Comprehensive Systematic Review for Advanced Nursing Practice

Cheryl Holly, EdD, RN
Susan W. Salmond, EdD, RN, CTN, CNE
Marie K. Saimbert, BPharm, MLIS, MSN, RN

“This book comprehensively and concisely examines the complexities related to asking clinical questions, searching for the evidence, appraising and summarizing the evidence, and getting evidence into practice… I commend this book to health professionals who are seeking to do the best they can in health care.”
— Alan Pearson, AM
The Joanna Briggs Institute
Faculty of Health Sciences, University of Adelaide

In an age of rapidly expanding knowledge, it is crucial for health professionals to stay abreast of the most current evidence-based information when making clinical decisions. This textbook specifically is designed to meet the objectives of the Doctor of Nursing Practice (DNP) competency that relates to “Clinical Scholarship and Analytical Methods for Evidence-Based Practice.” It provides the knowledge and skills necessary for DNP students, faculty, and advanced practice nurses to conduct a comprehensive systematic review (CSR). The text sets forth a rigorous, step-by-step approach to the process of conducting a literature search, including both quantitative and qualitative studies, as well as “grey” literature. It describes how to extract and synthesize the most relevant data, how to integrate systematic reviews into practice, and how to disseminate the results.

The volume begins by addressing the basic concepts of systematic reviews and their relationship to clinical practice and policy, before delineating the systematic steps of this process along with the development of a systematic review proposal and clinical question. The book then describes how to find and select the best available evidence and explores specific types of systematic reviews, including experimental, observational, and economic evidence, and explores the current and future use of the process. Each chapter includes objectives, important points, end-of-chapter exercises, and references to facilitate learning. Mastery of the CSR process and application of the resultant evidential summaries will be of utmost benefit to nursing practitioners seeking to provide care according to the most current evidence-based knowledge.

Key Features
• Tailored specifically for graduate nursing courses in evidence-based practice
• Describes how to find and appraise relevant studies, including nonpublished “grey” literature, and offers criteria for selecting or excluding studies
• Guides readers through the process of searching the literature for evidence the review question
• Explains how to integrate the outcome of systematic reviews into practice
• Compares CSR methods, reviews of literature, integrated review, and meta-studies

Comprehensive Systematic Review for Advanced Nursing Practice
Cheryl Holly, EdD, RN, is associate professor and chair of the Department of Capacity Building Systems, and codirector of the New Jersey Center for Evidence-Based Practice at the University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing. At UMDNJ, she teaches doctor of nursing practice (DNP) program courses including information technology for evidence-based practice; quantitative methods of inquiry and program evaluation, which includes meta-analysis; and clinical inquiry seminars and works with DNP students in their capstone residency course. Dr. Holly holds a BS in Nursing degree from the Pace University, Lienhard School of Nursing, Pleasantville, NY; an MEd in Adult Health and Physical Illness; and EdD in Research and Evaluation in Curriculum/Teaching, both from Columbia University. Dr. Holly has completed postgraduate work in financial administration at the New York Medical College School of Public Health, and in economics, accounting, and comprehensive meta-analysis at the Pace University School of Business. She is certified as Train-the-Trainer in Comprehensive Systematic Review by the Joanna Briggs Institute and has offered workshops on Comprehensive Systematic Review across the country. Dr. Holly is the coordinator of the Eastern Nursing Research Society’s Research Interest Group on Comprehensive Systematic Review and Knowledge Translation, and a member of the Committee on Directors of the Joanna Briggs Institute of Nursing and Midwifery, and the Evidence Translation Group, Cochrane Nursing Care Field, and a member of the Cochrane Injuries Group. She has published extensively and presented internationally and nationally in the areas of EBP, systematic review, knowledge translation, and critical care nursing.

Susan W. Salmond, EdD, RN, CTN, CNE, is a dean and professor, and codirector of the New Jersey Center for Evidence-Based Practice at the UMDNJ School of Nursing in Newark, where she also has served in various other positions since 2005, including vice dean, associate for administration and planning, and associate dean for graduate studies. Dr. Salmond received a BSN from Villanova University, an MEd in Adult Health and Physical Illness, and EdD in Nursing Administration both from Columbia University. She is certified in nursing education and transcultural nursing. In addition to teaching and administrative responsibilities at UMDNJ, Dr. Salmond has taught at Seton Hall University and at Columbia University. At UMDNJ, Dr. Salmond teaches Qualitative Methods of Inquiry and Program Evaluation, which includes metasynthesis in the DNP program and works with DNP students on their capstone residency projects. She is the North American co-convenor of the Nursing Care Field of the Cochrane Collaboration and certified as a Train-the-Trainer in Comprehensive Systematic Review by the Joanna Briggs Institute of Nursing and Midwifery. Dr. Salmond has coauthored three editions of *Orthopaedic Nursing* and has authored two other books, and numerous book chapters and peer-reviewed journal articles. She is a highly sought after conference presenter and workshop leader, both nationally and internationally, in the areas of cultural competence, qualitative research, EBP, and systematic review.

Marie K. Saimbert, BPharm, MLIS, MSN, RN, is a reference librarian at the George F. Smith Library of the Health Sciences at the UMDNJ, a pharmacology instructor at the UMDNJ School of Nursing, and nurse/pharmacist informatics consultant at the Valley Health System in Ridgewood, NJ. She holds a MSN in Nursing Informatics (2008), MS in Library and Information Science (2003), BS in Pharmacy (1997), BS in Nursing (1994), and BS in English Literature (1994). She serves as an active member of the NY/NJ chapter of the Medical Library Association, the Nursing and Allied Health and Pharmacy and Drug Information Sections, the Health Science Library Association of NJ, the EBSCO Biomedical Advisory Board, and a liaison to the UMDNJ School of Nursing. Ms. Saimbert informs development, use, and maintenance of clinical information systems used by health professionals, and has spent more than 4 years facilitating systematic reviews and searching skills with nurses and nursing students. She has published nine articles and had nine recurring columns in the Health Sciences Library Association of New Jersey (HSLANJ) ePULSE. Research interests include library resource integration in health science courses; evidence-based nursing research and infusion of research into practice; nurses’ use of electronic technologies; integration of library tools; and decision trees into electronic systems to support EBP and life-long learning. She has practiced in both nursing (pediatrics) and pharmacy (community practice) disciplines.
Comprehensive Systematic Review for Advanced Nursing Practice

Cheryl Holly, EdD, RN
Susan W. Salmond, EdD, RN, CTN, CNE
Marie K. Saimbert, BPharm, MLIS, MSN, RN
For Bebe, Grace, and the guys for allowing me the time to complete this project.  CH

For my former, current, and future DNP students to help them through the process of systematic review, and to my family, who have always been supportive of my professional endeavors.  SS

For Mom, Dad, John, and those believing in the power of discoveries to shape and positively impact the way we care for ourselves and others.  MKS
Contents

Contributors ix
Foreword Alan Pearson xi
Preface xv
Acknowledgments xix
Reviewers xxi

PART I. INTRODUCTION 1
1. Systematic Review as the Basis for Evidence-Based Practice 3
   Susan W. Salmond and Cheryl Holly
2. Steps in the Systematic Review Process 13
   Susan W. Salmond

PART II. A FRAMEWORK FOR CONDUCTING SYSTEMATIC REVIEWS 33
3. Planning and Organizing a Systematic Review 35
   Cheryl Holly
4. Developing Clinical Questions for Systematic Review 55
   Marie K. Saimbert, Jenny Pierce, and Pam Hargwood

PART III. SEARCHING AND APPRAISING THE LITERATURE 75
5. Key Principles for Searching Literature 77
   Marie K. Saimbert
6. Resources and Techniques to Maximize Search Efforts 105
   Marie K. Saimbert, Jenny Pierce, Pam Hargwood, and John T. Oliver
7. Critical Appraisal 147
   Susan W. Salmond

PART IV. METHODS FOR SYSTEMATIC REVIEWS 163
8. Systematic Review of Experimental Evidence: Meta-Analysis 165
   Cheryl Holly
9. Systematic Review of Observational Evidence 189
   Cheryl Holly
10. Qualitative Metasynthesis 209
    Susan W. Salmond
11. Systematic Review of Economic Evidence 237
    Cheryl Holly
PART V. USING SYSTEMATIC REVIEWS IN PRACTICE 253

12. Systematic Reviews and Evidence-Informed Health Care Policy Making 255
   David Anthony Forrester, Rita Musanti, and Patricia Polansky

13. Using Systematic Reviews at the Point of Care 271
   Ronell Kirkley

14. Future Developments of Systematic Reviews and Evidence-Based Medicine 291
   Jos Kleijnen

   Appendix A: A Toolkit for Systematic Review 297
   Appendix B: Guidelines Sources 307
   Appendix C: Social Science and Biomedical Science Grey Literature 309
   Appendix D: Dissertations and Theses Databases 311
   Appendix E: Answer Keys to Chapter Exercises 315

Index 323
Contributors

David Anthony Forrester, PhD, RN, ANEF, Professor, University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing (SN), Professor in Residence: Interdisciplinary Health Research Consultant, Morristown Memorial Hospital (MMH-AH), Staff, New Jersey Center for Evidence-Based Practice, University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing (SN), Newark, NJ

Pam Hargwood, MLIS, Information and Education Librarian, University of Medicine and Dentistry of New Jersey (UMDNJ) Robert Wood Johnson (RWJ) Medical School Library of the Health Sciences, New Brunswick, NJ

Cheryl Holly, EdD, RN, is an associate professor and chair of the Department of Capacity Building Systems, and codirector of the New Jersey Center for Evidence-Based Practice at the University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing

Ronell Kirkley, DNP, CRNA, APN-Acute Care, Chief Nurse Anesthetist, The Department of Anesthesiology, The New York Methodist Hospital, Brooklyn, NY

Jos Kleijnen, MD, PhD, Director, Kleijnen Systematic Reviews, Ltd., London, England

Rita M. Musanti, PhD, APN-C, AOCNP, Clinical Nurse Researcher, MMH-AH, Clinical Assistant Professor, University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing (SN), Staff, New Jersey Center for Evidence-Based Practice, University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing (SN), Newark, NJ

John T. Oliver, MLIS, Reference and Instruction Librarian, Augustus C. Long Health Sciences Library, Columbia University, New York, NY

Lisa M. Paplanus, DNP, RN-C, CCRN, ACNP-BC, ANP-BC, Vascular Nurse Practitioner, Langone Medical Center, New York University Medical Center, New York, NY

Jenny Pierce, MS, Public Services Librarian, University of Medicine and Dentistry of New Jersey (UMDNJ) Robert Wood Johnson (RWJ) Medical School Library of the Health Sciences, Stratford, NJ

Patricia Polansky, MS, RN, Assistant Commissioner, Department of Health and Senior Services, State of New Jersey, and Clinical Assistant Professor, University of Medicine and Dentistry of New Jersey (UMDNJ) School of Nursing (SN), Newark, NJ

Marie K. Saimbert, BPharm, MLIS, MSN, RN, Reference librarian at the George F. Smith Library of the Health Sciences at the UMDNJ, Pharmacology Instructor at the UMDNJ School of Nursing, and Nurse/Pharmacist Informatics Consultant at the Valley Health System, Ridgewood, NJ

Susan W. Salmond, EdD, RN, CTN, CNE, Dean, Professor, and Codirector of the New Jersey Center for Evidence-Based Practice at the UMDNJ School of Nursing in Newark
I am delighted to have been invited to introduce this very comprehensive text on systematic review and evidence-based health care. Medical practitioners, nurses, and allied health professionals are afforded much status in most societies because they are seen to possess a specialized knowledge base. This knowledge base—which is the foundation for the increasingly complex decision making that characterizes health care delivery—is best described as a set of beliefs, ideas, and hypotheses that are sometimes (but not always) drawn from adequate, and preferably strong, evidence. The more convincing the evidence to support it is, the more trustworthy is the knowledge.

Basing practice on evidence has been claimed to be a feature of modern health care—but this claim is by no means the norm in everyday practice. Many health care practitioners continue to base their practice on what they learned in medical, nursing, or allied health schools; on trial and error in practice; or on reading single study reports in a small number of journals. None of these approaches to practice are appropriate in an age of rapidly changing knowledge. The material learned as undergraduate students becomes outdated very quickly, and the results of a single study, or of trial and error, do not stand up to the rigorous standards that are expected by society. Hence, the emergence of the evidence-based practice movement—a movement designed to capture, summarize, and provide useable information to busy practitioners to inform them when they make clinical decisions.

So, what counts as evidence? Whenever health professionals engage in practice, they make numerous clinical decisions. In making such decisions, practitioners draw on a wide range of knowledge—from knowledge of the basic biological and behavioral sciences; their assessment of the current context and of the individual patient; their own experience; and their own current understandings of research reports they may have recently read. All of this knowledge used to make a clinical decision can be referred to as evidence, and the validity of this evidence may be variable.

When making decisions, clinicians (often quite subconsciously) are often trying to select an appropriate activity or intervention, and assess the degree to which the decision will meet the need at hand. Health professionals seek evidence to substantiate the worth of a very wide range of activities and interventions, and, thus, the type of evidence needed depends on the nature of the activity and its purpose (Pearson, Wiechula, Court, & Lockwood, 2005).

This “ranking” of evidence based on study design is often referred to as an “evidence pyramid.” Starting at the base of the pyramid is “bench” research conducted in laboratories, and more often than not, performed on animals. This is where most research into ideas, techniques, and therapies starts. Case series and case reports represent collections of reports on the treatment of individual patients or a
report on a single patient, respectively. Case control studies represent studies in which patients who have an existing specific condition are compared with people who do not. Further up the pyramid are cohort studies. Cohort studies commonly investigate a large population of patients over time who have a specific condition/treatment and compare them with another group that has not been affected by, or exposed to, the condition or treatment of interest. Randomized controlled trials (RCTs) represent the studies that carry the most weight when translating evidence into practice. All aspects of RCTs are carefully planned to study the effect of a therapy (and “only” the therapy or intervention of interest) on patients—this is done by comparing intervention and control groups. This study design necessarily includes methodologies that reduce the potential for bias (e.g., blinding and randomization). Systematic reviews are at the peak of the evidence pyramid. They take the form of an exhaustive search of the scientific literature, usually focusing on a specific aspect of a clinical topic, to identify all relevant and methodologically sound studies. The studies are appraised and reviewed, and the results are summarized. A systematic review may also contain a meta-analysis. If several valid studies on a topic are sufficiently similar in one or more of the aspects of interest to the review question, the results of these studies can be combined and analyzed statistically as if they were from one large study.

On the other hand, one cannot forget the growing importance of qualitative study to the emerging paradigm of evidence-based health care. A naturalistic approach is used to examine context. Subjects are observed in their natural environment in hopes of expanding and illuminating phenomenon to discover associations for generating and/or refining theory (Bradley, Curry, & Devers, 2007).

Evidence-based health care practice focuses on the need for all health professionals to use those interventions that are supported by the most up-to-date evidence or knowledge available. The evidence-based approach acknowledges the difficulties faced by busy practitioners in keeping up-to-date with an ever-growing literature in health care, and emphasizes the importance of providing them with condensed information on a given topic, gathered through the systematic review of the international literature and accessible at the point of care.

Online information systems that provide appropriate, up-to-date evidence at the point of care are potentially among the most effective interventions to support evidence-based practice (Westbrook, Coiera, & Gosling, 2005). Online information systems have been shown to significantly improve the quality of clinicians’ answers to clinical problems and, if used effectively, the speed at which they can attain the information necessary to deal with a clinical problem correctly (Coiera, Westbrook, & Rogers, 2008; Magrabi, Coiera, Westbrook, Gosling, & Vickand, 2005; Westbrook et al., 2005). Summarized evidence sources represent an efficient way of disseminating evidence to doctors and nurses, and are becoming an increasingly popular tool used by health care workers consistently inundated with research, opinion, and information in general.

This book comprehensively and concisely examines the complexities related to asking clinical questions, searching for the evidence, appraising and summarizing the evidence, and getting the evidence into practice. Best practice in health care is practice that is based on the best available evidence, and it is surely the goal of all
health professionals to deliver the very best they can to patients, families, and communities. I commend this book to health professionals who are seeking to do the best they can in health care.

Alan Pearson, AM
Professor of Evidence-Based Health Care
and Executive Director
The Joanna Briggs Institute
Faculty of Health Sciences
The University of Adelaide
Adelaide, South Australia

REFERENCES


Preface

How do we understand the millions of research studies published each year? How do we deal with the conflicting and contradictory results we find? How do we know that the content is of high quality? And, finally, how do we know what to do with the findings? The answer, of course, is related to systematic review, a secondary research method that uses primary research studies to identify, appraise, and interpret available research for a focused clinical question. Evidence-based health care is grounded on the premise that although practitioners may become experts in their discipline, the explosion of scientific information has created a situation where knowledge is often not current. Systematic reviews are an efficient answer to the dilemma of too many papers to read in too little time, because they provide reliable evidential summaries of past research. By pooling results from multiple studies, findings are based on multiple populations, conditions, and circumstances. The pooled results of many small studies can have more precise, powerful, and convincing conclusions.

Increasingly, health care practitioners seek systematic reviews for point-of-care guidance. When done following the rigorous procedures presented in this book, systematic reviews are exemplars that bring research closer to practice—narrowing the gap for clinicians. Systematic reviews are not the end. Well-thought out care for patients, families, and communities is the goal. Toward those ends, results from systematic reviews require translation into interventions, policies, guidelines, and programs to serve populations.

Systematic reviews are often compared to traditional narrative review articles. However, narrative articles typically do not use explicit, systematic approaches in the review process and are more subjective. In narrative reviews, search strategies are not described, reasons for inclusion and exclusion of studies are not specified, critical appraisal is not done, and methods for synthesizing evidence are not clearly defined. Transparency is missing. Consequently, narrative reviews are more biased with a higher likelihood for inaccurate or unsubstantiated conclusions. Systematic reviews, on the other hand, are a form of research that aims to identify, evaluate, and summarize the findings of all quality, relevant individual studies on a topic systematically (Centre for Reviews and Dissemination, 2009), thereby relieving the end user of this time-consuming task. It requires the reviewers to have expertise in both the subject matter and the review method. Rigorous systematic reviews are completed by at least two reviewers and key steps, such as screening for inclusion criteria, critical appraisal, and data extraction, are done independently and compared to minimize potential for bias. With methods training, expert practitioners are assuming the critical task of performing systematic reviews.

The importance of systematic review is underscored by the recent publication of an Institute of Medicine report, “Finding What Works in Health Care: Standards for Systematic Reviews” (Eden, Levit, Berg, & Morton, 2011), written as a result of a
congressional mandate (Public Law 110-275, Section 304). The report focuses on the development and reporting of systematic reviews of publicly funded comparative effectiveness research acknowledging that these 21 standards are aspirational. It is essential to recognize that the tacit knowledge of clinical expertise and qualitative research is a valuable component of evidence-based practice that cannot be overlooked. We have attempted in this text to do justice to all aspects of systematic review: qualitative evidence, experimental evidence, observational evidence, and economic evidence, in keeping with the way in which advanced nursing practice will use evidence.

Our intent in writing this book is to provide a guide for understanding and conducting systematic reviews. In this book, we discuss the basic components of systematic reviews—planning, conducting, and reporting—and importantly, the relationship of systematic review to clinical practice and policy making. Chapters 1–3 address the steps in the systematic review process and development of a proposal and a clinical question. Chapter 1 relates the emerging paradigm of evidence-based practice to its research antecedent, the systematic review. Chapter 2 presents the steps to follow in conducting a systematic review, although these steps are discussed in depth in later chapters of the book. Chapter 3 outlines the process for developing a systematic review proposal and presents an example of a proposal for a comprehensive systematic review. Chapters 5–7 inform on finding and selecting the best available evidence. Chapter 5 presents the key principles for conducting an exhaustive search. Chapter 6 presents resources and useful tips to actually conduct a search and a description of the most commonly used databases. Chapter 7 describes how to appraise the quality of studies that have been selected to be in the review. Chapters 8–11 provide information on specific types of systematic review, such as those using experimental evidence, observational evidence, economic evidence, and qualitative evidence. Each chapter presents the common research designs within the context of a systematic review. The final section, Chapters 12–14, discusses the current and future use of systematic review. Chapter 12 discusses the use of systematic review in health policy formulation. Chapter 13 presents the systematic review process as the foundation for development of clinical guidelines. Chapter 14 provides a reflection on the future of systematic reviews. A toolkit for conducting a systematic review can be found in the Appendices. At the end of each chapter, we provide suggested readings and exercises for those who wish to learn more about the process of systematic review.

Upon completion of this book, nurses and other clinicians should see systematic reviews as approachable research with great potential to advance clinical practice toward evidence-based care. It all starts with questioning practice, and then methodically reviewing research to discover evidence for translation.

Cheryl Holly
Susan W. Salmond
Marie K. Saimbert
Newark, NJ
REFERENCES


Acknowledgments

A book is never just the work of one person. For this book, I had the unique opportunity of working with two others who challenged and inspired me throughout the process.

I was also fortunate to work with two former students on this project: Dr. Ronell Kirkly and Dr. Lisa Paplanus, both contributors to this book whose continued and future work in systematic review I look forward to reading. —Cheryl Holly

A heartfelt thank you for all of those who see the value of systematic review in advancing nursing practice. —Susan W. Salmond

Thank you Dean Salmond and Dr. Holly for always seeing librarians as cocollaborators in nursing research, and allowing me to take on this challenging project. A heartfelt thank you goes to librarians and staff at UMDNJ libraries who supported my efforts on this publication, especially Judy Cohn, Roberta Bronson Fitzpatrick, Pam Hargwood, Anna Huang, Kerry O’Rourke, Jenny Pierce, and Jan Skica. Much thanks is extended to John T. Oliver, a great cocollaborator with an inspiring skill set; Michelle Brewer; Barbara Gladson; Susan Gould-Fogerite; Julie Quain; Patricia May; Leslie-Faith Morritt Taub; Robin Siegel; Maura Sostack; Rick Wright from SCILS; Debby Magnan for the unwavering support; my writing mentors: Robert Deischer (Bloomfield College, NJ), Kathleen Cirillo (St. Mary’s High School, Elizabeth, NJ), Lorraine Steefel, DNP, RN, CTN (UMDNJ-School of Nursing, Newark, NJ), and Christine Karch, RN, for your generous heart—always leading by example—and for the professional and personal guidance since nursing school; all your support is definitely appreciated. Thank you for the faith, Mom, Dad, and John; I would not persevere through life as well without your cradle of love and understanding. —Marie K. Saimbert
Reviewers

Sarah Cantrell, MLIS, Education Services Librarian, Dahlgren Memorial Library, Georgetown University Medical Center, Washington, DC

Mercedes Echevarria, DNP, ANP-BC, PNP-BC, Assistant Professor and Director of the Doctor of Nursing Practice Program, University of Medicine and Dentistry of NJ, Newark, NJ

Mary C. Kamienski, PhD, FNP-BC, FAEN, Associate Professor and Chair, Department of Primary Care, University of Medicine and Dentistry of NJ, Newark NJ

Ross Ljungquist, MSLS, CSS, AHIP, Expert Searcher, Medical Research Library of Brooklyn, SUNY Downstate Medical Center, Brooklyn, NY

Marybeth Lyons, RN, MS, Clinical Nurse Specialist, Pediatrics and PICU, Westchester Medical Center, Valhalla, NY

Mike McGraw, MLIS, Reference and User Services Librarian, Cleveland Health Sciences Library, Case Western Reserve University, Cleveland, OH

Becky McKay, MA, MLIS, AHIP, Associate Professor, TAMHSC Bryan Campus Librarian Medical Sciences Library, University Libraries, Texas A&M University, Bryan, TX

Lisa M. Paplanus, DNP, RN-C, CCRN, ACNP-BC, ANP-BC, Vascular Nurse Practitioner, Langone Medical Center, New York University Medical Center, New York, NY

Cynthia J. Vaughn, MLIS, AHIP, Clinical Information Librarian, Assistant Professor, Preston Medical Library, University of Tennessee Graduate School of Medicine, Knoxville, TN
PART I

Introduction
CHAPTER ONE

Systematic Review as the Basis for Evidence-Based Practice

Susan W. Salmond and Cheryl Holly

OBJECTIVES

Upon completion of Chapter 1, you will be able to:

■ Differentiate between expert-driven health care and evidence-based health care
■ Define the components of evidence-based practice (EBP)
■ Understand the process of evidence-based health care and the value of systematic reviews as a quality source of evidence
■ Define filtered and unfiltered evidence

IMPORTANT POINTS

■ The evidence-based care paradigm calls for the integration of best research evidence, along with clinical expertise and the opinions and values of patients and their families, as a component in clinical decision making.
■ The EBP process includes asking a question, acquiring evidence to support the question, appraising the evidence, applying the evidence to a patient or group, acting to put the evidence to use for patients/groups, and assessing if the evidence leads to desired patient outcomes.
■ Systematic reviews are at the top of the evidence hierarchy because they provide a summary of research findings available on a particular topic or clinical question. Using an explicit, rigorous process to comprehensively identify, critically appraise, and synthesize relevant studies, findings from a systematic review have greater validity than a single research study.

INTRODUCTION

A paradigm is a traditional way of thinking, a traditional theory or model that guides behavior or practice. Paradigms are not static, and over time do undergo minor changes and adaptations. On occasion, significant agents of change drive
new ways of thinking, which are not minor changes, but represent significant shifts in perception, knowledge, and ways of behaving. The coexistence of the old and the new paradigm creates tension because the paradigms are incommensurable.

Health care today is in the midst of a paradigm shift from expert-driven health care to evidence-based health care. Expert-driven care is generally seen as a hierarchical system grounded in expert opinion and clinical skills. The rituals and traditions of this paradigm view the experienced practitioner as the source of knowledge and, as such, expert opinion and intuition, tradition, unsystematic clinical experience, and pathophysiologic rationale are primary influencers of practice and clinical decision making (Swanson, Schmitz, & Chung, 2010). Evidence-based health care is grounded on the premise that although practitioners may become expert in the art of their discipline, the explosion of scientific information has created a situation where one's knowledge of the science of the discipline is often not current.

Acknowledging the lag between discovery and actual practice and the significant variation in care and care outcomes, Iain Chalmers, editor of the James Lind Library, wrote “Although science is cumulative, scientists rarely cumulate scientifically” (as cited in Swanson et al., 2010, p. 287). The evidence-based care paradigm calls for the integration of best research evidence, along with clinical expertise and the opinions and values of patients and their families, as a component in clinical decision making. The aim of EBP is improving patient outcomes by a systematic approach to identifying and promoting practices that work, and eliminating those that are ineffective or harmful (Akobeng, 2005).

This chapter will present an overview of the emergence of evidence-based health care as the driving paradigm of health care today, highlighting the new knowledge and skill required to be successful. Through this overview of EBP, the central role of systematic reviews will be seen as a valuable source of evidence that contributes to clinical decision making.

**EVIDENCE-BASED PRACTICE DEFINED**

In this text, the term *evidence-based practice* is used to reflect a problem-solving approach to the delivery of health care that crosses all disciplines (Melnyk, Fineout-Overholt, Stilwell, & Williamson, 2009). An early definition of evidence-based medicine provided by Sackett and colleagues from the McMaster Medical School involved the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of an individual or groups of patients (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). This was subsequently expanded with clarifications that best evidence must be integrated with individual clinical expertise, patient/family preferences and values, and the clinical context. Figure 1.1 illustrates that EBP is a dynamic process that combines the four components of clinical decision making with the aim of improving patient outcomes. Understanding the components of the process and the constant interaction of the components is important. There is no rule for what is most important; rather, the weight given to each component varies according to the clinical situation (Melnyk et al., 2009). When EBP is put in action,
1. Systematic Review as the Basis for Evidence-Based Practice

Components of evidence-based practice.

Best Research Evidence

Use of the evidence-based paradigm emphasizes the need for practitioners to make clinical decisions guided by quality information. Quality or best evidence refers to timely, useful clinical evidence from research-based literature (Cook, Mulrow, & Haynes, 1997). New skills are needed for this to happen. Practitioners need skills to search for the best evidence because research evidence is constantly evolving. What is “best evidence” differs by the clinical question. Clinicians practicing from an evidence-based paradigm need to know what is the best research design to answer a specific clinical question as well as the skills to critically appraise published research for its rigor and trustworthiness. Awareness of the strength and the rigor of the actual study guides the decision making about whether the evidence should be incorporated into the clinical plan.

Clinical Expertise

Best evidence by itself is not sufficient to direct practice; rather, best evidence should inform clinical judgment. Knowledge gained through clinical practice is
sometimes referred to as practical knowledge, professional-craft knowledge, or practical “know-how” (Rycroft-Malone, Seers, Titchen, Harvey, Kitson, & McCormack, 2004), and includes the proficiency and judgment acquired through clinical experience and clinical practice (Sackett, 1998). Practitioners use their professional-craft knowledge, which is the proficiency and judgment acquired through clinical experience, to determine whether best evidence applies to the patient or group, and whether the evidence should be integrated into the clinical decision. This tacit knowledge is used to assess the course and effects of implemented interventions.

Once new practices based on best evidence are implemented, the clinician assesses the course and effects of the intervention and uses his or her clinical acumen to make necessary adjustments (Shah & Chung, 2009). This dynamic balance between evidence and expertise is captured by Sackett and colleagues as they describe the dangers in practice that is guided only by clinical expertise or only by best evidence. Without clinical expertise, practice risks becoming tyrannized by evidence, for even excellent external evidence may be inapplicable to or inappropriate for an individual patient. Without current best evidence, practice risks becoming rapidly out of date, to the detriment of patients (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

As this text focuses on the systematic review process, it will consequently emphasize best practice using empirical research; however, it is essential to recognize that the tacit knowledge of clinical expertise is a valuable component of EBP.

**Patient/Family Preference and Values**

It is insufficient to simply blend expertise and evidence, for at the heart of EBP is the patient. Practicing from an evidence-based perspective requires the clinician to recognize the uniqueness of the patient and family, and value the client as a codecision maker in selection of interventions or approaches toward his or her improved health. Best evidence on treatments should be adapted to be congruent with the distinct needs of the patient and family. Needs are influenced by many factors including patient values and beliefs, and the social, emotional, and physical environment. Making the patient central to the decision-making process involves the following:

1. Developing a relationship with the client
2. Listening to the client’s expectations, concerns, and beliefs
3. Learning about the patient’s experiences in managing his or her illness or treatment regimen
4. Informing the client of the evidence and one’s clinical assessment/judgment
5. Explicitly incorporating preferences into clinical decision making (Rycroft-Malone et al., 2004)

**Clinical Context**

Clinical care takes place within contexts and systems that may dictate their nature, because they affect both patients and professionals (Dieppe, Rafferty, & Kitson, 2002). Sources of evidence in the clinical context may include audit and performance data, patient stories and narratives, knowledge about the culture of the organization and
the individuals within it, social and professional networks, and information from stakeholder evaluation and local and national policy (Rycroft-Malone et al., 2004). These sources of data can be used to inform practice decisions, practice changes, as well as inform about the need for research-based evidence.

**EVIDENCE-BASED PRACTICE PROCESS**

Figure 1.2 depicts the EBP process and links it to Sackett, Straus, Richardson, Rosenberg, and Haynes's (2000) "A" Steps Model. The process will be defined here and its components (ask, acquire, appraise, apply, act, and assess) explained in depth.

Practicing from an evidence-based paradigm calls for clinicians to adopt a mind-set of informed skepticism. Instead of simply accepting tradition, hierarchy, and expert opinion, the EBP clinician questions “why” things are being done as they are, “whether” there is a better way to do it, and “what” the evidence suggests may
be best in the specific clinical situation (Salmond, 2007). This clinical inquiry stance, along with concerns generated from evidence at the practice level (clinical expertise, patient values, and contextual issues), leads the clinician to recognize the need to ask for further information. A lifelong, self-directed learning process of clinical questioning, searching for and appraising information, and incorporating relevant information into daily practice is central to evidence-based health care (Akobeng, 2005).

**Ask**

There is both an art and science to asking clinical questions to efficiently obtain needed information for informed clinical decisions regarding patients. Information needs from practice are converted into focused, structured, searchable questions that are relevant to the clinical issue by using the population, intervention, comparison, outcome (PICO) approach or similar approaches described in further detail in Chapters 3 and 4. The PICO approach provides a systematic way to identify the components of the clinical issue and structure the question in a way that will guide the search for evidence (Stillwell, Fineout-Overholt, Melnyk, & Williamson, 2010). These four components of a good clinical question can be thought of as data fields that will aid in the search for evidence and answers. How the question is framed or whether the question will include all the components of PICO, such as a “C” or comparison, will depend on the type of question. For example, a PICO for a prognosis question usually has no “C” or comparison.

**Acquire**

After the question is framed, the next step in the process is to acquire the evidence. Practitioners should first search sites where research has already been critically reviewed and summarized and deemed of sufficient quality to guide clinical practice. These resources are sometimes referred to as filtered resources. Filtered resources feature the latest evidence-based literature on a clinical question. Filtered resources containing EBP information can be part of the clinical information systems (CISs) at a health care facility for use by health professionals. They collect and synthesize evidence from various sources, and they typically offer some interpretation and appraisal. Other sources with filtered information include websites such as Best Evidence (http://www.bestevidence.org/) and Bandolier (http://www.medicine.ox.ac.uk/bandolier/), journals such as Evidence-Based Nursing, and repositories in institutions and organizations where one can find critically appraised topics (CATs) or summaries of the best available evidence that provide readily accessible evidence. One good site for CATs is the Centre for Evidence-Based Medicine in Toronto, available through the Knowledge Translation (KT) Clearinghouse website funded by the Canadian Institute of Health Research (http://ktclearinghouse.ca/cebm/resources/web). Assuming one is drawing from a trustworthy source, the value of this type of evidence is that the work of appraisal has been done and the practitioner can move directly to examining applicability to the context and congruency with patient preference.

In the absence of information from sites that have preappraised the research, searches using individual bibliographic databases are the next action. To begin, start
at the top of the evidence hierarchy, searching for systematic reviews and evidence-based guidelines—both preprocessed evidence making it easier for practitioners to use. Clinical guidelines generally promulgated by professional groups, government agencies, and local practices gather, appraise, and combine evidence of varying levels. They include practice recommendations designed to assist the practitioner in making patient decisions. Sources for evidence-based clinical guidelines include the National Guideline Clearinghouse (http://www.guideline.gov), the Agency for Healthcare Research and Quality (http://www.ahrq.gov), and the U.S. Preventive Services Task Force Recommendations (http://www.uspreventiveservicestaskforce.org/recommendations.htm).

Systematic reviews are searched for first because they provide a summary of research findings available on a particular topic or clinical question. Using an explicit, rigorous process to comprehensively identify, critically appraise, and synthesize relevant studies, findings from a systematic review have greater validity than a single research study. The search for systematic reviews should initially focus on sites that focus on this type of evidence. This includes the Cochrane Collaboration (http://www.cochrane.org), the Campbell Collaboration (http://www.campbellcollaboration.org), and the Joanna Briggs Institute (http://www.joannabriggs.edu.au). One can also search for systematic reviews on PubMed by using the search feature PubMed Clinical Queries or Special Queries.

If systematic reviews are not present on the topic of interest/clinical question, retrieval of individual studies is the next source. Both systematic reviews and individual studies will need to be critically appraised by the practitioner. In searching, the components of the PICO question can be used as search terms. One can further limit the search by stipulating the preferred research design for the question being asked. Knowing the preferred research design (and thus, the strongest evidence), one can begin the search by stipulating the research approach, thus narrowing to “best” available evidence.

Appraise

Once relevant evidence has been acquired, the next step in ensuring that best evidence informs practice is to subject each study to scrutiny, to appraise the retrieved systematic reviews or individual studies for quality and confidence in the trustworthiness of the data and its clinical usefulness. The new paradigm of EBP requires developing the skill set to examine a research study for its fit to clinical practice. The appraisal process differs depending on the type of research design used. Both primary studies and secondary reviews must be appraised for their quality. More information about critical appraisal is presented in Chapter 7 as well as in the specific chapters on systematic review of observational, experimental, qualitative, and economic evidence.

Apply

After high-quality studies have been selected from the appraisal process, the next step is to determine whether there is applicability to one’s own context and patient population. The decision to apply that results in real-time clinical practice is based
on the magnitude of the findings, its applicability to different populations, and the
strength of the evidence.

In considering the magnitude of the findings or the clinical significance, the
practitioner must ask, “Is the size of the benefit (effect size) likely to help my patient?”
This requires agreement between the patient and practitioner on the outcome that is
important to the patient. The practitioner can provide the evidence to the patient
about the likelihood of benefit or harm specific to the intervention, comparison inter-
ventions, and the desired outcome in plain language so that the patient can make an
informed decision.

In research that examines whether interventions work, such as randomized
controlled trials (RCTs), the intervention is often tested in a carefully defined
population under tightly controlled situations that do not simulate real-world
settings. The practitioners must determine whether the settings and patient pop-
ulations from the studies or systematic review are similar to their own routine
practice, and whether the interventions used can be duplicated and are accept-
able to patients. Thus, in the application stage, one is questioning the ability to
apply the findings to one’s own context and one’s own patient population. It is
important to recognize that although the data may be objective, the meanings
have intrinsically subjective value depending on the audience, and may differ
among nurses, physicians, patients, and administrators (Manchikanti, Boswell,
& Giordano, 2007).

A final factor to consider in examining applicability is the strength of the
evidence. It is not unusual for studies to be of poor quality and, frequently, the
recommendations of systematic reviews emphasize the need for more high-quality
trials. One only has to consider the progression of recommendations for bed rest
in the presence of low back pain. Recommendations from “experience” called for
bed rest in episodes of acute back pain and sciatica. Early recommendations from
lower levels and lower quality of evidence found bed rest to be effective in allevi-
ating low back pain. Subsequent higher quality clinical trials found different results.
In a 2010 systematic review on whether to advise patients to rest in bed versus
to stay active for acute low back pain and sciatica, the moderate-quality evidence
showed that patients with acute low back pain may experience small benefits in
pain relief and functional improvement when advised to stay active, as compared
to recommendations for bed rest. There was little or no difference between the two
approaches in patients with sciatica (Dahm, Brurberg, Jamtvedt, & Hagen, 2010).
In other words, activity was recommended. However, it must be pointed out that
hierarchy of evidence is not absolute. It may be that observational studies with suf-
filently large and consistent treatment effects may be more compelling than small
RCTs (Manchikanti et al., 2007).

**Act and Assess**

If the practitioner identifies that the evidence can be applied to practice, the final
steps are to act (put it into practice) and to assess whether the expected outcomes
are achieved. This ongoing monitoring and review provides ongoing practice-based
data on efficacy and effectiveness.
1. Systematic Review as the Basis for Evidence-Based Practice

SUMMARY

This chapter has highlighted the new skills that nurses need in light of the paradigm shift to EBP. The components of EBP require best evidence to be integrated with patient values, the clinical context, and with clinical judgment/expertise. The process for incorporating the new paradigm requires an ongoing sense of inquiry in which the practitioner asks or challenges the way things are and whether practice is based on best practice, has the skills to acquire and appraise the evidence, makes decisions about whether to apply the evidence, and then acts by implementing the new practice and assessing the outcomes of the change.

EXERCISES

Review some of the policies and procedures in your place of employment. Can you tell what evidence was used to write these policies or procedures?

REFERENCES


CHAPTER TWO

Steps in the Systematic Review Process

Susan W. Salmond

OBJECTIVES

Upon completion of Chapter 2, you will be able to:

■ Review the definition for systematic review and importance of systematic reviews in clinical practice
■ Outline steps involved in conducting a systematic review or steps in the systematic review process

IMPORTANT POINTS

■ Systematic reviews provide reliable evidential summaries of completed research.
■ A systematic review is a research method undertaken to provide an in-depth answer to a clinical question and to guide best practice.
■ Systematic reviews may be quantitative or qualitative in nature or use mixed methods for a more comprehensive review.

INTRODUCTION

How can a practitioner stay current with the exponential expansion of health care literature? Should a clinician be relying on the results of a single study for making decisions in clinical practice? How does a practitioner make sense of the variable quality of published literature and the variable results of quality research? Systematic reviews are an efficient answer to some of these concerns because they provide reliable evidential summaries of past research for the busy practitioner. By pooling results from multiple studies, findings are based on multiple populations, conditions, and circumstances. The pooled results of many small studies can have more precise, more powerful, and more convincing conclusions (Cook, Mulrow, & Haynes, 1997). Table 2.1 captures benefits of systematic reviews over single studies.
The synthesis is brought forward in a single statement, which is extremely valuable for the busy practitioner, and is likely to reduce the time lag for getting new evidence into practice, which is currently estimated to be about 17 years. For administrators, review articles help generate clinical policies that optimize outcomes using available resources. For researchers, systematic reviews help to summarize and clarify existing data and avoid unnecessary duplication of prior work (Margaliot & Chung, 2007). Systematic review allows new research to be designed and conducted from the most well-informed (and therefore well-armed) standpoint. By critically examining primary studies, it is possible to see the inconsistencies among diverse pieces of research evidence (Cook et al., 1997), and this helps researchers to refine hypotheses, more accurately estimate sample sizes, and define future research agendas.

A systematic review applies the same level of scientific rigor to the review process as used when conducting original research. It uses methods that are transparent, reproducible, and objective, thereby reducing the likelihood of bias and random error in the summarization process. Systematic reviews that follow this process and are appraised to have validity (the extent to which its design and conduct are likely to have been protected from bias) are a quality source of evidence to the practitioner and policy maker, and are replacing primary research as the source of evidence on which decisions are based (Evans & Pearson, 2001). This chapter will describe in depth the purpose of a systematic review and the steps in performing a systematic review.
2. Steps in the Systematic Review Process

**SYSTEMATIC REVIEW**

The word *systematic* refers to order and planning. In a systematic review, there is a set of transparent, orderly, structurally interrelated steps, carried out in a way that avoids bias and allows for peer review and independent verification. The systematic review addresses a clearly defined question. It uses a systematic and explicit methodology to identify, select, and critically appraise relevant studies. As an outcome of the critical appraisal process, decisions are made to include or exclude a study from the review so that the final data extraction and analyses use only data from high-quality, trustworthy studies. After data extraction, data from the primary studies are evaluated; however, it may or may not be possible to combine the data from the different studies. Quantitative aggregation, or meta-analysis, is the statistical pooling of the results from two or more separate studies that generates summary (pooled) estimates of effect. Qualitative aggregation, or metasynthesis, is an interpretive process that provides a framework for the synthesis/summary of findings from multiple qualitative studies relating to a phenomenon of interest (Evans & Pearson, 2001). Integrative review is often used when statistical analysis is not possible (Fineout-Overholt, O’Mathúna, & Kent, 2008).

Systematic reviews are often compared with traditional narrative review articles. However, narrative articles typically do not use explicit, systematic approaches in the review process and are more subjective. In narrative reviews, search strategies are not described, reasons for inclusion and exclusion of studies are not specified, critical appraisal is not done, and methods for synthesizing evidence are not clearly defined. Transparency is missing. Consequently, narrative reviews are more biased with a higher likelihood for inaccurate or unsubstantiated conclusions.

Systematic reviews, on the other hand, are a form of research that aims to identify, evaluate, and summarize the findings of all quality, relevant, individual studies on a topic systematically (Centre for Reviews and Dissemination, 2009), thereby relieving the end user of this time-consuming task. It requires the reviewers to have expertise in both the subject matter and the review method. Rigorous systematic reviews are completed by at least two reviewers, and key steps such as screening for inclusion criteria, critical appraisal, and data extraction are done independently and compared to minimize potential for bias. With methods training, expert practitioners are assuming the critical task of performing systematic reviews.

**STEPS IN THE SYSTEMATIC REVIEW PROCESS**

Systematic reviews are retrospective, observational research studies (Cook et al., 1997). Like primary research, they have preplanned methods, and the “subjects” in the research are original studies. By following the review steps described in the succeeding texts, it protects against unintended bias in the identification, selection, and use of published work in these reviews, and yields more trustworthy conclusions.

Systematic reviews are undertaken to answer specific, often narrow, clinical questions in depth. Although originally, the review process was focused on
experimental studies, most commonly the randomized controlled trial, review methods have evolved for descriptive, observational, and interpretive research. Reviews may be quantitative or qualitative in nature, or a mixed review may be done. The steps in the process are the same; however, the technique used for each step will vary based on the type of question, type of research design, and approach to synthesis.

**Step 1: Formulating a Question**

Systematic reviews seek answers to specific, often narrow, clinical questions (Cook et al., 1997). The question should be clinically relevant, and often, it stems from unanswered questions in clinical practice. The question serves as the framework for the search, selection, and synthesis of studies (Evans, 2001a). If the question is too narrow, the number of included studies and patients may be small, and the precision of the review will be low. In contrast, if the question is left very broad, it will capture many more studies and patients but may fail to detect important relationships between subgroups of patients and the outcomes of interest (Margaliot & Chung, 2007). The question guides many of the review steps, including establishing eligibility criteria, performing the search for studies, collecting data from included studies, and presenting findings (Higgins & Green, 2008).

The PICO acronym is frequently used as a guide to specify the population or patient groups being studied, the intervention of interest, any comparators, and the outcomes of interest. Dans, Dans, and Silvestre (2008) use the acronym PEO, standing for populations, exposures, and outcomes.

*P* refers to the *population of interest* and is generally characterized by demographics (older adults, middle-aged women) and disease or condition (older adults at risk for a fall, middle-aged women with menopausal symptoms). *I* or *E* refers to the *intervention* or *exposure* being evaluated, and may include a treatment, diagnostic test, harmful exposure, or a prognostic factor. *C* refers to the *comparison exposure/intervention* and may or may not be included in the question. *O* refers to the *outcome* expected and could include a disease, complication, or a measure of health (Dans et al., 2008), and may be accompanied by a specification of time. For studies of appropriateness and meaning, an adaptation of the PICO (PICo) may be used, where *P* stands for the *population of interest*, *I* for the *phenomena of interest*, and *Co* for the *context* (The Joanna Briggs Institute [JBI], 2010). Criteria for and examples of questions of effectiveness, diagnosis, etiology or harm, prognosis, and meaning are given in Table 2.2. A more in-depth look at question type and development is provided in Chapter 4.

The PICO can be written as a question: “In children and adolescents, do cognitive-behavioral psychological interventions decrease needle-related procedural pain and distress?” or as an objective “to assess the efficacy of cognitive-behavioral psychological interventions for needle-related procedural pain and distress in children and adolescents.” Generally, the objective or question is written as a single sentence. Secondary objectives targeting different participant groups, subgroups, and different comparisons of interventions or different outcome measures may also be developed.
### TABLE 2.2
Asking Focused Questions

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Element of the Clinical Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P</strong> Patient</td>
<td></td>
</tr>
<tr>
<td><strong>I</strong> Intervention (or Cause, Prognosis) or Phenomenon of Interest</td>
<td></td>
</tr>
<tr>
<td><strong>C</strong> Comparison (Optional)</td>
<td></td>
</tr>
<tr>
<td><strong>O</strong> Outcome</td>
<td></td>
</tr>
</tbody>
</table>

**Co:** In qualitative studies (meaning questions), combine the C and O for context. The context may or may not have a time horizon.

Describe as accurately as possible the patient or group of patients of interest (e.g., target clinical condition, coexisting condition, ethnicity, age group).

What is the main intervention or therapy you wish to consider? This can be a form of a treatment, a diagnostic test, type of service delivery, and may also include any exposures to disease, or factors influencing prognosis.

Describe if there is an alternative/comparative treatment to the main intervention, including an actual intervention, treatment as usual, no disease, placebo, a different prognostic factor, absence of risk factors.

Describe the clinical outcome of interest or effects relating to the intervention, such as prevention of side effects, morbidity, quality of life, and cost-effectiveness. Include a time frame if relevant.

<table>
<thead>
<tr>
<th>Intervention or therapy</th>
<th>In patients with chronic back pain</th>
<th>does keeping a pain diary</th>
<th>—</th>
<th>reduce pain and increase functional ability?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention or therapy</td>
<td>In patients with sacral pressure ulcers</td>
<td>does the use of hydrocolloid dressings</td>
<td>compared to gauze dressings</td>
<td>provide greater patient comfort?</td>
</tr>
<tr>
<td>Intervention or therapy</td>
<td>In acute care hospitals</td>
<td>how does having a rapid response team</td>
<td>compared with not having a rapid response team</td>
<td>affect the number of cardiac arrests during a 3-month period?</td>
</tr>
<tr>
<td>Etiology</td>
<td>Are school-aged children</td>
<td>who have been exposed to in-home second-hand smoke</td>
<td>compared with children not exposed to in-home second-hand smoke</td>
<td>at greater risk for asthma and frequent respiratory infections?</td>
</tr>
<tr>
<td>Diagnosis or diagnostic test</td>
<td>In patients with suspected deep vein thrombosis</td>
<td>is an ultrasound scan</td>
<td>compared with a venogram</td>
<td>more accurate in diagnosing deep vein thrombosis?</td>
</tr>
</tbody>
</table>

(Continued)
Step 2: Establishing the Inclusion Criteria

The inclusion and exclusion criteria set boundaries on the articles that will be selected for the study. Inclusion/exclusion criteria should address the types of studies, the types of people, the interventions or exposures, and the types of outcomes that are of interest (Farquhar & Vail, 2006; Higgins & Green, 2008; JBI, 2008). Too restrictive a list will yield few studies, small number of patients, and reduced precision, whereas broad criteria may result in an unmanageable number of studies and invalid conclusions. Inclusion and exclusion criteria are established a priori (Margaliot & Chung, 2007). It should be possible to explain the criteria based on a sound rationale from the perspective of the nursing, medical, or social sciences literature, rather than on unsubstantiated clinical, theoretical, or personal reasoning (JBI, 2008).

Inclusion Criteria for Studies

When setting inclusion criteria for studies, the acceptable study designs as well as any threshold criteria within the design need to be identified. Systematic reviews for the Cochrane Collaboration are primarily reviews of effectiveness and set inclusion criteria to include only randomized controlled trials and clinical controlled trials (types of study designs). One could set further criteria by indicating “all randomized controlled comparisons,” thus specifying there must be a comparator group or “all randomized controlled trials with allocation concealment” that would restrict the retrieved studies to studies where the treatment to be allocated is not known before the patient entered into the study, or “attrition rate of less than 10%,” which would eliminate the bias of mortality.

Unlike the Cochrane Collaboration, the philosophy of the JBI adopts a pluralistic approach to study designs and provides procedures for the review of evidence on feasibility, appropriateness, meaningfulness, and effectiveness. To this end, they do not restrict study designs to randomized controlled trials or clinical controlled trials, but rather, the designs flow from the type of review being conducted. The language

<table>
<thead>
<tr>
<th>Type of Question</th>
<th>Element of the Clinical Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prognosis or prediction</td>
<td>In older women with osteoarthritis does the use of a Cox-2 inhibitor compared with other NSAIDs decrease the risk of GI bleeding?</td>
</tr>
<tr>
<td>Meaning</td>
<td>How do family members who witness an unsuccessful in-hospital resuscitation perceive the helpfulness or harmfulness of the experience in the first month of grieving?</td>
</tr>
</tbody>
</table>

*Source: Adapted from Salmond, 2007; Melnyk, Fineout-Overholt, Stillwell, & Wiliamson, 2010; and Stillwell, Fineout-Overholt, Melnyk, & Williamson, 2010.*
used highlights the importance of searching for the “best available” evidence, not simply the preferred design. In many JBI reviews, there will be a hierarchy of studies that specify a range of studies to be used if the primary study type is not found. Thus, for a study of effectiveness, one would specify that randomized controlled trials would be sought but, in the absence of quality RCTs, other experimental study designs would be included. The hierarchy of evidence in an effectiveness study is generally well accepted to begin with RCTs, followed by quasi-experimental studies, cohort (with control) designs, case-controlled designs, observational studies, and finally, expert opinion in the absence of higher levels of evidence. The hierarchical wording for a review of effectiveness could read:

The review will consider randomized controlled trials; in the absence of RCTs other research designs, such as non-randomized controlled trials and before-and-after studies, will be considered for inclusion in a narrative summary to enable the identification of current best evidence . . . (JBI, 2008, p. 20).

For studies of meaning, the selection of study design stems from whether one is restricting the design to interpretive or critical designs or is inclusive of both. To this end, the inclusion criteria may include interpretive studies with designs such as phenomenology, grounded theory, and ethnography; critical studies with designs such as action research and feminist research; or a combination of both. The wording for inclusion criteria in a study of meaning could read:

This review will consider studies that focus on qualitative data including, but not limited to, designs such as phenomenology, ground theory, ethnography, action research and feminist research. In the absence of research studies, other text such as opinion papers and reports will be considered in a narrative summary. (JBI, 2008, p. 31).

One must also specify inclusion criteria for dates during which studies should be retrieved (i.e., 2005–2010), and the accepted languages that can be included. Many systematic reviews limit the language to English, which does create a language bias and may call into question the trustworthiness of the findings. For example, if a review topic was “to assess the efficacy of acupuncture in alleviating pain and increasing functional ability in adults with chronic low back pain,” restriction to English may exclude many studies published in Chinese that could bias the findings.

**Inclusion Criteria for Participants**

Inclusion criteria specify the demographic characteristics of the population, the diseases or conditions of interest, and the setting. Characteristics of the population include factors such as gender, age, race, or educational status. These characteristics are used if they have relevancy to the review question. Disease or conditions of interest may include presence of a condition such as hot flashes or stress incontinence or the designation of a disease according to set diagnostic criteria. Settings may include hospitalized patients, residents of nursing facilities, or community-dwelling
or residents of specific communities. Exclusion criteria can be used to restrict studies that deal with types of people who may react to the intervention in a different way (Higgins & Green, 2008). The participant inclusion criteria may be written as a narrative, such as “The review included studies where the participants were adult intensive care patients, family members of adult intensive care patients, intensive care nurses caring for the adult critically ill patient, and ward/unit nurses receiving transfer patients from the intensive care unit. Studies examining the transfer experience for infants, children, or psychiatric patients were excluded from this review.”

In qualitative studies, the population is frequently combined with the context. Context may include cultural factors, geographic locations, specific gender-based or racial interests, and setting of care because they relate to the meanings that the population ascribes to the phenomenon of interest.

**Inclusion Criteria for Interventions/Phenomena of Interest**

The interventions of interest and the comparator interventions (if any) must be delineated. Depending on the question, the intervention may be broad such as “anti-inflammatory drugs,” or can be narrow such as nonsteroidal anti-inflammatory drugs, or even narrower to a specific drug such as naproxen. According to Higgins and Green (2008), comparators may include inactive control intervention (no treatment, placebo, standard care) or active control intervention (a different option or approach of the same intervention, a different drug or a different kind of therapy). When possible, describe the intervention and comparator in detail. It is not enough to identify a drug or a treatment or exposure. There needs to be further detail of the definition, intensity, timing, duration, and method of delivery (Forbes, 2003). Furthermore, it is necessary to determine how to handle trials that included only part of intervention, or trials that included the intervention of interest combined with another intervention.

In a qualitative systematic review, the phenomenon of interest may vary based on the complexity of the topic. For example, the phenomenon of interest may be transition into the workforce. This could be further delineated as the experience of new graduates in the first 6 months of transition or the experience of second-career new graduates. The phenomenon of interest may be expanded or revised as the protocol develops (JBI, 2008).

**Inclusion Criteria for Outcomes**

Inclusion criteria for outcomes attempt to delineate the outcomes of interest for the review that are clinically relevant. According to Higgins and Green (2008), outcomes for studies may include survival (mortality), clinical events (need for intubation, resuscitation, strokes), knowledge levels, patient-reported outcomes (pain, suffering, anxiety, functional ability, quality of life, satisfaction), potential and actual adverse events (hospital-acquired pressure ulcers, ventilator-associated pneumonia), burdens (demands on caregivers, frequency of tests restrictions on lifestyle), and economic outcomes (costs and resource use). A review may consider a single outcome or a range of outcomes.
Further consideration is given to whether there are specific methodological approaches required for measuring the outcome and the timing of the outcome (short term, medium term, and long term). Sources to assist the investigator in determining relevant outcomes include clinical experiences, feedback from advisory groups and consumers, and evidence from the literature. Outcomes are established in advance, although others may be added as the review progresses. The Cochrane Handbook for Systematic Reviews suggests no more than seven main outcomes, and defines main outcomes as those that are essential for decision making with a focus on patient-important outcomes (Higgins & Green, 2008).

**Step 3: Developing a Search Strategy/Performing the Search**

A comprehensive, unbiased search of the literature is the hallmark of a systematic review. The search is meant to be exhaustive, and errors, or lapses, in the search process potentially result in a biased or otherwise incomplete evidence base (McGowan & Sampson, 2005). It is critical to have an expert librarian familiar with searches for systematic reviews as part of the team. It is a time-consuming process and cannot be rushed because the quality of the final product depends on the effectiveness of the search. Chapters 5 and 6 provide more comprehensive information on searching.

The search process used in systematic review science is unlike searches for any other scholarly work in its comprehensiveness and iterative approach. Essential components of the search include keyword identification, search strategies for multiple databases, hand-searching journals, footnote chasing, gray literature (e.g., unpublished research and theses) searching, and author contact (Magarey, 2001). The search strategy is clearly documented, making it transparent so the search can be evaluated for quality as well as facilitating replication of and consistency in the search approach used when the systematic review is updated (Yoshii, Plaut, McGraw, Anderson, & Wellik, 2009).

**Planning for the Search**

An appointment should be made early in the process with a librarian to discuss end goals for the review. The librarian will need to know the objective of the review, such as “My SR will inform a local community project,” or “We are thinking of starting with interventions aimed at teenagers and obesity.” Discussion about preliminary searches that the reviewer has already tried and the resources/databases that have already been searched will allow the librarian to provide more direct advice. Bring to the meeting example articles or citations that typify the kind of research being considered to inform the systematic review.

The librarian will work closely with the investigators to understand the systematic review question, refine the questions, and characterize them in terms of their elements within the PICO format. The PICO along with the inclusion and exclusion criteria assist in the formulating of key terms. Concept mapping and synonym identification are important components of key term mapping. The librarian will further assist in expanding the complete set of terms and Boolean logic combinations to use in the search, and will adapt the search to match the structure of the different databases that will be used in the search.
Components of the Search

The search strategy requires identification of the databases to be used. In nursing, there are four major bibliographic databases that are generally searched first—Ovid, MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Embase. Although there will be redundancy in paper identification because of the differences in indexing across databases, a paper may be in one database and not the other, making a search of each database essential. In addition to bibliographic databases, comprehensive searches may include a search of trial registries and special subject bibliographies (lists of materials that relate to a particular discipline or subject). Registers of clinical trials, available through the CENTRAL database of the Cochrane Collaboration, are an important resource to systematic reviewers.

Searching goes beyond traditional databases to protect against potential publication bias and database bias (McGowan & Sampson, 2005). There is likely valuable information in the gray literature. Timely gray literature captures documents that are not indexed by commercial publishers and cannot be found easily through conventional channels. Scientific gray literature comprises newsletters, reports, working papers, theses, government documents, bulletins, fact sheets, conference proceedings, and other publications distributed free, available by subscription, or for sale. A website called GreyNet (http://www.greynet.org) assists investigators and librarians with the use and production of gray literature. The search should also include strategies to identify unpublished dissertations and theses (Dissertation Abstracts, ProQuest Dissertations & Theses Database, Theses Canada, Index to Theses in Great Britain and Ireland), because it may identify studies that were not accepted for publication. Conference proceedings are a good source of identifying other unpublished studies. Investigators may correspond with authors who have published on the topic of interest or other colleagues expert in the field to also identify any unpublished manuscripts and other gray literature. The Virginia Henderson International Nursing Library of Sigma Theta Tau International (STTI) is a gray literature site holding all of the STTI conference abstracts and author contact information.

Hand searching and footnote chasing are two other approaches to study identification. The investigators should identify the journals that commonly publish on the topic area. These journals should be hand searched for possible articles. Consideration needs to be given to how extensive hand searching should be. Footnote chasing involves reviewing the references of published studies for the primary studies cited. These approaches are especially important in areas where the science is not well established and for qualitative studies where titles may be metaphorical and studies are not always coded by research design. Finally, an author search should be conducted using the names of authors who have published more than two papers on the review topic.

Managing the Citations

Bibliography citation management tools will allow for citations or references to be placed in an online space that the research team can access, organize, and add to. Examples of fee-based bibliography citation management tools or software include
### TABLE 2.3
Advantages to Using a Citation Management System

- Permanent storage of citations, making it easy to keep track of them and use them for this and related projects
- Sharing of citations among research partners
- Sorting of citations by author, title, year, or other fields. The citation tool should also allow for organization of references in groups or categories such as “Group 1: Citations for SR Results section.”
- Deletion of duplicate citations. This is especially useful because duplicate references will occur when searching multiple databases.
- Customization of the look of each reference adding information, such as personal research notes or comments for a reference
- Ability to attach files near citations or references stored in the manager, such as PDF full-text article files for references
- Ability to import citations or references of web pages
- Placement of citations into your systematic review paper in specific formatting styles such as Journal of the American Medical Association (JAMA) or American Psychological Association (APA)

EndNote, Reference Manager, and RefWorks. Some free citation management tools accessible via the Internet include BibDesk (citation manager that works with Macintosh [Apple, Inc.] computers), Carmun, Citavi, CiteULike, Connotea, JabRef, Mendeley, WizCite, and Zotero.

Organization is paramount throughout the systematic review research process. Search strategies should be written down on paper and search steps saved via database save options. Relevant citations should be imported into citation management software or tools. The advantages of this process are reported in Table 2.3.

Citation management software such as EndNote may work with systematic review article analysis tools, such as the JBI’s Comprehensive Review Management System (CReMS). Ask a librarian about available fee-based citation management tools that the library may offer. Librarians may provide instructions or workshops on how to use specific managers. They can also alert you to new tools available in online databases to manage citations such as “My Workspace,” a feature from Ovid Technologies as of summer 2010, available on all databases you search on the OvidSP search retrieval system. Citations saved in “My Workspace” can be exported into a new Microsoft Word (Microsoft Corporation) document or bibliography management tools such as Citavi, EndNote, or Reference Manager. Microsoft Word 2007 includes a References tab that can be used to format citations in select styles such as APA, MLA (Modern Language Association), and Chicago.

**Keeping the Search Current and Documenting the Search**

Setting up RSS (Really Simple Syndication) feeds for notification about new manuscripts aids in keeping the search current while the work of appraisal, extraction,
and synthesis occurs. Referral to Current Contents, a web-based current awareness database, can inform investigators of new material because it provides daily updates of complete tables of contents, abstracts, and bibliographic information from leading scholarly journals and evaluated websites. Information in this source is usually more up-to-date than traditional databases. Many reviewers will rerun the search (with new date limits) prior to final data extraction and synthesis.

Throughout the search, the strategies used, databases searched, number of items downloaded from each database, and number of duplicate items removed must be recorded for final reporting. This information is often reported both in a narrative and in an algorithm/flow chart describing the total number of records identified through search, total number found in hand searching, author contacting and footnote chasing, and number of duplicates removed. Guidelines for reporting can be found by referring to Consolidated Standards of Reporting Trials (CONSORT), Quality of Reporting of Meta-analyses (QUOROM), Meta-analysis of Observational Studies in Epidemiology (MOOSE), and Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statements. In essence, these guidelines tell investigators and authors what information is required to ensure that readers (and reviewers) can properly evaluate the study (Brand, 2009).

**Step 4: Selection of Articles to Be Included in the Systematic Review**

Although conduct of a systematic review is usually a team effort, there are steps that mandate at least two individuals independently perform the function. This enhances the reliability of the study. Selection of articles to be included in the systematic review requires this two-person approach.

**Screening of Titles and Abstracts**

Once the search has been conducted, the first step in study selection is to screen the titles and/or abstracts for its fit with the PICO question and inclusion/exclusion criteria. Generally, the initial search retrieves a large number of potentially useful articles; however, only a small percentage of these articles end up in the final review article. The first round of elimination occurs as the titles or abstracts are reviewed against the inclusion/exclusion criteria. The article is rejected if its title or abstract is sufficient to provide the information that the publication is not relevant. Oftentimes, it is because the publication is not a research study, there is a population other than specified in the inclusion criteria, the article is anecdotal, or the intervention varied in a meaningful way. Once titles and abstracts have been reviewed by two independent investigators, their findings are reviewed. Any differences are discussed and the articles re-reviewed for a decision whether to exclude or move on to the next step in selection, which is critical appraisal of the full text. If necessary, a third party can be used to resolve any dispute. At this stage, it is better to err on the side of overinclusion (Rys, Władyściuk, Skrzekowska-Baran, & Małecki, 2009) and the full text article can be retrieved and critically appraised.
Critical Appraisal of Retrieved Studies

The usefulness of the findings from systematic reviews depends on the quality of the individual studies within the review. All studies that met the relevant inclusion criteria are next subject to a quality assessment, a process that ensures that studies included in the final review had adequate internal validity—that their design and conduct are likely to prevent systematic errors or bias. Consequently, the process enhances the credibility of the conclusions drawn (Thomas, Ciliska, Dobbins, & Micucci, 2004; Rys, et al., 2009). The appraisal is usually based on structured scales or questionnaires that vary according to the type of research (quantitative or qualitative) and the study design used. Most items are scored as yes, no, or can't tell; or met, unmet, or unclear.

Reviews are performed independently by two investigators. After independent reviews are completed, the investigators compare the independent appraisals and dialog about any differences—returning to the original study to confirm rationale for their opinion. A third party is used in the event that the two reviewers cannot reach agreement. The final decision in the appraisal process is to include or exclude the study. Exclusion may be based on a proportion of the criteria rated as no/unmet or can't tell/unclear, or by differentially weighting certain items and needing to obtain a preset score. Excluded studies and the rationale for exclusion are recorded in a table of excluded studies.

Chapter 7 provides more information on critical appraisal, and Chapters 8, 9, 10, and 11 provide specific information related to appraisal of observational, experimental, qualitative, and economic evidence.

Step 5: Data Extraction

In a systematic review, the subject is the primary (original) research article. Data extraction involves sourcing and recording relevant information from the original article. Using a standardized approach by two reviewers ensures accuracy of this process. Data are extracted about the study design components, and these data are summarized in a table of included studies that provides information for each included study. Data extraction tools are available through the Cochrane Collaboration and the JBI and can be individualized to the study. Data collection tools serve as the record of the data collected and help to ensure that all relevant data are collected and that the chances of transcription error are minimized. It also allows for the accuracy of data to be checked (Evans, 2001b). Data extraction tools are part of the research proposal and should be piloted with a representative sample of the studies, and then adapted based on this review (Forbes, 2003; Magarey, 2001).

Although individual chapters will provide more information on data extraction for that particular study design, common design factors are identified as follows and in Table 2.4. These factors are generally included in a “study characteristics table.”

- **Methods** information refers to the type of design, and if the study is quantitative, approaches to minimize bias should be described. Information on methodology, methods, and the phenomena of interest should be reported for qualitative studies.
<table>
<thead>
<tr>
<th>Methodology/Methods</th>
<th>Participants and Setting</th>
<th>Interventions</th>
<th>Outcome Measures/Adverse Outcomes</th>
<th>Results</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>What was the:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study design?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study purpose/aims?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study duration?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific methods used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Quantitative Designs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence generation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allocation sequence concealment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blinding?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td></td>
<td></td>
<td>Number of intervention groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relevant demographic characteristics of sample</td>
<td></td>
<td></td>
<td>Details of specific intervention for each group and integrity of intervention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criteria for diagnosis/condition identification</td>
<td></td>
<td></td>
<td>Qualitative studies generally have no interventions but are exploring a phenomena of interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relevant comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contextual factors: setting, culture, geography</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of intervention groups</td>
<td></td>
<td></td>
<td>Outcomes and time points when outcome measures are collected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Details of specific intervention for each group and integrity of intervention</td>
<td></td>
<td></td>
<td>Outcome definition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualitative studies generally have no interventions but are exploring a phenomena of interest</td>
<td></td>
<td></td>
<td>Unit of measurement and interpretation of measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td>Qualitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience of participants</td>
<td></td>
<td></td>
<td>Quantitative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authors key conclusions</td>
<td></td>
<td></td>
<td>Number of participants allocated to each intervention group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative</td>
<td></td>
<td></td>
<td>Number for which outcome is being reported on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing participants</td>
<td></td>
<td></td>
<td>Statistical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subgroup analysis</td>
<td></td>
<td></td>
<td>Estimate of effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualitative</td>
<td></td>
<td></td>
<td>Subgroup analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Findings with descriptive illustrations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Participant data provide not only sample size information, but also any demographic or disease factors that could influence the direction and strength of an intervention effect (quantitative) or the meaning of the experience (qualitative), as well as those characteristics that would assist the readers in determining applicability to their own patient population. The setting is usually indicated for quantitative studies. In qualitative work, establishing the context is quite important, and information regarding setting, geographical location, culture, and participant information is important in establishing the context. Disease characteristics such as staging, diagnostic parameters, or certain symptoms could be relevant data.

For quantitative studies, details of interventions should be provided for the experimental group(s) and control group. This should include enough detail to allow replication. For studies examining drugs or physical interventions, provide detail on route of delivery/surgical technique, dose, frequency, timing, and length of treatment. For educational and psychobehavioral intervention studies, report on the contents of the intervention, who delivered it, and the format and timing of the delivery (Higgins & Green, 2008). Additionally, it is important to report on the integrity of the intervention—did it go as planned?

Outcomes of interest are specified a priori in the research protocol and in data extraction; only those outcomes that were identified in advance are extracted. Outcome measures should be defined (to also include explanation of scoring) along with when the measure will be taken. Adverse outcomes are collected when the study is examining harmful effects of interventions and similar to reporting interventions; the definition of the adverse outcome must be clearly described to allow for comparison. In randomized controlled trials, a tool extracting data related to bias is also completed. For qualitative studies, the method of data analysis used in the primary study is identified.

The results extracted are based on the research design, and the quantitative research proposal will specify which outcome measures, time points, and summary statistics are to be extracted. When using JBI or Cochrane Collaboration software for quantitative reviews, there are required fields that must be completed inclusive of the sample sizes per group and the intervention or exposure per group. For outcomes that are dichotomous, the number with the exposure and the total sample for both control and treatment groups are entered. For continuous data, the mean and standard deviation plus sample size are extracted for each outcome specified in the protocol for both the control and intervention (exposure) group. If the publication does not provide all of the results data with needed clarity for the different groups, attempts should be made to contact the author. For qualitative studies, the results extracted include the findings or the conclusion reached by the investigator, presented in the form of themes or metaphors with accompanying text, which illustrates these findings (JBI, 2008). The reviewer reads and rereads the paper to identify the findings and the appropriate illustrations that capture the different concepts within the theme. Each finding/illustration is assessed for congruency, and the reviewer grades the credibility of the researcher’s interpretation.

Author conclusions are generally reported. Conclusions should be examined for congruency with the findings.

Funding sources/conflict of interest is now considered important information to collect.
Step 6: Data Synthesis

The inherent purpose of a systematic review is not only to provide data about the included studies, but also to summarize the findings of the included studies. This can be accomplished through a statistical analysis, a qualitative synthesis, or a narrative descriptive synthesis. A meta-analysis is a statistical approach that calculates a pooled estimate of effect and its confidence interval, and provides a combined estimate of effectiveness of a particular treatment (Forbes, 2003; Lipp, 2003; Magarey, 2001). Meta-analysis can only be used when the studies have similar questions, use the same population, administer the intervention in a similar perspective, and focus on the same interventions. This is especially valuable when the primary literature consists of small, underpowered studies. Pooling allows for a more precise estimate of the true effect of the intervention (Margaliot & Chung, 2007). Meta-analysis reports odds ratios for dichotomous data and mean and standard deviation for continuous data (Magarey, 2001). Data that are conflicting (i.e., measured with different outcome measures and that are widely variable) cannot be pooled in a meta-analysis; rather, they are reported through a descriptive synthesis. A descriptive synthesis provides a tabular summary of all studies related to each key piece of information identified as important and facilitates analysis of comparison across studies. Both approaches allow for identification of underlying causes of heterogeneity, leading to suggestions for future research.

Metasynthesis is used for qualitative studies pool and seeks to generate new interpretations from the findings of individual studies (Evans, 2001a). Qualitative metasynthesis involves a synthesis of findings across studies using qualitative comparative analysis. The aim of qualitative metasynthesis is to capture similarities and differences in language, concepts, images, and other ideas around a target experience (Sandelowski, Docherty, & Emden, 1997). The goal in quantitative meta-analysis is to reduce findings to a “common metric”; however, the aims for qualitative metasynthesis are quite different—they are to “enlarge the interpretive possibilities of findings and deconstruct larger narrative and general theories” (Sandelowski et al., 1997, p. 369). The approach to metasynthesis is to determine how studies are related, or dissonant, through a compare and contrast analysis (Walsh & Downe, 2004). Common themes/concepts are identified and discordance and dissonance are noted. Cross-study analysis then occurs with findings interpreted using metaphors and concepts applicable across studies, and finally, synthesis statements that capture the essence of the interpreted findings are set forth (Walsh & Downe, 2004).

Step 7: Recommendations for Practice and Future Research and Writing the Review

The purpose of systematic reviews is to guide practice and provide the data on which to base plans for future research. To this end, the goal of the systematic review is to draw conclusions from the data, recognizing that some studies may be more highly rated because of their level of evidence. As one attempts to reach conclusions, it is important to speak of limitations of the primary studies.
Whether this be the fact that reviews were lower levels of evidence, limited to the English language, or not able to perform meta-analysis because of heterogeneity, addressing limitations increases the confidence in the recommendations (Pai et al., 2004). Recommendations for practice and future research should flow from the data synthesis.

There is a growing movement to obtain consistency in the write-up of systematic reviews, and several guidelines are available to standardize the writing process. Guidelines, such as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; http://www.prisma-statement.org) and Consolidated Standards of Reporting Trials (CONSORT; http://www.consort-statement.org), not only assist with appraising studies, but also help to identify best practices for conducting and writing up a systematic review (Liberati et al., 2009; Turpin, 2005). For writing up studies of controlled trials, the QUOROM guidelines should be used (Moher et al., 1999), and for observational studies, the MOOSE guidelines should be followed (Stroup et al., 2000).

**Step 8: Updating the Systematic Review**

As science evolves with the accumulation of new knowledge, what was at one point considered to be effective and safe may in the future be shown to be ineffective or harmful or vice versa (Chalmers & Haynes, 1994). Updating systematic reviews aims to incorporate new evidence into a previously completed review (Moher & Tsertsvadze, 2006). Systematic reviews registered with either Cochrane or the JBI require that review authors keep the review up-to-date. The question regarding when a review needs to be updated depends on the rapidity and scope of scientific and technological developments, nature of the health condition, and its public health importance (Moher et al., 2008). As a rule of thumb, the literature should be reviewed every 2 years to determine the advancement of knowledge and need for an updated review.

**SUMMARY**

This chapter has highlighted the benefits of systematic reviews as compared with traditional narrative reviews. The steps in the systematic review process have been presented to provide an overview of the comprehensiveness and rigor in the process. Systematic reviews that are retrieved to answer clinical questions should be reviewed for their adherence to the steps in this process.

**EXERCISES**


Can you determine the steps the reviewers took in constructing this systematic review? Are they clear enough for you to be able to use this same method?


2. Steps in the Systematic Review Process


SUGGESTED READINGS


