FOURTH EDITION

EVIDENCE-BASED GERIATRIC NURSING PROTOCOLS
FOR BEST PRACTICE

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Evidence-Based Geriatric Nursing Protocols for Best Practice

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Evidence-Based Geriatric Nursing Protocols for Best Practice

4th Edition

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Foreword

The first book I reached for in 2001 when I began my serious inquiry of best nursing practices for older adults was the initial edition of this very text. In fact, I had both a home version and an office version. It was never far from my reach, and I used it daily when developing a series of teaching plans to educate nurses on the care of hospitalized elders. Because each protocol was and remains research or evidence based, it represented the state of the science on care problems faced by staff nurses caring for older adults.

So, you might imagine how thrilled I was to be asked to write the foreword for the fourth edition of *Evidence-Based Geriatric Nursing Protocols for Best Practice*. Initially only 15 chapters, the fourth edition now has 34 chapters—testimony to the growing body of geriatric nursing knowledge. New chapters include function-focused care, catheter-associated urinary tract infection prevention, mistreatment detection, acute care models, and transitional care. There is a heightened sense of urgency to deploy these protocols in practice and education because of recent reports and policy changes that are spotlighted by the debate and discussion surrounding the passage of the 2010 Affordable Care Act. Whereas the final outcome of the law remains to be seen, Americans agree that there is an urgent resolve for action. The public is waking up to the fact that "It's tomorrow already," as discussed in a recent AARP Bulletin—speaking to the multitude of complex national issues, not the least of which is health care reform (Toedtman, 2011). The message to nurses is that we must embrace this reality and work to fully use and promote these geriatric nursing protocols and motivate others to do the same.

Proposed changes to the Centers for Medicare and Medicaid Services (CMS) measurements of quality and cost in health care delivery include the introduction of accountable care organizations (ACO) and value-based purchasing (VBP; CMS, 2011; Welton, 2010). Delivery model innovation mandates that health care must break away from traditional models and practices and move toward more efficient and safer care—a clinical transformation calling for the use of clinical protocols and improved coordination and collaboration (Health Care Advisory Board, 2010). Although the new language may seem daunting, geriatric nurses have used this paradigm for years. A recent Wall Street Journal report on health care summarized it best by saying, "Sometimes innovation means getting back to basics" (Landro, 2011). In truth, it is exactly why geriatric nursing protocols may be better received and, most importantly, implemented in the years ahead. These protocols address basic gerontological tenets: access and quality of care, especially for vulnerable populations; prevention of iatrogenic conditions; the institutionalization of best practices; and the application of innovative and interdisciplinary models of care.

These are uncertain times in health care, with new payment systems and models of care being developed; however, the overriding theme is urgency and delivering results. Therefore, take these protocols and adopt them as your unit based standards. Talk to your patients and families about how nurses have developed methods to improve their care and reduce the risk of complications. Create teaching plans that supplement the protocols with actual patient situations, develop documentation templates to integrate

the protocols into your charting system, and develop quality improvement initiatives to measure the degree to which you are currently using these protocols and set goals to improve their use.

The 2011 Institute of Medicine (IOM) report, *The Future of Nursing: Leading Change, Advancing Health*, makes our directive clear and powerful. The IOM was founded on the following premise: *"Knowing is not enough; we must apply. Willing is not enough, we must do"* (von Goethe).

Now, more than ever, nurses are called upon to lead efforts to embed evidence-based practice in daily operations. As the IOM report states, "nurses have key roles to play as team members and leaders for a reformed and better-integrated, patient-centered health care system" (p. xii). The process of implementing sweeping change in health care will likely take years; however, nurses must start pragmatically and focus on these critically important protocols that have demonstrated improved outcomes for older adults. Simply stated, "Pick this book up and use it."

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- Springer Publishing Company for its ongoing support of quality geriatric nursing publications
- Nurses Improving Care for HealthSystem Elders (NICHE) hospitals that bring many of these protocols to the bedside and are leaders in ensuring geriatric nursing best practices

Introduction

Older adults are overwhelmingly the majority of hospitalized patients and are, by far, the most complicated patients to care for in the acute care setting. They suffer from multiple complex medical problems, take multiple medications, are the most vulnerable to iatrogenic events, experience prolonged hospital stays, and are the more likely to die in the hospital (versus community or other setting). Acute care nurses have an enormous responsibility when providing care to older adults in this rapidly changing healthcare environment with increasing regulatory requirements and short staffing. Even though older persons are our fastest growing segment in the United States, most nursing programs, like medical programs, are just now incorporating geriatrics into the curriculum. Many unfamiliar with geriatrics might ask: What's so different about older people? Don't they have the same diagnoses as younger adults, like diabetes, hypertension, and heart disease? The answer to that is yes, they do have the same diseases; however, physiological changes that occur with aging, multiple coexisting medical problems, and multiple medications place older adults at significantly higher risk for complications, including death, while hospitalized. The nurse armed with information on the unique ways in which older adults present with subtle signs and symptoms may actually avert complications. Additionally, the nurse equipped with knowledge about and implementation of proactive assessment and interventions may actually prevent these complications in the first place.

As in the previous, second edition (honored as *American Journal of Nursing*, Geriatric Book of the Year, 2003), we will present assessment and interventions for common geriatric syndromes. Geriatric syndromes are increasingly recognized as being related to preventable iatrogenic complications, or those that occur as a direct result of medical and nursing care, causing serious adverse outcomes in older patients (See Iatrogenesis chapter). We are also very happy to present five new topics and several new expert contributors in this edition. Many of these topics have been updated from the protocols that appear on the website of the Hartford Institute for Geriatric Nursing at NYU (www.HartfordIGN.org). The new topics in this edition are:

- Interventions to Prevent Functional Decline in the Acute Care Setting
- Catheter-Associated Urinary Tract Infection Prevention
- Mistreatment Detection
- Acute Care Models
- Transitional Care

In this fourth edition of *Evidence-Based Geriatric Nursing Protocols for Best Practice*, we provide guidelines that are developed by experts on the topics of each chapter and are based on best available evidence. A systematic method, the AGREE appraisal process (AGREE Next Steps Consortium, 2009; Levin & Vetter, 2007; Singleton & Levin, 2008), was used to evaluate the protocols in the second edition and identify a process to help us improve validity of the book's content. Thus, a systematic process,

described in Chapter 1, was developed to retrieve and evaluate the level of evidence of key references related to specific assessment and management strategies in each chapter. The purpose in determining the best available evidence was to answer the clinical questions posed. The chapter authors rated the levels of evidence based on the work of Stetler and colleagues (1998) and Melnyk and Fineout-Overholt (2011). The first chapter in this book, "Developing and Evaluating Clinical Practice Guidelines: A Systematic Approach," details the process of how the clinical practice guidelines were developed and how they complied with the AGREE items for rigour of development (AGREE Next Steps Consortium, 2009). Chapter 1, written by leaders in the field of evidence-based practice in the United States, will most likely be the most important chapter reference for understanding the rating of the levels of evidence. Most of the protocols reflect assessment and intervention strategies for acute care recommended by expert authors who have reviewed the evidence using this process; the evidence provided may come from all levels of care and may not have been specifically tested in the hospital setting.

How to Best Use This Book

The standard nursing approach was used as a guideline for the outline of each topic as deemed appropriate by the chapter author(s) providing: overview and background information on the topic, evidence-based assessment and intervention strategies, and a topic-specific case study with discussion. The text of the chapter provides the context and detailed evidence for the protocol; the tabular protocol is not intended to be used in isolation of the text. We recommend the reader to take the following into consideration when reviewing the chapters:

- Review the objectives to ascertain what is to be achieved by reviewing the chapter.
- Review the text, noting the level of evidence presented in the reference section— Level I, being the highest (e.g., systematic review/meta-analysis) and Level VI, the lowest (e.g., expert opinion). Refer back to Chapter 1, Figure 1.2 for definitions of level of evidence to understand the quantitative evidence that supports each of the recommendations. Keep in mind that it is virtually impossible to have evidence for all assessments and interventions, which *does not* mean it is not going to be used as an intervention. Many interventions that have been successfully used for years have not been quantitatively researched but are well known to be effective to experts in the field of geriatrics.
- Review the protocols, and keep in mind they reflect assessment and intervention strategies for acute care, recommended by experts who have reviewed the evidence. This evidence is from all levels of care (e.g., community, primary care, long-term care) and not necessarily the hospital setting and should be applied to the unique needs of the individual patient.
- The focus should always be patient centered, which takes into consideration many other factors specific to the individual.
- Review the case study and discussion in each topic, which provides a more real life, practical manner in which the protocol may be applied in clinical practice.
- Resources in each chapter to provide easy access to tools discussed in the chapter and to link readers with organizations that provide on-going, up-to-date information and resources on the topic.
- An Appendix provides additional geriatric-specific resources for the reader that can be applied to all topics.

Although this book is entitled *Evidence-Based Geriatric Nursing: Protocols for Best Practice*, the text may be utilized by educators for geriatric nursing courses and advance practice nurses and by many other disciplines including interdisciplinary team members, nursing home and other staff educators, social workers, dieticians, advance practice nurses, physician assistants, and physicians. Many interventions that are proactively identified and implemented by nurses can make a significant difference in improving outcomes, but nurses cannot provide for the complex needs of older adults in isolation. Research has shown that interdisciplinary teams have dramatically improved geriatric patient care and outcomes. We know that communication and collaboration are essential to improve care coordination and prevent iatrogenic complications (IOM, 2001). Caring for the older adult, as the baby boom population continues to "age in," will be an ultimate challenge in healthcare. Each of us must work together and be committed to provide a culture of safety that vulnerable older adults need in order to receive the safest, evidence-based clinical care with optimum outcomes.

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Evidence-Based Geriatric Nursing Protocols for Best Practice

Developing and Evaluating Clinical Practice Guidelines: A Systematic Approach

1

Rona F. Levin and Susan Kaplan Jacobs

Clinical decision making that is grounded in the best available evidence is essential to promote patient safety and quality health care outcomes. With the knowledge base for geriatric nursing rapidly expanding, assessing geriatric clinical practice guidelines (CPGs) for their validity and incorporation of the best available evidence is critical to the safety and outcomes of care. In the second edition of this book, Lucas and Fulmer (2003) challenged geriatric nurses to take the lead in the assessment of geriatric clinical practice guidelines (CPGs), recognizing that in the absence of best evidence, guidelines and protocols have little value for clinical decision making. In the third edition of this book, Levin, Singleton, and Jacobs (2008) proposed a method for ensuring that the protocols included in the book were based on a systematic review of the literature and synthesis of best evidence.

The purpose of this chapter is to describe the process that was used to create the fourth edition of *Evidence-Based Geriatric Nursing Protocols for Best Practice*. Prior to the third edition of this book, each chapter author individually gathered and synthesized evidence on a particular topic and then developed a "nursing standard of practice protocol" based on that evidence. There was no standard process or specific criteria for protocol development nor was there any indication of the "level of evidence" of each source cited in the chapter (i.e., the evidence base for the protocol). In the third edition and this fourth edition, the process previously used to develop the geriatric nursing protocols has been enhanced. This chapter is a guide to understanding how the geriatric nursing protocols in these third and fourth editions were developed and describes how to use the process to guide the assessment and/or development and updating of practice protocols in any area of nursing practice.

DEFINITION OF TERMS

Evidence-based practice (EBP) is a framework for clinical practice that integrates the best available scientific evidence with the expertise of the clinician and with patients' preferences and values to make decisions about health care (Levin & Feldman, 2006; Straus, Richardson, Glasziou, & Haynes, 2005). Health care professionals often use the terms *recommendations*, *guidelines*, and *protocols* interchangeably, but they are not synonymous.

A recommendation is a suggestion for practice, not necessarily sanctioned by a formal, expert group. A clinical practice guideline is an "official recommendation" or suggested approach to diagnose and manage a broad health condition (e.g., heart failure, smoking

cessation, or pain management). A protocol is a more detailed guide for approaching a clinical problem or health condition and is tailored to a specific practice situation. For example, guidelines for falls prevention recommend developing a protocol for toileting elderly, sedated, or confused patients (Rich & Newland, 2006). The specific practices or protocol each agency implements, however, is agency specific. The validity of any of these practice guides can vary depending on the type and the level of evidence on which they are based. Using standard criteria to develop or refine CPGs or protocols assures reliability of their content. Standardization gives both nurses, who use the guideline/protocol, and patients, who receive care based on the guideline/protocol, assurance that the geriatric content and practice recommendations are based on the best evidence.

In contrast to these practice guides, "standards of practice" are not specific or necessarily evidence based; rather, they are a generally accepted, formal, published framework for practice. As an example, the American Nurses Association document, *Nursing: Scope and Standards of Practice* (American Nurses Association, 2010), contains a standard regarding nurses' accountability for making an assessment of a patient's health status. The standard is a general statement. A protocol, on the other hand, may specify the assessment tool(s) to use in that assessment—for example, an instrument to predict pressure-ulcer risk.

THE AGREE INSTRUMENT

The AGREE (*Appraisal of Guidelines for Research & Evaluation*) instrument (http://www .agreecollaboration.org/), created and evaluated by international guideline developers and researchers for use by the National Health Services (AGREE Collaboration, 2001), was initially supported by the UK National Health Services Management Executive and later by the European Union (Cluzeau, Littlejohns, Grimshaw, Feder, & Moran, 1999).

Released in 2001 in its initial form, the purpose of the AGREE instrument is to provide standard criteria with which to appraise CPGs. This appraisal includes evaluation of the methods used to develop the CPG, assessment of the validity of the recommendations made in the guideline, and consideration of factors related to the use of the CPG in practice. Although the AGREE instrument was created to critically appraise CPGs, the process and criteria can also be applied to the development and evaluation of clinical practice protocols. Thus, the AGREE instrument has been expanded for that purpose: to standardize the creation and revision of the geriatric nursing practice protocols in this book.

The initial AGREE instrument and the one used for clinical guideline/protocol development in the third edition of this book has six quality domains: (a) *scope and purpose*, (b) *stakeholder involvement*, (c) *rigour of development*, (d) *clarity and presentation*, (e) *application*, and (f) *editorial independence*. A total of 23 items divided among the domains were rated on a 4-point Likert-type scale from *strongly disagree* to *strongly agree*. Appraisers evaluate how well the guideline they are assessing meets the criteria (i.e., items) of the six quality domains. For example, when evaluating the rigour of development, appraisers rated seven items. The reliability of the AGREE instrument is increased when each guideline is appraised by more than one appraiser. Each of the six domains receives an individual domain score and, based on these scores, the appraiser subjectively assesses the overall quality of a guideline.

Important to note, however, is that the original AGREE instrument was revised in 2009 (http://www.agreetrust.org/), is now called AGREE II, and is the version that we used for this fourth edition (AGREE Next Steps Consortium, 2009). The revision added one new item to the rigour of development domain. This is the current Item 9, which underscores the importance of evaluating the evidence that is applied to practice. Item 9

TABLE 1.1

Sample domain and items from the AGREE II instrument for critical appraisal of clinical practice guidelines with rating scale.

Domain 3: Rigour of Development

   7. Systematic methods were used to search for evidence.

   8. The criteria for selecting the evidence are clearly described.

   9. The strengths and limitations of the body of evidence are clearly described

10. The methods for formulating the recommendations are clearly described.

11. The health benefits, side effects, and risks have been considered in formulating the recommendations.

12. There is an explicit link between the recommendations and the supporting evidence.

13. The guideline has been externally reviewed by experts prior to its publication.

14. A procedure for updating the guideline is provided.

Source: The AGREE Research Trust. (2009). *Appraisal of Guidelines for Research and Evaluation, AGREE II Instrument.* Retrieved from http://www.agreetrust.org/index.aspx?o=1397

reads: "The strengths and limitations of the body of evidence are clearly described." The remainder of the changes included a revision of the Likert-type scale used to evaluate each item in the AGREE II, a reordering of the number assigned to each item based on the addition of the new Item 9 and minor editing of items for clarity. No other substantive changes were made. Table 1.1 includes the items that are in the rigour of development domain and were used for evaluation of evidence in the current edition of this book.

The rigour of development section of the AGREE instrument provides standards for literature-searching and documenting the databases and terms searched. Adhering to these criteria to find and use the best available evidence on a clinical question is critical to the validity of geriatric nursing protocols and, ultimately, to patient safety and outcomes of care.

Published guidelines can be appraised using the AGREE instrument as discussed previously. In the process of guideline development, however, the clinician is faced with the added responsibility of appraising all available evidence for its quality and relevance. In other words, how well does the available evidence support recommended clinical practices? The clinician needs to be able to support or defend the inclusion of each recommendation in the protocol based on its level of evidence. To do so, the guideline must reflect a systematic, structured approach to find and assess the available evidence.

The Search for Evidence Process

Models of EBP describe the evidence-based process in five steps:

1. Develop an answerable question.
2. Locate the best evidence.
3. Critically appraise the evidence.
4. Integrate the evidence into practice using clinical expertise with attention to patient's values and perspectives.
5. Evaluate outcome(s).
   (Flemming, 1998; McKibbon, Wilczynski, Eady, & Marks, 2009; Melnyk & Fineout-Overholt, 2011)

Locating evidence to support development of protocols, guidelines, and reviews requires a comprehensive and systematic review of the published literature, following Steps 1 and 2. A search begins with Step 1, developing an answerable question, which may be in the form of a specific "foreground" question (one that is focused on a particular clinical issue), or it may be a broad question (one that asks for overview information about a disease, condition, or aspect of healthcare) (Flemming, 1998; Melnyk & Fineout-Overholt, 2011; Straus et al., 2005) to gain an overview of the practice problem and interventions and gain insight into its significance. This step is critical to identifying appropriate search terms, possible synonyms, construction of a search strategy, and retrieving relevant results. One example of an answerable foreground question asked in this book is "What is the effectiveness of restraints in reducing the occurrence of falls in patients 65 years of age and older?" Foreground questions are best answered by individual primary studies or syntheses of studies, such as systematic reviews or meta-analyses. PICO templates work best to gather the evidence for focused clinical questions (Glasziou, Del Mar, & Salisbury, 2003). PICO is an acronym for *population*, *intervention* (or occurrence or risk factor), *comparison* (or control), and *outcome*. In the preceding question, the population is patients at risk of falling, 65 years of age and older; the intervention is use of restraints; the implied comparison or control is no restraints; and the desired outcome is decreased incidence of falls. An initial database search would consider the problem (falls) and the intervention (restraints) to begin to cast a wide net to gather evidence. A broader research query, related to a larger category of disease or problem and encompassing multiple interventions, might be "What is the best available evidence regarding the use of restraints in residential facilities?" (Griggs, 2009)

General or overview/background questions may be answered in textbooks, review articles, and "point-of-care" tools that aggregate overviews of best evidence, for example, online encyclopedias, systematic reviews, and synthesis tools (BMJ Publishing Group Limited; The Cochrane Collaboration; Joanna Briggs Institute; UpToDate; Wolters Kluwer Health). This may be helpful in the initial steps of gathering external evidence to support the significance of the problem you believe exists prior to developing your PICO question and investing a great deal of time in a narrow question for which there might be limited evidence.

Step 2, locating the evidence, requires a literature search based on the elements identified in the clinical question. Gathering the evidence for the protocols in this book presented the challenge to conduct literature reviews, encompassing *both* the breadth of overview information as well as the depth of specificity represented in high-level systematic reviews and clinical trials to answer specific clinical questions.

Not every nurse, whether he or she is a clinical practitioner, educator, or administrator, has developed proficient database search skills to conduct a literature review to locate evidence. Beyond a basic knowledge of Boolean logic, truncation, and applying categorical limits to filter results, competency in "information literacy" (Association of College & Research Libraries, 2000) requires experience with the idiosyncrasies of databases, selection of terms, and ease with controlled vocabularies and database functionality. Many nurses report that limited access to resources, gaps in information literacy skills, and, most of all, a lack of time are barriers to "readiness" for EBP (Pravikoff, Tanner, & Pierce, 2005).

For both the third and current edition of this book, the authors enlisted the assistance of a team of New York University health sciences librarians to assure a standard and efficient approach to collecting evidence on clinical topics. Librarians as intermediaries

have been called "an essential part of the health care team by allowing knowledge consumers to focus on the wise interpretation and use of knowledge for critical decision making, rather than spending unproductive time on its access and retrieval" (Homan, 2010, p. 51). The *Cochrane Handbook for Systematic Reviews of Interventions* points out the complexity of conducting a systematic literature review and highly recommends enlisting the help of a healthcare librarian when searching for studies to support locating studies for systematic reviews (Section 6.3.1; Higgins & Green, 2008). The team of librarian/searchers were given the topics, keywords, and suggested synonyms, as well as the evidence pyramid we agreed upon, and they were asked to locate the best available evidence for each broad area addressed in the following chapters.

Search Strategies for Broad Topics

The literature search begins with database selection and translation of search terms into the controlled vocabulary of the database if possible. The major databases for finding the best primary evidence for most clinical nursing questions are CINAHL (Cumulative Index to Nursing and Allied Health Literature) and MEDLINE. The PubMed interface to MEDLINE was used, as it includes added "unprocessed" records to provide access to the most recently published citations. For most topics, the PsycINFO database was searched to ensure capturing relevant evidence in the literature of psychology and behavioral sciences. The Cochrane Database of Systematic Reviews and the Joanna Briggs Institute's evidence summaries (The Cochrane Collaboration; Joanna Briggs Institute) were also searched to provide authors with another synthesized source of evidence for broad topic areas.

The AGREE II instrument was used as a standard against which we could evaluate the process for evidence searching and use in chapter and protocol development (AGREE Next Steps Consortium, 2009). Domain 3, rigour of development, Item 7, states: "The search strategy should be as comprehensive as possible and executed in a manner free from potential biases and sufficiently detailed to be replicated." Taking a tip from the *Cochrane Handbook*, a literature search should capture both the subject terms and the methodological aspects of studies when gathering relevant records (Higgins & Green, 2008). Both of these directions were used to develop search strategies and deliver results to chapter authors using the following guidelines:

- To facilitate replication and update of searches in all databases, search results sent to authors were accompanied by a *search strategy*: listing the keywords/descriptors and search string used in each database searched (e.g., MEDLINE, PsycINFO, CINAHL).
- The time period searched was specified (e.g, 2006–2010).
- Categorical limits or methodological filters were specified. (Some examples are the article type: "meta-analysis" or the "systematic review subset" in Pubmed; the "methodology" limit in PsycINFO for meta-analysis OR clinical trial; the "research" limit in CINAHL.)
- To facilitate replication and update of MEDLINE/PubMed searches, searches were saved and chapter authors were supplied with a login and password for a *My NCBI* account (National Center for Biotechnology Information, U.S. National Library of Medicine), linking to Saved Searches to be rerun at later dates.

The librarian then aggregated evidence in a RefWorks database and sent this output to all chapter authors to enhance their knowledge base and provide a foundation for further exploration of the literature.

Limits, Hedges, and Publication Types

Most bibliographic databases have the functionality to exploit the architecture of the individual citations to *limit* to articles tagged with publication types (such as "meta-analysis" or "randomized controlled trial" in MEDLINE). In CINAHL, methodological filters or "hedges" (Haynes, Wilczynski, McKibbon, Walker, & Sinclair, 1994) for publication types "systematic review," "clinical trials," or "research" articles are available. The commonly used PubMed "Clinical Queries" feature (http://www.nlm.nih.gov/pubs/techbull/mj10/mj10_clin_query.html) is designed for *specific* clinical questions such as the example mentioned previously. Gathering evidence to support broader topics, such as the protocols in this book, presents the searcher with a larger challenge. Limiting searches by methodology can unwittingly eliminate the best evidence for study designs that do not lend themselves to these methods. For example, a cross-sectional retrospective design may provide the highest level of evidence for a study that examines "nurses' perception" of the practice environment (Boltz et al., 2008). Methodological filters have other limitations, such as retrieving citations tagged "randomized controlled trials as topic" or abstracts that state a "systematic review of the literature" was conducted (which is not the same as retrieving a study that is actually a systematic review). Chapter authors were cautioned that the CINAHL database assigns publication type "systematic review" to numerous citations that upon review, we judged to be "Level V" review articles (narrative reviews or literature reviews), not necessarily the high level of evidence we would call "Level I," (which according to our scheme are studies that do a rigorous synthesis and pooling or analysis of research results). It may not be easily discernible from an article title and abstract whether the study is a systematic review with evidence synthesis or a narrative literature review (Lindbloom, Brandt, Hough, & Meadows, 2007). These pitfalls of computerized retrieval are justification for the review by the searcher to weed false hits from the retrieved list of articles.

Precision and Recall

An additional challenge to an intermediary searcher is the need to balance the comprehensiveness of recall (or "sensitivity") with precision ("specificity") to retrieve a "useful" number of references. The *Cochrane Handbook* states: "Searches should seek high sensitivity, which may result in relatively low precision" (Section 6.3; Higgins & Green, 2008). Thus, retrieving a large set of articles may include many irrelevant hits. Conversely, putting too many restrictions on a search may exclude relevant studies. The goal of retrieving the relevant studies for broad topic areas required "sacrificing precision" and deferring to the chapter authors to filter false or irrelevant hits (Jenkins, 2004; Matthews et al., 1999). The iterative nature of a literature search requires that an initial set of relevant references for both broad or specific research questions serves to *point* authors toward best evidence as an adjunct to their own knowledge, their own pursuit of "chains of citation" (McLellan, 2001) and related records, and their clinical expertise. Thus, a list of core references on physical restraints, supplied to a chapter author, might lead to exploring citations related to wandering, psychogeriatric care, or elder abuse (Fulmer, 2002).

LEVELS OF EVIDENCE

Step 3, critical appraisal of the evidence, begins with identifying the methodology used in a study (often evident from reviewing the article abstract) followed by a critical reading and evaluation of the research methodology and results. The coding scheme described in the subsequent text provides the first step in filtering retrieved studies based on research methods.

Levels of evidence offer a schema that, once known, helps the reader to understand the value of the information presented to the clinical topic or question under review. There are many schemas that are used to identify the level of evidence sources. Although multiple schemas exist, they have commonalities in their hierarchical structure, often represented by a pyramid or "publishing wedge" (DiCenso, Bayley, & Haynes, 2009; McKibbon et al., 2009). The highest level of evidence is seen at the top of a pyramid, characterized by increased relevance to the clinical setting in a smaller number of studies. The schema used by the authors in this book for rating the level of evidence comes from the work of Stetler et al. (1998) and Melnyk and Fineout-Overholt (2005; See Figure 1.1).

A Level I evidence rating is given to evidence from synthesized sources (systematic reviews), which can either be meta-analyses or structured integrative reviews of evidence, and CPG's based on Level I evidence. Evidence rated as Level II comes from a randomized controlled trial. A quasi-experimental study such as a nonrandomized controlled single

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FIGURE 1.1

Levels of quantitative evidence.

Level I
Systematic Reviews

Level II
Single experimental study (RCT's)

Level III
Quasi-experimental studies

Level IV
Non-experimental studies

Level V
Case report/program evaluation/narrative literature reviews

Level VI
Opinions of respected authorities
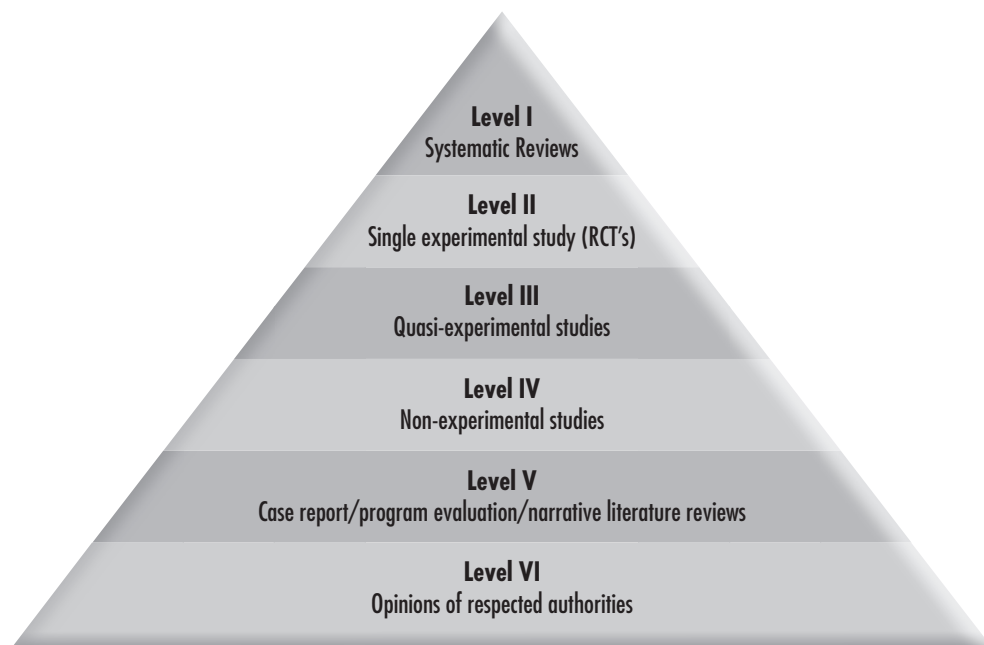
Systematic Reviews (Integrative/Meta-analyses/CPG's based on systematic reviews) Adapted from Stetler, C. B., Morsi, D., Rucki, S., Broughton, S., Corrigan, B., Fitzgerald, J., . . . Sheridan, E. A. (1998). Utilization-focused integrative reviews in a nursing service. *Applied Nursing Research*, *11*(4), 195–206; Melnyk, B. M., & Fineout-Overholt, E. (2005). *Evidence-based practice in nursing & healthcare: A guide to best practice* (p. 608). Philadelphia, PA: Lippincott Williams & Wilkins.

EXHIBIT 1.1

An example of a coded literature citation supplied to protocol author.

REF ID: 22449 Level IV

Boltz, M., Capezuti, E., Bowar-Ferres, S., Norman, R., Secic, M., Kim, H. et al. (2008). Hospital nurses' perception of the geriatric nurse practice environment. *Journal of Nursing Scholarship,* *40*(3), 282-289.

Purpose: To test the relationship between nurses' perceptions of the geriatric nurse practice environment (GNPE) and perceptions of geriatric-care delivery, and geriatric nursing knowledge. Design: A secondary analysis of data collected by the New York University Hartford Institute Benchmarking Service staff using a retrospective, cross-sectional, design. Methods: Responses of 9,802 direct-care registered nurses from 75 acute-care hospitals in the US that administered the GIAP (Geriatric Institutional Assessment Profile) from January 1997 to December 2005 were analyzed using linear mixed effects modeling to explore associations between variables while controlling for potential covariates. Findings: Controlling for hospital and nurse characteristics, a positive geriatric nurse practice environment was associated with positive geriatric care delivery (F=4,686, p<.0001) but not geriatric nursing knowledge. The independent contribution of all three dimensions of the geriatric nurse practice environment (resource availability, institutional values, and capacity for collaboration) influences care delivery for hospitalized older-adult patients. Conclusions: Organizational support for geriatric nursing is an important influence upon quality of geriatric care. Clinical Relevance: Hospitals that utilize an organizational approach addressing the multifaceted nature of the GNPE are more likely to improve the hospital experience of older adults.

group pretest and posttest time series or matched case-controlled study is considered Level III evidence. Level IV evidence comes from a nonexperimental study, such as correlational descriptive research and qualitative or case-control studies. A narrative literature review, a case report systematically obtained and of verifiable quality, or program evaluation data are rated as Level V. Level VI evidence is identified as the opinion of respected authorities (e.g., nationally known) based on their clinical experience or the opinions of an expert committee, including their interpretation of non-research-based information. This level also includes regulatory or legal opinions. Level I evidence is considered the strongest.

For all topics, the results of literature searches were organized in a searchable, web-based RefWorks "shared" folder and coded for level of evidence. The authors were then charged with reviewing the evidence and deciding on its quality and relevance for inclusion in their chapter or protocol. The critical appraisal of research uses specialized tools designed to evaluate the methodology of the study. Examples are the AGREE instrument (which this volume of protocols conforms to) (AGREE Next Steps Consortium, 2009), the Critical Appraisal Skills Programme (CASP) (Solutions for Public Health), and the PRISMA Statement (PRISMA: Transparent reporting) among others.

An additional feature implemented in the previous edition of this book is the inclusion of the level and type of evidence for each reference, which leads to a recommendation for practice (See Exhibit 1.1). Using this type of standard approach ensures that this book contains protocols and recommendations for use with geriatric patients and their families that are based on the best available evidence.

SUMMARY

The protocols contained in this edition, therefore, have been refined, revised, and/or developed by the authors using the best available research evidence as a foundation,

with the ultimate goal of improving patient safety and outcomes. The systematic process we used for finding, retrieving, and disseminating the best evidence for the fourth edition of *Geriatric Nursing Protocols for Best Practice* provides a model for the use of research evidence in nursing education and in clinical practice. Translating nursing research into practice requires competency in information literacy, knowledge of the evidence-based process, and the ability to discern the context of a research study as ranked hierarchically. The following chapters and protocols present both overview and foreground information in readiness for taking the next steps in the EBP process: Step 4, integrate the evidence with clinical expertise and patient's values and perspective, and Step 5, evaluate outcome.

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Measuring Performance, Improving Quality

<div align="right">2</div>

Lenard L. Parisi

EDUCATIONAL OBJECTIVES

After completion of this chapter, the reader will be able to:

1. discuss key components of the definition of quality as outlined by the Institute of Medicine (IOM)
2. describe three challenges of measuring quality of care
3. delineate three strategies for addressing the challenges of measuring quality
4. list three characteristics of a good performance measure

Nadzam and Abraham (2003) state that, "The main objective of implementing best practice protocols for geriatric nursing is to stimulate nurses to practice with greater knowledge and skill, and thus improve the quality of care to older adults" (p. 11). Although improved patient care and safety certainly is a goal, providers also need to be focused on the implementation of evidence-based practice and on improving outcomes of care. The implementation of evidenced-based nursing practice as a means to providing safe, quality patient care, and positive outcomes is well supported in the literature. However, in order to ensure that protocols are implemented correctly, as is true with the delivery of all nursing care, it is essential to evaluate the care provided. Outcomes of care are gaining increased attention and will be of particular interest to providers as the health care industry continues to move toward a "pay-for-performance (P4P)/value-based purchasing (VBP)" reimbursement model.

BACKGROUND AND STATEMENT OF PROBLEM

The improvement of care and clinical outcomes—or, as it is commonly known as Performance Improvement—requires a defined, organized approach. Improvement efforts are typically guided by the organization's Quality Assessment (measurement) and Performance Improvement (process improvement) model. Some well-known models or approaches for improving care and processes include Plan-Do-Study-Act (PDSA; Institute for Health Care Improvement, see http://www.ihi.org/IHI/Topics/Improvement/ImprovementMethods/Tools/Plan-Do-Study-Act%20(PDSA)%20Worksheet) and Six

Sigma (see http://asq.org/learn-about-quality/six-sigma/overview/overview.html). These methodologies are simply an organized approach to defining improvement priorities, collecting data, analyzing the data, making sound recommendations for process improvement, implementing identified changes, and then reevaluating the measures. Through Performance Improvement, standards of care (e.g., Nurses Improving Care for Health-system Elders [NICHE] protocols, in this case) are identified, evaluated, analyzed for variances, and improved. The goal is to standardize and improve patient care and outcomes. Restructuring, redesigning, and innovative processes aid in improving the quality of patient care. However, nursing professionals must be supported by a structure of continuous improvement that empowers nurses to make changes and delivers reliable outcomes (Johnson, Hallsey, Meredith, & Warden, 2006).

From the very beginning of the NICHE project in the early 1990s (Fulmer et al., 2002), the NICHE team has struggled with the following questions: How can we measure whether the combination of models of care, staff education and development, and organizational change leads to improvements in patient care? How can we provide hospitals and health systems that are committed to improving their nursing care to older adults with guidance and frameworks, let alone tools for measuring the quality of geriatric care? In turn, these questions generated many other questions: Is it possible to measure quality? Can we identify direct indicators of quality? Or do we have to rely on indirect indicators (e.g., if 30-day readmissions of patients older than the age of 65 drop, can we reasonably state that this reflects an improvement in the quality of care)? What factors may influence our desired quality outcomes, whether these are unrelated factors (e.g., the pressure to reduce length of stay) or related factors (e.g., the severity of illness)? How can we design evaluation programs that enable us to measure quality without adding more burden (of data collection, of taking time away from direct nursing care)? No doubt, the results from evaluation programs should be useful at the "local" level. Would it be helpful, though, to have results that are comparable across clinical settings (within the same hospital or health system) and across institutions (e.g., as quality benchmarking tools)? Many of these questions remain unanswered today, although the focus on defining practice through an evidence-based approach is becoming the standard, for it is against a standard of care that we monitor and evaluate expected care. Defining outcomes for internal and external reporting is expected, as is the improvement of processes required to deliver safe, affordable, and quality patient care.

This chapter provides guidance in the selection, development, and use of performance measures to monitor quality of care as a springboard to Performance Improvement initiatives. Following a definition of quality of care, the chapter identifies several challenges in the measurement of quality. The concept of performance measures as the evaluation link between care delivery and quality improvement is introduced. Next, the chapter offers practical advice on what and how to measure (Fulmer et al., 2002). It also describes external comparative databases sponsored by Centers for Medicare & Medicaid Services (CMS) and other quality improvement organizations. It concludes with a description of the challenge to selecting performance measures.

It is important to reaffirm two key principles for the purposes of evaluating nursing care in this context. First, at the management level, it is indispensable to measure the quality of geriatric nursing care; however, doing so must help those who actually provide care (nurses) and must impact on those who receive care (older adult patients). Second, measuring quality of care is not the end goal; rather, it is done to enable the continuous use of quality-of-care information to improve patient care.

ASSESSMENT OF THE PROBLEM

Quality Health Care Defined

It is not uncommon to begin a discussion of quality-related topics without reflecting on one's own values and beliefs surrounding quality health care. Many have tried to define the concept; but like the old cliché "beauty is in the eye of the beholder," so is our own perception of quality. Health care consumers and providers alike are often asked, "What does quality mean to you?" The response typically varies and includes statements such as "a safe health care experience," "receiving correct medications," "receiving medications in a timely manner," "a pain-free procedure or postoperative experience," "compliance with regulation," "accessibility to services," "effectiveness of treatments and medications," "efficiency of services," "good communication among providers," "information sharing," and "a caring environment." These are important attributes to remember when discussing the provision of care with clients and patients.

The IOM defines *quality of care* as "the degree to which health services for individuals and populations increase[s] the likelihood of desired health outcomes and are consistent with current professional knowledge" (Kohn, Corrigan, & Donaldson, 2000, p. 211). Note that this definition does not tell us what quality is, but what quality should achieve. This definition also does not say that quality exists if certain conditions are met (e.g., a ratio of x falls to y older orthopedic surgery patients, a 30-day readmission rate of z). Instead, it emphasizes that the likelihood of achieving desired levels of care is what matters. In other words, quality is not a matter of reaching something but, rather, the challenge, over and over, of improving the odds of reaching the desired level of outcomes. Thus, the definition implies the cyclical and longitudinal nature of quality: What we achieve today must guide us as to what to do tomorrow—better and better, over and over. The focus being on improving processes while demonstrating sustained improvement.

The IOM definition stresses the framework within which to conceptualize quality: knowledge. The best knowledge to have is research evidence—preferably from randomized clinical trials (experimental studies)—yet without ignoring the relevance of less rigorous studies (nonrandomized studies, epidemiological investigations, descriptive studies, even case studies). Realistically, in nursing, we have limited evidence to guide the care of older adults. Therefore, professional consensus among clinical and research experts is a critical factor in determining quality. Furthermore, knowledge is needed at three levels: To achieve quality, we need to know what to do (knowledge about best practice), we need to know how to do it (knowledge about behavioral skills), and we need to know what outcomes to achieve (knowledge about best outcomes).

The IOM definition of quality of care contains several other important elements. "Health services" focuses the definition on the care itself. Granted, the quality of care provided is determined by such factors as knowledgeable professionals, good technology, and efficient organizations; however, these are not the focus of quality measurement. Rather, the definition implies a challenge to health care organizations: The system should be organized in such a way that knowledge-based care is provided and that its effects can be measured. This brings us to the "desired health outcomes" element of the definition. Quality is not an attribute (as in "My hospital is in the top 100 hospitals in the United States as ranked by *U.S. News & World Report*"), but an ability (as in "Only x% of our older adult surgical patients go into acute confusion; of those who do, y% return to normal cognitive function within z hours after onset").

In the IOM definition, *degree* implies that quality occurs on a continuum from unacceptable to excellent. The clinical consequences are on a continuum as well. If the care is of unacceptable quality, the likelihood that we will achieve the desired outcomes is nil. In fact, we probably will achieve outcomes that are the opposite of what are desired. As the care moves up the scale toward excellent, the more likely the desired outcomes will be achieved. Degree also implies quantification. Although it helps to be able to talk to colleagues about, say, unacceptable, poor, average, good, or excellent care, these terms should be anchored by a measurement system. Such systems enable us to interpret what, for instance, poor care is by providing us with a range of numbers that correspond to *poor*. In turn, these numbers can provide us with a reference point for improving care to the level of average: We measure care again, looking at whether the numbers have improved, then checking whether these numbers fall in the range defined as *average*. Likewise, if we see a worsening of scores, we will be able to conclude whether we have gone from, say, good to average. *Individuals* and *populations* underscores that quality of care is reflected in the outcomes of one patient and in the outcomes of a set of patients. It focuses our attention on providing quality care to individuals while aiming to raise the level of care provided to populations of patients.

In summary, the IOM definition of quality of care forces us to think about quality in relative and dynamic rather than in absolute and static terms. Quality of care is not a state of being but a process of becoming. Quality is and should be measurable, using performance measures—"a quantitative tool that provides an indication of an organization's performance in relation to a specified process or outcome" (Schyve & Nadzam, 1998, p. 222).

Quality improvement is a process of attaining ever better levels of care in parallel with advances in knowledge and technology. It strives toward increasing the likelihood that certain outcomes will be achieved. This is the professional responsibility of those who are charged with providing care (clinicians, managers, and their organizations). On the other hand, consumers of health care (not only patients but also purchasers, payors, regulators, and accreditors) are much less concerned with the processes in place, as with the results of those processes.

Clinical Outcomes and Publicly Reported Quality Measures

Although it is important to evaluate clinical practices and processes, it is equally important to evaluate and improve outcomes of care. Clinical outcome indicators are receiving unprecedented attention within the health care industry from providers, payors, and consumers alike. Regulatory and accrediting bodies review outcome indicators to evaluate the care provided by the organization prior to and during regulatory and accrediting surveys, and to evaluate clinical and related processes. Organizations are expected to use outcome data to identify and prioritize the processes that support clinical care and demonstrate an attempt to improve performance. Providers may use outcomes data to support best practices by benchmarking their results with similar organizations. The benchmarking process is supported through publicly reported outcomes data at the national and state levels. National reporting occurs on the CMS website, where consumers and providers alike may access information and compare hospitals, home-care agencies, nursing homes, and managed care plans. For example, the websites http://www.hospitalcompare.hhs.gov, http://www.medicare.gov/nhcompare/, and http://www.medicare.gov/HomeHealthCompare

list outcome indicators relative to the specific service or delivery model. Consumers may use those websites to select organizations and compare outcomes, one against another, to aid in their selection of a facility or service. These websites also serve as a resource for providers to benchmark their outcomes against those of another organization. Outcomes data also become increasingly important to providers as the industry shifts toward a P4P/ VBP model.

In a P4P/VBP model, practitioners are reimbursed for achieved quality-of-care outcomes. Currently, the CMS has several P4P initiatives and demonstration projects (see http://www.cms.gov/DemoProjectsEvalRpts/ for details). The *Hospital Quality Initiative* (see http://www.cms.gov/HospitalQualityInits/ and http://www.cms.gov/HospitalQualityInits/Downloads/Hospital_VBP_102610.pdf for a detailed overview) is part of the U.S. Department of Health and Human Services' broader national quality initiative that focuses on an initial set of 10 quality measures by linking reporting of those measures to the payments the hospitals receive for each discharge. The purpose of the Premier Hospital Quality Incentive Demonstration (see http://www.cms.gov/HospitalQualityInits/35_HospitalPremier.asp for more details and outcomes) was to have improved the quality of inpatient care for Medicare beneficiaries by giving financial incentives to almost 300 hospitals for high quality. The Physician Group Practice Demonstration, mandated by the Medicare, Medicaid, and State Children's Health Insurance Program (SCHIP) Benefits Improvement and Protection Act of 2000 (BIPA), is the first P4P initiative for physicians under the Medicare program. The Medicare Care Management Performance Demonstration (Medicare Modernization Act [MMA] section 649), modeled on the "bridges to excellence" program, is a 3-year P4P demonstration with physicians to promote the adoption and use of health information technology to improve the quality of patient care for chronically ill Medicare patients. The Medicare Health Care Quality Demonstration, mandated by section 646 of the MMA, is a 5-year demonstration program under which projects enhance quality by improving patient safety, reducing variations in utilization by appropriate use of evidence-based care and best practice guidelines, encouraging shared decision making, and using culturally and ethnically appropriate care.

INTERVENTIONS AND CARE STRATEGIES

Measuring Quality of Care

Schyve and Nadzam (1998) identified several challenges to measuring quality. First, the suggestion that quality of care is in the eye of the beholder points to the different interests of multiple users. This issue encompasses both measurement and communication challenges. Measurement and analysis methods must generate information about the quality of care that meets the needs of different stakeholders. In addition, the results must be communicated in ways that meet these different needs. Second, we must have good and generally accepted tools for measuring quality. Thus, user groups must come together in their conceptualization of quality care so that relevant health care measures can be identified and standardized. A common language of measurement must be developed, grounded in a shared perspective on quality that is cohesive across, yet meets the needs of various user groups. Third, once the measurement systems are in place, data must be collected. This translates into resource demands and logistic issues as to who is

to report, record, collect, and manage data. Fourth, data must be analyzed in statistically appropriate ways. This is not just a matter of using the right statistical methods. More important, user groups must agree on a framework for analyzing quality data to interpret the results. Fifth, health care environments are complex and dynamic in nature. There are differences across health care environments, between types of provider organizations, and within organizations. Furthermore, changes in health care occur frequently, such as the movement of care from one setting to another and the introduction of new technology. Finding common denominators is a major challenge.

Addressing the Challenges

These challenges are not insurmountable. However, making a commitment to quality care entails a commitment to putting the processes and systems in place to measure quality through performance measures and to report quality-of-care results. This commitment applies as much to a quality-improvement initiative on a nursing unit as it does to a corporate commitment by a large health care system. In other words, once an organization decides to pursue excellence (i.e., quality), it must accept the need to overcome the various challenges to measurement and reporting. Let us examine how this could be done in a clinical setting.

McGlynn and Asch (1998) offer several strategies for addressing the challenges to measuring quality. First, the various user groups must identify and balance competing perspectives. This is a process of giving and taking: not only proposing highly clinical measures (e.g., prevalence pressure ulcers) but also providing more general data (e.g., use of restraints). It is a process of asking and responding: not only asking management for monthly statistics on medication errors but also agreeing to provide management with the necessary documentation of the reasons stated for restraint use. Second, there must be an accountability framework. Committing to quality care implies that nurses assume several responsibilities and are willing to be held accountable for each of them: (a) providing the best possible care to older patients, (b) examining their own geriatric nursing knowledge and practice, (c) seeking ways to improve it, (d) agreeing to evaluation of their practice, and (e) responding to needs for improvement. Third, there must be objectivity in the evaluation of quality. This requires setting and adopting explicit criteria for judging performance, then building the evaluation process on these criteria. Nurses, their colleagues, and their managers need to reach consensus on how performance will be measured and what will be considered excellent (and good, average, etc.) performance. Fourth, once these indicators have been identified, nurses need to select a subset of indicators for routine reporting. Indicators should give a reliable snapshot of the team's care to older patients. Fifth, it is critical to separate as much as possible the use of indicators for evaluating patient care and the use of these indicators for financial or nonfinancial incentives. Should the team be cost conscious? Yes, but cost should not influence any clinical judgment as to what is best for patients. Finally, nurses in the clinical setting must plan how to collect the data. At the institutional level, this may be facilitated by information systems that allow performance measurement and reporting. Ideally, point-of-care documentation will also provide the data necessary for a systematic and goal-directed quality-improvement program, thus, eliminating separate data abstraction and collection activities.

The success of a quality-improvement program in geriatric nursing care (and the ability to overcome many of the challenges) hinges on the decision as to what to measure.

We know that good performance measures must be objective, that data collection must be easy and as burdenless as possible, that statistical analysis must be guided by principles and placed within a framework, and that communication of results must be targeted toward different user groups. Conceivably, we could try to measure every possible aspect of care; realistically, however, the planning for this will never reach the implementation stage. Instead, nurses need to establish priorities by asking these questions: Based on our clinical expertise, what is critical for us to know? What aspects of our care to older patients are high risk or high volume? What parts of our elder care are problem-prone, either because we have experienced difficulties in the past or because we can anticipate problems caused by the lack of knowledge or resources? What clinical indicators would be of interest to other user groups: patients, the general public, management, payors, accreditors, and practitioners? Throughout this prioritization process, nurses should keep asking themselves: What questions are we trying to answer, and for whom?

Measuring Performance — Selecting Quality Indicators

The correct selection of performance measures or quality indicators is a crucial step in evaluating nursing care and is based on two important factors: frequency and volume. Clearly, high-volume practices or frequent processes require focused attention—to ensure that the care is being delivered according to protocol or processes are functioning as designed. Problem-prone or high-risk processes would also warrant a review because these are processes with inherent risk to patients or variances in implementing the process. The selection of indicators must also be consistent with organizational goals for improvement. This provides buy-in from practitioners as well as administration when reporting and identifying opportunities for improvement. Performance measures (indicators) must be based on either a standard of care, policy, procedure, or protocol. These documents, or standards of care, define practice and expectations in the clinical setting and, therefore, determine the criteria for the monitoring tool. The measurement of these standards simply reflects adherence to or implementation of these standards. Once it is decided what to measure, nurses in the clinical geriatric practice setting face the task of deciding how to measure performance. There are two possibilities: either the appropriate measure (indicator) already exists or a new performance measure must be developed. Either way, there are a number of requirements of a good performance measure that will need to be applied.

Although indicators used to monitor patient care and performance do not need to be subject to the rigors of research, it is imperative that they reflect some of the attributes necessary to make relevant statements about the care. The measure and its output need to focus on improvement, not merely the description of something. It is not helpful to have a very accurate measure that just tells the status of a given dimension of practice. Instead, the measure needs to inform us about current quality levels and relate them to previous and future quality levels. It needs to be able to compute improvements or declines in quality over time so that we can plan for the future. For example, to have a measure that only tells the number of medication errors in the past month would not be helpful. Instead, a measure that tells what types of medication errors were made, perhaps even with a severity rating indicated, compares this to medication errors made during the previous months, and shows in numbers and graphs the changes over time that will enable us to do the necessary root-cause analysis to prevent more medication errors in the future.

Performance measures need to be clearly defined, including the terms used, the data elements collected, and the calculation steps employed. Establishing the definition

prior to implementing the monitoring activity allows for precise data collection. It also facilitates benchmarking with other organizations when the data elements are similarly defined and the data collection methodologies are consistent. Imagine that we want to monitor falls on the unit. The initial questions would be as follows: What is considered a fall? Does the patient have to be on the floor? Does a patient slumping against the wall or onto a table while trying to prevent himself or herself from falling to the floor constitute a fall? Is a fall due to physical weakness or orthostatic hypotension treated the same as a fall caused by tripping over an obstacle? The next question would be the following: Over what time are falls measured: a week, a fortnight, a month, a quarter, a year? The time frame is not a matter of convenience but of accuracy. To be able to monitor falls accurately, we need to identify a time frame that will capture enough events to be meaningful and interpretable from a quality improvement point of view. External indicator definitions, such as those defined for use in the National Database of Nursing Quality Indicators, provide guidance for both the indicator definition as well as the data collection methodology for *nursing-sensitive indicators*. The nursing-sensitive indicators reflect the structure, process, and outcomes of nursing care. The *structure* of nursing care is indicated by the supply of nursing staff, the skill level of the nursing staff, and the education/certification of nursing staff. *Process* indicators measure aspects of nursing care such as assessment, intervention, and registered nurse (RN) job satisfaction. Patient *outcomes* that are determined to be nursing sensitive are those that improve if there is a greater quantity or quality of nursing care (e.g., pressure ulcers, falls, intravenous [IV] infiltrations) and are not considered "nursing-sensitive" (e.g., frequency of primary C-sections, cardiac failure; see http://www.nursingquality .org/FAQPage.aspx#1 for details). Several nursing organizations across the country participate in data collection and submission, which allows for a robust database and excellent benchmarking opportunities.

Additional indicator attributes include validity, sensitivity, and specificity. *Validity* refers to whether the measure "actually measures what it purports to measure" (Wilson, 1989). *Sensitivity* and *specificity* refer to the ability of the measure to capture all true cases of the event being measured, and only true cases. We want to make sure that a performance measure identifies true cases as true, and false cases as false, and does not identify a true case as false or a false case as true. Sensitivity of a performance measure is the likelihood of a positive test when a condition is present. Lack of sensitivity is expressed as false positives: The indicator calculates a condition as present when in fact it is not. Specificity refers to the likelihood of a negative test when a condition is not present. False-negatives reflect lack of specificity: The indicators calculate that a condition is not present when in fact it is. Consider the case of depression and the recommendation in Chapter 9, Depression in Older Adults, to use the Geriatric Depression Scale, in which a score of 11 or greater is indicative of depression. How robust is this cutoff score of 11? What is the likelihood that someone with a score of 9 or 10 (i.e., negative for depression) might actually be depressed (false-negative)? Similarly, what is the likelihood that a patient with a score of 13 would not be depressed (false positive)?

Reliability means that results are reproducible; the indicator measures the same attribute consistently across the same patients and across time. Reliability begins with a precise definition and specification, as described earlier. A measure is reliable if different people calculate the same rate for the same patient sample. The core issue of reliability is measurement error, or the difference between the actual phenomenon and its measurement: The greater the difference, the less reliable the performance measure. For example,

suppose that we want to focus on pain management in older adults with end-stage cancer. One way of measuring pain would be to ask patients to rate their pain as none, a little, some, quite a bit, or a lot. An alternative approach would be to administer a visual analog scale, a 10-point line on which patients indicate their pain levels. Yet another approach would be to ask the pharmacy to produce monthly reports of analgesic use by type and dose. Generally speaking, the more subjective the scoring or measurement, the less reliable it will be. If all these measures were of equal reliability, they would yield the same result. Concept of reliability, particularly inter-rate reliability, becomes increasingly important to consider in those situations where data collection is assigned to several staff members. It is important to review the data collection methodology and the instrument in detail to avoid different approaches by the various people collecting the data.

Several of the examples given earlier imply the criterion of interpretability. A performance measure must be interpretable; that is, it must convey a result that can be linked to the quality of clinical care. First, the quantitative output of a performance measure must be scaled in such a way that users can interpret it. For example, a scale that starts with 0 as the lowest possible level and ends with 100 is a lot easier to interpret than a scale that starts with 13.325 and has no upper boundary except infinity. Second, we should be able to place the number within a context. Suppose we are working in a hemodialysis center that serves quite a large proportion of patients with end-stage renal disease (ESRD) and are older than the age of 60—the group least likely to be fit for a kidney transplant yet with several years of life expectancy remaining. We know that virtually all patients with ESRD develop anemia (hemoglobin [Hb] level less than 11 g/dL), which in turn impacts on their activities of daily living (ADL) and independent activities of daily living (IADL) performance. In collaboration with the nephrologists, we initiate a systematic program of anemia monitoring and management, relying in part on published best practice guidelines. We want to achieve the best practice guideline of 85% of all patients having Hb levels equal to or greater than 11 g/dL. We should be able to succeed because the central laboratory provides us with Hb levels, which allows us to calculate the percentage of patients at Hb of 11 g/dL or greater.

The concept of risk-adjusted performance measures or outcome indicators is an important one. Some patients are more sick than others, some have more comorbidities, and some are older and frailer. No doubt, we could come up with many more risk variables that influence how patients respond to nursing care. Good performance measures take this differential risk into consideration. They create a "level playing field" by adjusting quality indicators on the basis of the (risk for) severity of illness of the patients. It would not be fair to the health care team if the patients on the unit are a lot sicker than those on the unit a floor above. The team is at greater risk for having lower quality outcomes, not because they provide inferior care, but because the patients are a lot more sick and are at greater risk for a compromised response to the care provided. The more sick patients are more demanding in terms of care and ultimately are less likely to achieve the same outcomes as less ill patients. Performance measures must be easy to collect. The many examples cited earlier also refer to the importance of using performance measures for which data are readily available, can be retrieved from existing sources or can be collected with little burden. The goal is to gather good data quickly without running the risk of having "quick and dirty" data.

We begin the process of deciding how to measure by reviewing existing measures. There is no need to reinvent the wheel, especially if good measures are out there. Nurses should review the literature, check with national organizations, and consult with

colleagues. Yet, we should not adopt existing measures blindly. Instead, we need to subject them to a thorough review using the characteristics identified previously. Also, health care organizations that have adopted these measures can offer their experience.

It may be that after an exhaustive search, we cannot find measures that meet the various requirements outlined previously. We decide instead to develop our own in-house measure. The following are some important guidelines:

1. *Zero in on the population to be measured*. If we are measuring an undesirable event, we must determine the group at risk for experiencing that event, then limit the denominator population to that group. If we are measuring a desirable event or process, we must identify the group that should experience the event or receive the process. Where do problems tend to occur? What variables of this problem are within our control? If some are not within our control, how can we zero in even more on the target population? In other words, we exclude patients from the population when good reason exists to do so (e.g., those allergic to the medication being measured).
2. *Define terms*. This is a painstaking but essential effort. It is better to measure 80% of an issue with 100% accuracy than 100% of an issue with 80% accuracy.
3. *Identify and define the data elements and allowable values required to calculate the measure*. This is another painstaking but essential effort. The 80/100 rule applies here, as well.
4. *Test the data collection process*. Once we have a prototype of a measure ready, we must examine how easy or difficult it is to get all the required data.

IMPLEMENTING THE QUALITY ASSESSMENT AND PERFORMANCE IMPROVEMENT PROGRAM

Successful Performance Improvement programs require an organizational commitment to implementation of the Performance Improvement processes and principles outlined in this chapter. Consequently, this commitment requires a defined, organized approach that most organizations embrace and define in the form of a written plan. The plan outlines the approach the organization uses to improve care and safety for its patients. There are several important elements that must be addressed in order to implement the Performance Improvement program effectively. The scope of service, which addresses the types of patients and care that is rendered, provides direction on the selection of performance measures. An authority and responsibility statement in the document defines who is able to implement the quality program and make decisions that will affect its implementation. Finally, it is important to define the committee structure used to effectively analyze and communicate improvement efforts to the organization.

The success of the Performance Improvement program is highly dependent on a well-defined structure and appropriate selection of performance measures. The following is a list of issues that, if not addressed, may negatively impact the success of the quality program:

1. *Lack of focus*: a measure that tries to track too many criteria at the same time or is too complicated to administer, interpret, or use for quality monitoring and improvement
2. *Wrong type of measure*: a measure that calculates indicators the wrong way (e.g., uses rates when ratios are more appropriate; uses a continuous scale rather than a discrete scale; measures a process when the outcome is measurable and of greater interest)
3. *Unclear definitions*: a measure that is too broad or too vague in its scope and definitions (e.g., population is too heterogeneous, no risk adjustment, unclear data elements, poorly defined values)

4. *Too much work*: a measure that requires too much clinician time to generate the data or too much manual chart abstraction
5. *Reinventing the wheel*: a measure that is a reinvention rather than an improvement of a performance measure
6. *Events not under control*: measure focuses on a process or outcome that is out of the organization (or the unit's) control to improve
7. *Trying to do research rather than quality improvement*: data collection and analysis are done for the sake of research rather than for improvement of nursing care and the health and well-being of the patients
8   *Poor communication of results*: the format of communication does not target and enable change
9. *Uninterpretable and underused*: uninterpretable results are of little relevance to improving geriatric nursing care

In summary, the success of the Quality Assessment Performance Improvement Program's ability to measure, evaluate, and improve the quality of nursing care to health system elders is in the planning. First, it is important to define the scope of services provided and those to be monitored and improved. Second, identify performance measures that are reflective of the care provided. Indicators may be developed internally or may be obtained from external sources of outcomes and data collection methodologies. Third, it is important to analyze the data, pulling together the right people to evaluate processes, make recommendations, and improve care. Finally, it is important to communicate findings across the organization and celebrate success.

RESOURCES

Hospital Compare
http://www.hospitalcompare.hhs.gov/

Nursing Home Compare
http://www.medicare.gov/nhcompare/

Home Health Compare
http://www.medicare.gov/HomeHealthCompare

Centers for Medicare and Medicaid Services Hospital Quality Initiatives
http://www.cms.gov/HospitalQualityInits/

Centers for Medicare and Medicaid Services Hospital Quality Initiatives Press Release, dated 9/17/09
http://www.cms.gov/HospitalQualityInits/downloads/HospitalPremierPressReleases20090817.pdf

Centers for Medicare and Medicaid Services Demonstration Projects and Evaluation Reports
http://www.cms.gov/DemoProjectsEvalRpts/MD/list.asp?intNumPerPage=all

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Age-Related Changes in Health

<div style="text-align:right">3</div>

Constance M. Smith and Valerie T. Cotter

EDUCATIONAL OBJECTIVES

On completion of this chapter, the reader should be able to:

1. describe the structural and functional changes in multiple body systems that occur during the normal aging process
2. understand the clinical significance of these age-related changes regarding the health and disease risks of the older adult
3. discuss the components of a nursing assessment for the older adult in light of the manifestations of normal aging
4. identify care strategies to promote successful aging in older adults, with consderation of age-related changes

The process of normal aging, independent of disease, is accompanied by a myriad of changes in body systems. As evidenced by longitudinal studies such as the Baltimore Longitudinal Study of Aging (2010), modifications occur in both structure and function of organs and are most pronounced in advanced age of 85 years or older (Hall, 2002). Many of these alterations are characterized by a decline in physiological reserve, so that, although baseline function is preserved, organ systems become progressively less capable of maintaining homeostasis in the face of stresses imposed by the environment, disease, or medical therapies (Miller, 2009). Age-related changes are strongly impacted by genetics, as well as by long-term lifestyle factors, including physical activity, diet, alcohol consumption, and tobacco use (Kitzman & Taffet, 2009). Furthermore, great heterogeneity occurs among older adults; clinical manifestations of aging can range from stability to significant decline in function of specific organ systems (Beck, 1998).

The clinical implications of these age-related alterations are important in nursing assessment and care of the older adult for several reasons. First, changes associated with normal aging must be differentiated from pathological processes in order to develop appropriate interventions (Gallagher, O'Mahony, & Quigley, 2008). Manifestations of aging can also adversely impact the health and functional capability of older adults and

For description of Evidence Levels cited in this chapter, see Chapter 1, Developing and Evaluating Clinical Practice Guidelines: A Systematic Approach, page 7.

require therapeutic strategies to correct (Matsumura & Ambrose, 2006). Age-associated changes predispose older persons to selected diseases (Kitzman & Taffet, 2009). Thus, nurses' understanding of these risks can serve to develop more effective approaches to assessment and care. Finally, aging and illness may interact reciprocally, resulting in altered presentation of illness, response to treatment, and outcomes (Hall, 2002).

This chapter describes age-dependent changes for several body systems. Clinical implications of these alterations, including associated disease risks, are then discussed followed by nursing assessment and care strategies related to these changes.

CARDIOVASCULAR SYSTEM

Cardiac reserve declines in normal aging. This alteration does not affect cardiac function at rest and resting heart rate, ejection fraction, and cardiac output remain virtually unchanged with age. However, under physiological stress, the ability of the older adult's heart to increase both rate and cardiac output, in response to increased cardiac demand, such as physical activity or infection, is compromised (Lakatta, 2000). Such diminished functional reserve results in reduced exercise tolerance, fatigue, shortness of breath, slow recovery from tachycardia (Watters, 2002), and intolerance of volume depletion (Mick & Ackerman, 2004). Furthermore, because of the decreased maximal attainable heart rate with aging, a heart rate of greater than 90 beats per minute (bpm) in an older adult indicates significant physiological stress (Kitzman & Taffet, 2009).

Age-dependent changes in both the vasculature and the heart contribute to the impairment in cardiac reserve. An increase in the wall thickness and stiffness of the aorta and carotid arteries results in diminished vessel compliance and greater systemic vascular resistance (Thomas & Rich, 2007). Elevated systolic blood pressure (BP) with constant diastolic pressure follows, increasing the risk of isolated systolic hypertension and widened pulse pressure (Joint National Committee [JNC], 2004). Strong arterial pulses, diminished peripheral pulses, and increased potential for inflamed varicosities occur commonly with age. Reductions in capillary density restrict blood flow in the extremities, producing cool skin (Mick & Ackerman, 2004).

As an adaptive measure to increased workload against noncompliant arteries, the left ventricle and atrium hypertrophy become rigid. The ensuing impairment in relaxation of the left ventricle during diastole places greater dependence on atrial contractions to achieve left ventricular filling (Lakatta, 2000). In addition, sympathetic response in the heart is blunted because of diminished β-adrenergic sensitivity, resulting in decreased myocardial contractility (Thomas & Rich, 2007).

Additional age-related changes include sclerosis of atrial and mitral valves, which impairs their tight closure and increases the risk of dysfunction. The ensuing leaky heart valves may result in aortic regurgitation or mitral stenosis, presenting on exam as heart murmurs (Kitzman & Taffet, 2009). Loss of pacemaker and conduction cells contributes to changes in the resting electrocardiogram (ECG) of older adults. Isolated premature atrial and ventricular complexes are common arrhythmias, and the risk of atrial fibrillation is increased (Thomas & Rich, 2007). Because of atrial contractions in diastole, S_4 frequently develops as an extra heart sound (Lakatta, 2000).

Baroreceptor function, which regulates BP, is impaired with age, particularly with change in position. Postural hypotension with orthostatic symptoms may follow, especially after prolonged bed rest, dehydration, or cardiovascular drug use, and can cause dizziness and potential for falls (Mukai & Lipsitz, 2002).

Cardiac assessment of an older adult includes performing an ECG and monitoring heart rate (40–100 bpm within normal limits), rhythm (noting whether it is regular or irregular), heart sounds (S_1, S_2, or extra heart sounds S_3 in heart disease or S_4 as a common finding), and murmurs (noting location where loudest). The apical impulse is displaced laterally. In palpation of the carotid arteries, asymmetric volumes and decreased pulsations may indicate aortic stenosis and impaired left cardiac output, respectively. Auscultation of a bruit potentially suggests occlusive arterial disease. Peripheral pulses should be assessed bilaterally at a minimum of one pulse point in each extremity. Assessment may reveal asymmetry in pulse volume suggesting insufficiency in arterial circulation (Docherty, 2002). The nurse should examine lower extremities for varicose veins and note dilation or swelling. In addition, dyspnea with exertion and exercise intolerance are critical to note (Mahler, Fierro-Carrion, & Baird, 2003).

BP should be measured at least twice (Kestel, 2005) on the older adult and performed in a comfortably seated position with back supported and feet flat on the floor. The BP should then be repeated after 5 minutes of rest. Measurements in both supine and standing positions evaluate postural hypotension (Mukai & Lipsitz, 2002).

Nursing care strategies include referrals for older adults who have irregularities of heart rhythm and decreased or asymmetric peripheral pulses. The risk of postural hypotension emphasizes the need for safety precautions (Mukai & Lipsitz, 2002) to prevent falls. These include avoiding prolonged recumbency or motionless standing and encouraging the older adult to rise slowly from lying or sitting positions and wait for 1 to 2 minutes after a position change to stand or transfer. Overt signs of hypotension such as a change in sensorium or mental status, dizziness, or orthostasis should be monitored, and fall-prevention strategies should be instituted. Sufficient fluid intake is advised to ensure adequate hydration and prevent hypovolemia for optimal cardiac functioning (Docherty, 2002; Watters, 2002).

Older adults should be encouraged to adopt lifestyle practices for cardiovascular fitness with the aim of a healthy body weight (body mass index [BMI] 18.5–24.9 kg/m²; American Heart Association Nutrition Committee et al., 2006) and normal BP (JNC, 2004). These practices involve a healthful diet (Knoops et al., 2004), physical activity appropriate for age and health status (Netz, Wu, Becker, & Tenenbaum, 2005), and elimination of the use of and exposure to tobacco products (U.S. Department of Health and Human Services [USDHHS], 2004a).

PULMONARY SYSTEM

Respiratory function slowly and progressively deteriorates with age. This decline in ventilatory capacity seldom affects breathing during rest or customary limited physical activity in healthy older adults (Zeleznik, 2003); however, with greater than usual exertional demands, pulmonary reserve against hypoxia is readily exhausted and dyspnea occurs (Imperato & Sanchez, 2006).

Several age-dependent anatomic and physiologic changes combine to impair the functional reserve of the pulmonary system. Respiratory muscle strength and endurance deteriorate to restrict maximal ventilatory capacity (Buchman et al., 2008). Secondary to calcification of rib cage cartilage, the chest wall becomes rigid (Imperato & Sanchez, 2006), limiting thoracic compliance. Loss of elastic fibers reduces recoil of small airways, which can collapse and cause air trapping, particularly in dependent portions of the lung. Decreases in alveolar surface area, vascularization, and surfactant production adversely affect gaseous exchange (Zeleznik, 2003).

Additional clinical consequences of aging include an increased anteroposterior chest diameter caused by skeletal changes. An elevated respiratory rate of 12–24 breaths per minute accompanies reduced tidal volume for rapid, shallow breathing. Limited diaphragmatic excursion and chest/lung expansion can result in less effective inspiration and expiration (Buchman et al., 2008; Mick & Ackerman, 2004). Because of decreased cough reflex effectiveness and deep breathing capacity, mucus and foreign matter clearance is restricted, predisposing to aspiration, infection, and bronchospasm (Watters, 2002). Further, elevating the risk of infection is a decline in ciliary and macrophage activities and drying of the mucosal membranes with more difficult mucous excretion (Htwe, Mushtaq, Robinson, Rosher, & Khardori, 2007). With the loss of elastic recoil comes the potential for atelectasis. Because of reduced respiratory center sensitivity, ventilatory responses to hypoxia and hypercapnia are blunted (Imperato & Sanchez, 2006), putting the older adult at risk for development of respiratory distress with illness or administration of narcotics (Zeleznik, 2003).

The modifications in ventilatory capacity with age are reflected in changes in pulmonary function tests measuring lung volumes, flow rates, diffusing capacity, and gas exchange. Whereas total lung capacity remains constant, vital capacity is reduced and residual volume is increased. Reductions in all measures of expiratory flow (forced expiratory volume in 1 second [FEV_1], forced vital capacity [FVC], FEV_1/FVC, peak expiratory flow rate [PEFR]) quantify a decline in useful air movement (Imperato & Sanchez, 2006). Because of impaired alveolar function, diffusing capacity of the lung for carbon monoxide (DLCO) declines as does pulmonary arterial oxygen tension (PaO_2), indicating impaired oxygen exchange; however, arterial pH and partial pressure of arterial carbon dioxide ($PaCO_2$) remain constant (Enright, 2009). Reductions in arterial oxygen saturation and cardiac output restrict the amount of oxygen available for use by tissues, particularly in the supine position, although arterial blood gas seldom limits exercise in healthy subjects (Zeleznik, 2003).

Respiratory assessment includes determination of breathing rate, rhythm, regularity, volume (hyperventilation/hypoventilation), depth (shallow, deep; Docherty, 2002), and effort (dyspnea; Mahler et al., 2003). Auscultation of breath sounds throughout the lung fields may reveal decreased air exchange at the lung bases (Mick & Ackerman, 2004). Thorax and symmetry of chest expansion should be inspected. A history of respiratory disease (tuberculosis, asthma), tobacco use (expressed as pack years), and extended exposure to environmental irritants through work or avocation is contributory (Imperato & Sanchez, 2006).

Subjective assessment of cough includes questions on quality (productive/nonproductive), sputum characteristics (note hemoptysis; purulence indicating possible infection), and frequency (during eating or drinking, suggesting dysphagia and aspiration; Smith & Connolly, 2003).

Secretions and decreased breathing rate during sedation can reduce ventilation and oxygenation (Watters, 2002). Oxygen saturation can be followed through arterial blood gases and pulse oximetry (Zeleznik, 2003) while breathing rate (greater than 24 respirations per minute), accessory muscle use, and skin color (cyanosis, pallor) should also be monitored (Docherty, 2002). The inability to expectorate secretions, the appearance of dyspnea, and decreased saturation of oxygen (SaO_2) levels suggest the need for suctioning to clear airways (Smith & Connolly, 2003). Optimal positioning to facilitate respiration should be regularly monitored with use of upright positions (Fowler's or orthopneic position) recommended (Docherty, 2002). Pain assessment may be necessary to allow

ambulation and deep breathing (Mick & Ackerman, 2004). See Atypical Presentation of Disease section for assessment of pneumonia, tuberculosis, and influenza.

Nursing care strategies useful in facilitating respiration and maintaining patent airways in the older adult include positioning to allow maximum chest expansion through the use of semi- or high-Fowler's or orthopneic position (Docherty, 2002). Additionally, frequent repositioning in bed or encouraging ambulation, if mobility permits, is advised (Watters, 2002). Analgesics may be necessary for ambulation and deep breathing (Mick & Ackerman, 2004).

Hydration is maintained through fluid intake (6–8 oz per day) and air humidification, which prevent desiccation of mucous membranes and loosen secretions to facilitate expectoration (Suhayda & Walton, 2002). Suctioning may be necessary to clear airways of secretions (Smith & Connolly, 2003) while oxygen should be provided as needed (Docherty, 2002). Incentive spirometry, with use of sustained maximal inspiration devices (SMIs), can improve pulmonary ventilation, mainly inhalation, as well as loosen respiratory secretions, particularly in older adults who are unable to ambulate or are declining in function (Dunn, 2004).

Deep breathing exercises, such as abdominal (diaphragmatic) and pursed-lip breathing, in addition to controlled and huff coughing, can further facilitate respiratory function. Techniques for healthy breathing, including sitting and standing erect, nose breathing (Dunn, 2004), and regular exercise (Netz et al., 2005) should be promoted. Education on eliminating the use of and exposure to tobacco problems should be emphasized (USDHHS, 2004a).

RENAL AND GENITOURINARY SYSTEMS

In normal aging, the mass of the kidney declines with a loss of functional glomeruli and tubules in addition to a reduction in blood flow. Concomitantly, changes occur in the activity of the regulatory hormones, vasopressin (antidiuretic hormone), atrial natriuretic hormone, and renin-angiotensin-aldosterone system (Miller, 2009). These alterations combine to result in diminished glomerular filtration rate (GFR), with a 10% decrement per decade starting at age 30, as well as impaired electrolyte and water management (Beck, 1998).

Despite these changes, the older adult maintains the ability to regulate fluid balance under baseline conditions; however, with age, the renal system is more limited in its capacity to respond to externally imposed stresses. This reduced functional reserve increases vulnerability to disturbances in fluid homeostasis as well as to renal complications and failure (Lerma, 2009), particularly from fluid/electrolyte overload and deficit, medications, or illness (Miller, 2009).

The decline in functional nephrons emphasizes the risk from nephrotoxic agents including nonsteroidal anti-inflammatory drugs (NSAIDs), β-lactam antibiotics, and radiocontrast dyes. Reduced GFR impairs the older adult's ability to excrete renally cleared medications such as aminoglycoside antibiotics (e.g., gentamicin) and digoxin, increasing the risk of adverse drug reactions (Beyth & Shorr, 2002). Dosages should be based on GFR estimated by the Cockcroft-Gault equation for creatinine clearance (Péquignot et al., 2009) or the modification of diet in renal disease (MDRD) rather than by serum creatinine concentration (Miller, 2009; National Kidney Disease Education Program, 2009). Values of serum creatinine remain unchanged despite an age-associated decline in GFR because of the parallel decrease in both older adults' skeletal muscle

mass, which produces creatinine and GFR for creatinine elimination. Thus, serum creatinine levels overestimate GFR to result in potential drug overdose (Beck, 1998).

Increased risk of electrolyte imbalances can result from an age-dependent impairment in the excretion of excessive sodium loads, particularly in heart failure and with NSAID use, leading to intravascular volume overload. Clinical indicators include weight gain (greater than 2%); intake is greater than output; edema; change in mental status; tachycardia; bounding pulse; pulmonary congestion with dyspnea, rales; increased BP and central venous pressure (CVP); and distended neck/peripheral veins (Beck, 1998).

Conversely, sodium wasting or excess sodium excretion when maximal sodium conservation is needed, can occur with diarrhea. Hypovolemia and dehydration may ensue (Stern, 2006), manifesting as acute change in mental status (may be the initial symptom), weight loss (greater than 2%), decreased tissue turgor, dry oral mucosa, tachycardia, decreased BP, postural hypotension, flat neck veins, poor capillary refill, oliguria (less than 30 mL/hr), increased hematocrit and specific gravity of urine, blood urea nitrogen (BUN): plasma creatinine ratio greater than 20:1, and serum osmolality greater than 300 mOsm/kg (Mentes, 2006).

Impaired potassium excretion puts the older adult at risk for hyperkalemia, particularly in heart failure and with use of potassium supplements, potassium-sparing diuretics, NSAIDs, and angiotensin-converting enzyme (ACE) inhibitors (Mick & Ackerman, 2004). Clinical indicators include diarrhea, change in mental status, cardiac dysrhythmias or arrest, muscle weakness and areflexia, paresthesias and numbness in extremities, ECG abnormalities, and serum potassium greater than 5.0 mEq/L (Beck, 1998).

Limited acid excretion capability can cause metabolic acidosis during acute illness in the older adult. This condition presents as Kussmaul's respirations, change in mental status, nausea, vomiting, arterial blood pH less than 7.35, serum bicarbonate less than 22 mEq/L, and $PaCO_2$ less than 38 mm Hg with respiratory compensation (Beck, 1998).

Causes of abnormal water metabolism with age include diminution in maximal urinary concentrating ability, which, in concert with blunted thirst sensation and total body water, can result in hypertonic dehydration and hypernatremia (Mentes, 2006). Often associated with insensible fluid loss from fever (Miller, 2009), hypernatremia presents with thirst; dry oral mucosa; dry, furrowed tongue; postural hypotension; weakness; lethargy; serum sodium less than 150 mEq/L; and serum osmolality less than 290 mOsm/kg. Disorientation, seizures, and coma occur in severe hypernatremia (Suhayda & Walton, 2002).

Impaired excretion of a water load, exacerbated by ACE inhibitors, thiazide diuretics (Miller, 2009), and selective serotonin reuptake inhibitors (SSRIs; Mentes, 2006), predisposes the older adult to water intoxication and hyponatremia (Beck, 1998). Clinical indicators involve lethargy, nausea, muscle weakness and cramps, serum sodium less than 135 mEq/L, and serum osmolality less than 290 mOsm/kg. Confusion, coma, and seizures are seen in severe hyponatremia (Suhayda & Walton, 2002).

Changes in the lower urinary tract with age include reduced bladder elasticity and innervation, which contribute to decreases in urine flow rate, voided volume, and bladder capacity, as well as increases in postvoid residual and involuntary bladder contractions. A delayed or decreased perception of the signal from the bladder to void translates into urinary urgency (Kevorkian, 2004). Increased nocturnal urine flow, which results from altered regulatory hormone production, impaired ability to concentrate urine,

and bladder–muscle instability, can lead to nocturnal polyuria (Miller, 2009). In older men, benign prostatic hyperplasia (BPH) can result in urinary urgency, hesitancy, and frequency. All these changes combine to increase the risk of urinary incontinence in the older adult. Further, urgency and nocturia increase the risk of falls. Changes with age in the physiology of the urinary tract such as increased vaginal pH and decreased antibacterial activity of urine in addition to the functional changes of the bladder contribute to the development of bacteriuria, with potential for urinary tract infection (UTI; Htwe et al., 2007; Stern, 2006).

Renal assessment includes monitoring for renal function (GFR) based on creatinine clearance, particularly in acute and chronic illness (Lerma, 2009; Miller, 2009; Péquignot et al., 2009). The choice, dose, need, and alternatives for nephrotoxic and renally excreted agents should be considered (Beyth & Shorr, 2002).

Dehydration, volume overload, and electrolyte status are assessed first by screening for risk of fluid/electrolyte imbalances based on the older adult's age, medical and nutritional history, medications, cognitive and functional abilities, psychosocial status, and bowel and bladder patterns. Data on fluid intake and output; daily weights; and vital signs, including orthostatic BP measurements, are needed. Heart rate is a less reliable indicator for dehydration in older adults because of the effects of medications and heart disease (Suhayda & Walton, 2002).

Physical assessment for fluid/electrolyte status focuses on skin for edema and turgor. Note that turgor in older adults is a less reliable indicator for dehydration because of poor skin elasticity, and assessment over the sternum or inner thigh is recommended. Additional assessment involves the oral mucosa for dryness as well as cardiovascular, respiratory, and neurologic systems. Acute changes in mental status, reasoning, memory, or attention may be initial symptoms of dehydration (Suhayda & Walton, 2002). Pertinent laboratory tests include serum electrolytes, serum osmolality, complete blood count (CBC), urine pH and specific gravity, BUN, hematocrit (Mentes, 2006), and arterial blood gases (Beck, 1998).

Evaluations of urinary incontinence, UTI, and nocturnal polyuria using a 72-hour voiding diary are recommended. See Atypical Presentation of Diseases section for UTI. Voiding history and rectal exam are required to diagnose BPH (see Chapter 18, Urinary Incontinence). Fall risk should be addressed when nocturnal or urgent voiding is present (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies).

Ongoing care involves monitoring for renal function (Lerma, 2009; Miller, 2009; Péquignot et al., 2009) and for levels of nephrotoxic and renally cleared drugs (Beyth & Shorr, 2002). Maintenance of fluid/electrolyte balance is paramount (Beck, 1998). To prevent dehydration, older adults weighing between 50 and 80 kg are advised to have a minimum fluid intake of 1,500–2,500 mL/day (unless contraindicated by medical condition; Suhayda & Walton, 2002) from both fluids and food sources including fruits, vegetables, soups, and gelatin with avoidance of high salt and caffeine (Mentes, 2006; Ney, Weiss, Kind, & Robbins, 2009).

Incontinence care and exercise can contribute to management of voiding problems, including reduced incontinence, of nursing home residents (Schnelle et al., 2002). Behavioral interventions recommended for nocturnal polyuria include limited fluid intake in the evening, avoidance of caffeine and alcohol, and prompted voiding schedule (Miller, 2009). Institution of safety precautions and fall prevention strategies are needed in nocturnal or urgent voiding (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies).

OROPHARYNGEAL AND GASTROINTESTINAL SYSTEMS

Age-specific alterations in the oral cavity can adversely affect the older adult's nutritional status. Deterioration in the strength of muscles of mastication as well as potential for tooth loss and xerostomia because of dehydration or medications may reduce food intake (Hall, 2009). Contributing to poor appetite are an altered taste perception and a diminished sense of smell (see Chapter 20, Oral Health Care; Ney et al., 2009; Visvanathan & Chapman, 2009).

Changes in the esophagus with age include delayed emptying in addition to decreases in upper and lower esophageal sphincter pressures, sphincter relaxation, and peristaltic contractions. Although these alterations rarely impair esophageal function and swallowing sufficiently to cause dysphagia or aspiration in normal aging, such conditions can develop in conjunction with disease or medication side effects in older adults (Gregersen, Pedersen, & Drewes, 2008; Ney et al., 2009). Diminished gastric motility with delayed emptying contributes to altered oral drug passage time and absorption in the stomach; elevated risk of gastroesophageal reflux disease (GERD; Hall, 2009); and decreased postprandial hunger, leading to diminished food intake and possible malnutrition (Visvanathan & Chapman, 2009). Reduced mucin secretion impairs the protective function of the gastric mucosal barrier and increases the incidence of NSAID-induced gastric ulcerations (Newton, 2005). Although the motility and most absorptive functions of the small intestine are preserved with age, absorption of vitamin B_{12}, folic acid, and carbohydrates declines (Hall, 2009). In addition, malabsorption of calcium and vitamin D contributes to the risk of osteoporosis. Supplementation with calcium and vitamins D and B_{12} is now recommended for older adults (USDHHS, 2005; Visvanathan & Chapman, 2009).

Age-dependent weakening of the large intestine wall predisposes older adults to diverticulosis and may lead to diverticulitis (Hall, 2009). Because motility of the colon appears to be preserved with age, increased self-reports of constipation in older adults may be attributed instead to altered dietary intake, medications, inactivity, or illness. Diminished rectal elasticity, internal anal sphincter thickening, and impaired sensation to defecate contribute to the risk of fecal incontinence in older adults (Gallagher et al., 2008), although this condition is primarily found in combination with previous bowel surgery or disease and not in normal aging (Hall, 2009).

Pancreatic exocrine output of digestive enzymes is preserved to allow normal digestive capacity with aging (Hall, 2009). Regarding endocrine function, aging changes in carbohydrate metabolism allow a genetic predisposition for diabetes to become manifest (Meneilly, 2010). An age-related decrease in gallbladder function increases the risk of gallstone formation. Although liver size and blood flow decline with age, reserve capacity maintains adequate hepatic function, and values of liver function tests remain stable; however, the liver is more susceptible to damage by stressors including alcohol and tobacco. Associated with changes in the hepatic and intestinal cytochrome P450 system (Hall, 2009), clearance of a range of medications, including many benzodiazepines, declines to result in increased potential for dose-dependent adverse reactions to these drugs (Beyth & Shorr, 2002).

Reductions in antimicrobial activity of saliva and immune response of the gastrointestinal tract with age contribute to a high risk for infectious and inflammatory diseases of this system (Htwe et al., 2007). Further, impaired enteric neuronal function may blunt the older adult's reaction to infection and inflammation and result in atypical presentation of disease (see Atypical Presentation of Disease section; Hall, 2002).

In the gastrointestinal evaluation, the abdomen and bowel sounds are assessed. Liver size, as well as reports of pain, anorexia, nausea, vomiting, and altered bowel habits should be noted (Visvanathan & Chapman, 2009). Assessment of the oral cavity includes dentition and chewing capacity (Chapman, 2007; see Chapter 20, Oral Health Care).

Weight is monitored with calculation of BMI and compared to recommended values (American Hearth Association Nutrition Committee et al., 2006; Visvanathan & Chapman, 2009). Deficiencies in diet can be identified through comparisons of dietary intake, using a 24- to 72-hour food intake record, with nutritional guidelines (Chapman, 2007; Roberts & Dallal, 2005; USDHHS, 2005). In addition, laboratory values of serum albumin, prealbumin, and transferrin are useful nutritional indicators. Low albumin concentration can also affect efficacy and potential for toxicity of selected drugs, including digoxin and warfarin (Beyth & Shorr, 2002). Several instruments for screening the nutritional status, eating habits, and appetite of older adults are available (see Resources section and Chapter 22, Nutrition; Ney et al., 2009).

Signs of dysphagia such as coughing or choking with solid or liquid food intake should be reported for further evaluation. If aspiration from dysphagia is suspected, the lungs must be assessed for the presence of infection, typically indicated by unilateral or bilateral basilar crackles in the lungs, dyspnea, tachypnea, and cough (Imperato & Sanchez, 2006). A decline in function or change in mental status may signal atypical presentation of respiratory infection from aspiration (Ney et al., 2009). Evaluation of GERD is based on typical and atypical symptoms (see Atypical Presentation of Disease section; Hall, 2009).

To assess constipation or fecal incontinence, a careful history with a 2-week bowel log noting laxative use is needed. Fecal impaction is assessed by digital examination of the rectum as a hardened mass of feces, which can be palpated. The impaction may also be palpated through the abdomen (Gallagher et al., 2008).

For continuing care, referrals should be provided to a registered dietician for poor food intake, unhealthy BMI (healthy BMI: 18.5–24.9 kg/m²; overweight: 25–29.9 kg/m²; obesity: 30 kg/m² or greater; American Hearth Association Nutrition Committee et al., 2006), and unintentional weight loss of 10% or greater in 6 months (Chapman, 2007; Ney et al., 2009). Drug levels and liver function tests are monitored if drugs are metabolized hepatically (Beyth & Shorr, 2002). Explanation of normal bowel frequency, the importance of diet and exercise, and recommended types of laxatives addresses constipation problems (Gallagher et al., 2008). Mobility should be encouraged to prevent constipation, and prophylactic laxatives should be provided if constipating medications such as opiates are prescribed (Stern, 2006). Community-based food and nutrition programs (Visvanathan & Chapman, 2009) and education on healthful diets using the food pyramid for older adults may be useful in improving dietary intake (see Chapter 22, Nutrition; JNC, 2004; USDHHS, 2005).

MUSCULOSKELETAL SYSTEM

Musculoskeletal tissues undergo age-associated changes that can negatively impact function in the older adult. In sarcopenia or the loss of muscle mass and strength, a decline in the size, number, and quality of skeletal muscle fibers occurs with aging. Lean body mass is replaced by fat and fibrous tissue (Loeser & Delbono, 2009) so that by age 75, only 15% of the total body mass is muscle compared to 30% in a young, healthy adult (Matsumura & Ambrose, 2006). These alterations result in diminished contractile muscle force with increased weakness and fatigue plus poor exercise tolerance. Age-specific physiological alterations contributing to sarcopenia include reductions in muscle innervation, insulin

activity, and sex steroid (estrogen, testosterone) and growth hormone levels. Additionally, individual factors such as weight loss, protein deficiency, and physical inactivity can accelerate development of this condition to progress to a clinically significant problem (Jones et al., 2009). Sarcopenia has been documented to affect function adversely in older adults by increasing the risk of disability, falls, unstable gait, and need for assistive devices. Physical activity, particularly strength training, and adequate intake of energy and protein can prevent or reverse sarcopenia (Narici, Maffulli, & Maganaris, 2008).

Age-dependent bone loss occurs in both sexes and at all sites in the skeleton. Whereas bone mass peaks between ages 30 and 35, density decreases thereafter at a rate of 0.5% per year. This decrement, caused by reduced osteoblast activity in the deposition of new bone, is accompanied by deterioration in bone architecture and strength. Further, from 5–7 years following menopause during estrogen decline, bone loss in women accelerates to a 3%–5% annual rate (USDHHS, 2004b). This loss, resulting from osteoclast activation with elevated bone breakdown or resorption, occurs mainly in cancellous or trabecular bone such as the vertebral body and may develop into Type I osteoporosis in women aged 51–75 years who risk vertebral fractures. Following this postmenopausal period, bone loss slows again in women and involves cortical bone in the long bones of the extremities. With aging, both women and men may develop Type II osteoporosis and are susceptible to hip fractures and kyphosis from vertebral compression fractures in later life (Simon, 2005).

An age-associated decline in the strength of ligaments and tendons, which are integral to normal joint function, predisposes to increased ligament and tendon injury, more limited joint range of motion (ROM), and reduced joint stability, leading to osteoarthritis (Narici et al., 2008). Degeneration of intervertebral discs caused by dehydration and poor nutrient influx elevates the risk of spinal osteoarthritis, spondylosis, and stenosis with aging (Loeser & Delbono, 2009).

Age-related changes in articular cartilage, which covers the bone endings in joints to allow smooth movement, involve increased dehydration, stiffening, crystal formation, calcification, and roughening of the cartilage surface. Although these alterations have a minor effect on joint function under baseline conditions, the aging joint is less capable of withstanding mechanical stress, such as the stress caused by obesity or excess physical activity, and is also more susceptible to disease including osteoarthritis (Loeser, 2010).

Age-dependent changes in stature include dorsal kyphosis, reduction in height, flexion of the hips and knees, and a backward tilt of the head to compensate for the thoracic curvature. A shorter stride, reduced velocity, and broader base of support with feet more widely spaced characterize modifications in gait with age (Harris et al., 2008).

The musculoskeletal assessment includes inspection of posture, gait, balance, symmetry of body parts, and alignment of extremities. Kyphosis, bony enlargements, or other abnormalities should be noted. The clinician should palpate bones, joints, and surrounding muscles, evaluating muscle strength on a scale of 0/5, and noting symmetry and signs of atrophy of major upper and lower extremity muscle groups. Active and passive ROM for major joints is evaluated, noting pain, limitation of ROM, and joint laxity. Joint stabilization and slow movements in ROM examinations are advised to prevent injury. Functionality, mobility, fine and gross motor skills, balance, and fall risk should be assessed (see Chapter 6, Assessment of Physical Function and Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies; Harris et al., 2008).

For continuing care, referrals to physical or occupational therapy may be appropriate. Increased physical activity, including exercises for ROM (Netz et al., 2005) and muscle strengthening and power (Narici et al., 2008) are recommended to maintain maximal

function. Interventions to promote such behavior in older adults involve health education, goal setting, and self-monitoring (Conn, Minor, Burks, Rantz, & Pomeroy, 2003). Pain medication may be needed to enhance functionality (see Chapter 14, Pain Management; McCleane, 2008). Strategies to prevent falls (see Chapter 15, Falls Prevention: Assessment, Diagnoses, and Intervention Strategies) and avoid physical restraints (see Chapter 13, Physical Restraints and Side Rails in Acute and Critical Care Settings) are appropriate.

To prevent and treat osteoporosis, adequate daily intake of calcium (1,200 mg for women aged 50 years and older) and vitamin D (400 IU for women aged 50–70 years and 600 IU for women aged 71 years and older), physical exercise, and smoking cessation are recommended (USDHHS, 2004b). In addition, routine bone mineral density screening for osteoporosis is advised for women aged 65 years and older, as well as for women aged 60–64 years at increased risk for osteoporotic fractures (Agency for Healthcare Research and Quality, 2010).

NERVOUS SYSTEM AND COGNITION

Age-related alterations in the nervous system can affect function and cognition in older adults. Changes include a reduced number of cerebral and peripheral neurons (Hall, 2002), modifications in dendrites and glial support cells in the brain, and loss and remodeling of synapses. Decreased levels of neurotransmitters, particularly dopamine, as well as deficits in systems that relay signals between neurons and regulate neuronal plasticity also occur with aging (Mattson, 2009).

Combined, these neurological changes contribute to decrements in general muscle strength; deep tendon reflexes; sensation of touch, pain, and vibration; and nerve conduction velocity (Hall, 2002), which result in slowed coordinated movements and increased response time to stimuli (Matsumura & Ambrose, 2006). These clinical consequences, although relatively mild in normal aging, cause an overall slowing of motor skills with potential deficits in balance, gait, coordination, reaction time, and agility (Harris et al., 2008; Narici et al., 2008). Such decline in function can adversely affect an older adult's daily activities, notably ambulation and driving, and predispose to falls and injury (Craft, Cholerton, & Reger, 2009).

Neurological changes, along with thinning of the skin, compromise thermoregulation in the older adult. These result in decreased sensitivity to ambient temperature as well as impaired heat conservation, production, and dissipation with predisposition to hypothermia and hyperthermia (Kuchel, 2009). Febrile responses to infection may be blunted or absent (see Atypical Presentation of Disease section; High, 2009; Htwe et al., 2007; Watters, 2002).

With age, the speed of cognitive processing slows (Bashore & Ridderinkhof, 2002) and some degree of cognitive decline is common (Park, O'Connell, & Thomson, 2003) but not universal in the older adult population (Stewart, 2004). Older adults demonstrate significant heterogeneity in cognitive performance, which may be positively impacted by education, good health, and physical activity (Christensen, 2001; Colcombe & Kramer, 2003).

Specific cognitive abilities exhibit differing levels of stability or decline with age. For example, crystallized intelligence, or the information and skills acquired from experience, remains largely intact, whereas fluid intelligence, or creative reasoning and problem solving, declines (Christensen, 2001). Sustained attention is unaffected by aging, although divided attention, or the ability to concentrate on multiple tasks concurrently,

deteriorates. The mild decline in executive function, which includes the capability of directing behavior and completing multistep tasks, usually has minimal impact on an older adult's ability to manage daily activities. Although language abilities and comprehension appear stable, spontaneous word finding may deteriorate and is often a complaint of older adults. Remote memory, or recalling events in the distant past, and procedural memory, or remembering ways to perform tasks, remain intact but declarative memory, or learning new information, is slowed (Craft et al., 2009). However, despite some deficits, memory functions are adequate for normal life in successful aging (Henry, MacLeod, Phillips, & Crawford, 2004).

Changes in the nervous system increase the risk of sleep disorders (Espiritu, 2008) and delirium in the older adult, especially in acute care (see Chapter 11, Delirium). Neural changes affect the perception, tolerance, and response to treatment of pain (McCleane, 2008). In addition, age-specific alterations predispose neurons to degeneration, contributing to Alzheimer's disease (Charter & Alekoumbides, 2004), Parkinson's disease, and Huntington's disease (Mattson, 2009).

Assessment, with periodic reassessment, of baseline functional status (see Chapter 6, Assessment of Physical Function) should include evaluation of fall risk, gait, and balance (see Chapter 15, Falls Prevention: Assessment, Diagnoses, and Intervention Strategies) as well as basic, instrumental, and advanced activities of daily living (ADLs). During acute illness, functional status, pain (see Chapter 14, Pain Management), and symptoms of delirium (see Chapter 11, Delirium) should be monitored. Evaluation of baseline cognition with periodic reassessment (see Chapter 8, Assessing Cognitive Function) and sleep disorders (Espiritu, 2008) is warranted. The impact of physical and cognitive changes of aging on an older adult's level of safety and attentiveness in daily tasks should be determined (Bashore & Ridderinkhof, 2002; Craft et al., 2009; Henry et al., 2004; Park et al., 2003). Temperature indicating hypothermia (less than 95 °F or less than 35 °C) or hyperthermia (greater than 105 °F or greater than 40.6 °C) must be closely watched (Kuchel, 2009; Lu, Leasure, & Dai, 2010).

For care of the older adult, fall prevention strategies should be implemented (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies). If delirium is identified, nursing interventions for its treatment are needed (see Chapter 11, Delirium). Particularly during surgery, procedures such as the use of warmed intravenous fluids and humidified gases should be instituted to maintain normal temperatures and prevent hypothermia in the older patient (Watters, 2002). Lifestyle modifications recommended to improve cognitive function include regular physical exercise (Colcombe & Kramer, 2003), intellectual stimulation (Mattson, 2009), and a healthful diet (JNC, 2004; USDHHS, 2005). Behavioral interventions for sleep disorders may be warranted (Irwin, Cole, & Nicassio, 2006).

IMMUNE SYSTEM AND VACCINATION

Immunosenescence, or the age-related dysfunction in immune response, is characterized by reduced cell-mediated immune function and humoral immune responses (Weiskopf, Weinberger, & Grubeck-Loebenstein, 2009), as well as increased inflammatory response (High, 2009; Hunt, Walsh, Voegeli, & Roberts, 2010). In older adults, it is responsible, in part, for the increased susceptibility to and severity of infectious diseases (Htwe et al., 2007), the lower efficacy of vaccination (Weiskopf et al., 2009), and the chronic inflammatory state, which may contribute to chronic disease with age (Hunt et al., 2010).

Infectious diseases are a critical threat to older adults, especially since vaccination efficacy declines with age. Mortality rates for infectious diseases are highest for adults older than 85 years (Htwe et al., 2007), whereas reactivation of viruses, particularly varicella zoster leading to herpes zoster, occurs significantly more frequently in older adults (High, 2009). Immunosenescence, by dampening the induction of adaptive immune responses, results in reduced response rates to vaccination. For example, influenza vaccination has a protection rate of only 56% in older persons. Further, antibody titers following booster vaccinations, such as against tetanus, are lower and decline faster with diminished antibody function in older adults compared to younger individuals (Weiskopf et al., 2009).

Current immunization recommendations for older adults are available from the Centers for Disease Control and Prevention (CDC, 2010). Vaccination with pneumococcal polysaccharide for pneumococcal infections is recommended for individuals 65 years of age and older, with one-time revaccination indicated if the patient was vaccinated 5 or more years previously and was aged younger than 65 years at the time of primary vaccination. For seasonal influenza, all individuals 50 years of age and older should be vaccinated with the inactivated vaccine just prior to influenza season each year. A single dose of zoster vaccine is recommended for all adults 60 years of age and older regardless of prior zoster history. A complete tetanus vaccine series is indicated for individuals having an uncertain history of tetanus immunization or having received fewer than three doses. Boosters should be given at 10-year intervals or more frequently with high-risk injuries. Hepatitis vaccines should also be considered for older adults depending on circumstances such as potential exposure and travel (CDC, 2010; High, 2009).

ATYPICAL PRESENTATION OF DISEASE

Diseases, particularly infections, often manifest with atypical features in older adults. Signs and symptoms are frequently subtle in the very old. These may initially involve nonspecific declines in functional or mental status, anorexia with reduced oral intake, incontinence, falls (Htwe et al., 2007), fatigue (Hall, 2002), or exacerbation of chronic illness such as heart failure or diabetes (High, 2009).

As a presenting sign of infection, fever is often blunted or absent, particularly in the very old (High, 2009), frail, or malnourished (Watters, 2002) adults. Compared to young adults with a normal mean baseline body temperature of 98.6 °F (37 °C), frail older adults have a lower mean oral baseline temperature of 97.4 °F (36.3 °C; Lu et al., 2010). A blunted response to inflammatory stimuli in combination with lower basal temperature can result in a lack of measurable febrile response. Increasing age is a predisposing factor for the absence of fever (Htwe et al., 2007).

Assessment of the older patient should note any changes from baseline (including those that are subtle and nonspecific) in functioning, mental status and behavior (e.g., increased/new onset confusion), appetite, or exacerbation of chronic illness (High, 2009; Watters, 2002). This is especially important in individuals with cognitive impairment who are unable to describe symptoms.

To detect fever, normal temperature should be established for the older adult and monitored for changes of 2–2.4 °F (1.1–1.3 °C) above baseline (Htwe et al., 2007). Oral temperatures of 99 °F (37.2 °C) or greater on repeated measurements also can be used to signify fever. The difficulty of diagnosing infection based on signs and symptoms may result in greater reliance on laboratory and radiologic evaluations (High, 2009).

In the assessment of disease, both typical and atypical symptoms must be considered. Evaluation for pneumococcal pneumonia includes monitoring for typical symptoms such as productive cough, fever, chills, and dyspnea as well as insidious, atypical symptoms including tachypnea, lethargy (Bartlett et al., 2000), weakness, falls, decline in functional status, delirium, or increased/new-onset confusion with absent high fever. Decreased appetite and dehydration may be the only initial symptoms in the older adult (Imperato & Sanchez, 2006). Although chest radiograph is basic to diagnosis, the older adult who is dehydrated may not show infiltrate or consolidation, and these findings may appear only after hydration (Htwe et al., 2007).

Clinical features of tuberculosis in the older person are often atypical and nonspecific. Presenting symptoms may include dizziness, nonspecific pain, or impaired cognition rather than the typical manifestations of fever, night sweats, cough, or hemoptysis (High, 2009). Typical influenza symptoms of cough, fever, and chills may be combined with altered mental status in older adults (Htwe et al., 2007).

UTI in older adults may present with classical symptoms of dysuria, flank or suprapubic discomfort, hematuria, and urinary frequency and urgency, or atypical symptoms of new-onset/worsening incontinence, anorexia, confusion, nocturia, or enuresis (Htwe et al., 2007).

For peritonitis, atypical symptoms such as confusion and fatigue may be manifest rather than the typical symptoms of rigidity (Hall, 2002). Evaluation of GERD is based on typical presenting symptoms of heartburn (pyrosis) and acid regurgitation, as well as atypical symptoms in the older adult of dysphagia, chest pain, hoarseness, vomiting, chronic cough, or recurrent aspiration pneumonia (Hall, 2009).

CASE STUDY

Ms. M is an 89-year-old woman presenting with productive cough, dyspnea, fatigue, and increased confusion over the past week. Her vital signs are pulse, 96 bpm; temperature, 98.6 °F; respiration, 31 bpm; and BP, 110/55. A chest radiograph shows multilobe infiltrates with a diagnosis of pneumonia. How severe is her pneumonia?

Ms. M's symptoms of a respiratory rate greater than 30 respirations per minute, multilobe infiltrates on a chest radiograph, and diastolic BP of less than 60 mm Hg characterize her pneumonia as severe (Bartlett et al., 2000), and she is likely to require admission to an intensive care unit. However, several age-related changes affect her symptoms of pneumonia. Pneumonia may present in the older adult with typical symptoms of productive cough, fever, and dyspnea or with more insidious, atypical symptoms of tachypnea, lethargy (Bartlett et al., 2000), weakness, falls, decline in functional status, or increased/new-onset confusion. Decreased appetite and dehydration may be the only initial symptoms (Imperato & Sanchez, 2006).

Because of reduced sympathetic innervation of the heart with age, the heart rate of an older adult does not increase in response to stress comparable to that of a younger individual (Kitzman & Taffet, 2009). Thus, 96 bpm in an 89-year-old person is tachycardic and indicates a severe stress reaction. Furthermore, because of a blunted febrile response to infection particularly in a very old, frail, or malnourished adult, a fever may not be manifest even with severe infection (High, 2009; Htwe, 2007; Lu et al., 2010; Watters, 2002).

SUMMARY

Changes that occur with age strongly impact the health and functional status of older adults. Thus, recognition of and attention to these alterations are critically important in nursing assessment and care. Armed with knowledge of age-related changes and using the clinical protocol described in this chapter, nurses can play a vital role in improving geriatric standards of practice. Designing interventions that take age-related changes into consideration, educating patients and family caregivers on these alterations, and sharing information with professional colleagues will all serve to ensure optimal care of older adults.

NURSING STANDARD OF PRACTICE

Protocol 3.1: Age-Related Changes in Health

I. GOAL: To identify anatomical and physiological changes, which are attributed to the normal aging process.

II. OVERVIEW: Age-associated changes are most pronounced in advanced age of 85 years or older, may alter the older person's response to illness, show great variability among individuals, are often impacted by genetic and long-term lifestyle factors, and commonly involve a decline in functional reserve with reduced response to stressors.

III. STATEMENT OF PROBLEM: Gerontological changes are important in nursing assessment and care because they can adversely affect health and functionality and require therapeutic strategies; must be differentiated from pathological processes to allow development of appropriate interventions; predispose to disease, thus emphasizing the need for risk evaluation of the older adult; and can interact reciprocally with illness, resulting in altered disease presentation, response to treatment, and outcomes.

IV. AGE-ASSOCIATED CARDIOVASCULAR CHANGES
- A. Definition(s)
  Isolated systolic hypertension: systolic BP >140 mm Hg and diastolic BP <90 mm Hg.
- B. Etiology
  1. Arterial wall thickening and stiffening, decreased compliance.
  2. Left ventricular and atrial hypertrophy. Sclerosis of atrial and mitral valves.
  3. Strong arterial pulses, diminished peripheral pulses, cool extremities.
- C. Implications
  1. Decreased cardiac reserve.
     a. At rest: No change in heart rate, cardiac output.
     b. Under physiological stress and exercise: Decreased maximal heart rate and cardiac output, resulting in fatigue, shortness of breath, slow recovery from tachycardia.

Protocol 3.1: Age-Related Changes in Health *(cont.)*

 c. Risk of isolated systolic hypertension; inflamed varicosities.

 d. Risk of arrhythmias, postural, and diuretic-induced hypotension. May cause syncope.

D. Parameters of Cardiovascular Assessment

 1. Cardiac assessment: ECG; heart rate, rhythm, murmurs, heart sounds (S_4 common, S3 in disease). Palpate carotid artery and peripheral pulses for symmetry (Docherty, 2002).

 2. Assess BP (lying, sitting, standing) and pulse pressure (Mukai & Lipsitz, 2002).

V. AGE-ASSOCIATED CHANGES IN THE PULMONARY SYSTEM

A. Etiology

 1. Decreased respiratory muscle strength; stiffer chest wall with reduced compliance.

 2. Diminished ciliary and macrophage activity, drier mucus membranes. Decreased cough reflex.

 3. Decreased response to hypoxia and hypercapnia.

B. Implications

 1. Reduced pulmonary functional reserve.

  a. At rest: No change.

  b. With exertion: Dyspnea, decreased exercise tolerance.

 2. Decreased respiratory excursion and chest/lung expansion with less effective exhalation. Respiratory rate of 12–24 breaths per minute.

 3. Decreased cough and mucus/foreign matter clearance.

 4. Increased risk of infection and bronchospasm with airway obstruction.

C. Parameters of Pulmonary Assessment

 1. Assess respiration rate, rhythm, regularity, volume, depth (Docherty, 2002), and exercise capacity (Mahler et al., 2003). Ascultate breath sounds throughout lung fields (Mick & Ackerman, 2004).

 2. Inspect thorax appearance, symmetry of chest expansion. Obtain smoking history.

 3. Monitor secretions, breathing rate during sedation, positioning (Watters, 2002; Docherty, 2002), arterial blood gases, pulse oximetry (Zeleznik, 2003).

 4. Assess cough, need for suctioning (Smith & Connolly, 2003).

D. Nursing Care Strategies

 1. Maintain patent airways through upright positioning/repositioning (Docherty, 2002), suctioning (Smith & Connolly, 2003).

 2. Provide oxygen as needed (Docherty, 2002); maintain hydration and mobility (Watters, 2002).

 3. Incentive spirometry as indicated, particularly if immobile or declining in function (Dunn, 2004).

 4. Education on cough enhancement (Dunn, 2004), smoking cessation (USDHHS, 2004a).

Protocol 3.1: Age-Related Changes in Health *(cont.)*

VI. AGE-ASSOCIATED CHANGES IN THE RENAL AND GENITOURINARY SYSTEMS

A. Definition(s)

To determine renal function (GFR):

Cockcroft-Gault equation: Calculation of creatinine clearance in older adults (Péquignot et al., 2009).

For Men

$$\text{Creatinine clearance (mL/min)} = \frac{(140 - \text{age in years}) \times (\text{body weight in kg})}{72 \times (\text{serum creatinine, mg/dL})}$$

For women, the calculated value is multiplied by 85% (0.85).

MDRD: see National Kidney Disease Education Program calculator (National Kidney Disease Education Program, 2009).

B. Etiology

1. Decreases in kidney mass, blood flow, GFR (10% decrement/decade after age 30). Decreased drug clearance.
2. Reduced bladder elasticity, muscle tone, capacity.
3. Increased postvoid residual, nocturnal urine production.
4. In males, prostate enlargement with risk of BPH.

C. Implications

1. Reduced renal functional reserve; risk of renal complications in illness.
2. Risk of nephrotoxic injury and adverse reactions from drugs.
3. Risk of volume overload (in heart failure), dehydration, hyponatremia (with thiazide diuretics), hypernatremia (associated with fever), hyperkalemia (with potassium-sparing diuretics). Reduced excretion of acid load.
4. Increased risk of urinary urgency, incontinence (not a normal finding), urinary tract infection, nocturnal polyuria. Potential for falls.

D. Parameters of Renal and Genitourinary Assessment

1. Assess renal function (GFR through creatinine clearance; Lerma, 2009; Miller, 2009; National Kidney Disease Education Program, 2009; Péquignot et al., 2009).
2. Assess choice/need/dose of nephrotoxic agents and renally cleared drugs (Beyth & Shorr, 2002; see Chapter 17, Reducing Adverse Drug Events.
3. Assess for fluid/electrolyte and acid/base imbalances (Suhayda & Walton, 2002).
4. Evaluate nocturnal polyuria, urinary incontinence, BPH (Miller, 2009). Assess UTI symptoms (see Atypical Presentation of Disease section; Htwe et al., 2007).
5. Assess fall risk if nocturnal or urgent voiding (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies)

E. Nursing Care Strategies

1. Monitor nephrotoxic and renally cleared drug levels (Beyth & Shorr, 2002).
2. Maintain fluid/electrolyte balance. Minimum 1,500–2,500 mL/day from fluids and foods for 50- to 80-kg adults to prevent dehydration (Suhayda & Walton, 2002).
3. For nocturnal polyuria: limit fluids in evening, avoid caffeine, use prompted voiding schedule (Miller, 2009).

Protocol 3.1: Age-Related Changes in Health *(cont.)*

    4. Fall prevention for nocturnal or urgent voiding (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies).

VII. AGE-ASSOCIATED CHANGES IN THE OROPHARYNGEAL AND GASTROINTESTINAL SYSTEMS

  A. Definition(s)

    BMI: Healthy, 18.5–24.9 kg/m^2; overweight, 25–29.9 kg/m^2; obesity, 30 kg/m^2 or greater.

  B. Etiology

    1. Decreases in strength of muscles of mastication, taste, and thirst perception.

    2. Decreased gastric motility with delayed emptying.

    3. Atrophy of protective mucosa.

    4. Malabsorption of carbohydrates, vitamins B_{12} and D, folic acid, calcium.

    5. Impaired sensation to defecate.

    6. Reduced hepatic reserve. Decreased metabolism of drugs.

  C. Implications

    1. Risk of chewing impairment, fluid/electrolyte imbalances, poor nutrition.

    2. Gastric changes: altered drug absorption, increased risk of GERD, maldigestion, NSAID-induced ulcers.

    3. Constipation not a normal finding. Risk of fecal incontinence with disease (not in healthy aging).

    4. Stable liver function tests. Risk of adverse drug reactions.

  D. Parameters of Oropharyngeal and Gastrointestinal Assessment

    1. Assess abdomen, bowel sounds.

    2. Assess oral cavity (see Chapter 20, Oral Health Care); chewing and swallowing capacity, dysphagia (coughing, choking with food/fluid intake; Ney et al., 2009). If aspiration, assess lungs (rales) for infection and typical/atypical symptoms (Bartlett et al., 2000; High, 2009; see Atypical Presentation of Disease section).

    3. Monitor weight, calculate BMI, compare to standards (American Hearth Association Nutrition Committee et al., 2006). Determine dietary intake, compare to nutritional guidelines (Chapman, 2007; USDHHS, 2005; Visvanathan & Chapman, 2009; see Chapter 22, Nutrition).

    4. Assess for GERD; constipation and fecal incontinence; fecal impaction by digital examination of rectum or palpation of abdomen.

  E. Nursing Care Strategies

    1. Monitor drug levels and liver function tests if on medications metabolized by liver. Assess nutritional indicators (Chapman, 2007; USDHHS, 2005; Visvanathan & Chapman, 2009).

    2. Educate on lifestyle modifications and over-the-counter (OTC) medications for GERD.

    3. Educate on normal bowel frequency, diet, exercise, recommended laxatives. Encourage mobility, provide laxatives if on constipating medications (Stern, 2006).

    4. Encourage participation in community-based nutrition programs (Visvanathan & Chapman, 2009); educate on healthful diets (USDHHS, 2005).

Protocol 3.1: Age-Related Changes in Health *(cont.)*

VIII. AGE-ASSOCIATED CHANGES IN THE MUSCULOSKELETAL SYSTEM

A. Definition(s)

Sarcopenia: Decline in muscle mass and strength associated with aging.

B. Etiology

1. Sarcopenia evokes increased weakness and poor exercise tolerance.
2. Lean body mass replaced by fat with redistribution of fat.
3. Bone loss in women and men after peak mass at age 30 to 35 years.
4. Decreased ligament and tendon strength. Intervertebral disc degeneration. Articular cartilage erosion. Changes in stature with kyphosis, height reduction.

C. Implications

1. Sarcopenia: increased risk of disability, falls, unstable gait.
2. Risk of osteopenia and osteoporosis.
3. Limited ROM, joint instability, risk of osteoarthritis.

D. Nursing Care Strategies

1. Encourage physical activity through health education and goal setting (Conn, 2003) to maintain function (Netz et al., 2005).
2. Pain medication to enhance functionality (see Chapter 14, Pain Management). Implement strategies to prevent falls (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies and Chapter 13, Physical Restraints and Side Rails in Acute and Critical Care Settings).
3. Prevent osteoporosis by adequate daily intake of calcium and vitamin D, physical exercise, smoking cessation (USDHHS, 2004b). Advise routine bone mineral density screening (Agency for Healthcare Research and Quality, 2010).

IX. AGE-ASSOCIATED CHANGES IN THE NERVOUS SYSTEM AND COGNITION

A. Etiology

1. Decrease in neurons and neurotransmitters.
2. Modifications in cerebral dendrites, glial support cells, synapses.
3. Compromised thermoregulation.

B. Implications

1. Impairments in general muscle strength; deep tendon reflexes; nerve conduction velocity. Slowed motor skills and potential deficits in balance and coordination.
2. Decreased temperature sensitivity. Blunted or absent fever response.
3. Slowed speed of cognitive processing. Some cognitive decline is common but not universal. Most memory functions are adequate for normal life.
4. Increased risk of sleep disorders, delirium, neurodegenerative diseases.

C. Parameters of Nervous System and Cognition Assessments

1. Assess, with periodic reassessment, baseline functional status (Craft et al., 2009; see Chapter 6, Assessment of Physical Function and Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies). During acute illness, monitor functional status and delirium (see Chapter 11, Delirium).
2. Evaluate, with periodic reassessment, baseline cognition (see Chapter 8, Assessing Cognitive Function) and sleep disorders (Espiritu, 2008).

Protocol 3.1: Age-Related Changes in Health *(cont.)*

    3. Assess impact of age-related changes on level of safely and attentiveness in daily tasks (Park et al., 2003; Henry et al., 2004).
    4. Assess temperature during illness or surgery (Kuchel, 2009).
  D. Nursing Care Strategies
    1. Institute fall preventions strategies (see Chapter 15, Fall Prevention: Assessment, Diagnoses, and Intervention Strategies).
    2. To maintain cognitive function, encourage lifestyle practices of regular physical exercise (Colcombe & Kramer, 2003), intellectual stimulation (Mattson, 2009), healthful diet (JNC, 2004).
    3. Recommend behavioral interventions for sleep disorders.

X. AGE-ASSOCIATED CHANGES IN THE IMMUNE SYSTEM
  A. Etiology
    1. Immune response dysfunction (Kuchel, 2009) with increased susceptibility to infection, reduced efficacy of vaccination (Htwe et al., 2007), chronic inflammatory state (Hunt et al., 2010).
  B. Nursing Care Strategies
    1. Follow CDC immunization recommendations for pneumococcal infections, seasonal influenza, zoster, tetanus, and hepatitis for the older adult (CDC, 2010; High, 2009).

XI. ATYPICAL PRESENTATION OF DISEASE
  A. Etiology
    1. Diseases, especially infections, may manifest with atypical symptoms in older adults.
    2. Symptoms/signs often subtle include nonspecific declines in function or mental status, decreased appetite, incontinence, falls (Htwe et al., 2007), fatigue (Hall, 2002), exacerbation of chronic illness (High, 2009).
    3. Fever blunted or absent in very old (High, 2009), frail, or malnourished (Watters, 2002) adults. Baseline oral temperature in older adults is 97.4 °F (36.3 °C) versus 98.6 °F (37 °C) in younger adults (Lu et al., 2010).
  B. Parameters of Disease Assessment
    1. Note any change from baseline in function, mental status, behavior, appetite, chronic illness (High, 2009).
    2. Assess fever. Determine baseline and monitor for changes 2–2.4 °F (1.1–1.3 °C) above baseline (Htwe et al., 2007). Oral temperatures above 99 °F (37.2 °C) or greater also indicate fever (High, 2009).
    3. Note typical and atypical symptoms of pneumococcal pneumonia (Bartlett et al., 2000; Htwe et al., 2007; Imperato & Sanchez, 2006), tuberculosis (Kuchel, 2009), influenza (Htwe et al., 2007), UTI (Htwe et al., 2007), peritonitis (Hall, 2002), and GERD (Hall, 2009).

XII. EVALUATION/EXPECTED OUTCOMES (FOR ALL SYSTEMS)
  A. Older adult will experience successful aging through appropriate lifestyle practices and health care.

Protocol 3.1: Age-Related Changes in Health *(cont.)*

   B. Health care provider will
      1. Identify normative changes in aging and differentiate these from pathological processes.
      2. Develop interventions to correct for adverse effects associated with aging.
   C. Institution will
      1. Develop programs to promote successful aging.
   D. Will provide staff education on age-related changes in health.

XIII. FOLLOW-UP MONITORING OF CONDITION
   A. Continue to reassess effectiveness of interventions.
   B. Incorporate continuous quality improvement criteria into existing programs.

RESOURCES

Government Informational Agencies

Agency for Healthcare Research and Quality
http://www.ahrq.gov

Administration on Aging
http://www.aoa.gov

National Institute on Aging
http://www.nia.nih.gov

Non-Profit Organizations

Health and Age Foundation
http://www.healthandage.org

American Federation of Aging Research
http://www.afar.org

Alliance for Aging Research
http://www.agingresearch.org

National Council on Aging
http://www.ncoa.org

Smith-Kettlewell Eye Research Institute
http://www.ski.org

CRONOS
http://www.unu.edu/unupress/food/V183e/begin.htm

Professional Societies

The National Gerontological Nursing Association
http://www.ngna.org

The National Conference of Gerontological Nurse Practitioners
http://www.ncgnp.org/

The American Geriatrics Society
http://www.americangeriatrics.org/

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