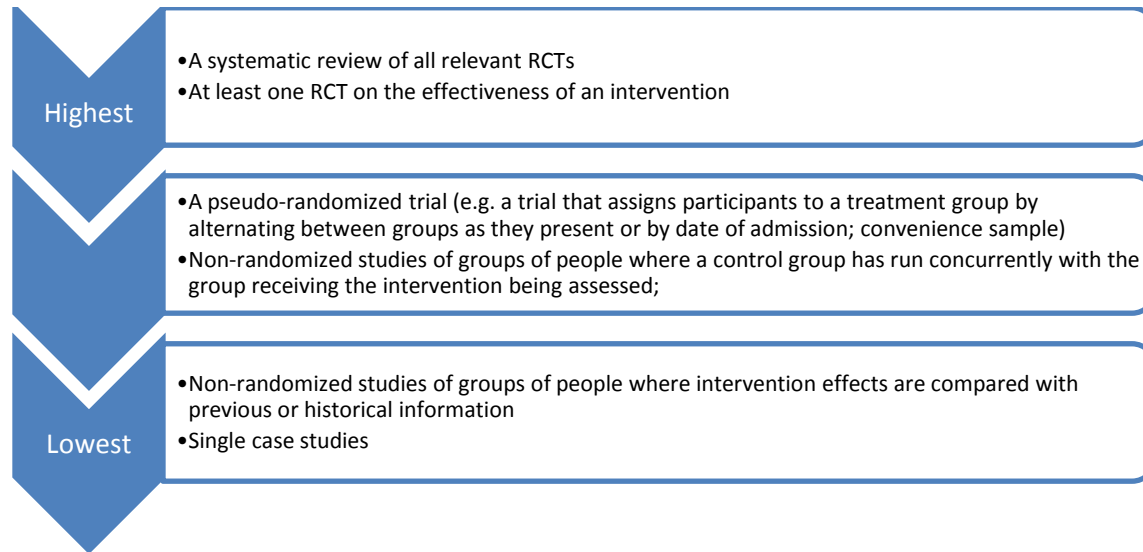
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Figure 3. Cochrane Reviews Levels of Evidence (Highest to Lowest)



Based on information from Cochrane Collaboration.¹⁴
Cochrane Reviews are updated regularly, ensuring that treatment decisions can be based on the most up-to-date and reliable evidence. A searchable database of *Cochrane Reviews* is available at <http://www2.cochrane.org/reviews/>.

ONS Putting Evidence Into Practice

ONS Putting Evidence into Practice (PEP[®]) resources are designed to provide evidence-based interventions for patient care and teaching. Interventions can be incorporated into telephone triage, policies and procedures, quality/performance improvement activities, and standards of care and order sets. ONS PEP recommendations are grouped into 6 classes^{15,16} (Figure 4):

Figure 4. Oncology Nursing Society PEP Recommendation Levels

Recommended for Practice	Interventions for which effectiveness has been demonstrated by strong evidence from rigorously designed studies, meta-analysis, or systematic reviews, and for which expectation of harm is small compared to the benefits
Likely to Be Effective	Interventions for which effectiveness has been demonstrated from a single rigorously conducted

	controlled trial, consistent supportive evidence from well-designed controlled trials using small samples, or guidelines developed from evidence and supported by expert opinion
Benefits Balanced With Harm	Interventions for which clinicians and patients should weigh the beneficial and harmful effects according to individual circumstances and priorities
Effectiveness Not Established	Interventions for which insufficient or conflicting data or data of inadequate quality currently exist, with no clear indication of harm
Effectiveness Unlikely	Interventions for which lack of effectiveness has been demonstrated by negative evidence from a single rigorously conducted controlled trial, consistent negative evidence from well-designed controlled trials using small samples, or guidelines developed from evidence and supported by expert opinion
Not Recommended for Practice	Interventions for which lack of effectiveness or harmfulness has been demonstrated by strong evidence from rigorously conducted studies, meta-analyses, or systematic reviews, or interventions where the costs, burden, or harm associated with the intervention exceeds anticipated benefit

Based on information from Oncology Nursing Society.¹⁵

ONS PEP resources cover a wide variety of symptoms and side effects. A complete listing of available topics is available on the ONS PEP Web site <http://www.ons.org/Research/PEP/>.

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines™)

The National Comprehensive Cancer Network (NCCN), a not-for-profit alliance of 21 leading cancer centers promotes quality improvement and recognizes the significance of creating evidence-based clinical practice guidelines appropriate for use by patients, clinicians, and other health care decision makers.¹⁷ The NCCN consensus guidelines are considered by many oncology health care providers to be the most comprehensive and most frequently updated clinical practice guidelines available in any area of medicine. Covering 97% of all patients with cancer and updated on a continual basis, the NCCN Guidelines are developed through an explicit review of the evidence integrated with expert medical judgment (consensus) by multidisciplinary panels from NCCN member institutions.¹⁷ A listing of the NCCN Steering Committee members can be found at http://www.nccn.org/professionals/physician_gls/gl_steering_committee.asp). There are

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currently (in 2011) more than 135 NCCN Guidelines available for clinician use. NCCN Guidelines panels address cancer detection, prevention and risk reduction, workup and diagnosis, treatment, and supportive care.¹⁷ NCCN levels of evidence combine review of evidence and consensus opinion (Figure 5).

Figure 5. NCCN Levels of Evidence

Category 1	Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate
Category 2A	Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate
Category 2B	Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate
Category 3	Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate

Based on information from NCCN.¹⁸

Practical Applications: Solving Clinical Questions

While you may use the principles of EBP only to locate and put into practice interventions that have been studied by other health care practitioners, occasionally you may find that there is nothing in the published literature to address your problem. At this point, you may begin to consider going through the process of evaluating anecdotal evidence to prove or disprove your usual care. The 4 basic steps of EBP will sound very familiar to nurses (as the nursing process), other medical professionals (as the scientific process), or quality improvement specialists¹⁹:

- Step 1 - *Define the problem.* Convert your information need into an answerable question
- Step 2 - *Generate alternative solutions.* Find the best evidence
- Step 3 - *Evaluate and select an alternative.* Appraise search results for validity and usefulness
- Step 4 - *Implement and follow up on the solution.* Apply the findings to your clinical practice, evaluate performance, disseminate findings

Step 1. Define the problem

Diagnose the situation so that your focus is on the problem, not just its symptoms. Helpful techniques at this stage include using flowcharts to identify the expected steps of a process and cause-and-effect diagrams to define and analyze root causes¹⁹:

- Review and document how processes currently work (who does what, with what information, using what tools, communicating with what organizations and individuals, in what time frame, using what format, etc)
- Evaluate the possible impact of new tools and revised policies in the development of a model of “what should be”

Step 2. Generate alternative solutions

Postpone the selection of one solution until several alternatives have been proposed. Having a standard with which to compare the characteristics of the final solution is not the same as defining the desired result. A standard allows us to evaluate the different results offered by alternatives. Considering multiple alternatives can significantly enhance the value of your final solution. Once the team or individual has decided the “what should be” model, this target standard becomes the basis of a road map for investigating alternatives. Team problem-solving techniques are useful tools in this stage of problem solving. Many alternative solutions should be generated before any are evaluated. A common mistake in problem solving is that alternatives are evaluated as they are proposed, so the first acceptable solution is chosen, even if it’s not the best fit. If we focus on trying to get the results we want, we miss the potential for learning something new that will allow for real improvement.¹⁹

Step 3. Evaluate and select an alternative

Skilled problem solvers use a series of considerations when selecting the best alternative. They consider the extent to which

- A particular alternative will solve the problem without causing other unanticipated problems
- All the individuals involved will accept the alternative
- Implementation of the alternative is likely
- The alternative fits within the organizational constraints¹⁹

Step 4. Implement and follow up on the solution

Leaders may be called upon to order the solution to be implemented by others, “sell” the solution to others, or facilitate the implementation by involving the efforts of others. The most effective approach, by far, has been to involve others in the implementation as a way of minimizing resistance to subsequent changes. Feedback channels must be built into the implementation of the solution, to produce continuous monitoring and testing of actual events against expectations. Problem solving can only be effective in an organization if the solution remains in place; is disseminated to all stakeholders,

including by publication in the health care literature; and is updated to respond to future changes.¹⁹

EBP as an Essential Component of Professional Practice

Within the nursing profession, it is expected that new information in the form of research findings will be incorporated constantly and knowledgeably into nursing practice. The staff nurse is a critical link in bringing research-based changes into clinical practice. Health care organizations are beginning to create mechanisms to facilitate the process of translational research—that is, moving research findings from the literature to bedside practice.

Eizenberg²⁰ conducted a cross-sectional survey with a convenience sample of 243 nurses from northern Israel, who worked in hospitals or in the community. The purpose of the study was to identify factors that predicted professional behaviors. Results showed the self-reported professional behavior of nurses with a university degree was more evidence-based than that of those without a degree (ie, diploma). Moreover, evidence-based nursing practice was more likely to be utilized where there was access to a library with nursing and medical journals, and opportunities for working with a computer and for searching the Internet in the workplace. The variables emerging as predicting evidence-based nursing practice were education, skills in locating various research sources, support of the organization for searching and reading professional literature, knowledge sources based on colleagues and system procedures (inhibiting variable), knowledge sources based on reading professional literature, and knowledge sources based on experience or intuition.²⁰

Barriers to EBP

The current approach to practice change is to make use of evidence-based interventions when considering or making changes to clinical practice. Brown et al²¹ conducted a study of 458 nurses to assess attitudes and perceived barriers to evidence-based nursing practice at an academic medical center. The health care organization itself was identified as the primary barrier to EBP, followed by communication of research findings, clinician attitudes, and availability of or belief in innovation. Through open-ended questions, 4 themes were identified as barriers to research utilization: time, knowledge, support, and culture.²¹

Implications for Nursing Practice

The implementation of EBP practice into the delivery of nursing care will be essential to combat the economic and environmental issues that are challenging health care. Nurse leaders will need to become fluent in gathering and interpreting evidence so that they

can formulate an implementation plan to translate knowledge into practice. Included in the application of EBP is considering patient preference while applying a scientifically grounded plan of care. Research reports need to be written simply and clearly to communicate findings and foster understanding by clinical practitioners, and health care institutions must make changes to surmount the time and knowledge barriers perceived by nurses who wish to utilize EBP. An infrastructure of nurse scientists and bedside practitioners with interests in determining new knowledge and innovation should be developed by the nurse leader to ensure a constant influx of valid, reliable, and current information available to make cost-effective and efficient decisions in care delivery. Creating a culture of change and involvement of nurses at all levels of practice is necessary to move forward with full utilization of EBP. Encouraging nurses to pursue educational opportunities will further enhance their ability to improve the care that patients receive.

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Practice Exercises

1. Think about a clinical problem you encountered in the past week. Perhaps it was a patient with a comorbid condition you had never dealt with before. Log on to the Cochrane Collaboration Web site at www.cochrane.org. Find the topic list and read the review on the condition. Did you find information on this site useful to your patient problem or practice setting? Why or why not?
2. Develop a list of the resources you need to participate in evidence-based practice (EBP). Make note of the resources that were easy to find and those that you found difficult to access.
3. Identify resources that exist in your organization. Consider ways of accessing resources that do not currently exist in your clinical setting. Create an action plan for getting involved in EBP, and include a time frame and economic resources. Identify potential collaborators for your efforts related to EBP.
4. Do a Web search on “evidence-based nursing.” Review various Web resources to identify the most helpful Web sites for your practice setting.

Learning Assessment

To successfully complete this activity and receive continuing education credit, you must read the text and score at least 70% on the learning assessment, and complete the evaluation form. You can access the learning assessment and evaluation form by selecting the link below. If you provide your e-mail address, you will receive an immediate e-mail notification with a link to your printable statement of credit.

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1. **Most current health care practices are based on**
 - a. anecdote
 - b. consensus opinions
 - c. systematic reviews
 - d. quasi-experimental research

2. **Which statement about the scientific method is accurate?**
 - a. It seeks to determine cause-and-effect relationships
 - b. It's useful in legal investigations
 - c. It's too formal to use in most patient care inquiries
 - d. It provides evidence that isn't usually transferable to large populations

3. **The last step of the scientific method is**
 - a. analyzing data
 - b. evaluating data
 - c. drawing a conclusion
 - d. communicating results

4. **Which type of evidence is considered the *least* scientifically valid?**
 - a. expert opinion
 - b. statistical evidence
 - c. anecdotal evidence
 - d. testimonial evidence

5. **Which of the following often is used as an educational tool?**
 - a. case study
 - b. expert opinion
 - c. consensus opinion
 - d. systematic review

6. **Which type of evidence uses a control group but not a randomized design?**
 - a. consensus opinions
 - b. nonexperimental research
 - c. quasi-experimental research
 - d. standardized clinical control trial

7. **The gold standard for evidence-based care is**
 - a. the systematic review
 - b. the consensus statement
 - c. a study using experimental design
 - d. the randomized clinical control trial

8. **When evaluating a nursing intervention to alleviate nausea and vomiting, the NCCN Clinical Practice Guidelines level of evidence that reflects a lower level of evidence and uniform consensus is**
 - a. Category 1
 - b. Category 2A
 - c. Category 2B
 - d. Category 3