CHAPTER I

OHIO LAW AND STANDARDS FOR NURSES

(1 Contact Hour, Category A)

(This CE Activity, OLN-I-1265-10, being offered by Elite CME, Inc. has been approved for 1.0 contact hours, Category A, by the Ohio Board of Nursing through the approver unit at the Ohio League for Nursing (OBN-006-92) and this program is valid through February 3, 2013.)

Purpose

This course is designed to educate nursing professionals in the state of Ohio about the laws, rules and guidelines governing their practice. It is a Category A course directly related to Chapter 4723 of the Ohio Revised Code (ORC) – the Nurse Practice Act – and rules of the Board of Nursing set forth in Chapter 4723-1 to 4723-27 of the Ohio Administrative Code.

Objectives

After completing this course, an individual will be able to:

- Define Interpretive Guidelines issued by the Ohio Nursing Board and explain how nurses can use them.
- List the situations when a nurse may rely on protocols.
- Explain the difference between protocols and preprinted orders by licensed prescribers.
- List the standards expected of a nurse under state law that defines the practice of nursing by a registered nurse.
- List the standards expected of a licensed practical nurse under state law that defines the practice of nursing by a licensed practical nurse.
- Explain the differences in the scopes of practice and nursing processes for registered nurses and licensed practical nurses, and other specialty licensees.
- List the rules for practice by licensed nurses that create a safe environment for clients.
- Identify which health care personnel may delegate nursing tasks.
- List the factors a licensed nurse must consider before delegating a nursing task.

Introduction

The state of Ohio requires registered nurses and licensed practical nurses to practice in accordance with the standards of state nursing care specified in the Ohio Nurse Practice Act, Chapter 4723 of the Ohio Revised Code (ORC), and the Ohio Administrative Code (OAC), Chapters 4723-1 to 4723-27. Each year, the Board of Nursing and the Legislature review amendments for inclusion and revisions of the existing code. Prominent changes are reviewed in continuing education courses to help nurses stay current with the standards.

To refer directly to the revised code or the administrative code online, use the following links:

Ohio Revised Code: All statutes of a permanent and general nature of the state as revised and consolidated into general provisions, title, chapters and sections, including all bills passed. For nurses, see ORC Chapter 4723 at *http://codes.ohio.gov/orc/4723*.

Ohio Administrative Code: A codification of the administrative agencies of the state, including all rules filed with an effective date. The Ohio Board of Nursing is the agency charged with specifying rules and processes governing practices and standards that fulfill the requirements of the Nurse Practice Act. See OAC Chapter 4723-1 through 4723-27 at *http://codes.ohio.gov/orc/4723*.

This course provides an overview of the scopes and standards of safe practice by nursing professionals as well as rules on delegation of tasks by nurses. Other components include a look at recent Ohio Board of Nursing guidelines for professionals, which provide clarification of the rules found in the OAC. It is presented in four parts:

Part I: What's new: Recent interpretive guidelines – These statements adopted by the Ohio Board of Nursing are meant to clarify and add further guidance to licensed professionals on certain practices as they apply to the rules. The guidelines are meant to help nurses who seek to promote safety in their work.

Part II: The scopes of practice for Ohio licensed nurses – The Nurse Practice Act and OAC rules outline specific boundaries of practice for nursing professionals.

Part III: Standards of safe practice for Ohio licensed nurses – The OAC includes specific rules for safe practice in nursing. These include rules that promote and protect client safety.

Part IV: Laws and rules on delegation of nursing tasks – The OAC outlines a number of specific rules for nurses when delegating nursing tasks to licensed and unlicensed health care workers.

Part I: What's new: Recent interpretive guidelines

About interpretive guidelines

The Ohio Board of Nursing is charged in Chapter 4723 of the Ohio Revised Code with overseeing the profession of nursing and enforcing the laws and rules that apply to it. From time to time, the board offers interpretive guidelines on select nursing activities and procedures, "not to announce new policy, but to give licensees specific instruction on their obligations under existing law."

Joint statement on protocols

In an important announcement in January 2010, the Ohio Board of Nursing, the State Medical Board of Ohio and the Ohio State Board of Pharmacy issued a joint regulatory statement on the use of protocols to initiate or adjust medications. The statement "should not be construed as a new policy, but rather, as an attempt to clarify existing law," it says. "Such clarification is intended for the benefit of practitioners and the public as a way to promote better understanding of the laws governing the practice of medicine and nursing."

Although several of the relevant rules can be found in Pharmacy Board and Medical Board chapters of the administrative code, this guideline is important to nurses because it deals directly with their scope of practice as defined by the state revised code and elaborated on in the Ohio Administrative Code. (See Part II for an overview of the scope of practice for nursing professionals.)

The joint statement says: "It has been brought to our collective attention that protocols are being used often, in a variety of settings, as a means to have unauthorized individuals initiate or adjust medications. **Only an authorized prescriber (physician; advanced practice nurse with a certificate to prescribe; or a physician assistant with a certificate to prescribe and physician delegated prescriptive authority, and, if applicable consistent with the policies of the health care facility) can initiate or adjust medications."**

The statement emphasizes that the state Pharmacy Board rule on protocols [4729-5-01(K) and (L)(1)(2)] permits reliance on protocols in only **three situations:**

1. Emergencies.
2. Administration of biologicals for the purpose of preventing disease.
3. Administration of vaccines for the purpose of preventing disease.

The guideline provides the following information:

For the purposes of enforcing Rule 4729-5-01(K) and (L)(1)(2) O.A.C.:

K. "Standing order" will mean the same as the term "protocol."

L. "Protocol" is defined as:

1. A definitive set of treatment guidelines that include definitive orders for drugs and their specified dosages which have been authorized by a prescriber as defined in rule 4729-5-15 of the Administrative Code and have been approved by the state board of pharmacy to be used by certified or licensed health care professionals when providing limited medical services to individuals in an emergency situation when the services of a prescriber are not immediately available; or
2. A definitive set of treatment guidelines that include definitive orders for drugs and their specified dosages which have been authorized by a prescriber as defined in rule 4729-5-15 of the Administrative Code and have been approved by the state board of pharmacy to be used by certified or licensed health care professionals when administering biologicals or vaccines to individuals for the purpose of preventing diseases.
3. A definitive set of written treatment guidelines that include patient-specific and dose-specific orders for the administration of a specific drug that

have been authorized by a prescriber to be used when the services of that prescriber are not immediately available. The state board of pharmacy must approve the treatment guidelines prior to implementation. A list of the board-approved drugs used in the treatment guidelines shall be displayed on the pharmacy board web site *(www.pharmacy.ohio.gov)*. To be considered for approval by the board, the treatment guidelines must meet the following requirements:

a. The drugs shall only be administered by an individual authorized by law to administer the drugs that are listed in the treatment guidelines.
b. A prescriber must complete an assessment and make a diagnosis prior to ordering a set of treatment guidelines.
c. The treatment guidelines:
   i. Can only be initiated upon the order of a prescriber, and the prescriber, utilizing positive identification, must create an order in the patient record to acknowledge and document an adjustment made pursuant to the treatment guidelines before another dose or frequency adjustment can be made;
   ii. Shall only apply to adjusting the dose or frequency of the administration of a specific drug that has been previously ordered by a prescriber;
   iii. Apply only to those drugs that may require calculations for specific dose and frequency adjustments which shall be based on objective measures;
   iv. Apply only to those drugs for which the therapeutic dose is significantly lower than the dose expected to cause detrimental adverse effects;
   v. Do not apply to those drugs for which a dosage change selected within the usual normal dose range could cause detrimental adverse effects;
   vi. Can be performed without requiring the exercise of medical judgment;
   vii. Will lead to results that are reasonably predictable and safe;
   viii. Can be performed safely without repeated medical assessments;
   ix. Performed improperly, would not present a danger of immediate and serious harm to the patient.

A protocol may be used only by individuals authorized by law to administer the drugs and to perform the procedures included in the protocol.

Preprinted orders

The statement also clarifies that protocols are NOT the same as preprinted orders, which ARE permitted in inpatient settings. Rule 4729-5-01(J) says:

J. "Preprinted order" is defined as a patient-specific, definitive set of drug treatment directives to be administered to an individual patient who has been examined by a prescriber and for whom the prescriber has determined that the drug therapy is appropriate and safe when used pursuant to the conditions set forth in the preprinted order. Preprinted orders may be used only for inpatients in an institutional facility as defined in Chapter 4729-17 of the O.A.C.

Frequently asked questions

When is it appropriate to use protocols?

A protocol may only be used in a true emergency, or for biologicals or vaccines administered to individuals for the purpose of preventing diseases. For all other situations, all orders must be patient-specific with well-defined parameters for administration, and authorized by the prescriber prior to implementation. The parameters to be used include: (1) description of the intended recipients, (2) drug name and strength, (3) specific instructions on how to administer the drug, (4) dosage, (5) frequency, and (6) a signature of the authorized prescriber. The administration of drugs that are not patient-specific or authorized by the prescriber prior to implementation would be the unauthorized practice of medicine, which is a **felony** in this state.

Enforcing the appropriate use of protocols as described above is not intended to address or limit the practice of certified registered nurse anesthetists or anesthesiologist assistants administering anesthesia in accordance with statute and rule. This information is also not meant to disrupt the consultative agreement between pharmacist, authorized prescriber and patient.

What is an example of a "true emergency?"

For the purposes of this rule, examples of "true emergencies" would be cases such as heart attacks, severe burns, cyanide poisonings, electrocutions or severe asthmatic attacks. Examples of non-emergencies would be earaches, stomachaches or infections.

What is an example of a biological or vaccine administered to an individual for the purpose of preventing disease?

For purposes of this rule, examples of biologicals or vaccines administered to individuals for the purpose of preventing diseases would be flu vaccines, tetanus toxoids, hepatitis B vaccines or PPD tuberculosis tests. Note that vaccines such as typhoid oral vaccine that must be taken over several days cannot be dispensed by a nurse who is not authorized to prescribe. These drugs must be dispensed by an authorized prescriber to his or her own patients or by a pharmacist pursuant to a prescription.

How does a non-prescriber adjust or initiate medication in an inpatient setting?

Pharmacy Board Rule 4729-5-01 OAC addresses the adjustment or initiation of medication in inpatient settings through use of preprinted orders. A preprinted order is defined as a patient-specific, definitive set of drug treatment directives to be administered to an individual patient who has been examined by a prescriber and for whom the prescriber has determined that the drug therapy is appropriate and safe when used pursuant to the conditions set forth in the order. Preprinted orders may be used only for inpatients. Because the preprinted order is patient-specific and is prescribed by an authorized prescriber who has examined the patient, these are not protocols and are therefore appropriate for use in an inpatient facility.

What is the difference between "dispense" and "administer"?

The Pharmacy Board defines "dispense" as "the final association of a drug with a particular patient pursuant to the prescription, drug order, or other lawful order of a prescriber and the professional judgment of and the responsibility for: interpreting, preparing, compounding, labeling, and packaging a specific drug." (4729-5-01(B) O.A.C.) "Administer" is defined in the Revised Code as "the direct application of a drug, whether by injection, inhalation, ingestion, or any other means to a person or an animal." (3719.01(A) O.R.C.) To easily remember the difference between the two in practice, you may use this simplified distinction: "Administration" means "*here's a dose, take it NOW*." "Dispensing" means "*here's a dose, take it LATER*." "Dispensing" is limited to pharmacists and authorized prescribers. "Administration" may be performed by a nurse pursuant to the order of an authorized prescriber.

More information

The full statement and list of frequently asked questions (FAQs) can be accessed online at: *http://www.nursing.ohio.gov/PDFS/JOINT%20REGULATORY%20STATEMENT%202010.pdf*

Part II: The scopes of practice for Ohio licensed nurses

The Nurse Practice Act

Nurses in Ohio are accountable for the laws and rules regarding nursing practice in the state. The Nurse Practice Act (the law governing nursing practice) is codified in Chapter 4723 of the Ohio Revised Code (ORC), which defines the scopes of practice for registered and licensed practical nurses. The rules regarding nursing practice, the Ohio Administrative Code (OAC), "fill in" the law by specifying the rules and processes developed by the Board of Nursing (Board) to carry out the law. Rules are promulgated by the board and are reviewed at least every five years. Rules hearings are an open process, including an annual public hearing each November in which nurses are encouraged to participate. Standards of safe nursing practice, continuing education requirements and principles of delegation are some of the topics outlined in the rules.

Definitions [ORC 4723.01]

The first section of the Ohio Nurse Practice Act is an explanation of definitions used in the text; it

defines the general scopes of practice for nurses:

- "**Registered nurse**" means an individual who holds a current, valid license issued under Chapter 4723 that authorizes the practice of nursing as a registered nurse.
- "**Practice of nursing as a registered nurse**" means providing to individuals and groups nursing care requiring specialized knowledge, judgment and skill derived from the principles of biological, physical, behavioral, social and nursing sciences. Such nursing care includes:
  - Identifying patterns of human responses to actual or potential health problems amenable to a nursing regimen.
  - Executing a nursing regimen through the selection, performance, management and evaluation of nursing actions.
  - Assessing health status for the purpose of providing nursing care.
  - Providing health counseling and health teaching.
  - Administering medications, treatments and executing regimens authorized by an individual who is authorized to practice in this state and is acting within the course of the individual's professional practice.
  - Teaching, administering, supervising, delegating and evaluating nursing practice.
- "**Nursing regimen**" may include preventative, restorative and health-promotion activities.
- "**Assessing health status**" means the collection of data through nursing assessment techniques, which may include interviews, observation and physical evaluations for the purpose of providing nursing care.
- "**Licensed practical nurse**" means an individual who holds a current, valid license issued under Chapter 4723 that authorizes the practice of nursing as a licensed practical nurse.
- "**The practice of nursing as a licensed practical nurse**" means providing to individuals and groups nursing care requiring the application of basic knowledge of the biological, physical, behavioral, social and nursing sciences at the direction of a licensed physician, dentist, podiatrist, optometrist, chiropractor or registered nurse. Such nursing care includes:
  - Observation, patient teaching and care in diverse health care settings.
  - Contributions to the planning, implementation and evaluation of nursing.
  - Administration of medications and treatments authorized by an individual who is authorized to practice in this state and is acting within the course of the individual's professional practice, except that administration of intravenous therapy medications may be administered by a licensed practical nurse upon proof of completion of a course in medication administration approved by the board of nursing.
  - Administration to an adult of intravenous therapy authorized by an individual who is authorized to practice in this state and is acting within the course of the individual's professional practice.
  - Delegation of nursing tasks as directed by a registered nurse.
  - Teaching nursing tasks to licensed practical nurses and individuals to whom the licensed practical nurse is authorized to delegate nursing tasks as directed by a registered nurse.
- "**Certified registered nurse anesthetist," "clinical nurse specialist," "certified nurse-midwife," and "certified nurse practitioner**" means a registered nurse who holds a valid certificate of authority issued under chapter 4723 that authorizes the practice of nursing as the named practitioner.

Scope of practice

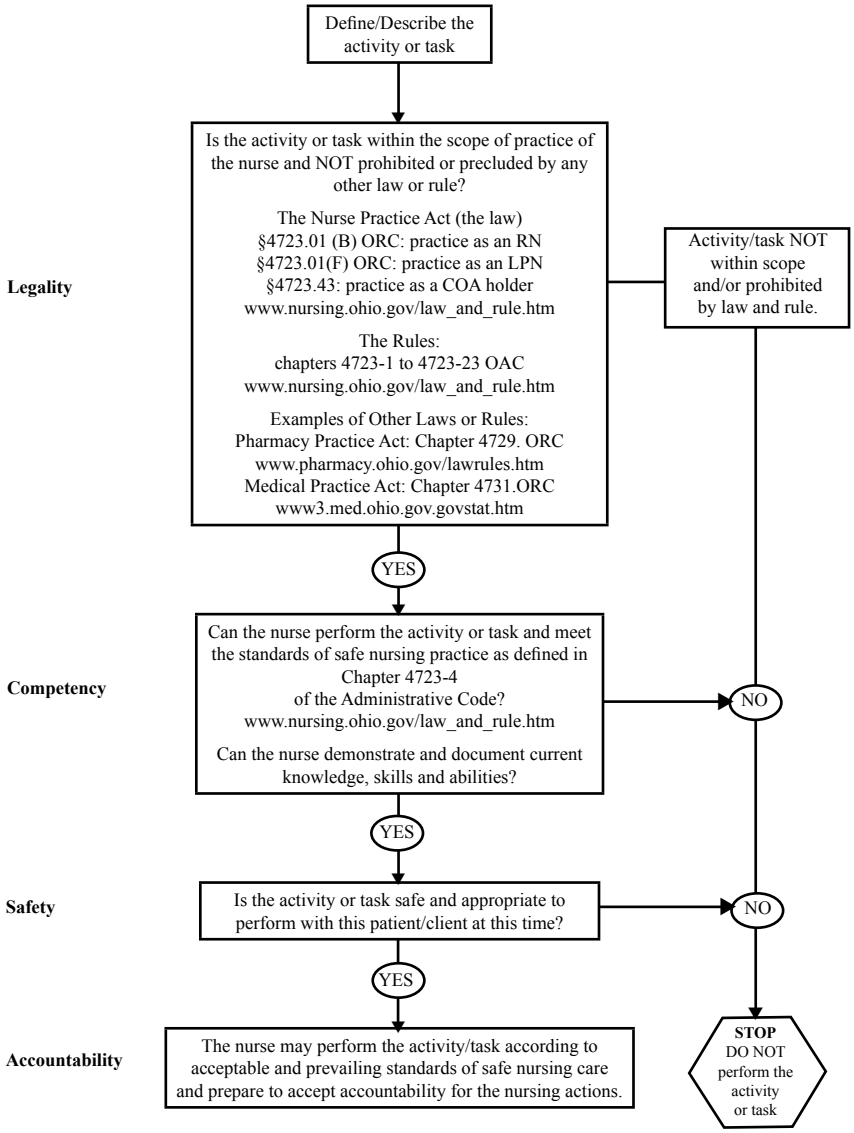
Scope of practice refers to an area of competence, usually obtained through formal study, training or professional experience, and one for which a certification or other proof of qualification is awarded. Professional accountability is the state of being accountable or responsible for professional obligations, including legal liability for failure to perform as expected. The licensed nurse is legally responsible and accountable for knowing the defined scope of nursing practice as outlined in the Ohio Revised Code and state rules and regulations that expand upon the ORC.

The OAC lists standards of practice for registered nurses and licensed practical nurses to meet the mandates of the Revised Code and state rules. Sections 4723-4-03 and 4723-4-04 of the administrative code are clear: A licensed nurse must maintain currently knowledge of the duties, responsibilities and accountabilities for safe nursing practice. They nurse must demonstrate competence, accountability and skills in all aspects of nursing care. This includes recognition, referral or consultation and intervention when a complication arises.

And in many cases, nurses are required to make critical decisions about whether a specific activity or task falls within their scope of practice. The Ohio Board of Nursing has prepared a chart to help nurses make those decisions within the law.

Decision Making Model

Scope of Practice Decision Making Model



Scope of specialized nursing services

A certified registered nurse anesthetist, clinical nurse specialist, certified nurse-midwife or certified nurse practitioner may provide to individuals and groups nursing care that requires knowledge and skill obtained from advanced formal education and clinical experience.

A nurse authorized to practice as a **certified nurse-midwife**, in collaboration with one or more physicians, may provide the management of preventive services and those primary care services necessary to provide health care to women antepartally, intrapartally, postpartally and gynecologically, consistent with the nurse's education and certification, and in accordance with rules adopted by the board. No certified nurse-midwife may perform version, deliver breech or face presentation, use forceps, do any obstetric operation, or treat any other abnormal condition except in emergencies. A certified nurse-midwife who holds a certificate to prescribe may, in collaboration with one or more physicians, prescribe drugs and therapeutic devices in accordance with rules adopted by the board.

A nurse authorized to practice as a **certified registered nurse anesthetist**, with the supervision and in the immediate presence of a physician, podiatrist or dentist, may administer anesthesia and perform anesthesia induction, maintenance, and emergence, and may perform with supervision preanesthetic preparation and evaluation, postanesthesia care, and clinical support functions consistent with the nurse's education and certification and in accordance with rules adopted by the board. A certified registered nurse anesthetist is not required to obtain a certificate to prescribe in order to provide the anesthesia care described in this division. The physician, podiatrist or dentist supervising a certified registered nurse anesthetist must be actively engaged in practice in this state. When a certified registered nurse anesthetist is supervised by a podiatrist, the nurse's scope of practice is limited to the anesthesia procedures that the podiatrist has the authority to perform.

A nurse authorized to practice as a **certified nurse practitioner**, in collaboration with one or more physicians or podiatrists, may provide preventive and primary-care services and evaluate and promote patient wellness within the nurse's nursing specialty, consistent with the nurse's education and certification, and in accordance with rules adopted by the board. A certified nurse practitioner who holds a certificate to prescribe may, in collaboration with one or more physicians or podiatrists, prescribe drugs and therapeutic devices.

A nurse authorized to practice as a **clinical nurse specialist**, in collaboration with one or more physicians or podiatrists, may provide and manage the care of individuals and groups with complex health problems and provide health care services that promote, improve and manage health care within the nurse's nursing specialty, consistent with the nurse's education and in accordance with rules adopted by the board.

RN and LPN: Clarifying scopes of practice

The purpose of this section is to help clarify and differentiate the scope of practice of the registered nurse (RN) and the licensed practical nurse (LPN), and the role of each as a member of the health care team.

Educational preparation

The Ohio Board of Nursing establishes the minimum standards for curriculum, faculty qualifications and student progression for both the registered nurse (RN) and practical nursing (PN) pre-licensure nursing education program. Only those students who have graduated from an approved pre-licensure nursing education program are eligible to sit for the licensure exam (NCLEX®).

There are some basic differences between the RN and the PN pre-licensure education program. The PN program must be a minimum of one academic or calendar year; the RN program must be a minimum of two academic years. The RN curricula focus is on the principles of biological, physical, behavioral, social and nursing sciences across the life span. The PN programs focus on basic biological, physiological, social and behavioral sciences as well as nursing art and science across the life span. The RN applies these principles to provide complex care to individual and groups in a variety of settings using specialized knowledge, judgment and skill. The LPN applies this knowledge to provide basic care to individuals and groups in structured settings.

Scope of practice

Both the RN and the LPN are valuable members of the health care team. Both are expected to know and practice within their respective scopes of practice as stated in the Nurse Practice Act [Chapter 4723 Ohio Revised Code (ORC)] and the standards of safe nursing care as stated in Chapter 4723-4, Ohio Administrative Code (OAC). The legal scope of practice for both the RN and the LPN can be found in Section 4723.01 Ohio Revised Code.

Revised Code, the Nurse Practice Act. The RN and LPN are required to maintain current knowledge of the duties, responsibilities and accountabilities for practicing within their respective scopes of practice and for safe nursing practice. The scopes of practice for the RN and the LPN are based on their respective educational programs.

RNs have the authority to identify patterns of human responses to actual or potential health problems by independently:

- Providing preventative, restorative and health promotion activities.
- Assessing health status for the purpose of providing nursing care.
- Providing health counseling and health teaching.
- Teaching, delegating, administering, supervising and evaluating nursing practice.

The LPN has a dependent role and provides patient care only at the direction of the registered nurse, licensed physician, dentist, podiatrist, optometrist or chiropractor. "Direction" means communicating a plan of care to a licensed practice nurse.

Supervision would include the initial and ongoing directions, procedural guidance and observation and evaluation by the RN of the nursing care provided by the LPN. The amount of supervision that would be required for the LPN would be decided by the RN on an individual basis. The nursing care provided by the LPN includes patient observation, direct patient care, patient teaching and contributing to the planning and evaluation of patient care.

Both the RN and the LPN administer medications and treatments and execute regimens authorized by an appropriately authorized individual, such as physicians or an advanced practice nurse. Both the RN and LPN are responsible for implementing the nursing process in the delivery of nursing care (Rules 4723-4-7 and 4723-4-08 Ohio Administrative Code).

The Nursing Board receives many questions about the LPN's role in the assessment component of the nursing process. While the law does not specifically address the issue of the LPN's role in the assessment process, the rule as found in 4723-4-08 Ohio Administrative Code clearly places the responsibility for the analysis of the data on the RN. It is the responsibility of the LPN to contribute to that data analysis by collecting objective and subjective data at the direction of the RN and by reporting and documenting the information collected.

The LPN contributes to all steps of the nursing process. It is the responsibility of the RN to direct the LPN in the roles of collection of data, the implementation of the plan of nursing care and the evaluation of the nursing care.

RN role/nursing process:

- Collect and document objective and subjective data.
- Analyze assessment data.
- Establish, accept or modify a nursing diagnosis.
- Implement the current plan of nursing care.
- Evaluate and document the patient's response to the nursing care.
- Reassess and revise the nursing plan of care as appropriate.

LPN role/nursing process:

- Collect and document objective and subjective assessment data and observations about the patient's condition.
- Contribute observations to the nursing assessment and report data to the appropriate practitioner.
- Implement the current plan of nursing care at the direction of the RN, licensed physician, dentist, podiatrist, optometrist or chiropractor.
- Contribute to and document the evaluation of the patient's response to the nursing plan of care.
- Contribute to the revision of the nursing plan of care.

- Contribute to the evaluation of the patient's response to the plan of care through documentation and verbal communication with other members of the health care team.

Part III: Standards of safe practice for Ohio licensed nurses
Ensuring client safety

Identification
All licensed nurses providing direct nursing care to a client, including certified nurse-midwives, certified nurse practitioners, certified registered nurse anesthetists and clinical nurse specialists must display the applicable title or initials set forth in division C of section 2723.03 of the Revised Code to identify their relevant licensure. They must identify their titles whenever interacting with a client or other health care providers on behalf of the client in person or on the telephone.

The approved initials are:
1. A person licensed to practice nursing as a registered nurse may use that title and the initials "**R.N.**"
2. A person licensed to practice nursing as a licensed practical nurse may use that title and the initials "**L.P.N.**"
3. A person authorized to practice nursing as a certified registered nurse anesthetist may use that title, the initials "**C.R.N.A.**" or "**N.A.**," and any other title or initials approved by the board of nursing;
4. A person authorized to practice nursing as a clinical nurse specialist may use that title, the initials "**C.N.S.**," and any other title or initials approved by the board;
5. A person authorized to practice nursing as a certified nurse-midwife may use that title, the initials "**C.N.M.**," and any other title or initials approved by the board;
6. A person authorized to practice nursing as a certified nurse practitioner may use that title, the initials "**C.N.P.**," and any other title or initials approved by the board;
7. A person authorized to practice as a certified registered nurse anesthetist, clinical nurse specialist, certified nurse-midwife, or certified nurse practitioner may use the title "**advanced practice nurse**" or the initials "**A.P.N.**"

Professional care: Nurses may delegate tasks, including medication administration, only in accordance with Chapters 4723-13, 4723-23, 4723-26 or 4723-27 of the Administrative Code. These include regulations that express specific rules on delegating tasks (See Part IV of this course), and the standards for delegating tasks to community health workers and medication aides. Nurses must report and document assessments, observations and care provided to a client and the client's response to that care. Nurses shall not falsify any client records – including case management documents or reports, or time records and other documents related to billing for nursing services. They must report – accurately and in a timely manner – any errors or deviations from the current valid order that occur with a client.

A safe environment: Nurses shall implement measures to promote a safe environment for each client and delineate, establish and maintain professional boundaries with each client.

This means that at all times when providing direct nursing care to a client, they shall provide privacy during examination or treatment and in the care of personal or bodily needs and treat each client with courtesy, respect and with full recognition of dignity and individuality.

A licensed nurse shall not:
- Engage in behavior that causes or may cause (or may be reasonably interpreted as) physical, verbal, mental or emotional abuse to a client.
- Misappropriate a client's property or engage in behavior (or what appears to be such behavior) to seek or obtain personal gain at the client's expense or that constitutes inappropriate involvement in the client's personal relationships or financial matters.
- Engage in sexual conduct with a client or conduct in the course of practice that is sexual, seductive or sexually demeaning – or conduct that may be reasonably interpreted as such.

(For the purpose of these rules, the client is always presumed incapable of giving free, full, or informed consent to sexual activity with the nurse.)

Supervision concerns: A licensed nurse, when functioning in an administrative role, shall verify that each nurse, dialysis technician, or medication aide under the nurse administrator has a current valid license to practice nursing in Ohio or valid certificate to practice as a dialysis technician or medication aide in Ohio; and other valid documents of approval or certification as required by the board.

When nursing practice, as set forth in section 4723.01 of the Revised Code, is supervised or evaluated, only a registered nurse may supervise and evaluate the practice of other registered nurses and licensed practical nurses. In matters other than the practice of nursing, a non-nursing supervisor may evaluate a nurse employee.

Honesty
A licensed nurse shall not make any false, misleading or deceptive statements, or submit or cause to be submitted any false, misleading or deceptive information or documentation to:
- The Nursing Board or any representative of the board.
- Current employers.
- Prospective employers when applying for positions requiring a nursing license.
- Facilities in which or organizations for whom the nurse is working a temporary or agency assignment.
- Other members of the client's health care team.
- Law enforcement personnel.

Part IV: Laws and rules on delegation of nursing tasks
Definitions
Chapter 4723-13 of the Administrative Code outlines definitions, rules and standards for the delegation of nursing tasks, including administering medications, for nurses. The chapter begins with definitions of terms for the chapter. Among them are:
- "**Client**" means the recipient of nursing care, which may include an individual, a group or a community.
- "**Delegation**" means the transfer of responsibility for the performance of a selected nursing task from a licensed nurse authorized to perform the task to an individual who does not otherwise have the authority to perform the task.
- "**Delegating nurse**" means the nurse who delegates a nursing task or assumes responsibility for individuals who are receiving delegated nursing care.
- "**Direction**" means communicating a plan of care to a licensed practical nurse. Direction by a registered nurse is not meant to imply the registered nurse is supervising the licensed practical nurse in the employment context.
- "**Licensed nurse**" means a registered nurse or a licensed practical nurse licensed to practice nursing in Ohio.
- "**Medication aide**" means an individual who holds a current valid certificate issued under Chapter 4723 of the Revised Code that authorizes the individual to administer medications in nursing homes or residential care facilities.
- "**Nursing tasks**" means those activities that constitute the practice of nursing as a licensed nurse and may include, but are not limited to, assistance with activities of daily living that are performed to maintain or improve the client's well-being when the client is unable to perform that activity for him or herself.
- "**Unlicensed person**" means an individual not currently licensed by the board as a registered nurse or licensed practical nurse, or an individual who does not hold a current valid certificate to practice as a dialysis technician or administer medications as a medication aide.

General information
Only a licensed nurse may delegate a nursing task to an unlicensed person.

However, individuals who are registered, certified, licensed or otherwise legally authorized in Ohio under any law, including some nursing specialists, may engage in the practice for which they are registered, certified, licensed or authorized. Unlicensed individuals covered by any other law or rule that authorizes them to administer medications also may do so.

An unlicensed person also may assist with self-directed care, including self-administration of medications in a facility where the substantial purpose of the setting is other than the provision of health care.

Medication aides

On March 26, 2009, the Medication Aide Pilot Program at various non-hospital settings ended. Since then, the state allows any nursing home or resident care facility to utilize one or more medication aides to administer prescription medications to its residents. The medication aide must hold a current, valid medication aide certificate issued by the board and have received appropriate, prescribed training. A licensed nurse must delegate the task of medication administration to the medication aide.

Chapter 4723-67 of the Revised Codes limits the prescription medications the aide may administer to:

- Oral medications.
- Topical medications.
- Medications administered as drops to the eye, ear or nose.
- Rectal and vaginal medications.
- Medications prescribed with a designation authorizing or requiring administration on an as-needed basis, but only if a nursing assessment of the patient is completed before the medication is administered.

Medication aides may NOT administer prescription medications containing a schedule II controlled substance, as defined in section 3719.01 of the Revised Code; and medications requiring dosage calculations. They may NOT administer prescription medications by injection; intravenous therapy procedures; or splitting pills for purposes of changing the dose being given.

Prohibitions.

No person to whom a nursing task is delegated may delegate the nursing task to any other person. The act of delegating a task does not mean an unlicensed person may perform that task on any individual other than the person specified by the delegating nurse.

Remember: An unlicensed person who performs a nursing task and does not comply with all the provisions set forth in chapter 4723-15, and who is not otherwise excepted from licensure pursuant to section 4723.32 of the Revised Code or otherwise legally authorized, shall be engaging in the unauthorized practice of nursing, which is prohibited by section 4723.03 of the Revised Code.

Criteria and standards

Who can delegate: A registered nurse may delegate a nursing task to an unlicensed person if all the conditions set by chapter 4723-13-05 of the OAC are met. A licensed practical nurse may delegate to an unlicensed person only at the direction of a registered nurse.

Medications: Except as otherwise allowed by law, a licensed nurse may delegate to an unlicensed person the administration of only the following medications:

- Over-the-counter topical medications to be applied to intact skin for the purpose of improving a skin condition or providing a barrier.
- Over-the-counter eye drop, ear drop, and suppository medications, foot soak treatments, and enemas.

Considerations before delegating: Before delegating a task to an unlicensed person, delegating nurses must determine a number of points. First, they must ensure that the task is within their own scope of practice and knowledge, skill and abilities. Then, they must be convinced the task is within the knowledge, skill and ability of the unlicensed person who will perform the delegated task, and that appropriate resources and support are available for the performance of the task and management of the outcome. The delegating nurse must ensure that adequate and appropriate supervision of the nursing task by a licensed nurse is available.

Other criteria include determining that:

- The nursing task requires no judgment based on nursing knowledge and expertise on the part of the unlicensed person performing the task.
- The results of the nursing task are reasonably predictable.
- The nursing task can be safely performed according to exact, unchanging directions, with no need to alter the standard procedures for performing the task.
- The performance of the nursing task does not require that complex observations or critical decisions be made with respect to the task.
- The nursing task does not require repeated performance of nursing assessments.
- The consequences of performing the nursing task improperly are minimal and not life-threatening.

Before delegating a nursing task, the delegating nurse must identify the person on whom the nursing task may be performed and set a specific timeframe during which it will be done. The delegating nurse also must complete an evaluation of the conditions that relate to the delegation, including an evaluation of the person who needs nursing care; the types, complexity and frequency of care the person requires; and the stability of the individual who needs care. The delegating nurse also must review evaluations performed by other licensed health care professionals.

Remember: The delegating nurse is accountable for the decision to delegate nursing tasks to an unlicensed person. If a licensed nurse determines that an unlicensed person is not correctly performing a delegated nursing task, the licensed nurse must immediately intervene.

Works cited

- LA Writer Ohio Laws & Rules-Chapter 4723: Nurses, http://codes.ohio.gov/orc/4723.
- Ohio Board of Nursing Decision-Making Model Pub #OBN-103, http://www.nursing.ohio.gov/pdfs/Decmodel.pdf, accesses 7/24/08.
- Ohio Nurses Association, http://www.ohnurses.org.
- Ohio Board of Nursing http://www.nursing.ohio.gov/

(Final examination questions on next page.)

NOTES

OHIO LAW AND STANDARDS FOR NURSES

Final Examination Questions

Choose True or False for questions 1 through 10 and mark your answers on the Final Examination Sheet found on page 57 or take your test online at www.elitecme.com.

1. "Protocols," a definitive set of treatment guidelines that include definitive orders for drugs and their specified dosages, may not be used in emergencies.

   True False

2. The Nurse Practice Act (the law regarding nursing practice) is codified in Chapter 4723 of the Ohio Revised Code (ORC), which defines the scopes of practice for registered and licensed practical nurses.

   True False

3. "Practice of nursing as a registered nurse" includes providing health counseling and health teaching.

   True False

4. According to Ohio Codes, licensed practical nurses may not administer intravenous therapy medications, even with completion of a course in medication administration.

   True False

5. The Scope of Practice Decision Making Model helps nurses assess the legality, competency, safety and accountability of their actions when deciding what activities and tasks they may undertake under state laws and rules.

   True False

6. Licensed practical nurses (LPNs) may collect data, analyze it and create nursing plans for a person.

   True False

7. A person authorized to practice nursing as a certified nurse practitioner may use that title, the initials "CNP" and any other title or initials authorized by the board.

   True False

8. At all times when providing direct nursing care to the client, nurses shall provide privacy during examination or treatment and in the care of personal and bodily needs.

   True False

9. Unlicensed persons may not assist with self-directed care, including self-administration of medications.

   True False

10. A licensed nurse may delegate to an unlicensed person the administration of over-the-counter eye drop and foot soak treatments.

    True False

CHAPTER 2

DIABETES MELLITUS

(12 CONTACT HOURS)

Learning objectives

- Identify the various types of diabetes.
- Identify the prevalence of diabetes in the United States.
- Discuss the pathophysiology of diabetes.
- Identify the nonmodifiable and modifiable risk factors for developing diabetes.
- Understand the recommended screening guidelines to prevent diabetes.
- Understand the recommended diagnostic tests to confirm diabetes.
- Identify the common signs and symptoms of diabetes.
- Identify the psychological impact of a diabetes diagnosis for the patient and family.
- Compare and contrast the various treatment modalities of diabetes (nutrition/diet, oral medications, insulin, pumps and surgical options).
- Identify and understand the role of the nurse caring for a patient diagnosed with diabetes.
- Identify the cultural considerations related to caring for the diabetic patient and family.
- Discuss the future of diabetic treatment, including stem cell research.

Introduction

Diabetes mellitus is a common, chronic, complex disease that encompasses a group of disorders that have intolerance to the production of glucose. Proper management of diabetes requires a collaborative approach with the patient and family to make lifelong behavioral and lifestyle changes. The nurse has an enormous role in planning, organizing and empowering the patient and family.

Regardless of a nurse's specialty, each of us has been responsible for the care of a patient living with diabetes. Although nurses may have a basic understanding of diabetes, it is important for them to understand the complexity of the disease and feel comfortable in their knowledge of it to ensure that they give patients the right information to control their diabetes and to avoid serious complications.

Diabetes is the world's most prevalent metabolic disease, and it is the leading cause of adult blindness, renal failure, gangrene and the necessity for limb amputations [63]. Since 2007, diabetes has reached epidemic proportions worldwide, making it the sixth-leading cause of death in the United States. Growing numbers of people are dealing with acute and chronic complications, disability and death caused by the diabetic disease process.

Prevalence of diabetes in the United States and worldwide

In June 2008, the National Diabetes Information Clearinghouse (NDIC) and the American Diabetes Association (ADA) updated their websites reflecting the prevalence of diabetes for the year 2007 [19,58]:

- **Diabetes in the United States**

  In 2007, there were 23.6 million people (children and adults) – 8 percent of the total United States population – living with diabetes. [54].This included 17.9 million people diagnosed and 5.7 million who were not diagnosed. In 2007, of the total 23.6 million people, 1.6 million were new cases diagnosed in people aged 20 years or older. Between 2005 and 2007, more than 3 million people were diagnosed with diabetes every year.
  - Only a fraction of the total number of cases are found under the age of 20:
    - 186,300 (0.22 percent) of all people in this age group have diabetes. About one in every 400 to 600 children and adolescents has type 1 diabetes. In 2007, approximately 2 million adolescents (one in six overweight adolescents) aged 12-19 had pre-diabetes. Although type 2 diabetes can occur in youth, the nationally representative data that would be needed to monitor diabetes trends in youth by type are not available. Clinically based reports and regional studies suggest that type 2 diabetes, although still rare, is being diagnosed more frequently in children and adolescents, particularly in American Indians, African Americans and Hispanic/Latino Americans.
  - The majority of diabetes is found in patients over the age of 20:
    - Age 20 or older: 23.5 million (10.7 percent) of all people in this age group have diabetes.
    - Age 60 or older: 12.2 million (23.1 percent) of all people in this age group have diabetes.
    - Men: 12.0 million (11.2 percent) of all men age 20 or older have diabetes, although nearly one-third of them do not know it.
    - Women: 11.5 million or 10.2 percent of all women age 20 or older have diabetes, although nearly one-quarter of them do not know it. The prevalence of diabetes is at least two to four times higher among non-Hispanic black, Hispanic/Latino American, American Indian, and Asian/Pacific Islander women than among non-Hispanic white women.
    - Non-Hispanic whites: 14.9 million (9.8 percent) of all non-Hispanic whites aged 20 years or older have diabetes.
    - Non-Hispanic blacks: 3.7 million (14.7 percent) of all non-Hispanic blacks aged 20 years or older have diabetes.
- **Prediabetes in the United States**
  - The overall statistics do not include patients diagnosed with prediabetes (metabolic syndrome), 57 million people.
  - Prevalence of impaired fasting glucose (IFG) in people younger than 20: United States:
    - From 1999 to 2000, 7.0 percent of U.S. adolescents aged 12 to 19 had IFG.
  - Prevalence of IFG in people aged 20 years or older, United States, 2007:
    - In 2003 to 2006, 25.9 percent of U.S. adults age 20 or older and 35.4 percent of adults aged 60 or older had IFG. Applying this percentage to the entire U.S. population in 2007 yields an estimated 57 million American adults age 20 or older with IFG, suggesting that at least 57 million American adults had prediabetes in 2007.
    - After adjusting for population age and sex differences, IFG prevalence among U.S. adults aged 20 years or older in 2003 to 2006 was 21.1 percent for non-Hispanic blacks, 25.1 percent for non-Hispanic whites, and 26.1 percent for Mexican Americans.
- **Gestational diabetes**

  According to the ADA, gestational diabetes affects about 4 percent of all pregnant women, approximately 135,000 cases in the United States each year [12]. Approximately two per 1,000 pregnancies are complicated by pre-existing diabetes (type 1 or type 2) [77].
- **Diabetes and death in the United States**

  According to the Diabetes Research Institute and the Centers for Disease Control and Prevention (CDC), diabetes is now the sixth-leading cause of death among adults by disease and reduces life expectancy by one-third [37]. Just a few years ago, in 2006, diabetes was the seventh-leading cause of death listed on U.S. death certificates. The ranking is based on the 72,507 death certificates in 2006 in which diabetes was listed as the underlying cause of death. According to death certificate reports, diabetes contributed to a total of 233,619 deaths in 2005, the latest year for which data on contributing causes of death are available.
  - It should be noted that the data may be skewed because research has demonstrated that only about 35 to 40 percent of decedents with diabetes had it listed anywhere on the death certificate, and only about 10 to 15 percent had it listed as the underlying cause of death.
- **Cost of diabetes in the United States**
  - Diabetes is a major public health concern and debt to the U.S. population. In 2007, the total (direct and indirect) cost in the U.S. was 174 billion. However, according to the Diabetes Research Institute, diabetes costs the American people an estimated $218 billion each year [37]. This includes:
    - Direct medical costs: $116 billion in 2007, up from 91.8 billion in 2002 [19]. After adjusting for population age and sex differences, average

medical expenditures among people with diagnosed diabetes were 2.3 times higher than what expenditures would be in the absence of diabetes.
- Indirect costs: $58 billion; up from 39.8 billion in 2002 [19]. Indirect costs comprise the amount spent on disability, work loss and premature mortality.

Even though the statistics are astonishing in the U.S., it is more profound globally. According to the World Health Organization (WHO), more than 180 million people worldwide have diabetes, and the number is more than likely to double by 2030 [76]. The WHO (2008) released the following data as well [76]:

- In 2005, an estimated 1.1 million people died from diabetes.
  - Approximately 80 percent of diabetes deaths occur in low and middle-income countries.
  - Half of all diabetes deaths occur in people under the age of 70 years; 55 percent are women.
  - WHO projects that diabetes deaths will increase by more than 50 percent in the next 10 years without urgent action. Most notably, the data may shift because diabetes deaths are projected to increase by over 80 percent in upper-middle income countries between 2006 and 2015.

Understanding the role of the pancreas and diabetes

The pancreas is a banana-shaped organ that lies behind the stomach, with the head and neck extending into the curve of the duodenum and the tail lying against the spleen. The pancreas has endocrine and exocrine capabilities [19]:

- **Endocrine function** involves the islets of Langerhans, microscopic structures that are responsible for two major hormones, glucagon (secreted by the alpha cells) and insulin (secreted by the beta cells) that have an enormous effect on diabetes.
  - **Glucagon** is a hormone that increases blood glucose levels when the blood sugar is low.
  - **Insulin** is a hormone that stimulates growth and promotes the movement, storage and metabolism of carbohydrates, protein and fat. Insulin plays a role in lowering the blood glucose levels by allowing glucose to move across the cell membranes into many tissues.
- **Exocrine function** is responsible for the digestive enzymes excreted to facilitate the eating process. Although the exocrine function of the pancreas plays an enormous role in excreting various digestive enzymes every day, it does not have any relation or effect to diabetes.

Normal pathophysiology in a nondiabetic individual

When an individual eats or drinks something, the body responds by raising the blood sugar to provide energy and nutrients to the cells and organs. Carbohydrate foods provide most of the glucose absorbed and used by the body; proteins and fats provide smaller amounts [75]. According to the ADA, a patient without diabetes will maintain a fasting blood glucose level between 70-99 milligrams/per deciliter (mg/dl) and less than 140 mg/dl postprandial (two hours after eating) [2]. Our bodies cannot differentiate the type of glucose ingested, but after eating any meal or drinking, the blood sugar normally rises, often to between 120 and 130 mg/dl, but generally not above 140 mg/dl [52]. Once the blood sugar rises, the pancreas will respond by releasing insulin to help control the metabolism of the carbohydrates ingested.

Insulin secreted via the pancreas "opens the doors" of the cells throughout the body by binding to insulin receptors on the cell membranes. Once the doors open, insulin travels immediately to the liver via the bloodstream. The pancreas secretes approximately 40 to 50 units of insulin daily into the liver in a two-step manner [19]:

- Low levels during fasting (basal insulin secretion).
- Increased levels 10 minutes after eating (prandial). Insulin will continue to be released periodically if hyperglycemia persists.

Once the insulin is in the liver, it promotes the production and storage of glycogen (long chains of glucose) [19]. Glycogen is required to ensure that a normal, therapeutic blood glucose level is maintained throughout the day. Therefore, if an individual ingests a large amount of food, the excess glucose will be converted into glycogen and stored within the liver and muscles.

During a hypoglycemic event (blood glucose 70 mg/dl) brought on by an individual choosing to skip a meal or choosing to ingest a smaller portion, the body responds by mobilizing glucose into the bloodstream and cells from the stored glycogen to raise the blood glucose levels [19]. At the same time, another major hormone, glucagon, allows glucose to be released from glycogen as needed from the storage sites (predominantly within the liver and muscles) whenever the blood glucose levels are low [19]. The glucagon will then mobilize the glucose from the storage sites to increase the concentrations of glucose in the bloodstream. It is imperative that the pancreas and hormones respond appropriately to prevent complications and the glucose and nutrients from getting to organs and tissues.

Normal pathophysiology in a diabetic patient

In the diabetic patient, the glucose is unable to "unlock" the cell and enter into the body's cells, allowing it to stay in the bloodstream and induce a hyperglycemic state that denies the cells their source of energy [75]. Without therapeutic levels of glucose, the body cannot function adequately because glucose is the main fuel for the central nervous system (CNS). The brain cannot store glucose; therefore it requires a continuous supply. The body attempts to compensate for the insufficiency, however. When the cells are unable to absorb the glucose, they rely on fat and protein for energy. Fat (in the form of triglycerides) and proteins should only be utilized as "reserves" for fuel and not used as energy under normal conditions [19]. If the body continues to use fat and protein for the source of energy, the cells break down, inducing a form of emaciation, muscular atrophy and weakness [63].

Diabetes also causes insulin to either not be produced (Type 1 diabetes) or production to be decreased (Type 2 diabetes). In either instance, without an adequate supply of insulin, glucose is unable to properly move in the bloodstream to the tissues and organs, further exacerbating the cells that are starving for energy and nutrients for survival [2]. Over time, the patient will exhibit various symptoms due to the buildup of glucose in the bloodstream and lack of insulin production (See Signs and symptoms of diabetes).

Diagram 1 below (Role of insulin)

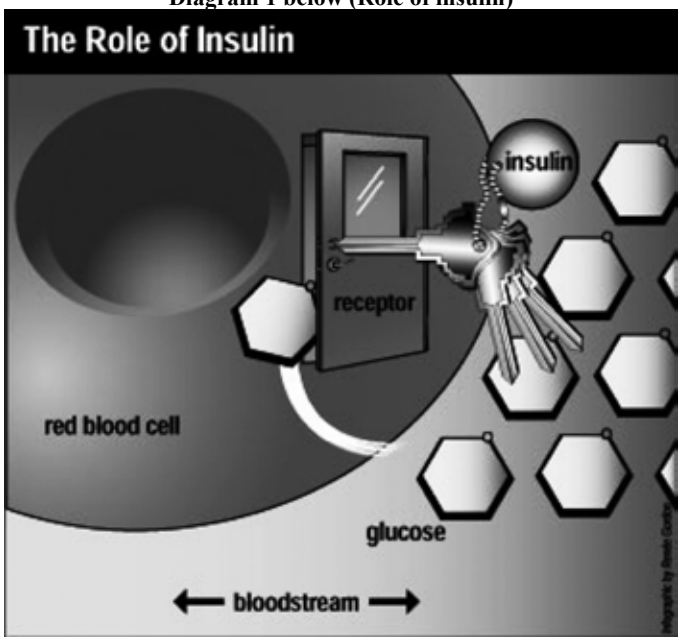


Diagram 1: Carbohydrates that we eat make our blood glucose rise. To utilize the carbohydrates and lower the blood sugar, insulin opens the doors of the body's cells to glucose circulating in the blood. The glucose enters the cells and is used as the cells' fuel for energy. Insulin binds to a spot on the cell surface called a receptor. Likened to a lock and key, insulin is the key that opens up the lock (receptor) so that glucose can pass through the door into the cell. Using this analogy in type 1 diabetes, the keys have been stolen because no insulin is produced (the pancreas does not make the insulin). With type 2 diabetes, the door will not open fully even with the right key, which is known as insulin resistance. Source: [52].

Type 1 diabetes

Type 1 diabetes was previously referred to as insulin-dependent diabetes mellitus (IDDM), juvenile-onset diabetes, ketosis prone diabetes, brittle diabetes and idiopathic diabetes. Type 1 diabetes is a multifactorial disease caused by an autoimmune destruction of insulin-producing pancreatic beta cells. It typically develops when the body's immune system destroys the pancreatic beta cells and insulin is no longer produced in response to the individual's ingestion of food. It is speculated that type 1 diabetes is caused by a family history, women who have had gestational diabetes, the pancreas attacking itself following certain viral infections or after the administration of certain drugs (autoimmune response) [75]. Other risk factors include the following:

- **Genetics** plays an enormous role in predisposing individuals to develop diabetes. In Type 1, family members are at risk of developing diabetes throughout their life. Researchers have identified genetic markers that determine immune responses, specifically DR3 and DR4 antigens on chromosome number six of the human leukocyte antigen (HLA) system, among 95 percent of people diagnosed with type 1 diabetes [25, 53]. The inherited antibodies can be detected in the blood years before the development of any clinical symptoms [25]. In the general population without any genetic predisposition, an individual has a one in 400 to one in 1,000 risk; however, a child of a diabetic patient has a one in 20 to one in 50 risk [51]. Interestingly, the offspring of a mother with type 1 diabetes has a 3 percent risk that increases to 6 percent if the father is affected [53]. The risk increases tremendously among identical twins, up to 25 to 50 percent [53].
- **Age.** Type 1 diabetes can occur at any age; however it is more common in children and young adults, typically under 40 years of age. Type 1 diabetes may account for 5 to 10 percent of all diagnosed cases of diabetes [53].

Type 2 diabetes

Type 2 diabetes was previously referred to as noninsulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes begins as insulin resistance, a disorder in which the cells do not utilize the insulin produced by the pancreas properly. As the need for insulin rises, the pancreas gradually loses its ability to produce insulin. In type 2, the body either does not make enough insulin (insulin deficiency), something interferes with the action of the insulin that is made by the pancreas (insulin resistance) or there is an increase in the hepatic glucose output [21]. Type 2 diabetes is the most common form nurses will care for in their career.

Type 2 diabetes may account for about 90 to 95 percent of all diagnosed cases of diabetes. Type 2 diabetes is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity and race/ethnicity – African Americans, Hispanic/Latino Americans, American Indians and some Asian Americans and native Hawaiians or other Pacific Islanders are at particularly high risk for type 2 diabetes. The prevalence of type 2 diabetes among African Americans is 1.6 times higher than that of the total U.S. population [50]. It is speculated that African Americans are at a higher risk because of correlating obesity and hypertension rates, especially among African American women [50].

Type 2 diabetes is increasingly being diagnosed in children and adolescents due to genetics, a significant incline in childhood obesity and decreased activity [25, 75].

The patient with type 2 diabetes typically presents as an obese patient with a family history of diabetes and a recent stressor, such as a death of family member, illness or loss of a job [75].

Although the origin is unknown, research has demonstrated that type 2 diabetes is influenced by genetics along with the combination of environmental factors. Type 2 diabetes is very complex and not all that well defined because there have been numerous susceptibility genes identified. The pathogenesis of type 2 diabetes revolves around genes that either influence viability or cellular responses to insulin or beta cell function or both [48].

- **Genetics**. Genetics plays an enormous role in the development of diabetes (90 percent). However, in contrast to type 1 diabetes, there is no identified HLA link. The maturity-onset diabetes of the young (MODY) is thought to be an autosomal dominant as it affects 50 percent of first-degree relatives. At this time, there are at least six types of MODY, and it is considered to be a subset of type 2 diabetes. Each specific type of MODY is caused by a specific mutation in the enzyme that is involved in the beta cell function and insulin action. For example, MODY3 develops after a mutation occurs in the hepatocyte nuclear factor alpha-1, and MODY2 can be attributed to a defect in the glucose-sensing ability (glucokinase mutation). Because only 2 to 5 percent of cases of diabetes are monogenic, they are classified as MODY [48].
  - The offspring of people with type 2 diabetes have a 15 percent chance of developing type 2 diabetes and a 30 percent risk of developing glucose intolerance (inability to metabolize carbohydrates normally).
- **Race/ethnicity.** Type 2 diabetes is prevalent in half of all black and Hispanic children and in over two-thirds of American Indian children [46].
- **Environment.** Environmental triggers can be exacerbated by exposure to a viral infection (mumps, rubella or coxsackievirus B4) and chemical toxins (smoked and cured meats) [53].
- **History** of gestational diabetes, polycystic ovarian syndrome (PCOS) or delivering a baby greater than nine pounds.
- **Modifiable risks.** There are certain risks that patients have the power to potentially change and control in their life, such as:
  - **Obesity.** Obesity is defined as being at least 20 percent over the recommended body weight for an individual's height and weight or having a body mass index (BMI) of at least 27 kilograms per meter squared (kg/m2) [53]. When an individual is obese, it hinders the ability of glucose to enter the liver, adipose tissue and skeletal muscle [48]. Intra-abdominal obesity is the single most important risk factor in determining who is at risk of developing type 2 diabetes. Research has demonstrated that severe obesity creates 10 times the risk of developing type 2 diabetes. In addition, having an excessive caloric intake contributes to obesity and predisposes an individual to type 2 diabetes [48].
    - The fat accumulation in nonadipose tissue (ectopic fat) is very common in insulin resistance and type 2 diabetes. The accumulation of lipids in the islets can be attributed to the impairment of insulin secretions, and insulin resistance has been attributed to excess fat in the muscle. Nonalcoholic steatohepatitis is the infiltration of fat within the liver and may result in cirrhosis and hepatic failure. Very little is understood about the pathogenesis of ectopic fat, but overnutrition is clearly the main culprit. Pancreatic fibrosis, which occurs in 33 to 66 percent of type 2 diabetics, can also contribute to the loss of beta cell function.
  - **Physical inactivity.**
  - **Hypertension** (greater than 130/85 in adults), High-density lipid proteins (HDL) cholesterol less than35 mg/dl and/or a triglyceride level greater than 250 mg/dl.

Insensitivity to insulin

Interestingly, patients living with or at risk for diabetes typically have a cellular resistance factor 60 to 80 percent of the time. Resistance to insulin also increases with obesity and a condition called metabolic syndrome. An integral part in the pathogenesis of type 2 diabetes and

metabolic syndrome is the decrease in beta cell responsiveness to the plasma glucose levels as well as abnormal glucagon secretions. (See the subsequent section for further explanation).

Type 2 diabetes, pre-diabetes and insulin resistance (metabolic syndrome)

Type 2 diabetes does not just occur overnight; often a patient will have one of the following conditions before being diagnosed with diabetes [29, 57]:

- **Prediabetes** is a condition in which a patient will have a higher-than-normal blood glucose level but not high enough to be classified as diabetes. People with prediabetes have an increased risk of developing type 2 diabetes, heart disease and a stroke. Prediabetes is a condition that needs to be assessed and monitored by health care professionals because of the seriousness and the risk of developing complicating diseases. As noted, in 2007, 57 million people (one in four) in the U.S. were diagnosed with prediabetes, and a higher prevalence is likely because many patients don't seek medical care to assess whether they have prediabetes.
- People with prediabetes have impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT) [19, 29, 52]:
  - IFG is a condition in which the fasting blood sugar level is 100 to 125 milligrams per deciliter (mg/dL) after an overnight fast. This level is higher than normal but not high enough to be classified as diabetes.
  - IGT is a condition in which the blood sugar level is 140 to 199 mg/dL after a two-hour oral glucose tolerance test (OGTT). This level is higher than normal but not high enough to be classified as diabetes.

Various research studies and the Diabetes Prevention Program (DPP) have demonstrated that most people with prediabetes develop type 2 diabetes within 10 years unless they make the following lifestyle changes [29, 57]:

- **Decrease weight.** Lose 5 to 7 percent of their body weight, approximately 10 to 15 pounds for someone who weighs 200 pounds. Losing just 5 to 7 percent of body weight prevents or delays diabetes by nearly 60 percent. The body mass index (BMI) chart is a measurement of body weight relative to the individual's height. Adults aged 20 or older can use the BMI table to find out whether they are normal weight, overweight, obese or extremely obese.
  - It is important to note that the BMI table has certain limitations as it may overestimate body fat in athletes and others who have a muscular build and underestimate body fat in older adults and others who have lost muscle. BMI for children and teens must be determined based on age and sex in addition to height and weight. Information about BMI in children, teens and adults, including a BMI calculator, is available from the Centers for Disease Control and Prevention (CDC) at *www.cdc.gov/nccdphp/dnpa/bmi.*
- **Diet changes.** Change their diet by decreasing the total calories and cutting out the total fat intake to reduce their risk of complications (such as heart disease).
- **Physical activity.** Increase their level of physical activity, such as walking 30 minutes a day five days a week. Physical activity helps muscle cells use blood glucose for energy by making the cells more sensitive to insulin.
  - In the DPP study, people aged 60 or older who made lifestyle changes lowered their chances of developing diabetes by 70 percent. Many participants in the lifestyle intervention group returned to normal blood glucose levels and lowered their risk for developing heart disease and other problems associated with diabetes. The Diabetes Prevention Program also showed that the diabetes drug Metformin reduced the risk of developing diabetes by 31 percent (See the section Medication modalities for the Type 2 diabetic for further discussion about Metformin.)

  It's important for health care professionals to urge their patients to be physically active, make wise food choices and reach and maintain a healthy weight.

Insulin resistance (commonly referred to as metabolic X syndrome) is a condition in which the body produces insulin but does not use it properly. Over the past decade, there has been a lot of hype correlating diabetes, metabolic syndrome and cardiovascular disease. However, it should be noted that since the late 1960s, research has demonstrated a significant association among diabetes, hypertension, obesity and hyperlipidemia [1]. Then, in the early 1990s, researchers discovered that the same chronic cluster of disorders was caused by insulin resistance and concluded that "insulin resistance syndrome" (syndrome X and metabolic syndrome) was the appropriate name for this condition. At the same time, researchers discovered from the Framingham Offspring Study that a clustering of risk factors, including hyperinsulinemia, dyslipidemia, hypertension and glucose intolerance (rather than hyperinsulinemia alone), characterized the underlying features of the insulin resistance syndrome [1].

- Individuals who are insulin resistant are unable to respond appropriately to insulin, and as a result, their bodies need more insulin to help glucose enter cells. The pancreas tries to keep up with this increased demand for insulin by producing more, but eventually the pancreas can't keep up with the body's needs. So excess glucose builds up in the bloodstream, setting the stage for diabetes. Many people with insulin resistance have high levels of both glucose and insulin circulating in their blood at the same time. Insulin resistance increases the chance of developing type 2 diabetes and heart disease.

A diagnosis of prediabetes or insulin resistance does not mean that diabetes and/or heart disease will definitely develop over the next few years. However, it should be looked upon as a wake-up call to make lifestyle changes to prevent or delay diabetes. According to the CDC (2008) [29]:

- Progression to diabetes among those with prediabetes is not inevitable. Studies have shown that people with prediabetes who lose weight and increase their physical activity can prevent or delay diabetes and return their blood glucose levels to normal.
- The Diabetes Prevention Program, a large prevention study of people at high risk for diabetes, showed that lifestyle intervention reduced developing diabetes by 58 percent during a three-year period. The reduction was even greater, 71 percent, among adults age 60 or older.
- Interventions to prevent or delay type 2 diabetes in individuals with prediabetes can be feasible and cost-effective. Research has found that lifestyle interventions are more cost-effective than medications.

Typically, patients with insulin resistance (metabolic X) and/or prediabetes do not exhibit any diabetic symptoms, and they may have one or both conditions for several years without noticing anything. People with a severe form of insulin resistance (metabolic X) may have a condition called acanthosis nigricans – dark patches of skin, usually on the back of the neck, elbows, knees, knuckles and the armpits – an early sign of prediabetes. Nurses and health care providers need to be attuned to the major risk factors (similar to the development of diabetes). According to the NDIC (2008) and the ADA, the risk factors for prediabetes, insulin resistance (Metabolic X) and diabetes are typically the same [57].

Research has demonstrated that 25 percent of the general nonobese, nondiabetic populations have insulin resistance at a magnitude similar to type 2 diabetes [53]. It occurs more frequently in men and Mexican Americans between the ages of 20 to 70. While metabolic syndrome may have a basis from a genetic standpoint, other influential environmental factors may be involved, including lack of exercise, excess nutrients and obesity [48]. Metabolic syndrome has a group of clinical traits that, when combined, increase the risk for developing cardiovascular disease significantly. According to the American Heart Association (AHA) and the National Heart, Lung and Blood Institute, metabolic syndrome is diagnosed when a minimum of three of the following criteria are met [48]:

- Elevated waist circumference (abdominal obesity). Increased abdominal adiposity (waist greater than 40 inches in men and greater than 35 inches for woman).
  - The excess fat in the intra-abdominal area is a huge component of the metabolic syndrome. The majority of experts concur that the combination of obesity, obesity-related cytokines called adipokines, excess nutrients and inflammatory

cytokines are the main contributors to beta cell death and insulin resistance in type 2 diabetes.

Regardless of which event occurred, the mechanisms that are responsible for insulin receptor binding or postreceptor can be reversed by weight loss [48].

- Elevated triglycerides (TG) greater than 150 mg/dl.
- Reduced HDL cholesterol (less than 40 mg/dl in men and less than 50 mg/dl for women).
- Fasting blood glucose (hyperglycemia) greater than 100 mg/dl).
- Increased blood pressures (130/85 mm Hg or greater).
- Research has also correlated other risk factors, such as physical inactivity, aging, hormonal imbalance and genetic predispositions [75].

Insulin resistance and prediabetes are diagnosed by one of the following laboratory tests [57]:

- **Fasting glucose test.** This test measures blood glucose in people who have not eaten anything for at least eight hours. This test is most reliable when done in the morning. Fasting glucose levels of 100 to 125 mg/dL are above normal but not high enough to be called diabetes, so that level is called prediabetes or IFG. People with IFG often have had insulin resistance for some time and are much more likely to develop diabetes than people with normal blood glucose levels.
- **Glucose tolerance test**. This test measures blood glucose after people fast for at least eight hours and two hours after they drink a sweet liquid provided by a doctor or laboratory. A blood glucose level between 140 and 199 mg/dL means glucose tolerance is not normal but is not high enough for a diagnosis of diabetes. This form of prediabetes is called IGT and, like IFG, it points toward a history of insulin resistance and a risk for developing diabetes.

For over a decade, the WHO, AHA and the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III have recognized and appreciated the significant correlation of metabolic syndrome, diabetes and cardiovascular disease [1,20]. Throughout their research they have seen a significant prevalence of metabolic syndrome with worsening glucose tolerance from 26 percent in patients with normal fasting glucose rising to 86 percent in those with diabetes. Metabolic syndrome is a very common disorder in the U.S. population for people over the age of 50. In contrast, diabetes without metabolic syndrome is uncommon in the over-50 population (only 13 percent of diabetic patients do not meet criteria for metabolic syndrome) [1].

In contrast, the ADA and the European Association for the Study of Diabetes state there is no solid evidence that any of the metabolic syndrome health factors contribute more together than they do individually. In other words, the whole is not greater than the sum of its parts. The authors recommend that doctors should [15]:

- Aggressively treat the individual health factors that lead to heart disease (diabetes, insulin resistance, unhealthy triglyceride and cholesterol levels, high blood pressure and signs of kidney disease).
- Continue to evaluate patients for other risks that can lead to heart disease.
- Avoid labeling patients with the term "metabolic syndrome."
- Avoid prescribing a treatment for the syndrome until new, solid evidence is found.

However, many health care providers have recognized the significant correlation of metabolic syndrome diabetes and cardiovascular disease. The American Academy of Family Physicians (AAFP) (2004) believes metabolic syndrome will overtake cigarette smoking as the No. 1 risk for developing cardiovascular disease [18]. It is imperative to monitor and diagnose this condition because it significantly correlates to an increased risk of the patient developing type 2 diabetes and heart disease [75].

According to the NDIC (2008), people whose test results indicate they have prediabetes should be educated about changing their lifestyle behaviors, and their blood glucose levels be rechecked in one to two years. At the time of diagnoses or recognizing a patient with the risk factors for developing diabetes, clinical research trials have demonstrated that the patient and family should be educated on the following [57]:

- The first therapy should always be an intensive lifestyle modification program because weight loss and physical activity are much more effective than any medication at reducing the risk for developing diabetes.
- At this time, several drugs have been shown to reduce diabetes risk to varying degrees, but at present, there is no drug approved by the U.S. Food and Drug Administration (FDA) to treat insulin resistance, prediabetes or to prevent type 2 diabetes. However, the ADA recommends the initiation of Metformin (See Medication modalities for Type 2 diabetics).

Gestational diabetes

Gestational diabetes (GDM) is a form of glucose intolerance that is diagnosed in some women during the later part of their pregnancy. The risk increases especially if the pregnant woman has coinciding risk factors for type 2 diabetes [75]. During pregnancy, the extra metabolic demands required to support the pregnancy and potential other co-morbidities or risk factors may cause the onset of diabetes. Throughout the pregnancy, the woman's hormones are providing growth for the baby, but these same hormones also block the action of the mother's insulin in her own body, potentially leading to insulin resistance.

In a normal pregnancy, there are complex alterations in the maternal glucose metabolism, insulin production and metabolic homeostasis. It is imperative that these complex alterations occur to ensure adequate nutrition for the mother and developing fetus [77]. Glucose is the primary fuel used by the fetus through the process of carrier-mediated diffusion, implying it is directly proportional to the maternal levels. At 10 weeks gestation, the fetus secretes its own insulin at adequate levels to balance the glucose ingested by the mom. Therefore, as the maternal glucose levels rise, the fetal glucose levels are increased, resulting in increased fetal insulin secretion. Each of the metabolic changes is elaborated upon as follows [77]:

- During the first trimester (through week 12 gestation), the pregnant woman's metabolic status is influenced by the rising levels of estrogen and progesterone. The hormones stimulate the beta cells in the pancreas to increase insulin production, promoting increased peripheral utilization of glucose and decreased blood glucose with fasting levels being reduced by approximately 10 percent. There is an increase in tissue glycogen stores and a decrease in the hepatic glucose production, which further increases the risk of hypoglycemia occurring during the first trimester.
- During the second and third trimesters, the pregnancy exerts a diabetogenic effect on the maternal metabolic status, thus increasing the risk of developing diabetes. Since there are significant hormonal changes occurring throughout this period, there is a decreased tolerance to glucose, increased insulin resistance, decreased hepatic glycogen stores and increased hepatic production of glucose. Maternal insulin requirements gradually increase from 18 to 24 weeks gestation to about 36 weeks. At 36 weeks, insulin requirements usually level off until labor begins.
- At birth (typically between 38 and 40 weeks gestation), the expulsion of the placenta prompts an abrupt decrease in levels of circulating placental hormones, cortisol and insulinase. Therefore, the maternal tissues quickly regain their prepregnancy sensitivity to insulin and she does not receive insulin unless the blood glucose level is greater than 200 mg/dl.
  - If the new mom is not breast feeding, the prepregnancy insulin-carbohydrate balance returns in about seven to 10 days.
  - If the new mom is breast-feeding, lactation uses maternal glucose, thus the breast-feeding mom's insulin requirements will remain low as long as she is nursing.

There are several risk factors that predispose women without a prior diabetic history to develop GDM, such as [27, 48]:

- Family history of diabetes.
- Delivering a baby greater than 4,000 g (macrosomia).
- Belonging to one of the high-risk ethnic groups (similar to the type 2 diabetic).
- Older than 25 years of age.
- Body mass index (BMI) greater than 25kg/m2.
- PCOS.
- Prior history of GDM and/or a history of complications of obstetrical associated with gestational diabetes (stillbirth).

Other/rare forms of diabetes

- **Latent autoimmune diabetes in adults (LADA),** also referred to as 1.5 diabetes or double diabetes, is diagnosed in individuals over the age of 30. The individuals demonstrate signs and symptoms of both type 1 and type 2 diabetes. Initially, people with LADA will still produce their own insulin, similar to a type 2 diabetic, but within a few years must take insulin to control blood glucose levels. In LADA, as in type 1 diabetes, the beta cells of the pancreas stop making insulin because the body's immune system attacks and destroys them [55].
- **Diabetes related to genetic conditions**, such as maturity-onset diabetes of youth (MODY) or mutated genes. These rare genetic forms of diabetes are elaborated as follows per the current medical diagnosis and treatment (CMDT) 2007 guidelines [53]:
  - **MODY** is a rare monogenic disorder characterized by noninsulin diabetes with an autosomal dominant inheritance in a person younger than 25 years of age. Typically, the patient presents with hyperglycemia related to impaired glucose, induced secretion of insulin and is nonobese.
  - **Diabetes due to mutant insulins** is a rare form of nonobese type 2 diabetes with an autosomal dominant genetic disposition in which the individual has only one normal insulin gene. The diabetes is mild and does not appear until middle age.
  - **Diabetes due to two mutant insulin receptors genes**. Over 40 percent of all diabetic patients have a defect in one of their insulin receptor genes; however it is rare for it to occur in two. If an individual has two mutant insulin receptor genes, it will be noted in infancy. The newborn will have a leprechaun-like phenotype and unfortunately, rarely survives.
  - **Diabetes associated with a mutation of mitochondrial deoxyribonucleic acid (DNA)** impairs the transfer of leucine or lysine into mitochondrial proteins. This rare form is transmitted only by the mother because sperm do not contain mitochondria. Typically the diabetes is mild and the patient responds to oral hypoglycemic agents. Interestingly, two-thirds of the patients with this form of diabetes have a hearing loss, and others in smaller amount (15 percent) may have coinciding myopathy (muscular weakness), encephalopathy (degenerative brain injury), lactic acidosis and strokelike episodes (MELAS).
- **Wolfram's syndrome** is an autosomal recessive neurodegenerative disorder that presents in childhood. Wolfram's syndrome consists of diabetes insipidus (DI), diabetes mellitus (DM), optic atrophy and deafness (DIDMOAD). At this time there is no treatment for the syndrome, and the patient typically lives to about 30.

Other rare forms of diabetes may result from one of these [31, 55]:

- Surgery.
- Drugs (steroid hormones, Dilantin, thiazide diuretics and thyroid hormones that may impair the normal action of insulin).
- Malnutrition.
- Infections.
- Other illnesses (pancreatitis or cystic fibrosis).
- All of the rare forms of diabetes, including the mutated genes and genetic predispositions, account for 1 to 5 percent of all diagnosed cases of diabetes [31]. Because they are so rare, little data is available online or in textbooks elaborating upon the details and mechanisms.

Signs and symptoms of diabetes

Patients often are unaware of their potential risk or are living unknowingly with diabetes. The initial signs and symptoms of diabetes may be very subtle, and a patient may assume they are caused by something else. The classic signs and symptoms of diabetes in general are the "three polys"; polyuria (excessive urine output), polydipsia (increase thirst) and polyphagia (extreme hunger) [63]. Other clinical signs noted during a clinical exam and revealed in blood and urine tests include: hyperglycemia, glycosuria (glucose in the urine) and ketonuria (ketones in the urine) [49, 63]:

- **Polyuria** occurs from increased glucose circulating in the blood, resulting in hyperglycemia. The hyperglycemia causes serum hyperosmolality, drawing water from the intracellular spaces into the general circulation. All of the extra fluid increases blood volume, leading to an increase in flow to the kidneys. The buildup of glucose, especially in the renal tubules, acts as an osmotic diuretic, thus increasing urine output. Polyuria can be measured in the urine when the blood glucose level exceeds the renal threshold for glucose, usually about 180 mg/dl. The condition is called glucosuria.
- **Polydipsia** occurs due to a decrease in the intracellular spaces. Water is pulled out into the general bloodstream and then compounded with an increased urinary output leading to dehydration and the patient having an urge to drink continuously.
- **Polyphagia** occurs when the glucose is unable to enter the cell without insulin, causing the energy level to decline (fatigue), but will stimulate the patient to have the urge to eat more (polyphagia). It is important to note that although the patient is increasing food intake, he or she will typically lose weight (maybe even become emaciated) because as the body loses water, it will break down proteins and fats in attempt to replenish the energy source.

Other potential signs and symptoms of diabetes are [8, 45, 48, 53]:

- **Dehydration** leading to hemoconcentration (increased blood concentration), hypovolemia (decreased blood volume), hyperviscosity (thick concentrated blood), hypoperfusion (decreased circulation) and hypoxia (poor tissue oxygenation).
- **Unusual weight loss** related to the breakdown of protein and fats and depletion of water, glycogen and triglycerides due to the lack of insulin. Therefore, reduced muscle mass occurs as the amino acids are diverted to form glucose and ketone bodies [8, 10].
- **Increased fatigue** due to a lack of energy from inappropriate absorption of glucose in the cells.
- **Irritability** due to fluctuations and/or changes in the blood glucose levels.
- **Blurred** vision typically occurs with polydipsia as it often develops when the lens are exposed to hyperosmolar fluids.
- **Postural hypotension**, which results from a lower plasma volume.
- **Paresthesias** (numbness and tingling of the lower extremities; "feeling the limbs are asleep") may or may not be present at the time of diagnosis as a result of a temporary dysfunction of peripheral sensory nerves. Paresthesias typically resolves once insulin is replaced and the glycemic levels are restored to a homeostasis level.

In addition, health care professionals should always contemplate a potential diagnosis of diabetes in women who have delivered large babies (macrosomia; greater than 9 pounds, or 4.1 kilograms), history of polyhydramnios (excess amount of amniotic fluid in the sac; occurs in 1 to 2 percent of all pregnancies) or pre-eclampsia or unexplained fetal loss, even if she did not develop GDM [53].

Type 1 diabetes affects the metabolism of fat, protein and carbohydrates so glucose accumulates in the blood and leaks into the urine when the glucose exceeds the kidney's ability to excrete it appropriately. Type 1 diabetes is correlated to the destruction of beta cells. Unfortunately, the patient typically does not exhibit any signs or symptoms until 80 to 90 percent of them are destroyed and insulin falls to critically low levels [63]. The major initial clinical manifestations noted in type 1 diabetes include the three polys [48].

Type 2 diabetes is typically more nonspecific because the patient will often complain of polyuria and polydipsia along with often being overweight, hyperlipidemic (high lipid levels) and having high blood pressure. However, children and adolescents may not present with only symptoms of polydipsia or polyuria and acanthosis nigricans [25]. Children often present with a preceding minor illness, such as a flulike episode, before being diagnosed with diabetes [46]. In addition, there have been several cases of children and adolescents who were undiagnosed with type 2 diabetes who had reported to the emergency room or their primary care provider in a hyperglycemic hyperosmolar state (HHS) that was confused with a diabetic ketoacidosis (DKA); unfortunately these cases had a high mortality rate caused by the lack of recognition and proper treatment [25]. (See the

section, Hyperglycemia and diabetes for further explanation).

The type of obesity fat seen in type 2 diabetic patients is predominately distributed on the upper segments of the body (especially in the abdomen, chest, neck and face) and less often on the appendages [53]. However, nurses should never think that type 2 diabetes occurs in only obese patients. Some who suffer it can be emaciated due to the breakdown of fat and protein. Another aspect of type 2 diabetes is the onset is usually slow and insidious, making the diagnosis difficult [48, 53]. Because the symptoms may be very subtle and/or intertwined with other co-morbidities, it is important to ensure the primary care provider recognizes other manifestations such as [8]:

- Recurrent infections, which are common due to the proliferation of increasing glucose circulating in the blood stream, impairing the blood supply and thus hindering the healing process.
- Acanthosis nigricans, a hyperpigmentation and thickening of the skin with velvety irregularities apparent in skin folds of the neck, axillae, elbows, knees, groin and abdomen [25].
- Genital pruritus, common especially in women due to circulating glucose and glycosuria (glucose excreted in the kidneys) which both promote the growth of fungus, such as Candida.
- Visual changes that occur from the water balance in the eye fluctuating due to increased glucose levels.
- Type 2 diabetes has a unique manifestation, HHS, characterized by a plasma osmolarity of 340 mOsm/L (greater than the normal range of 280-300 mOsm/L), elevated blood glucose (greater than 600mg/dl and may be as high as 1,000 to 2,000 mg/dl) and an altered level of consciousness [53]. HHS is a serious, life-threatening complication of type 2 diabetes (See Hyperglycemia and diabetes for further explanation)
- Gestational diabetes may or may not have any present symptoms. Many women remain asymptomatic throughout their pregnancy if they have no previous history of diabetes before conceiving. However, if a woman is at risk or may be developing symptoms, she may test positive with polyuria and glycosuria during her routine prenatal care appointments and she may complain of any of the following symptoms [22]:
  - Polydipsia.
  - Frequent urination.
  - Fatigue.
  - Nausea.
  - Frequent infections of bladder, vagina and skin.
  - Blurred vision.

Screening and diagnosing diabetes

There are over 6 million people in the U.S. living unknowingly with diabetes. Health care professionals must learn to recognize the symptoms and then educate patients and the community to ensure people recognize the signs and symptoms to prevent long-term complications. Some patients may present to their health care provider with the classic symptoms of the three polys (polyuria, polydipsia and polyphagia). Others may be diagnosed as they present for another concern or complaint. Unfortunately, there are some patients who fall below the radar because they avoid seeing doctors or they do not have access to adequate health care.

Health care professionals typically complete a routine urinalysis on each of their patients because it is relatively inexpensive. All patients over the age of 3 will have a urinalysis completed before seeing their health care provider. In a routine urinalysis, the health care provider will be able to screen for the following presence of glucose, but the test is not used for diagnostic measures [34, 53]:

- Glycosuria (sensitive to picking up less than 0.1 percent of glucose in urine) occurs when the renal threshold for glucose is exceeded (180 mg/dl or greater) due to osmotic diuresis [25].
- Ketonuria, with any amount found a concern as it may imply the possibility of diabetic ketoacidosis (DKA). Ketonuria occurs due to an abnormal breakdown of fatty acids (the backup source of energy) that may accumulate in the blood and urine when insulin is not available [49].

If glucose and/or ketones are found on the urinalysis, then the health care provider will initiate blood testing to confirm a diagnosis of prediabetes (insulin resistance/metabolic syndrome) or diabetes. However, nurses should realize there are different recommendations circulating among health care professionals to screen for diabetes, so the practice of the primary care provider may be different.

Children

Since 2007, the ADA and the American Academy of Pediatrics (AAP) have recommended a fasting blood glucose (FBG) at the age of 10 or the onset of puberty, and every two years if overweight (BMI greater than 85th percentile for age and sex), plus two additional risk factors (family history of diabetes in a first- or second-degree relative; high-risk race/ethnicity; signs of or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, or PCOS) [32, 45].

Adults

Since 2003, the U.S. Preventive Services Task Force (USPSTF) has recommended that adults with high blood pressure or high cholesterol be screened for type 2 diabetes (insulin-resistant diabetes) as part of an integrated approach to reduce their risk of cardiovascular disease, but concluded that further research is needed to determine whether widespread screening of the general population would improve health outcomes [62].

The National Guideline Clearinghouse (2009) and Current Practice Guidelines (2008) recommend that between the ages of 18 and 39, screening may be indicated in patients with risk factors for diabetes, previously identified impaired FBG or OGTT, history of GDM, hypertension, HDL-C less than 35 mg/dL and/or triglyceride greater than 250 mg/dL, PCOS, or history of vascular disease. Beginning at the age of 45, a fasting plasma glucose is recommended every three years on all patients, especially if the patient has a body mass index greater than 25 [45, 59].

The ADA (2007) guidelines are partially congruent with the previous recommendations that screening should begin with an FBG or OGTT every three years, beginning at the age of 45, especially if BMI is greater than 25. In addition, screening should be initiated earlier and more frequently in overweight patients with diabetes risks factors (family history, high-risk ethnic group, history of impaired glucose testing, GDM, mother with an infant birth weight greater than 9 pounds, comorbid conditions hypertension (greater than 140/90), dyslipidemia HDL less than 35mg/dl or triglycerides (TG) greater than 250 mg/dl), overweight (BMI greater than 25), PCOS or acanthosis nigricans, history of vascular disease or habitually physically inactive [45].

Adults with comorbid hypertension or dyslipidemia (metabolic syndrome)

The AAFP (2007) and USPSTF (2003) recommend screening for type 2 diabetes in patients with hypertension or dyslipidemia because of the potential correlating metabolic syndrome and risk for developing type 2 diabetes. However the specific testing and frequency is not mentioned or suggested. There is strong evidence that in hypertensive patients, the health care provider needs to be more aggressive in controlling the blood pressure when diabetes is coinciding [45].

According to the Journal of Family Practice (2009), research reiterates the information provided by the AAFP and USPSTF that although there are no specific guidelines for patients with hypertension (HTN) or dyslipidemia, practitioners should still educate their patients at risk. In addition, unless the patient meets another guideline or recommendation, then all patients should be screened beginning at 45 according to the ADA [60].

Pregnant women

The USPSTF (2003) and AAFP (2007) have found insufficient evidence that routine screening for gestational diabetes substantially improves the health of mothers or their babies, although it is implemented in care among pregnant women between 24 and 28 weeks gestation [45,62].

According to the ADA (2007), all pregnant women should be screened for the potential risk of developing GDM at their first prenatal visit [45]:

- A woman with a high risk of developing GDM (obesity with a BMI greater than 27, family history, personal history of GDM, glycosuria, previous delivery of a large for

gestational age infant, or PCOS), is urged to get an OGTT completed as soon as possible. If an OGTT is not completed with the initial testing, then the woman should be tested between 24 and 28 weeks gestation.
- A woman with an average risk of developing GDM is recommended to test between 24 and 28 weeks gestation.
- For a woman with a low risk of developing GDM (less than 25 years old; not of Hispanic, African, Native American, South or East Asia or Pacific Islander ancestry; with weight normal before pregnancy; no history of abnormal glucose tolerance; no previous history of poor obstetric outcome; and no known diabetes in a first-degree relative), no glucose testing is recommended.

Most health care providers also will order a routine electrolyte panel at least annually, regardless of any symptoms or family history because of the prevalence of diabetes in our country. However, according to the Quality Adjusted Life Year (QALY) (2004), failure of health care providers to adhere to the recommended guidelines is not cost-effective for our health care system and budget [45].

Before assessing fasting blood glucose (FBG) or OGTT, the patient should be free from any acute illnesses. If so, then the nurse should instruct the patient three days before testing to continue a regular diet with at least 150 to 200 grams (g) of carbohydrates daily and then no caloric intake at least eight hours before the test [35]. If the patient is having a serum fasting blood glucose, the blood will be taken upon arrival at the laboratory. However, if the patient has been ordered an OGTT, the patient will be instructed to drink 75 to 100 g of glucose over five minutes. OGTT may be ordered for one or two hours in nonpregnant adults [35].

The ADA and AAFP (2007) and the USPSTF (2003) comply with the following acceptable diagnostic measurements for children and non-pregnant adults [35, 45, 46, 53]:
- **Diabetes** is diagnosed by:
  - A fasting blood glucose level greater than 126 mg/dl on two or more occasions (a normal FBG is less than 100 mg/dl).
  - A random plasma glucose concentration greater than 200mg/dl taken at any time, regardless of the last meal.
  - Two-hour plasma oral glucose tolerance test (OGTT) greater than 200 mg/dl (two hours after ingesting 75g of a glucose load). A normal FBG level for nondiabetics is 70-110 mg/dl). A normal OGTT is less than 140mg/dl. There are certain medications that may skew the OGTT, such as diuretics, contraceptives, glucocorticoids, niacin and phenytoin [10].
- **Prediabetes** (high risk for developing diabetes). Normoglycemia is defined as a plasma glucose level less than 100 mg/dl in the FBG and less than 140 mg/dl in the two hour OGTT.
  - Impaired glucose tolerance (IGT) is diagnosed in a patient without any prior history of diabetes by:
    - FBG greater than 126mg/dl and a plasma glucose 140-200mg/dl.
    - Two-hour OGTT greater than 140 mg/dl, but less than 200 mg/dl.
  - Impaired fasting glucose (IFG) is diagnosed in a patient without any prior history of diabetes by:
    - FBG 100-125 mg/dl and a plasma glucose less than140mg/dl.

It can be a little tricky to find a normal level because the levels may be different if a patient is pre-diabetic, undiagnosed or living with diabetes. The ADA and the American College of Endocrinology (ACE) have provided the following 2008 ranges to ensure compliance by patients and health care professionals; see Table 1 [3, 13]:

Table 1: Diagnostic results for pre-diabetes and diabetes

	Pre-diabetes per the ADA and ACE	**Living with diabetes guidelines by the ADA and ACE**
Normal fasting blood glucose level	Less than100 mg/dl	70–130 mg/dl
Postprandial (2 hours after eating)	Less than140 mg/dl	Less than180 mg/dl
Diagnostic for diabetes Fasting plasma glucose (FPG) 2 hours postprandial (after eating) oral glucose tolerance test (OGTT)	Greater than 126 mg/dl greater than 200 mg/dl	Greater than 126 mg/dl greater than 200 mg/dl

*Table 1 devised based upon the ADA and ACE literature review.

In a pregnant woman, the ADA and AAFP (2007) and USPSTF (2003) recommend the following diagnostic measurement for GDM [45, 67]:
- FBG greater than 126 mg/dl or a casual plasma glucose greater than 200mg/dl and precludes the need for an OGTT challenge. However, most providers caring for pregnant woman will order an OGTT between 24-28 weeks gestation. Diagnosis is confirmed if:
  - Initial screening for gestational diabetes is accomplished by performing a 50-g, one-hour OGTT at 24 to 28 weeks of gestation. Normal should be less than 130 to 140 mg/dl; both are accepted. If the patient does not pass the one-hour test (results greater than 140 mg/dl), the woman will have to complete a 75 or 100-g, three-hour OGTT. The patient will be instructed to remain without food or drinks for eight to 12 hours before the exam. During the exam, she will be tested upon arrival to obtain a fasting level. Then she will drink the 75- or 100-g glucose challenge within five minutes, and then be tested every hour for three hours and three-hours after she completes the glucose challenge.
- Diagnosis of GDM is confirmed if the woman's level is above normal on any two of the following parameters [11]:
  - Fasting 95 mg/dl.
  - 1-hour 180 mg/dl.
  - 2-hour 155 mg/dl.
  - 3-hour 140 mg/dl.

Once diabetes is diagnosed, then the patient can anticipate having the following routine tests completed to monitor the management and appropriate care [36, 53]:
- **Chemistry profile** to assess the electrolyte panel, especially the blood sugar and kidney function.
- **FBG** will be ordered if the patient is experiencing any signs or symptoms of hypoglycemia or hyperglycemia because it is quick and cheaper than the chemistry profile. In addition, it may be ordered to assess for complications, such as DKA or HHS.
- **Glycosylated hemoglobin (c) (HbA1c)** is a laboratory test that should be monitored every six months if the patient is meeting specific treatment goals; otherwise it will be completed every three months. The HbA1c will be ordered approximately every three months to monitor the average glucose level over the previous three months; however it is not used as a diagnostic measurement for diabetes. Anytime the glucose level is elevated or erratic, glucose attaches to the hemoglobin molecule then remains there for the life of the hemoglobin, typically 120 days in a healthy person. The normal level should be below 7 percent, typically 4 to 6 percent in healthy individuals [34]. According to the CDC (2008), for every 1 percent reduction in results of A1C blood tests (e.g., from 8.0 to 7 percent), the risk of developing eye, kidney and nerve disease is reduced by 40 percent [30]. The ADA recommends all diabetics keep their HbA1C less than 7 percent [7].
- **Urinalysis** to assess for the presence of glucose, ketones and proteins [34]:
  - The presence of glucose in the urine indicates hyperglycemia (greater than 180 mg/dl).
  - The presence of ketones indicates that carbohydrates in the body are diminished and fats are broken down. If ketones are present in the urine, ketonuria is diagnosed and is an indicator of DKA. However, if DKA is speculated and the urine ketones are negative, rule out renal insufficiency as it may skew the data. If the kidneys are not functioning appropriately, the kidneys may not be able to filter the ketones, leading to a false negative.
  - The presence of protein in the urine (microalbuminuria). Normally, less than 150 mg of protein is excreted in

the urine within a 24-hour period. If microalbuminuria is noted, it is an early indicator of nephropathy in diabetic patients. It is important to assess for the presence of microalbumin to screen all diabetic patients for the future development of renal failure. The primary provider may refer the patient to urologists or order a urine culture because urinary tract infections may cause excretion of proteins in the urine. Other causes of microalbuminuria include heart failure, hypertension and heavy exercise; therefore a positive result is confirmed with three additional tests over the next few months.

- **Serum cholesterol and triglyceride levels**. The lipids are ordered to assess for atherosclerosis and cardiac impairments every three to six months.
- **Thyroid function tests** will be ordered every three to six months to assess for the risk of coinciding thyroid disease that typically occurs in diabetic patients due to the autoimmune effect.

General treatment modalities for all diabetic patients

The key to being successful in the treatment of diabetes and metabolic syndrome (prediabetes) is collaborating with the patient and family by providing education with each visit to ensure the patient is empowered to control the diabetes instead of allowing the diabetes to control the patient. Regardless of the type of diabetes, all patients need to make lifestyle changes and monitor their diabetes as recommended by the ADA and European Association for the study of diabetes [45]:

- **Weight loss**. One of the major, first-line treatment modalities is to encourage the patient to lose weight by choosing healthy foods and exercising. Losing weight will decrease the complications related to the heart and mortality risk factors correlated to obesity (BMI greater than 30 and increased abdominal fat).
- **Nutrition therapy**. Nutrition is one of the key factors in maintaining euglycemia, but it may be impeded or customized based upon the culture, lifestyle and financial issues of the patient and family. It is important to convey that in order to maintain glycemic control, the patient should learn to count carbohydrates or follow the conventional meal plan (three meals a day and three snacks). The ADA does not provide a specific meal plan for every diabetic patient; rather, it is important for the patient to be familiar with his or her own nutritional goals and laboratory values to assess whether he or she is within the guidelines. In addition to the education provided by the nurse and physicians, the patient and family should be encouraged to discuss their nutrition with a registered dietician (RD) to help customize their own nutritional needs and goals.

Although there are no specific recommendations for diabetic patients, there are certain parameters that should be adhered to on a daily basis, as well as the importance of understanding the relationship between foods and insulin [25, 47].

- Typically, the ADA encourages most patients to be familiar with the following food groups:
  - **Carbohydrates**, which are the body's main and preferred energy source. The ADA recommends that most patients limit their total carbohydrates to 40 to 60 percent of their total calorie intake; however it may be customized by the patient's average blood glucose levels [49. 74]. Carbohydrates are composed of starches (breads, cereals, rice, and pasta), fruit, milk/yogurt, and sugars/sweets (gum, sodas, fruit drinks and pastries) [74].
  - **Fiber** is also considered a carbohydrate, but the body does not digest it. Therefore, it cannot raise the blood glucose level. Fiber is an important nutrient that promotes health by improving carbohydrate metabolism and lowering the patient's cholesterol levels [19]. Main sources are whole grains, legumes, fruits and vegetables. All diabetics should be encouraged to increase the fiber in their diet to control their blood glucose as well as adhere to the recommended carbohydrates per meal [44]. The ADA recommends that individuals should ingest 20 to 35 grams of fiber a day from a variety of sources [74].
    - The nurse should educate patients to increase fluids and to gradually add high fiber in their diets to reduce abdominal cramping, loose stools and flatulence [19]. In addition, increasing too much high fiber at one time can increase the risk of hypoglycemia.
  - **Proteins** help the body function appropriately by maintaining homeostasis and helping in the repair of tissues. Proteins are very complex, because there are complete proteins and non-proteins. A complete protein is a food that contains nine essential amino acids (found in meat, poultry, seafood, dairy products, eggs and soy) [74]. Incomplete proteins are missing one or more essential amino acids (beans, peas, nuts, seeds and vegetables) [74]. Protein is very important to patients with diabetes. The ADA recommends protein intake be approximately 15 to 20 percent of total calorie intake for people with normal kidney function [49, 74]. For patients with microalbuminuria (increased protein in the urine), protein should be reduced to 10 percent of their total calories a day to slow the progression of kidney failure [49].
    - For type 1 diabetics, protein has little effect on glucose levels if the patient is taking enough insulin. However, if the patient ingests large amounts of protein, it can increase the blood glucose level, thus increasing the insulin needed [74]. The newer school of thought from the ADA and research is to have the individual patient monitor his or her protein intake and blood glucose levels to assess whether any changes need to be addressed with their provider.
    - If the patient is a type 2 diabetic, protein stimulates the production of insulin; therefore, a small rise in insulin does lower the blood glucose levels [74].
  - **Fat** is required in small doses to provide essential fatty acids, carry the fat soluble vitamins (A, D, E and K), maintain healthy skin and produce components needed for some hormones [74]. Similar to proteins, fat typically has little effect on the total blood glucose levels. However, it can affect the blood lipid levels, thus increasing the risk of heart disease. Therefore, the patient should avoid any fat high in trans-fatty acids [49].
  - **DASH diet**. The DASH diet may be encouraged or collaborated with a diabetic diet if the patient has a coinciding cardiac issue, such as HTN and/or dyslipidemia. The DASH diet emphasizes fruits, vegetables, low-fat dairy foods, whole grains, poultry, fish and nuts, while reducing saturated fats, red meat, sweets and sugar-containing beverages. Reducing sodium intake can further reduce blood pressure or prevent the increase in blood pressure that may accompany aging [20].

There are various approaches to acclimate patients and their families to the importance of maintaining a healthy balance of nutrition and controlling diabetes. Since 1995, the ADA and the American Dietetic Association have adopted the U.S. Department of Agriculture (USDA) Food Guide Pyramid [74]. It is a great diagram and tool to teach about food groups and appropriate portion sizes. In addition, the ADA recommends different tools to plan the most appropriate meals for patients and families. People should understand that they can change their plans as they gain better control of their diabetes, and should always be referred to a registered dietician to help them customize their meals.

- **Carbohydrate counting** is a practice that has been used for many years. To count carbohydrates, patients need to know their allotted carbohydrates for the day based upon their individual food intake, lifestyle, diabetes medications and physical activity [40]. A registered dietician will be the best health care professional to help patients and their families determine this daily allotment. Carbohydrate counting focuses on the total grams of carbohydrates, regardless of the source [49].

- The ADA has determined the following advantages and disadvantages for carbohydrate counting [47, 49]:
  - Advantages:
    - Patients may perceive it to be easier to focus only on the carbohydrates ingested on a daily basis.
    - Typically, patients are able to achieve a stable blood glucose control if their carbohydrate intake is consistent every day.
    - Patients on insulin or an insulin pump can match the carbohydrates ingested to the amount of insulin needed. For example, an initial formula of one unit of rapid acting insulin is administered for each 15 g of carbohydrates. Patients become proficient at reading food labels or weighing items to ensure they calculate the appropriate insulin dosage required for that particular snack or meal.
  - Disadvantages:
    - Although the patient may enjoy focusing on just one food group, it may also be a disadvantage if the patient loses focus on the other nutrient value of the food. For example, if a patient eats bacon or sausage for breakfast, the carbohydrates will be counted based upon the total number and type ingested. However, the patient may ignore the fat content, and too much fat exacerbates the risk of heart disease, cancer and weight gain.
- **Fat-gram counting** is a practice that has been around for almost 30 years that helps the patient learn about eating a low-fat diet to reduce the risk of cancer. Fat-gram counting is helpful for type 2 diabetics who are overweight to help reduce their total weight.
  - The ADA has determined the following advantages and disadvantages for fat-gram counting [47]:
    - Advantages:
      - Provides flexibility and control over the food choices ingested. Typically, the patient who counts fat grams will choose healthier foods such as low-fat fruits, vegetables, grains and low-fat dairy products.
    - Disadvantages:
      - Blood glucose levels may be inconsistent because the patient is only focusing on the fat ingested.
- **Food exchange system** is a unique way to group foods with similar nutritional values into lists to help diabetic patients eat consistent amounts of nutrients [47]. Initiated in the 1950s, it is probably the most popular [74].The ADA and the American Dietetic Association have published handy books, such as "Exchange Lists for Meal Planning" on three broad groups (the carbohydrates, meat and meat substitutes, and the fat group). In addition, there are books published every year that discuss the total number of nutrients based upon the patients' food choices at restaurants and their ethnic/cultural considerations.
  - The ADA has determined the following advantages and disadvantages for food exchanges [47]:
    - Advantages:
      - The patient has more knowledge of various nutrient groups and the correlation to their glucose level.
      - Typically it results in more consistency in the patient's blood glucose levels.
    - Disadvantages:
      - It requires the diligent patience of the patient to truly grasp the concept of "exchanging" foods.
- **Calorie counting** is a tool that has been encouraged for many years to lose, gain or maintain an individual's weight. Similar to the carbohydrate counting, the RD will be more apt to customize it to the patient based upon his or her weight, height and activity level.
  - The ADA has determined the following advantages and disadvantages for calorie counting [47]:
    - Advantages:
      - Allows the patient to expand the choices of foods as long as he or she abides by the total calorie goal a day.
    - Disadvantages:
      - May be time-consuming to calculate the calorie content of each food ingested.

Nursing considerations and education for the diabetic patient about nutrition [52]:

- Assess the blood glucose level for the type 1 diabetic and type 2 diabetic (on insulin) within one to two hours after meals to determine whether the insulin/carbohydrate regimen is adequate to emulate a "functioning" pancreas.
- If the patient is within an average weight (typical type 1 diabetic), encourage the patient to avoid gaining weight. Hyperinsulinemia (chronic high blood glucose levels) can occur with intensive treatment schedules and may result in weight gain.
- If the patient is overweight and/or obese (typical type 2 diabetic), reiterate to the patient the importance of monitoring and reducing total intake of saturated fat, cholesterol and sodium levels, especially if the person has coinciding conditions and co-morbidities. Research has demonstrated that reducing the total calories by 250 to 500 a day and increasing physical activity improves diabetes and weight control. In addition, reducing 10 percent of the body weight can significantly reduce the Hba1c levels.

Exercise. Exercising has phenomenal benefits on the metabolism of carbohydrates and insulin sensitivity [49]. According to the AAP (2004) and the AHA, all diabetic patients should be encouraged to exercise because it will improve physical fitness, emotional well-being, weight control, decrease cholesterol and triglyceride levels, improve work capacity and decrease cardiac complications [5, 20]. Regular physical activity reduces very low density lipoprotein (VLDL) levels, raises HDL cholesterol, and in some people lowers the LDL levels. It also can lower blood pressure, reduce insulin resistance and improve the function of the heart [70]. It should be important for the health care provider to find a level of activity that the patient can accomplish over the long term [18]. The AAFP (2004) recommends a combination of resistance and aerobic exercise, but any activity is better than none, and patients who have been sedentary need to start with walking and gradually increase duration and intensity [19, 20].

- Initially, the patient can be instructed to use low-weight dumbbells, elastic exercise bands or even heavy food containers that can provide the needed weight for resistance training.
- Instruct the patient to stretch for five to 10 minutes before performing any exercise, then have a five- to 10-minute cool-down period afterwards to reduce the risk of dysrhythmias.
- Gradually work up to aerobic exercise for 40 to 60 minutes. Aerobic exercise includes walking briskly, running, jogging, stationary or regular bicycling, swimming, dancing, rowing and cross-country skiing; they all improve cardiac output. If the patient is a type 1 diabetic, the patient should limit the exercise time to 20 to 40 minutes four to seven days a week.

Nursing considerations and exercise education for the diabetic patient [19]:

- Assess the blood glucose level before exercise.
  - If the patient is hyperglycemic (greater than 250 mg/dl), check the urine for ketones. If the patient has positive ketones, the patient should be instructed not to exercise because exercise would cause the patient to become hyperglycemic.
  - Type 1 diabetics should perform vigorous exercise only if their blood glucose levels are 80 to 250 mg/dl and no ketones are present.
  - Although the patient is at risk of becoming hyperglycemic, the patient can also become hypoglycemic. Therefore, encourage the patient to keep a snack on standby. Type 1 diabetics are unable to make the shift in hormones because the inadequate insulin supply doesn't allow proper flow of glucose to the cells. Hypoglycemia can occur during exercise and continue for up to 24 hours afterward, so patients might require an additional carbohydrate.
- Avoid exercising within one hour of insulin administration or at the peak of the insulin. Exercise can increase the absorption of

insulin from the injection site, increasing the blood glucose levels.
- Avoid exercising in extreme cold or heat.
- Assess for the following complications related to exercise:
  - If the patient has peripheral neuropathy, observe and limit the risk of foot and joint injuries. (See below, ADA recommendations for all diabetic patients to avoid injury).
  - If the patient has retinopathy, educate the patient to avoid the Valsalva maneuver and activities that increase the blood pressure because heavy lifting, rapid head motion or jarring activities can cause hemorrhage or retinal detachments.
  - If the patient has nephropathy, exercise may increase proteinuria (microalbuminuria).

It is important to note that the ADA recommends that all diabetic patients adhere to the following when they exercise to avoid injury and complications [10]:
- Wear proper fitting footwear.
- Never walk barefoot.
- Inspect the feet daily and after exercising.
- Avoid exercise in extreme heat or cold.
- Avoid exercise during periods of poor glucose control, avoid smoking to ensure adequate circulation, and any diabetic patient over 35 should have an exercise-stress electrocardiogram before any exercise routine.

Stress management (illness, surgery, corticosteroid therapy). Any time a diabetic patient is ill, the blood glucose levels will increase even though the intake has diminished [49]. The nurse should educate all patients on the following [25,49]:
- Assess the blood glucose levels at least four times a day while ill. As with patient exercise, assess the urine ketones if the glucose level is greater than 250 mg/dl.
- Encourage the patient to continue taking the usual insulin dose or an oral hypoglycemic agent.
- Encourage the patient to drink extra fluids, sipping 9 to 12 ounces of fluid each hour.
- Encourage the patient to substitute easily digested liquids or soft foods if solids are not being tolerated.
- Encourage patients to notify their health care provider if they are unable to eat for more than 24 hours or if vomiting and diarrhea last more than six hours.

Monitoring blood glucose levels. Self-monitoring of the daily blood glucose level (SMBG) is important for the diabetic patient, and devices to do so are available to purchase. It is important that patients and their families are adequately trained on their specific machine to ensure accurate readings. It is also important to note that self-monitoring is vital for patients to understand their average blood glucose readings, but a health care professional caring for a patient will not change the treatment plan based upon the patient's home readings because there are multiple variables that may skew the data. The accuracy of self-monitoring results depends upon the patient adhering to the manufacturer's directions and the following variables [68]:
- Quality of the meter, test strips and patient's training. The patient should always read and follow the directions from the manufacturer. Failure to comply may result in inaccurate results. In addition, if the patient has any sensory deficits or is unable to comprehend the directions, the nurse should encourage the patient to bring in his or her machine to ensure proper understanding and demonstration.
- Patient's hematocrit level. If the patient has a higher-than-normal hematocrit value, the patient will usually test lower on an SMBG than patients with normal hematocrit. In addition, if a patient has lower hematocrit values, the SMBG will test higher.
- Other substances in the body may interfere with the testing results, such as uric acid (a natural substance in the body that can be more concentrated in some people with diabetes), glutathione (an "anti-oxidant" also called GSH), and ascorbic acid (vitamin C).
- Altitude, temperature and humidity. Altitude, room temperature and humidity can cause unpredictable effects on glucose results. Therefore, patients should be advised to read the manufacturer's directions if the climate changes or they travel to another part of the country.

The ADA recommends that all diabetics maintain their daily blood glucose levels as follows [7]:
- Pre-prandial 70 to 130 mg/dl.
- Postprandial less than 180 mg/dl.

Collaborating with health care providers and endocrinologists

Typically, the patient's diabetes will be ultimately be managed by their primary health care provider, and then followed up by an endocrinologist or a cardiologist if other co-morbidities are present or as needed. Patients can expect their primary care provider or endocrinologist, whichever one is responsible for the treatment modalities, to see them every three months to assess their laboratory data (FBG, A1C, lipids). Other referrals include ophthalmologists and podiatrists. The patient should be seen annually unless an ophthalmologist or podiatrist says otherwise. It is important that any referrals or education are documented appropriately to avoid any potential complications to the patient and legal consequences for the health care provider.

In addition to the patient taking the diabetic agents (insulin and/or oral meds), he or she may be prescribed any or all of the following medications [24]:
- Annual flu vaccination to provide coverage two weeks to a month after injection for up to six months, although the flu vaccination should be avoided by anyone with an allergy to eggs or a current respiratory infection. The patient should be instructed to return for the flu vaccination once the respiratory infection has subsided.
- Pneumonia vaccination can be administered anytime during the year. According to the ADA, for most people, one shot will provide protection for life and typically provides effectiveness 60 percent of the time against the deadliest pneumonia pneumococcus and meningitis. However, people under 65 who have chronic illnesses or weakened immune systems should discuss with their doctor a potential repeat vaccination every five to 10 years [9].
- An ACE inhibitor (ACEI), such as Lisinopril, to help prevent the conversion of angiotension two, especially in the larger blood vessels, which causes vasoconstriction, may be prescribed. ACEI are ideal in diabetic patients to enhance vasodilatation, especially to the kidneys. The JNC 7 and the ADA recommend that the majority of patients with diabetes require two or more antihypertensive agents from different classes. Research has demonstrated that combining agents with two different mechanisms of action can result in an additive blood pressure-lowering effect and may permit for lower doses of each agent to be used, possibly decreasing the potential for dose-related side effects. Furthermore, the National Kidney Foundation recommends that patients with chronic kidney disease (including albuminuria and nephropathy), should be treated with an ACEI and/or angiotensin receptor blockers (ARB) (which prevent the conversion in the smaller arterioles) in combination with a diuretic.
- Baby aspirin up to 325 mg every day.

Because of coinciding hyperlipidemia/dyslipidemia, the third report of the expert panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III) (ATP) and the national cholesterol education program (NCEP) recommend that lipids should be controlled. The LDL cholesterol goal of therapy for most persons with diabetes should be less than 100 mg/dL. When LDL cholesterol levels are in the range of 100-129 mg/dL at baseline or on treatment, several therapeutic options are available [70]:
- Increasing intensity of LDL-lowering therapy.
- Adding a drug to modify atherogenic dyslipidemia (fibrate or nicotinic acid).
- Intensifying control of other risk factors, including hyperglycemia.

If triglyceride levels are greater than 200 mg/dL, non-HDL cholesterol becomes a secondary target of cholesterol-lowering therapy.

Table 2 (located at the end of this chapter): Drugs affecting lipoprotein metabolism [69].

According to the AHA (2007), children (boys over 10 and girls after menarche) should also be placed on drug therapy if after a six- to 12-month trial of fat- and cholesterol-restricted dietary management [45]:
- LDL is greater than 190 mg/dl.

- LDL is greater than 160 mg/dl and there are a positive family history of premature cardiac history and two other risk factors.
- The goal is to maintain the LDL less than 110 mg/dl to 130 mg/dl with a statin (HMG CoA reductase inhibitor).

Medication modalities for the type 1 diabetic

Patients living with Type 1 diabetes are reliant on insulin for the rest of their lives. Failure to administer exogenous or endogenous insulin injections will result in death. Other patients who may be required to receive insulin include[53]:

- People with type 2 diabetes who are unable to control their glucose levels with oral anti-diabetic drugs and/or diet.
- People with type 2 diabetes who at the time of diagnosis are unable to achieve glycemic control, especially if blood glucose values are greater than 250 or 300 (depending on the health care provider), AIC greater than 10 or the patient initially presented in a DKA state [25].
- People with diabetes who are experiencing physical stress (infection, surgery or corticosteroid therapy) and are unable to control their blood glucose levels between 110 and 180 mg/dl per the ADA.
- People with type 2 diabetics who are already taking two oral agents but are unable to maintain glycemic control.
- Pregnant women, regardless of whether they have a previous history of any form of diabetes or GDM.
- People with DKA or HHS.
- People who are receiving high-calorie tube feedings or parenteral nutrition.

Insulin is derived from animals (pork pancreas) or synthesized in the laboratory from either an alteration of pork insulin or recombinant DNA technology, using strains of Escherichia coli (E.coli) to form biosynthetic human insulin. Insulin is an endogenous hormone, secreted by the beta cells of the pancreas to lower the blood glucose levels by stimulating glucose passage across the cell membranes and uptake into the cells [25]. In addition, insulin also promotes the conversion of glucose to glycogen and inhibits hepatic glucose production from glycogen [25]. It should be noted that there are different types of insulin, and it should be prescribed on an individual basis.

Insulins are available in rapid-acting, short-acting, intermediate-acting and long-acting preparations. (See Table 3 located at the end of this chapter, Insulin Preparation).

Once an individual has been diagnosed with type 1 diabetes, it is important to discuss the potential options of administering insulin because it is a lifelong commitment. Insulin therapy can be administered in one of the following manners:

- Subcutaneous shot; dispensed in 100 units per ml (u/ml). For infants and toddlers, a pharmacist may prepare a diluted insulin preparation to ensure a smaller dosage [25].
  - Single daily injection is typically composed of intermediate-acting insulin or a combined short and intermediate.
  - Two-dose protocol injections are combined of short- and intermediate-acting insulin injected twice a day.
    - Two-thirds of the dose (intermediate acting and regular insulin in a two-to-one ratio) is administered before breakfast; and one-third is administered before the evening meal (intermediate acting and regular insulin in a one-to-one ratio).
  - Three-dose protocol.
    - Combination of short- and intermediate-acting before breakfast, short-acting insulin administered before evening meal, and intermediate-acting insulin administered at bedtime to lower fasting and after-breakfast blood glucose levels. In addition, it typically prevents a night-time hypoglycemic event.
  - Four-dose protocol.
    - Short-acting insulin 30 minutes before meals to provide the greatest amount of insulin to be present when needed.
    - Basal insulin is provided twice a day with an intermediate-acting or once-a-day injection of long-acting insulin.
    - If the patient is required to mix insulins, it is important for the nurse to convey the importance of compatibility to avoid changing the expected peak times. Mixing short- and intermediate-acting insulins produce normal blood glucose levels.

Alternative methods to administering insulin [19]:

- **Basal-bolus therapy**, in which it is administered once a day using glargine (a pre-filled lightweight syringe), then a bolus of rapid-acting insulin is administered with each meal and snack.
  - Avoid if the patient has any visual or neurological impairments.
- **Continuous subcutaneous insulin infusions** (CSII) "pump therapy" is becoming popular among children and teenagers.
  - Advantages of the CSII:
    - CSII are more effective in controlling blood glucose levels than a multiple injection schedule.
    - Externally worn pump that contains a syringe and reservoir with rapid or short-acting insulin and is connected to the patient via an infusion system.
  - Disadvantages of the CSII
    - Site infections occur if the infusion site is not cleaned or the needle is not changed every three days.
    - Hypoglycemia may result if the patient is receiving rapid-acting insulin and has a normal blood glucose level.
    - Higher risk of developing ketoacidosis if the patient does not adhere to the CSII recommendations or by infection, noncompliance or infusion obstruction.
- **Implanted insulin pumps** are implanted in the peritoneal cavity where insulin is absorbed by local blood vessels, similar to natural insulin release. The pump provides a reservoir re-filled with 400 units of insulin every one to two months. Complications that may arise include catheter blockage, pump failure and subcutaneous inflammation in the subcutaneous pockets.

Nursing considerations for the patient taking insulin [19]:

- Educate the patient on the purpose of their insulin (to emulate their nonfunctioning pancreas) and emphasize that it is required to sustain life.
- Educate the patient about the various types of insulin and the insulin prescribed by their physician. If the patient is prescribed more than one type, reinforce that changing insulins may affect their blood glucose and should be done under only the supervision and guidance of their prescribing provider.
- Educate the patient about the technique and sites.
  - **Technique**. The patient should be instructed to inject the insulin in the subcutaneous tissue at a 90-degree angle. In contrast, if it is a thin patient, inject at a 45-degree angle and avoid intramuscular (IM) since it has a faster absorption. It is not necessary to aspirate the blood.
  - **Sites**. The patient should always rotate the sites to prevent day-to-day changes in absorption and to prevent the development of lipohypertrophy (increased fat deposits in the skin) or lipoatrophy (loss of fatty tissue). Absorption is faster in the abdomen, followed by the deltoid, thigh and buttocks.
- Educate the patient about insulin storage, disposal and syringes. According to the ADA, the following guidelines are recommended [14]:
  - **Storage**. Although manufacturers recommend storing your insulin in the refrigerator, injecting cold insulin can sometimes make the injection more painful. To counter the reaction, many providers suggest storing the bottle of insulin you are using at room temperature; it will last one month. Always put the date and time that the insulin was opened, and check the expiration date to avoid administering insulin that has already expired.
  - **Syringe re-usage**. Ideally, it is better to always use new, clean insulin syringes and needles. However, the ADA says that many people safely reuse their insulin syringes. But it should be avoided if the patient is ill, has any open wounds on the hands or has poor resistance to infection. If the patient will re-use the needle

because of financial constraints, instruct the patient to always keep the needle and syringe clean by recapping the needle when it is not in use. Syringe makers will not guarantee the sterility of syringes that are reused. The patient should never use another person's syringe or allow another person to use their personal syringe.
    - **Syringe disposal**. Always dispose of the needles appropriately and safely to avoid anybody else picking up a used needle. The patient should place the needle or entire syringe in an opaque (not clear), heavy-duty plastic bottle with a screw cap or a plastic or metal box that closes firmly.
- In the elderly patient or one with a sensory impairment, it is important to ensure the patient is safe while administering his or her insulin.

In 2005, the FDA approved a new drug for the treatment of Type 1 diabetes, Symlin, an injectable medicine to control blood sugar for adults with type 1 and type 2 diabetes. Symlin is to be used in addition to insulin therapy in patients who cannot achieve adequate control of their blood sugars on intensive insulin therapy alone [42]. Since the approval in 2005, Symlin is to be used only in combination with insulin to help lower blood sugar during the three hours after meals. Symlin has a medication guide (FDA-approved patient labeling) and a risk minimization action plan (RiskMAP) because of three areas of concern.

- First, the principle risk associated with Symlin therapy is hypoglycemia, and this risk is greatest in patients with type 1 diabetes and in patients with gastroparesis (motility problems of the stomach, a long-term complication of diabetes).
- Second, the potential for medication errors, specifically mixing of Symlin with insulin in the same syringe, which can alter the activity of the insulin, is addressed in the medication guide and in physician labeling.
- Finally, the potential for off-label use in patients where the benefit/risk profile has not been characterized or demonstrated is also a concern and will be monitored by the sponsor.

Symlin should not be used if patients cannot tell when their blood sugar is low, have gastroparesis (slow stomach emptying), or are allergic to pramlintide acetate, metacresol, D-mannitol, acetic acid or sodium acetate. Side effects associated with Symlin include but are not limited to nausea, vomiting, abdominal pain, headache, fatigue and dizziness. Symlin has not been evaluated in the pediatric population [42].

Medication modalities for the Type 2 diabetic

The major goal for treating type 2 diabetic patients is controlling the blood glucose level and HbA1c levels, decreasing weight, increasing exercise, normalizing lipid profiles and blood pressure and preventing complications [25].The treatment laboratory goal for type 2 diabetes is to maintain an HbA1c less than 7 percent and a fasting and pre-prandial blood glucose of 70-130 mg/dl [45]. According to Clinical Diabetes (2002), blood glucose control has been shown to decrease the risk of macrovascular and microvascular complications of type 2 diabetic patients. At this time, it is unknown whether the blood glucose control decreases the risk of cardiovascular mortality. However, the United Kingdom Prospective Diabetes Study (UKPDS) suggests that good glycemic control probably does decrease cardiovascular risk in patients with Type 2 Diabetes [28].

Typically, the initial treatment for type 2 diabetes begins with education on changing the diet and exercising to lower the blood glucose level. In addition, many health care providers typically initiate a single oral diabetic, such as metformin, as it helps lower the blood glucose and decrease weight. Children are even started on metformin once they are weaned off insulin if they were initially placed on it because of a hyperglycemic state or DKA [25].

- Metformin improves the sensitivity of target cells to insulin, slows the gastrointestinal absorption of glucose and reduces the hepatic and renal glucose production. The dosage can be gradually increased to improve metabolic control. It should only be prescribed to patients with normal liver and kidney function, and no ketosis present.

If metformin is not well tolerated or the patient does not achieve euglycemia and another medication needs to be added, sulfonylurea or meglitinides may be used. However, they are not approved for children in the U.S. because of liver toxicity [25].

If the HbA1C is equal or greater than 7 percent, the ADA and European Association (2007) recommends adding either basal insulin (the most effective) or a sulfonylurea (least expensive) [45]. It is important to note that the treatment should be customized to the patient's risk for hypoglycemia, a very young or older age, end-stage renal disease, advanced cardiovascular or cerebrovascular disease and the life expectancy [45].

At this time, there are five distinct classes of anti-diabetic (hypoglycemic agents) available, each displaying unique pharmacologic properties designed to correct one or more of the metabolic abnormalities. The patient is typically started at the lowest dose, and then increased every one to two weeks until he or she reaches an acceptable blood glucose level [19]. These classes are the sulfonylureas, meglitinides, biguanides, thiazolidinediones and alpha-glucosidase inhibitors [10, 68]:

- **Sulfonylureas** (SU) are insulin secretagogues, meaning they force the pancreas to increase insulin production. Therefore, SUs are reserved only for patients with some remaining pancreatic beta cell function. The anticipated reductions while taking a sulfonylurea is a 0.8 to 2.0 reduction in the HbA1c and 60 to 70 points lower on the FBG. It is important for the nurse to monitor the renal function and speak with the doctor before administering because there is a crossover for patients with sulfa allergies. In addition, the nurse should tell the patient that the drugs are potentially photosensitizing, and hypoglycemia may occur. Hypoglycemia is more likely to occur with Diabinese and Novo-Propamide because of their longer duration of action. In addition, underweight older adult patients with cardiovascular, liver or kidney impairments are susceptible.
    - First generation: acetohexamide (Dymelor), chlorpropamide (Diabinese, Novo-Propamide), tolazamide (Tolinase), tolbutamide (Orinase).
    - Second generation: glyburide (Micronase/ DiaBeta), gipizide (Glucotrol), glimepiride (Amaryl). The second generations are used more frequently than the first generation medications because of a higher risk of hypoglycemia with the first-generation medications.
- **Biguanides** are insulin sensitizers because they reduce hepatic glucose output. The anticipated reductions while taking a biguanide is a 1.5 to 2.0 reduction in the HbA1c and lowering the FBG by 50 to 70 points. It is important to monitor the creatinine level and to avoid if the creatinine level rises above 1.4. The nurse needs to instruct the patient to avoid taking the medication and to inform the physician before any radiocontrast use or surgery on the day of the procedure and for 48 hours post-recovery. The major risks that may occur if the patient continues the medication are dehydration, impaired renal function and hypovolemia because everything is going through the kidneys, leading to a condition called lactic acidosis. In addition, the nurse should be conscious about signs and symptoms of those conditions, even if the patient is not scheduled for a procedure with radiocontrast or surgery. Hypoglycemia may occur if the patient is taking a coinciding SU and/or insulin.
- **Metformin** (glucophage) is one of the most common, first-line medications prescribed for type 2 diabetics, metabolic syndrome and PCOS because it has amazing results in reducing weight and inducing ovulation. Patients should be told that diarrhea is a common complaint once the medication is initiated, but it typically resolves. Regardless, the patient should inform the prescribing health care provider to avoid dehydration.
- **Meglitinides** are similar to the SU agents with their typical short-acting insulin secretagogues. The anticipated reductions while taking a meglitinide is a 1 to 1.5 percent in the HbA1c. The goal of meglitinides is a reduction in the postprandial glucose level because it helps with the absorption of carbohydrates while eating. Therefore, the patient should be instructed to take it one to 30 minutes before eating. During the meal, the medication provides a

quick insulin burst approximately 20 minutes after swallowing the pill. Meglitinides should be strongly encouraged if the patient has difficulty managing postprandial blood glucose levels. The main concern is to use with caution in patients with renal or hepatic impairments. Again, similar to SU agents, the major side effect is hypoglycemia, especially with Starlix. Therefore, if the patient skips a meal, he or she should not take a scheduled dose of Starlix to avoid hypoglycemia.

- Repaglinide (Prandin), nateglinide (Starlix).

- **Thiazolidinediones** (TZD) are insulin sensitizers because they work by promoting glucose utilization in the muscles and tissues. The anticipated reduction while taking a thiazolidinediones is 1 to 2 percent in the AIC. TZDs are potent drugs on the liver; therefore the nurse should monitor the alanine aminotransferase (ALT) before administering the dose because there is a rare risk of hepatic toxicity. In addition, there is a risk of edema, especially if the patient is on an SU or insulin. Therefore, do not initiate it if there are any signs and symptoms of heart failure. If the patient has any cardiovascular risks (as many diabetics do), TZDs should not be used with nitrates because it may exacerbate the risk of developing edema or heart failure. TZDs are not an ideal medication to administer to a female patient taking an oral contraceptive (OC) because it decreases the effectiveness. Another unique feature is the onset of action is delayed; it requires up to 12 weeks of use before attaining the maximum therapeutic level.
  - Pioglitazone (Actos), rosiglitazone (Avandia).
    - In November 2007, the FDA added a box warning for heart-related risks, especially heart attacks, in patients taking Avandia. The FDA recommends that patients with type 2 diabetes who have underlying heart disease or who are at high risk of heart attack should talk with their health care provider about the revised warning as they evaluate treatment options. FDA advises health care providers to closely monitor patients who take Avandia for cardiovascular risks. In August 2007, the FDA warned that Avandia may also worsen heart failure in some patients as well [41].
- **Alpha-glucosidase inhibitors** delay the intestinal carbohydrate absorption by reducing postprandial digestion of starches via enzyme action inhibitions, and it helps the dumping effect of carbohydrates. Therefore, the risk of developing hyperglycemia after meals is reduced because the intestinal absorption and digestion of carbohydrates is reduced. The anticipated reduction in the HbA1c is 0.3 to 0.9 percent. Hypoglycemia is rare unless administered with an SU or insulin.
  - Acarbose (Precose), miglitol (Glycet).

Before the primary care provider chooses an appropriate oral agent, the patient's history, age, blood sugar levels, HbA1c levels and costs are considered to ensure the patient will be able to comply with the medication regimen. If the primary care provider is considering the cost alone, SUs are the least expensive, taken once a day and have few side effects [19].

In January 2010, the Food and Drug Administration approved a new drug, Victoza (liraglutide), a once-daily injection to treat type 2 diabetes in some adults. Victoza is in a class of medicines known as glucagon-like peptide-1 (GLP-1) receptor agonists that help the pancreas make more insulin after eating a meal, the FDA said.

The agency also said that in five clinical trials involving more than 3,900 people, pancreatitis (inflammation of the pancreas) occurred more often in patients who took Victoza than in patients taking other diabetes medicines. Victoza should be stopped if there is severe abdominal pain, with or without nausea and vomiting, and should not be restarted if pancreatitis is confirmed by blood tests. Victoza should be used with caution in people with a history of pancreatitis.

The most common side effects observed with Victoza were headache, nausea and diarrhea. Other side effects included allergic-like reactions such as hives.

Victoza was not associated with an increased risk for cardiovascular events in people who were mainly at low risk for these events. FDA approved Victoza, however, with several post-marketing requirements under the Food and Drug Administration Amendments Act (FDAAA) to ensure that the company will conduct studies to provide additional information on the safety of this product.

In addition to a cardiovascular safety study to specifically evaluate the cardiovascular safety of Victoza in a higher risk population, the company also is required to conduct a five-year epidemiological study using a health claims database to evaluate thyroid and other cancer risks as well as risks for seriously low blood glucose levels (hypoglycemia), pancreatitis and allergic reactions. To specifically evaluate the risk of medullary thyroid cancer, the company is required to establish a cancer registry to monitor the rate of this type of cancer in the United States over the next 15 years.

In animal studies, Victoza caused tumors of the thyroid gland in rats and mice. Some of these tumors were cancers, which were significantly increased in rats who received excessive doses that were eight times higher than what humans would receive.

It is not known whether Victoza could cause thyroid tumors or a very rare type of thyroid cancer called medullary thyroid cancer in people. For this reason, Victoza should not be used as the first-line treatment for diabetes until additional studies are completed that support expanded use, the FDA said. Also, Victoza should not be used in people already at risk for medullary thyroid cancer, such as those who have medullary thyroid cancer in the family or those with a rare genetic condition known as multiple endocrineneoplasia syndrome type 2.

Another medication in the GLP-1 class is Byetta, an injectable drug that was approved by the FDA in 2005 as adjunctive therapy to improve blood sugar control in patients with type 2 diabetes who have not achieved adequate control on Metformin and/or a SU.

However, since 2007, Byetta has been on the FDA list and has received black box warnings. Starting in 2007, FDA reviewed 30 post-marketing reports of acute pancreatitis in patients taking Byetta. At that time, the FDA encouraged health care professionals to instruct patients taking Byetta to seek prompt medical care if they experience unexplained persistent severe abdominal pain, which may or may not be accompanied by vomiting. If pancreatitis is suspected, Byetta should be discontinued. If pancreatitis is confirmed, Byetta should not be restarted unless an alternative etiology is identified. In October 2007, the FDA received reports of six cases of hemorrhagic or necrotizing pancreatitis in patients taking Byetta [43].

Treatment of gestational diabetes

Any woman with diabetes contemplating a pregnancy should ideally discuss it with her health care provider before conception. The woman with type 1 diabetes will continue on her insulin, while the type 2 diabetic may discontinue her oral anti-diabetic agents or begin taking insulin throughout the pregnancy [77]. A pregnant woman with diabetes requires prompt, adequate treatment to normalize her maternal blood glucose levels and to avoid complications for the infant. The fetal risks are the same for women with all forms of diabetes (type 1, type 2 and GDM); however maternal risks are greater in women with type 1 diabetes [77]. This is because Type 1 creates erratic blood sugar control because of the absolute lack of insulin production and because women are more prone to have vascular, retinal or renal complications. Therefore, to prevent morbidity of the women and fetus, very aggressive treatment is necessary [48].

Although maternal and fetal morbidity and mortality rates have significantly decreased over the years, the risks of developing complications still exist. Research has demonstrated the most common complications that occur are [27, 77]:

- **Maternal**
  - Poor glycemic control around the time of conception and in the early weeks of pregnancy may be associated with an increased incidence of early pregnancy loss in women with a history of diabetes.
  - Pre-eclampsia or eclampsia is exacerbated (four times) in women with diabetes.
  - Hypertensive disorders, such as pre-clampsia or eclampsia, occur more frequently in women with a prior

history of diabetes, especially if she has coinciding renal dysfunction.
- Hydramnios (polyhydramnios) (increased amniotic fluid, greater than 2,000 milliliters) (ml) occurs more frequently in diabetic patients, causing an overdistention of the uterus. The overdistention of the uterus leads to additional risks, such as increases in the compression of the maternal abdominal blood vessels (vena cava and aorta), leading to hypotension while in the supine position; premature rupture of membranes (PROM); preterm labor; and postpartum hemorrhage.
- Infections are exacerbated because disorders of carbohydrate metabolism alters the body's normal resistance to infection. Although infections are prevalent with any form of diabetes, it is increased due to the pregnancy. It is important for nurses to teach pregnant women about the risks of infections and other problems that lead to further complications:
  - During a pregnancy, urinary tract infections (UTI) increase the risk of pre-term labor.
  - After pregnancy, postpartum infections.
- Ketoacidosis typically occurs more frequently in the second and third trimesters when the diabetogenic effect is the greatest. If a pregnant woman has coinciding risks, such as stress or infection, the risk for DKA is exacerbated.

- **Infant/neonatal**
  - Congenital anomalies (occurs in 6 to 10 percent of deliveries) of infants; typically cardiac defects are the most common.
  - Macrosomia (large infant). Although the pancreas is working overtime to produce more insulin, it is not lowering the blood glucose levels in the woman's body, and all of the extra blood glucose is being transported through the blood brain barrier into the placenta for the baby. The baby is unable to metabolize or excrete the extra blood glucose; thus the mom and nurses caring for the baby can expect the baby will continue to get larger (macrosomia). Macrosomia infants tend to have disproportionate increases in the shoulder and trunk, leading to another consequence: shoulder dystocia. Poor glycemic control in the later portion of the pregnancy, especially in women with a history of coinciding vascular disease, increases the risk of macrosomia. Macrosomia occurs in 25-40 percent of diabetic pregnancies. In addition, at birth, the nurse can expect the following:
    - Baby will develop hypoglycemia because its little body is used to the extra glucose.
    - Difficulty breathing due to the increased weight.
  - Other problems that cause neonatal morbidity include:
    - Spontaneous abortion (two times the risk) in diabetic women.
    - Macrosomia.
    - Hypoglycemia.
    - Respiratory distress syndrome (RDS).
    - Polycythemia (increased hematocrit level.
    - Hyperbilirubinemia (jaundice).

To prevent the potential risks and complications, the nurse needs to educate the woman and her partner about her diabetes (including the disease process, prevention, treatment and possible complications). During the first and second trimesters of pregnancy, the diabetic woman should see her provider every one to two weeks, rather than monthly as for a nondiabetic woman. It is important to establish and convey the importance of collaborating to recognize early signs of any potential problems to avoid complications. The overall goal is to achieve and maintain euglycemia for a pregnant diabetic woman in the range of 60 to 120 mg/dl [77]. In order to maintain euglycemia, the diabetic woman needs to comply with the combination therapy of checking the blood glucose levels, diet, insulin and exercise throughout her pregnancy [77]:

- **Blood glucose measurements** are completed frequently to assess compliance of the medical regimen throughout the day, such as before breakfast, lunch and dinner. Typically in a woman with true gestational diabetes, fasting blood glucose levels will be normal, while the postprandial blood glucose levels are elevated [27]. The rationale behind this concept is related to the metabolism of large carbohydrate boluses rather than carbohydrate intolerances at the baseline levels [27].
- **Diet** is individualized to the patient based on the blood (not urine) to allow for increased fetal and metabolic requirements.
  - Energy needs are based upon 30-35 calories per kilogram of the ideal body weight with an average of 2,200 calories (first trimester) to 2,500 calories (second and third trimesters).
  - Carbohydrates, protein and fat are important to balance with approximately:
    - 50 to 60 percent of the total calories being carbohydrates (minimum of 250 g per day). Limit simple carbohydrates and encourage complex carbohydrates that are high in fiber to regulate the blood glucose level by releasing more glucose. It may be easier for the pregnant woman to count carbohydrates at meals, so educate her to ingest 30 to 45 grams of carbohydrates at breakfast, 45 to 60 grams at lunch and dinner, then 15 grams for snacks [27].
    - 12 to 20 percent should be protein.
    - 20 to 30 percent from fat, with less than 10 percent from saturated fats.
- **Exercise** regimens should be individualized to the patient with the exact protocol by the physician. However, most encourage walking for 15 to 30 minutes four to six times a week about 30 to 40 minutes after eating to enhance the postprandial blood sugar levels [27].
  - A woman with vasculopathy should be encouraged to do only mild exercise to prevent the risk of injury to the placenta.

Medications

Since 2002, the American College of Gynecology (ACOG) and the AAFP has recommended that women with GDM be treated initially with an adequate, nutritious diet designed to achieve normal glycemic levels and to avoid ketoacidosis [71]. There are various perspectives about treating a woman with GDM with insulin or oral agents. However, in January 2009, a meta-analysis was published in Obstetrics and Gynecology based on research conducted over the previous years that did not demonstrate any significant differences in maternal glycemic control, infant birth weight, neonatal hypoglycemia or congenital malformations [73].

- Insulin is imperative to maintain euglycemia and proper metabolism of glucose. In addition, if the previous medical regimen in the type 1 and type 2 diabetic changes, the patient requires adequate education to avoid confusion and potential frustration for the pregnant woman. The following insulins are recommended [77]:
  - The woman will be started on short-acting insulin (Humalog/Lispro or Novolog) in combination with intermediate-acting insulin (NPH) in the morning to cover breakfast and lunch; then short-acting insulin at dinner (Humalog/Lispro or Novolog) [27]. Humalog is ideal for GDM patients to better control the postprandial blood sugar levels with less risk of hypoglycemia developing [27].

    Several trials have demonstrated a reduced risk of fetal macrosomia if the mother is treated with insulin during the pregnancy. Although insulin treatment is commonly prescribed in GDM, only 9 to 40 percent of treated mothers benefit. Treatment aims to achieve glucose levels of 130 mg per dL one hour postprandial. [27].
- Oral hypoglycemic agents may be administered if the glucose levels are lower. In one study, Glyburide provided outcomes comparable to those achieved with insulin in patients with GDM who had failed to achieve adequate glycemic control with diet alone [71].

After pregnancy the woman should continue to eat healthy, exercise and control her weight because research has demonstrated that 5 to 10 percent of women with gestational diabetes are found to have type 2 diabetes. In addition, women who have had gestational diabetes have a

20 to 50 percent chance of developing diabetes in the next five to 10 years [48, 75].

Surgical treatment options for diabetic patients

Many nurses may not be aware of the surgical treatment modalities that are available for the diabetic patient because there is little discussion of surgical modalities in recent nursing textbooks. However, there are various sites available online on recent research studies conducted over the past few years that are bringing hope and promise for the future for patients with diabetes.

According to the Science Daily (March 2008), growing evidence shows that surgery may effectively cure Type 2 diabetes based upon recent research [65]. Since 2005, a study published in Diabetes Care (2005), compared laparoscopic adjustable gastric banding (LAGB) and conventional diet (no-LAGB) in the prevention and remission of type 2 diabetes, hypertension and obesity over a four-year period [18,61]. In the study, there were 122 patients, and 73 chose to have the LAGB surgery. The results were as follows [18, 61]:

- In the primary intervention study, body weight, A1C, and systolic and diastolic blood pressure significantly decreased in the LAGB but not in the no-LAGB group.
- In the secondary intervention study, body weight, A1C, and systolic and diastolic blood pressure significantly decreased in the LAGB group but not in the no-LAGB group. Remission occurred in 45 percent of the LAGB patients and 4 percent of the no-LAGB patients. In addition, remission of arterial hypertension occurred in 51 percent of LAGB patients and 4 percent of no-LAGB patients.

Since 2005, the ADA also has reported on a research study published in the Journal of Clinical Endocrinology and Metabolism (2005), focusing on the satiety after achieving the LAGB surgery for 23 patients. The results were as follows [39]:

- Of 23 LAGB patients who attempted the protocol, 17 completed two breakfast tests. Five patients were excluded for failing to consume the meal adequately, three due to regurgitation of food and two due to delayed consumption. These patients were presumably too restricted by their bands to allow passage of the test meal.
- All of the patients became increasingly hungry preprandially, experienced maximal satiation immediately after the meal, and experienced decreasing satiety thereafter.

In 2008, the Journal of American Medical Association (JAMA) conducted a two-year research study on patients recently diagnosed as a type 2 diabetic with a BMI of 30 to 40. The patients were randomly assigned to receive conventional medical/behavioral therapy (medical therapy and a focus on weight loss through lifestyle modification) or LAGB, plus conventional medical/behavioral therapy. The results were amazing [33]:

- Complete remission of diabetes was achieved in 73 percent of the type 2 diabetics who underwent the LAGB, apparently due to more weight loss (20.7 verses 1.7 in the medical/behavioral group). The percentage of weight loss generally required for diabetes resolution was 10 percent, which was achieved in 86 percent of the surgical patients but in only 1 patient in the medical group.
- Complete remission of diabetes was only 13 percent of those in the medical/behavioral therapy group.
- No serious surgical complications were reported.

Although the research studies exemplify promising news for the future for diabetics, especially for the morbidly obese or patients with coexisting hypertension, as the ADA indicates, there are limitations to the studies. The majority of the research conducted is based on a limited number of patients, and further research needs to be conducted [18].

According to the American Society for Bariatric Surgery, LAGB is a relatively safe procedure that has been around for almost 30 years. Over the past three decades, the procedure has been enhanced [23]:

- Currently, the LAGB consists of an inflatable balloon that is connected to a silicone band. The surgeon controls the amount and degree of inflation or deflation of the balloon, which can always be adjusted as needed. Inflation of the balloon functionally tightens the band and thereby increases weight loss, while deflation of the balloon loosens the band and reduces weight loss. These bands can be inserted laparoscopically, thereby reducing the complications and discomfort of an open procedure.
- LAGB is a procedure that induces weight loss solely by the patient restricting the amount of food. Typically, 28 to 65 percent of patients lose excessive weight within two years, and 54 percent at five years. However, in order for the surgery to be effective, the patient needs to be compliant with the strict diet and frequent follow-up appointments for band adjustments. Another unique feature is that LAGB is a reversible procedure that does not carry the risks of nutritional and mineral deficiencies of other bariatric procedures.

According to the American Society for Bariatric Surgery, remission of diabetes with LAGB is seen in 64-66 percent of patients at one year. At this time, long-term results comparing LAGB with the traditional gastric bypass surgery (surgical incision in the abdomen to make the stomach smaller by creating a small pouch at the top of the stomach using surgical staples or a plastic band) are not yet available. The sleeve gastrectomy is another potential surgical procedure, similar to the LAGB and gastric bypass surgery. During this procedure, the surgeon creates a small, sleeve-shaped stomach that is larger than the stomach pouch created during the Roux-en-Y bypass (traditional gastric bypass surgery) and is about the size of a banana. Sleeve gastrectomy is typically considered a treatment option for bariatric surgery patients with a BMI of 60 or higher [26].

There are other surgical procedures and transplants that have been implemented to potentially to improve the quality of life for the diabetic patient.

- Whole pancreas transplantation can be performed in one of the following manners [49]:
  - Transplant of the pancreas alone (PTA).
  - Transplant of the pancreas and kidney (PAK).
  - Simultaneous pancreas and kidney transplant (SPK), ideal for diabetic patients with uremia.

According to the ADA, whole pancreas transplantation is ideal for type 1 diabetic patients with the HLA genetic composition because it "tricks" the body into accepting the donor organ recipient. Patients with a transplanted organ must take immunosuppressive drugs in order to prevent the immune system from fighting the new organ, and the side effects of these drugs may be worse than the problems caused by diabetes; the operation itself is serious. According to the ADA, one to two people in 10 die within a year of getting a pancreas transplant [17].

On a positive note, if the transplantation works and the body accepts the organ, the patient no longer has diabetes and is unlikely to get it again. Therefore, the patient does not require insulin shots and frequent blood glucose testing. The ADA has suggested that euglycemia levels may prevent further complications or any current co-morbidities from worsening, although many more studies are needed.

Unfortunately, there are not enough cadaver pancreases to go around because not enough people sign up to be organ donors, and each pancreas must meet strict guidelines. When a whole cadaver pancreas is not available, a person can receive a portion of a pancreas from a living relative.

Anytime a patient with diabetes is receiving a kidney transplant from a living relative, it is usually beneficial to perform a partial pancreas transplant at the same time. Because the transplanted kidney will become damaged by diabetes over time, transplanting a partial pancreas from the same donor will help control blood glucose levels and protect the new kidney from further damage. Transplant success seems higher when patients and donors are matched for HLA types, and a pancreas transplanted along with a kidney is less likely to fail than a pancreas transplanted alone.

The ADA website mentions a study conducted by JAMA (2003) indicating patients with functioning kidneys who therefore decline the PAK option have survival rates that are worse than those of patients who manage their diabetes with conventional therapy (insulin, diet, etc.). Therefore, the decision to have a pancreas-only transplant should be very carefully considered by both the patient and physician. Because of

the lower survival rates seen with pancreas-only transplants and because a pancreas transplanted along with a kidney is less likely to fail than a pancreas transplanted alone, pancreas transplants are nearly always done only in people with type 1 diabetes who are getting or already have a transplanted kidney. Remember that pancreas transplants work only for people with type 1 diabetes. The major problem in people with type 2 diabetes is not a failing pancreas, but the body's inability to respond to insulin in the right way.

It is important to realize there are many options for the patient, but there also are precise risk factors and history to consider before pursuing any options. The nurse should encourage the patient to discuss the most feasible with his or her primary care provider and consulting surgeon.

Hyperglycemia and diabetes

All diabetic patients are at risk of developing acute complications related to their diabetes. However, each realistic, potential acute complication is treatable and preventable with appropriate education and knowledge.

Typically, patients will experience hyperglycemia with any of the following occurrences [75]:

- Caloric intake exceeds their daily allowance (1500 to 2000 calories/day).
- Missing a dose of insulin and/or oral anti-diabetic agents.
- Stress and illness causes the release of hormones, such as epinephrine, cortisol, growth hormones and glucagon. The diabetic patient is unable to compensate for the fluctuation and changes in the various hormones being released.

The symptoms of hyperglycemia include the three polys, blurred vision, headache, lethargy, abdominal pain, ketonuria (if type 1 diabetic) or coma. It is imperative that nurses teach their patients about hyperglycemia to ensure the patient is aware of how to prevent, recognize and treat the problem. However, when a patient has hyperglycemia, it is always important to consider two other potential life-threatening conditions, DKA, typically found in type 1 diabetics, and hyperglycemic-hyperosmolar nonketotic syndrome (HHNS), typically found in type 2 diabetics. Although hyperglycemia, DKA and HHNS all have hyperglycemia in common, always remember the following:

- Hyperglycemia can occur without DKA or HHNS.
- DKA will have a blood glucose greater than 300 mg/dl and positive urine ketones.
- HHNS will have higher blood glucose, typically greater than 600 mg/dl, and no urine ketones.

Diabetic ketoacidosis (DKA) is a complication of hyperglycemia that develops when there is an absolute deficiency of insulin and an increase in the insulin counter-regulatory hormones specific to patients with type 1 diabetes during physical or emotional stress despite continued insulin therapy [51]. DKA is a common and potentially life-threatening condition that occurs primarily in children (20 to 40 percent) [25]. Research has demonstrated that the most common causes of DKA include incorrect or missed insulin doses, inaccurate administration of the insulin, illness, trauma or surgery [25].

DKA (insulin deficiency) is accompanied by an increase in hormones, such as epinephrine, norepinephrine, cortisol, growth hormones and glucagon) that are released when there is not enough glucose delivered into the cells [25]. DKA occurs when the muscle cells break down protein into amino acids that are converted to glucose by the liver, leading to hyperglycemia. The increase in adipose tissue releases fatty acids that are transformed by the liver into ketone bodies [49, 51, 75].

The onset of DKA is typically sudden, and the patient will initially exhibit signs of dehydration (polyuria, polydipsia) that will exacerbate the hyperosmolality process by producing symptoms of anorexia, nausea and vomiting (metabolic acidosis) [25, 53]. The patient will also have positive ketones excreted in the urine. The increased amount of ketones circulating will cause the patient to blow off a "fruity" smell from the mouth. Other characteristic signs that typically occur later include dehydration (including warm/dry skin with poor turgor, soft eyeballs, dry mucous membranes, oliguria, malaise, rapid but weak pulse and hypotension), abdominal pain, tachycardia, flushed ears and cheeks, Kussmaul respirations and altered level of consciousness [49, 51]. In addition, children typically exhibit complaints of abdominal or chest pain, nausea and vomiting because of the metabolic acidosis [25]. A patient left untreated will go into a coma, the vascular system will collapse and the patient will go into renal failure, especially when the blood glucose increases between 300 and 800 mg/dl [40].

Although there are many different symptoms that may be exhibited by a patient, it should be noted that the initial symptoms may be a diabetic coma because the other signs may have been masked or pacified by the patient. The patient's level of consciousness varies based upon the degree of the hyperosmolality [53]:

- If insulin deficiency develops slowly and the patient is able to maintain an adequate intake, the patient will remain alert, and the physical symptoms may be minimal.
- In contrast, if the patient is vomiting in response to the ketoacidosis process, the body will begin to compensate to the dehydration, further exacerbating the serum osmolality, less than 320-330 milli-osmole per kilogram (mOsm/kg). Essentially, the body is depleted and unable to maintain homeostasis, inducing the patient to be in a stupor or coma.

The initial diagnostic testing of hyperglycemia begins with the following laboratory findings, especially if DKA is speculated [40, 49, 51]:

- Blood glucose level greater than 250 mg/dl.
- Serum laboratory values:
  - Sodium (may be hypo, normal or hypernatremia).
  - Potassium (initially hyper with acidosis, but hypokalemia with dehydration).
  - Phosphate (low).
  - Bicarbonate (low, typically less than 15 mEq/L).
  - Osmolarity (variable).
  - Elevated BUN and creatinine due to the dehydration.
  - Serum ketones (positive).
  - Plasma pH less than 7.35.
  - Presence of urine ketones and glucose.

The treatment of hyperglycemia or DKA includes all of the following, depending on the severity of symptoms. If the patient is at home, the nurse should instruct the patient to understand the risks and then recognize the potential signs and symptoms of hyperglycemia. If the patient feels different or recognizes any of the signs and symptoms, he or she should check the blood glucose level. If the level is greater than 300 mg/dl, the patient should check the urine for ketones and increase fluid intake [75]. If the blood glucose is greater than 200 mg/dl for two days or if the person is ill or vomiting, the patient should contact the health care provider monitoring his or her diabetes.

- If the patient is in the hospital, the nurse should always assess the airway, level of consciousness, hydration status, electrolytes (if available) and blood glucose levels depending on the severity of the hyperglycemia and the patient's condition [49]. The nurse should adhere to the hospital's protocol for verifying a high blood glucose level with a serum laboratory test. Additional actions of the nurse may include the following, depending upon the hospital protocol, patient's status and the physician's orders [49]:
  - Assess the patient's vital signs (blood pressure, heart rate and respirations every 15 minutes).
  - Record intake and output, temperature and mental status every hour.
  - Assess the patient's fluid status. The primary goal is to restore volume and maintain perfusion to the patient's heart, brain and kidneys. Typically the physician will order one liter of an isotonic saline solution over 30 to 60 minutes. Another goal in replacing fluid therapy is to replace the total body fluid loss by administering a slow, 0.45 percent of normal saline; then when the patient's blood glucose levels reaches 250 mg/dl, add 5 percent of dextrose to the 0.45 percent of normal saline to prevent hypoglycemia when the serum osmolarity declines rapidly.
  - In order to lower the serum glucose, the nurse may administer an intramuscular (IM) or intravenous (IV) bolus of regular insulin. Typically, it is administered in an initial IV bolus of 0.1 units/kilogram, followed by an IV drip of 0.1 units/kilogram/hour. Most physicians will prescribe a continuous infusion because

of the four-minute half-life of IV insulin.
- If the patient has any significant changes in potassium and symptoms (fatigue, malaise, confusion, muscle weakness, shallow respirations, hypotension and weak pulse), the patient may have an electrocardiogram (ECG). In hypokalemia, the nurse can anticipate seeing ST-segment depression, flat or inverted T waves and increased U waves on the ECG [51]. Before administering an IV bolus of potassium, make sure the patient has voided at least 30 ml/hr to prevent the development of hyperkalemia.

It is important to assess and monitor for hypokalemia when a patient is hyperglycemic because it is a significant cause of death in the treatment of DKA [49].

Hyperosmolar hyperglycemic nonketotic syndrome (HHNK), also known as hyperosmolar hyperglycemic state (HHNS), occurs in type 2 diabetics, especially in older adults who may not even be aware that they have diabetes [49]. HHNS is a significantly dangerous, life-threatening complication with a high risk of mortality because of severe dehydration from prolonged hyperglycemia. Older adults are more prone to mortality, as high as 40 to 70 percent [52]. The development of HHNS rather than DKA is related to residual insulin secretion. In HHNS, the patient is able to secrete insulin to prevent the serum and urine ketones, but not enough to prevent hyperglycemia [49]. HHS is precipitated by one of the following conditions, although infection is the most prevalent cause [51]:

- Therapeutic agents.
  - Glucocorticoids.
  - Diuretics.
  - Beta-adrenergic blocking agents.
  - Chlorpromazine.
  - Diazoxide.
- Acute illnesses.
  - Infection.
  - Gangrene.
  - Urinary tract infection.
  - Burns.
  - Gastrointestinal bleeding.
  - Myocardial infarction.
  - Pancreatitis.
  - Stroke.
- Therapeutic procedures.
  - Peritoneal dialysis.
  - Hemodialysis.
  - Hyperosmolar alimentation (oral or parenteral).
  - Surgery.
- Chronic illnesses.
  - Renal disease.
  - Cardiac disease, including congestive heart failure (CHF).
  - Hypertension.
  - Previous stroke.
  - Alcoholism.

A patient with HHS may present with subtle, insidious symptoms. However, after the nurse collects the history, it will be noted there has been a decreased consumption of fluids with polyuria, polydipsia and weakness. If the patient presents with the initial symptoms, the patient may not be lethargic, confused or in a coma state because it presents with a serum osmolality greater than 310 mOsm/kg [40, 51].

The patient with HHNS will be diagnosed by exhibiting the following findings [40]:

- Severe hyperglycemia (typically greater than 600 mg/dl) in the absence of serum and urine ketones. Severe hyperglycemia occurs due to the coinciding severe hyperglycemia, and the glucose is not filtered into the urine [49].
- Severe hyperosmolality (310 mOsm/L).
- Dehydration (the patient may lose up to 15 to 25 percent of his or her body fluid) [49].
- Hypokalemia and/or hyponatremia.
- Altered levels of consciousness.

Nurses' role in treating HHS includes recognizing the signs, symptoms and diagnostic findings, replacing fluids and restoring normal blood glucose levels within 36 to 72 hours, correcting insulin and electrolyte imbalances, assessing urine output and vital signs [40, 49]:

- The first treatment is providing adequate fluid replacement to increase the fluid volume. If the patient is in shock or has severe hypotension, administer a hypotonic intravenous fluid (0.45 percent normal saline). However, if the patient has hypovolemia, then an isotonic solution (0.9 percent normal saline) is required. The patient will typically receive four to six liters of fluid over eight to 10 hours. Ideally, the nurse should expect to see a slow but steady improvement in the central nervous system function.
- The nurse should assess the patient hourly for signs of cerebral edema, abrupt changes in the mental status, abnormal neurological signs and coma. If the symptoms continue, it indicates that the patient is not getting the correct volume of fluid replacement or a rapid reduction in plasma osmolarity.
- Administer IV insulin at 10 units/hour to reduce the blood glucose levels. Once the patient's blood glucose maintains 250mg/dl, the physician should be notified to change the intravenous fluids to 5 percent Dextrose and 0.45 percent or 0.9 percent normal saline solution.
- Hyponatremia and hypokalemia replacements as needed.
- Ensure urine output is 50 mg/hour or more.

Hypoglycemia and diabetes

Another common, acute complication of diabetes is hypoglycemia (low blood glucose, less than 70 mg/dl), which occurs when there is not enough glucose available in relation to the circulating insulin [75]. Normal insulin secretion decreases when the blood glucose levels drop to approximately 83 mg/dl and the counter-regulatory hormones (glucagon and epinephrine) are activated at about 68 mg/dl [49]. It is important to teach the patient how to prevent hypoglycemia because it may cause neurological damage when the brain starves for glucose [75]. Hypoglycemia can be very dangerous for a type 1 diabetic because [49]:

- After one to five years of diagnosis, the regulation of circulating insulin dissipates because the patient is administering an injection, rather than the pancreas supplying the insulin as needed.
- Another problem is with long-standing hypoglycemia, the patient no longer has warning signs of the impending hypoglycemia. Unfortunately, this occurs in about 25 percent of all patients, and about 50 percent of patients who have had type 1 diabetes for 30 years or more.

Hypoglycemia typically occurs if the patient undereats (skip a meal) or administers too much insulin/oral anti-diabetic agents, and can be exacerbated during exercise. If a nurse is caring for a pregnant woman, it is important to note that she is more likely to develop hypoglycemia because her ideal glucose control is lower (60 to 120 mg/dl) [77].

The most common symptoms of hypoglycemia include hunger, sweating, tremor, blurred vision, headache, irritability, confusion, seizures and coma [49, 77]. If the patient should experience any of the symptoms (which typically occur around 50 mg/dl), or a family member finds the patient in a stupor or coma, confirm the blood glucose level with an SMBG (if at home). If a nurse is caring for the patient in the hospital, he/she should check the Accu-chek machine and then notify the hospital laboratory to confirm. However, at the hospital, the nurse should not sit around and wait for the laboratory department, and should treat the patient to prevent further lowering of the glucose level.

If the patient is at home or in the hospital setting with a mild case (patient remains alert, hungry, irritable, shaky, weak, headache and a blood glucose less than 60 mg/dl) of hypoglycemia, then treat the patient with a 10 to 15 gram carbohydrate snack, such as [49, 77]:

- Glucose tablets or gel.
- 4 ounces of orange juice.
- 6 ounces of regular soda.
- Miniature box of raisins.
- Six to eight Life Savers.
- Three graham crackers.

If the patient is at home or in the hospital with a moderate hypoglycemia event (cold, clammy skin, pale, rapid pulse, shallow respirations, marked change in mood, drowsiness and a blood glucose less than 40 mg/dl), then [49]:

- Treat symptoms with 15 to 30 grams of rapidly absorbed carbohydrates.
- Ingest additional foods, such as a low-fat milk or cheese, after 10 to 15 minutes.

If the patient is at home with a severe case of hypoglycemia (unable to swallow, unconscious, convulsions or blood glucose less than 20 mg/dl) [49]:

- The family member should administer 1 mg of glucagon as an intramuscular (IM) or subcutaneous (SQ) injection.

- Administer a second dose in 10 minutes if the patient remains unconscious.
- Notify the physician immediately.

If the patient is in the hospital with a severe case of hypoglycemia, the nurse should [49]:

- Administer glucagon IM or SQ and 50 percent of dextrose intravenous (IV). The nurse should always be cautious when administering glucagon, as it can cause aspiration, thus inducing a vomit.
- Once the patient awakens, give a simple sugar, then a small snack or meal.

The blood glucose level should be rechecked every 15 minutes; avoid overtreating as it may cause hyperglycemia and rebound hypoglycemia [75, 77]. The nurse's role in treating DKA includes recognizing the signs and symptoms, collaborating with the treating provider to correct the dehydration process, normalize the electrolytes and correct the acidosis. Throughout the treatment, the nurse will monitor the patient's blood glucose levels, amounts of insulin being administered, urine volume, vital signs and serum chemistries. Once the DKA has been corrected, the nurse needs to educate the patient and family explicitly about the importance of insulin and provide guidelines for "sick" days to prevent future occurrences.

Long-term complications of diabetes

Failure to properly identify or control any form of diabetes will increase the risk of developing severe, multisystem complications. Over time, uncontrolled hyperglycemia will lead to the following complications [53]:

- **Cardiovascular disease** is the leading cause of death from type 2 diabetes [28]. Heart disease occurs due to changes in the macrovascular (large blood vessels) and microvascular (small blood vessels) to compensate for the increased flow leading to atherosclerosis, abnormal platelets, red blood cells, clotting factors and changes in the arterial walls [28, 49, 51]. Each of the cardiovascular compensatory mechanisms is exacerbated if hypertension, hyperlipidemia, smoking or obesity are coinciding with the diabetes. The macrovascular complications include the following [49]:
  - Coronary artery disease (CAD) is the most common cause of death among diabetic patients, accounting for 40 to 60 percent of deaths. CAD is also a major risk factor in the development of a myocardial infarction (MI), especially in type 2 diabetes.
    - Most diabetic patients will die from a massive MI due to their extensive CAD, cardiomyopathy and abnormal blood clotting factors [49].
    - Heart failure occurs in approximately 50 percent of all patients after an MI [49].
  - Hypertension (greater than 130/80 if diabetic) affects 20 to 60 percent of all people with diabetes, leading to microvascular complications, such as retinopathy and nephropathy. From 2003 to 2004, 75 percent of adults with self-reported diabetes had blood pressure greater than or equal to 130/80 millimeters of mercury (mm Hg) or used prescription medications for hypertension [58]. The overall goal is to maintain the blood pressure at less than 130/80, according to the seventh report of the JNC 7 [45].
  - Hyperlipidemia (abnormal blood lipids). The overall goal is to maintain the LDL at less than 100mg/dl (may be less than 70mg/dl), TG less than 150mg/dl and HDL greater than 40mg/dl. Therefore the ADA recommends that the patient should have at least an annual lipid profile, then every two years if the patient has a low risk. Interestingly, although the patient is typically prescribed a statin to maintain a lower lipid profile, the ADA does not recommend routine monitoring of liver and muscle enzymes in asymptomatic patients unless the baseline enzymes were abnormal or the patient is taking drugs that interact with statins [45].
- **Cerebrovascular disease**
  Stroke is increased two to six times among older adults with type 2 diabetes because of the risk factors and elevated blood glucose levels. A patient who maintains a high HgbA1c due to elevated blood glucose levels at the time of the stroke could have a greater brain injury and higher mortality [49].
- **Peripheral vascular disease of the lower extremities**

According to the National Diabetes Information Clearinghouse (NDIC) (2008) [58]:

- In 2004, heart disease was noted on 68 percent of diabetes-related death certificates among people aged 65 years or older.
- In 2004, stroke was noted on 16 percent of diabetes-related death certificates among people aged 65 years or older.
- Adults with diabetes have heart disease death rates about two to four times higher than adults without diabetes.

The microvascular complications include retinopathy, nephropathy and neuropathy.

- **Diabetic retinopathy** is the leading cause of new-onset blindness among adults' ages 20 to 74 years. Diabetic retinopathy occurs because of alterations in the blood flow to the eyes, eventually leading to retinal ischemia. Interestingly, almost all patients with type 1 diabetes and 60 percent of patients with type 2 diabetes will have some degree of retinopathy. Diabetic retinopathy causes 12,000 to 24,000 new cases of blindness each year [58]. Retinopathy has been linked to fasting blood glucose levels above 129 mg/dl [49]. The overall goal is to prevent vision loss; therefore, the diabetic patient should be encouraged to have dilated eye exams or 7-field 30-degree fundus photography by an ophthalmologist annually. In addition, it is important to maintain the blood glucose levels and blood pressure [45]. Other eye complications related to diabetes include [49]:
  - Retinal hemorrhages, detachments and venous bleeding due to microaneurysms (small capillary wall dilations formed in the retinal vessels, leading to poor circulation).
  - Macular degeneration.
  - Double vision.
  - Open angle glaucoma.
- **Diabetic nephropathy** is the leading cause of renal failure requiring dialysis or a transplant in the U.S. The condition occurs in about 20 to 40 percent of all diabetic patients. Diabetes is the leading cause of kidney failure, accounting for 44 percent of new cases in 2005. In 2005, 46,739 people with diabetes began treatment for end-stage kidney disease in the United States and Puerto Rico. In 2005, a total of 178,689 people with end-stage kidney disease due to diabetes were living on chronic dialysis or with a kidney transplant in the United States and Puerto Rico [58]. The exact pathologic origin is unknown, but thickening of the basement of the glomeruli eventually impairs renal function. The first indication of nephropathy is the presence of albumin (microalbuminuria) in the urine. The overall goal is to prevent renal failure. Therefore, the blood glucose and blood pressure should be controlled, the serum creatinine and microalbuminuria should be screened annually, there should be an annual GFR calculation and the patient should be instructed to limit the protein intake to 0.8 g/kg in patients with any degree of chronic kidney disease (CKD) [45].

  If the patient tests positive for microalbuminuria, the ADA recommends the patient be started on the following medications [45]:
  - Type 1 diabetic should be on an ACE inhibitor.
  - Type 2 diabetes with hypertension should be on an ACE or ARB.
  - In addition, patients should maintain their blood pressure at less than 130/80 and limit protein to 10 percent of their dietary intake. The patient should be referred to a urologist.
- **Peripheral neuropathies** (somatic neuropathies) initially appear in the toes and feet, then progress upward into the fingers and hands. The diabetic patient will complain of numbness or tingling and pain that are described as "aching," "burning" or "shooting," and feelings of coldness in the feet. About 60 to 70 percent of people with diabetes have mild to severe forms of nervous system damage. The results of such damage include impaired sensation or pain in the feet or hands, slowed digestion of food in the stomach, carpal tunnel syndrome, erectile dysfunction or other nerve problems. Almost 30 percent of people over 40 with diabetes have impaired sensation in the feet, and at least one area that lacks feeling.

- Foot injuries are one of the most common complications of diabetes leading to hospitalizations related to sensory neuropathies, ischemia and infections [49]. Diabetes is the leading cause of amputations worldwide, approximately 60 percent. In 2004, about 71,000 nontraumatic lower-limb amputations were performed in people with diabetes [58]. The five-year mortality rate after a leg or foot amputation ranges from 39 to 68 percent [49].
    - Claw toe is a deformity that causes the toes to hyperextend, resulting in ulceration [49]. Health care professionals, therefore, should visually inspect patients' feet at every visit, and patients should be instructed to inspect their own feet daily with a mirror and have an annual foot exam by a podiatrist.

Other complications include any of the following [45]:

- **Visceral neuropathies** (autonomic neuropathies) that involves various entities:
    - Sweating dysfunction with an absence of sweating (anhydrosis) of the hands and feet.
    - Abnormal papillary function (constricted pupils that dilate slowly in the dark).
    - Cardiovascular dysfunction with a fixed cardiac rate that does not change with exercise, postural hypotension.
    - Gastrointestinal dysfunction, including upper gastric motility (gastroparesis) that results in constipation, dysphagia, anorexia, heartburn, nausea, vomiting and altered blood glucose control.
    - Genitourinary dysfunction, resulting in changes in bladder (inability to empty completely or a sensation of fullness) and sexual function (decreased libido, failure to ejaculate or no vaginal lubrication).
- **Periodontal disease**. Periodontal, or gum, disease is more common in people with diabetes. Among young adults, those with diabetes have about twice the risk of those without diabetes. Persons with poorly controlled diabetes (A1C greater than 9 percent) were nearly three times more likely to have severe periodontitis than those without diabetes. Almost one-third of people with diabetes have severe periodontal disease with loss of attachment of the gums to the teeth measuring 5 millimeters (mm) or more [58].
- **Male erectile dysfunction** (ED) occurs at an earlier age in men with diabetes (10 to 15 years earlier). Half of all diabetic men experience ED. ED is related to poor glucose control, obesity, hypertension, heavy smoking and other chronic micro and macrovascular conditions [49].
- Increased susceptibility to **infections**.

There are many complications that can occur in diabetic patients, so nurses must properly assess their patients' overall condition, risk factors, sensory deficits, access to health care and willingness to comply with the medical regimen to prevent injury or an early death.

Diabetes and cultural considerations

Nurses in a diverse America may be challenged when they encounter patients who have different beliefs, values and cultures from their own. It is important to be sensitive and respectful to the patient and family and come to know them as an individuals. In order to be most effective and respectful toward each patient that we care for, it is imperative for nurses to be culturally competent (learning, understanding and respecting the values and beliefs of others) [44].

Upon admission to a hospital facility, the nurse is required to ask patients whether they have any religious or cultural considerations that may affect their health care. It is important to truly ask the patient and respect the response. In addition, nurses should convey the patient's concerns to the appropriate disciplinarians and other nurses responsible for the care of the patient. If nurses are working in an outpatient facility, there are no set rules for health care professionals to ask their patients about their religious or cultural considerations. However, if a nurse works in an outpatient facility, it should be considered and asked of all patients.

The purpose of this section is to familiarize nurses on how to consider patient's cultural and religious beliefs. If you are caring for a patient, learn about his/her personal concerns to ensure you customize their care toward things the patient will be most apt to abide by to reduce the risk of developing diabetes and/or complications of diabetes. In addition, always ask the individual patient because he or she may not adhere to all of the recommendations of the religion or culture. Although there is a vast array of knowledge to be learned about various cultures, some of the major cultural and religious considerations are listed as follows [44].

- **Diet**
    - Islam prohibits followers from eating from sunrise to sunset during the month of Ramadan.
    - Judaism requires individuals to fast from sundown to sundown during Yom Kippur and the Day of Atonement.
    - Hindus and Seventh Day Adventists are forbidden to eat meat.
    - Filipinos enjoy eating rice with every meal and may feel deprived without it.
    - Japanese prefer small amounts of beef, fish or chicken mixed with vegetables and rice or noodles.
    - Mexican Americans, African Americans and Asian Indians have a high prevalence of developing diabetes in their lives, so it is important to understand the typical food choices that may be a factor contributing to their risk:
        - Mexican Americans enjoy eating lots of salt and fats in their cooking, which may be a contributing factor for their high development of type 2 diabetes. Therefore, the nurse should consider diabetes treatment and prevention programs for Mexican-Americans to include the following [50]:
            - Foods found in their traditional diet. Traditionally, Mexican-Americans tend to eat diets that are low-fat and high-fiber, which is certainly beneficial.
            - Assess the level of acculturation to American eating practices.
            - Ascertain the integration of folk medicine in consideration of their foods, hot and cold in regards to healing.
        - A research study conducted by a diabetes clinic in Atlanta, GA, the Grady Memorial Hospital, concluded that unfamiliar food options was the main reason African Americans did not adhere to low-fat, low-cholesterol diet recommendations. Therefore, it is critical that patients fully understand and realize the significance of their new diet; otherwise they may very well not follow it, which could lead to serious consequences, such as diabetes, obesity and hypertension [50].
        - Asian Indians living in the U.S. are composed of a very diverse culture that will vary among families based upon their religion. Although there are many religions practiced by Asian Indians, the most prevalent is Hinduism.
            - A survey among 73 Asian Indians adults residing in New York City and Washington, D.C., implemented by Diabetes Care (2004) and the ADA, demonstrated the following [50]:
                - Acculturation of this population in the U.S. has led to more frequent selection of American or other ethnic foods for main meals and replacement of traditional sweets with cookies, doughnuts and other Western pastries.
            - Length of stay in the U.S. had an effect on the choice of fats used in cooking; those who had lived here more than five years appeared to have decreased their consumption of butter and ghee (clarified butter) and used margarine as an alternative. These individuals continued to consume rice, chappati (flat bread), yogurt, dhal (a spiced lentil dish), and curried vegetables. Asian Indians also reported an increase in intake of whole grain breads, fish, poultry, meat, potato chips, cakes, cheese, fruit and alcoholic and nonalcoholic beverages (other

than water) after immigration to the U.S.

- Therefore, the Americanized Asian Indians changed their diet radically as they went from a low-fat, high-fiber diet to one with higher-fat animal protein, low fiber and high levels of saturated fat. One reason for this dramatic change is the increased tendency for Asian Indians to consume convenience foods at fast food restaurants. In addition, there are other factors to consider, such as stress and sedentary lifestyles, that increase their risk for developing chronic diseases, diabetes, obesity and hypertension.

- **Pregnancy**
  It is important to note that many Asian and Hispanic cultures practice a system of hot and cold body balance. During pregnancy, the woman is considered to be in a "hot" condition, and she will avoid "hot" foods such as protein. Therefore, it is important during pregnancy for the nurse to ask a woman who believes in a hot and cold practice whether she is eating protein-rich foods. In addition, many Hispanic women avoid iron supplements and pre-natal vitamins because they are considered "hot."

  Nurses caring for patients should always consider nutrition-related cultural variations by asking patients about their specific food habits. Collaborating with individual patients and families will provide a wealth of information for the nurse to provide appropriate suggestions to help patients modify traditional eating patterns to prevent and treat type 2 diabetes [50]. In addition, always discuss and refer patients and families to a registered dietician to ensure individual diets can be customized.

Paying for diabetes

The nurse needs to be empathetic, respectful and conscious about the initial costs of the SMBG machines, monthly costs of the supplies (lancets, alcohol wipes, syringes), medications (oral and insulin), choosing healthy nutritious foods and any other expenses patients may incur. Nurses should never assume that a patient or family is simply "noncompliant" in a health care regimen, but instead take the time to assess the patient and try to find the reason why.

In April 2007, the ADA noted that millions of American children and adults were living with diabetes without insurance or limited access to obtaining the supplies, medications and education necessary to successfully manage the disease and prevent diabetes-related complications [6]. Those who were not offered employer-sponsored health insurance or were ineligible for Medicaid assistance often were unable to obtain private insurance because policies excluded coverage of pre-existing conditions, such as their diabetes. While some states created high-risk insurance pools for such people, these often came with high costs and sometimes caps on covered expenses. The economic hardships that came with the recession of 2008-09 compounded the problem.

In 2009, the majority of patients diagnosed with diabetes were either covered by a private insurance company (39 percent) or Medicare (44 percent). Medicare is the leader in providing the most coverage for diabetic patients. But 11 percent of diagnosed diabetics under the age of 65 were uninsured and most likely to be from low-income backgrounds [54]. The other 6 percent of diabetic patients were unaccounted, for according to the National Conference of State Legislatures.

Some hope for these uninsured individuals and families came in late March 2010 when Congress approved a massive health care reform bill that was signed into law by President Barak Obama. Provisions of the new law include new consumer protections, expanded coverage of the uninsured – including subsidies in some cases – and eventually, penalties for people and businesses who don't buy insurance.

For diabetes patients, a key element is the law's guarantee of access to coverage and a ban on exclusions for pre-existing conditions. In the first year, the law creates a new, temporary insurance program for people who have been without insurance coverage for six months and who have a pre-existing condition. Premiums and coverage were to be the same as those paid by people without a pre-existing condition. Insurers also would be banned immediately from denying coverage for children with pre-existing conditions.

Later in 2010, insurers were to be barred from setting lifetime coverage limits for adults and children; and in 2014, annual limits on coverage will be barred as well.

The law set a 90-day deadline for creating the interim program, which is to be replaced by 2014 with state-based insurance marketplaces, called exchanges, that advocates say will help keep costs down. Meanwhile, the government was expected to pump $5 billion into a fund for administrative costs and to pay claims made during the interim program.

Most observers expected the federal government to contract with states' existing high-risk insurance pools to develop the interim program; according to a Kaiser Commission issue paper on Medicaid and the uninsured, as of January 2010, 34 states operated high-risk pools that provided health insurance to nearly 200,000 people. The interim program would operate under the new federal standards – and estimates were that about 5 million people would be eligible for the interim program.

Even with health insurance, Medicare or Medicaid, patients may not receive all of their required treatment modalities, such glucose monitors, test strips, lancets, emergency kits and medications. Therefore, it is imperative for physicians, nurses and educators to assess the community resources and programs within their community to find other potential financial help. For example, several retailers provide low-cost prescriptions on various medications; on Wal-Mart's main website in 2009, for example, the following oral anti-diabetic agents were offered in a 30-day supply for $4 [72]:

- Chlorpropamide 100mg tablets.
- Glimepiride 1mg, 2mg and 4mg tablets.
- Glimepiride 2 and 4mg tablets.
- Glipizide 5mg and 10mg tablets.
- Glipizide 10mg tab.
- Glyburide 2.5mg, 5 mg and micronized 3mg and 6mg tablets.
- Metformin 500mg, 850mg and 1000mg tablets.
- Metformin 500mg extended release tablet.

What happens to people who have coverage at work but then lose their job? The cost of Consolidated Omnibus Budget Reconciliation Act (COBRA) insurance is very pricey, especially for a family or individual who recently lost a job. The NDIC and the ADA recognized in 2004 that a person with diabetes spends an average of $13,243 a year on health care expenses [56]. Therefore, if a patient is not eligible for Medicare, Medicaid or private health insurance, there are other programs available, according to the NDIC, that the nurse can recommend for the patient and family dealing with diabetes (2004) [56]:

- **State Children's Health Insurance Program**, supported by the U.S. Department of Health and Human Services, was established to help children without health insurance. The program provides health coverage for children whose families earn too much to qualify for Medicaid but too little to afford private health insurance.
- **Health care services**. The Bureau of Primary Health Care, a service of the Health Resources and Services Administration, offers health care for people regardless of their insurance status or ability to pay. Encourage the patient to find a local health center by calling 1-800-400-2742 or visit the bureau's website at *www.bphc.hrsa.gov* on the Internet.
- **Hospital care** is provided to patients who are uninsured and require hospital care. In 1946, Congress passed the Hospital Survey and Construction Act, which was sponsored by Sens. Lister Hill and Harold Burton and is now known as the Hill-Burton Act. Although the program originally provided hospitals with federal grants for modernization, today it provides free or reduced-charge medical services to low-income people. The program is administered by the Department of Health and Human Services. For more information, call 1-800-638-0742 or visit *www.hrsa.gov/hillburton/default.htm* on the Internet.
- **Food and nutrition**. Food, nutrition education and access to health care services are also available through the U.S. Department of Agriculture's WIC (Women, Infants, and Children) program. Pregnant

women who meet residential, financial need and nutrition risk criteria are eligible for assistance. GDM is considered a medically based nutrition risk and would qualify a woman for assistance through the WIC program if she meets the financial need requirements and has lived in a particular state the required amount of time. WIC Phone: 703-305-2746. Internet: *www.fns.usda.gov/wic*.

- **Local resources** that may be available, including:
  - Lions clubs help with vision care.
  - Rotary clubs help with humanitarian and educational assistance.
  - Elks clubs provides charitable activities for youth and veterans.
  - Shriners offer need-based treatment for children at Shriners hospitals throughout the U.S.
- **Dialysis and transplantation**. In 1972, Congress passed legislation making people of any age with permanent kidney failure eligible for Medicare. To qualify, a patient must need regular dialysis or have had a kidney transplant, and must have worked under Social Security, the Railroad Retirement Board or as a government employee (or be the child or spouse of someone who has), or must already be receiving Social Security or Railroad Retirement benefits. Every American needing dialysis for chronic kidney failure is eligible for dialysis assistance. For more information, call the Centers for Medicare and Medicaid Services at 1-800-MEDICARE (633-4227) to request the booklet Medicare Coverage of Kidney Dialysis and Kidney Transplant Services. This booklet is also available on the Internet at *www.medicare.gov* under "Publications."
- **Transplants**: For information on financing an organ transplant, contact the following organization:
  - United Network for Organ Sharing (UNOS)
    Phone: 1-888-894-6361
    Website: *www.unos.org*.
- **Prosthetic care**. If a patient has had an amputation and is paying for compounding rehabilitation expenses, the following organizations provide financial assistance or information about locating financial resources for people who need prosthetic care:
  - Amputee Coalition of America
    Phone: 1-88-AMP-KNOW (267-5669)
    Website: *www.amputee-coalition.org.*
  - Easter Seals
    Phone: 1-800-221-6827
    Website: *www.easterseals.com*.
  - Prosthetics for Diabetics Foundation
    Phone: 770-267-0019
    Website: *www.expage.com/page/pfdfoundation*.

The future for diabetics

Researchers, scientists and physicians have been diligently attempting to control and cure diabetes for decades. One of the most intriguing developments was presented in April 2009 in Japan with the Diabetes Research Institute. For the first time, scientists discussed a hopeful development on how transplanted insulin-secreting cells called "islets" function when they are inside a living organism, or in vivo. In the past, researchers could only view the islets in a laboratory or in vitro [38]. In addition, the Diabetes Research Institute and scientists in Stockholm, Sweden, are transplanting human islets into diabetic mice. In a paper, The Anterior Chamber of the Eye Allows Studying Human Islet Cell Biology in Vivo, researchers report the following [38]:

- After transplantation of 500 islet equivalents per eye, recipient mice achieved and maintained normal blood sugar levels for over 150 days.
- Within one month of the transplant, new blood vessels formed around the islet cells to deliver necessary nutrients (a process called neovascularization).
- As more blood vessels grew around the islet cells, the mouse's diabetes gradually reversed.

However, according to the ADA, islet cell transplants were being conducted with great success in laboratory mice in the 1970s [16]. But the excitement that those experiments generated soon turned to frustration, as initial attempts to reproduce that success in humans were largely disappointing. For many years, progress was slow and few transplant recipients were able to stay diabetes-free for more than a few months before the transplanted islet cells failed. However, in recent years, scientists have begun to make rapid advances in transplant technology, and some of the most exciting new research comes from researchers at the University of Alberta in Edmonton, Canada. The scientists there have used a new procedure called the Edmonton Protocol to treat patients with type 1 diabetes, which is elaborated upon in the following [16]:

> In this procedure, researchers use specialized enzymes to remove islets from the pancreas of a deceased donor. For an average-size person (70 kg), a typical transplant requires about 1 million islets, equal to two donor organs. Since the islet cells are extremely fragile, transplantation occurs immediately after they are removed. The transplant itself is easy and takes less than an hour to complete. The surgeon uses ultrasound to guide placement of a small plastic catheter through the upper abdomen and into the liver. The islets are then injected through the catheter into the liver. It takes some time for the cells to attach to new blood vessels and begin releasing insulin. The doctor will order many tests to check blood glucose levels after the transplant, and insulin may be needed until control is achieved.

According to Science Daily (2007), reporting on the proceedings of the National Academy of Sciences, that has greatly boosted the number of immune T-cells able to shield transplanted pancreatic islet cells from attack by the immune system [64]. In addition, over the nine-week study of islet transplantation in diabetic mice, no pharmacologic immunosuppression therapy was administered, and the transplanted islet cells stayed healthy and produced insulin throughout the study. This is promising data that may allow physicians to perform islet cell transplants in type 1 diabetics, especially if immunosuppressant therapy is not required, because at this time, once patients have received any type of a transplant, they need immunosuppresant therapy for the rest of their lives to prevent the body from rejecting the donor cells.

According to the ADA, pancreatic transplants may treat type 1 diabetics if scientists can develop safe immunosuppresants that always work for the patient. Until safe immunosuppresants are fabricated and delivered, many doctors believe islet cell transplants are a better option.

- Islets are clusters of cells that make up 1 to 2 percent of the total pancreas that make insulin. In the patient with type 1 diabetes, islet cells are destroyed. With pancreatic islet transplantation, cells are taken from a donor pancreas and transferred into another person. Once implanted, the new islets begin to make and release insulin. Researchers hope that islet transplantation will help people with type 1 diabetes live without daily injections of insulin.

According to the National Institutes of Health (2009), there are different methods to obtain islet cells, depending on whether it is fetal, adult or embryonic tissue [66]:

- **Fetal tissue as source for islet cells**. Several groups of researchers are investigating the use of fetal tissue as a potential source of islet progenitor cells. For example, using mice, researchers have compared the insulin content of implants from several sources of stem cells – fresh human fetal pancreatic tissue, purified human islets and cultured islet tissue – and they have found that insulin content was initially higher in the fresh tissue and purified islets. However, with time, insulin concentration decreased in the whole tissue grafts, while it remained the same in the purified islet grafts. When cultured islets were implanted, however, their insulin content increased over the course of three months. The researchers concluded that precursor cells within the cultured islets were able to proliferate (continue to replicate) and differentiate (specialize) into functioning islet tissue, but that the purified islet cells (already differentiated) could not further proliferate when grafted. Importantly, the researchers found, however, that it was also difficult to expand cultures of fetal islet progenitor cells in culture.
- **Adult tissue as source for islet cells**. Many researchers have focused on culturing islet cells from human adult cadavers for use in developing transplantable material. Although differentiated beta cells are difficult to

proliferate and culture, some researchers have had success in engineering such cells to do this.

- Fred Levine and his colleagues at the University of California, San Diego, have engineered islet cells isolated from human cadavers by adding to the cells' deoxyribonucleic acid (DNA) special genes that stimulate cell proliferation. However, because once such cell lines that can proliferate in culture are established, they no longer produce insulin. The cell lines are further engineered to express the beta islet cell gene, Pdx1 (pancreatic and duodenal homeobox 1), also known as insulin promoter factor 1(PDX-1), which stimulates the expression of the insulin gene. The specific cell lines have been shown to propagate in culture and can be induced to differentiate to cells, which produce insulin. When transplanted into immune-deficient mice, the cells secrete insulin in response to glucose. The researchers are currently investigating whether these cells will reverse diabetes in an experimental diabetes model in mice.

  The investigators report that these cells do not produce as much insulin as normal islets, but it is within an order of magnitude. The major problem in dealing with these cells is maintaining the delicate balance between growth and differentiation. Cells that proliferate well do not produce insulin efficiently, and those that do produce insulin do not proliferate well. According to the researchers, the major issue is developing the technology to be able to grow large numbers of these cells that will produce normal amounts of insulin.

- Another promising source of islet progenitor cells lies in the cells that line the pancreatic ducts. Some researchers believe that multipotent (capable of forming cells from more than one germ layer) stem cells are intermingled with mature, differentiated duct cells, while others believe that the duct cells themselves can undergo a differentiation, or a reversal to a less mature type of cell, which can then differentiate into an insulin-producing islet cell.

  Susan Bonner-Weir and her colleagues reported in 2008 that when ductal cells isolated from adult human pancreatic tissue were cultured, they could be induced to differentiate into clusters that contained both ductal and endocrine cells. Over the course of three to four weeks in culture, the cells secreted low amounts of insulin when exposed to low concentrations of glucose, and higher amounts of insulin when exposed to higher glucose content. The researchers have determined by immunochemistry and ultra structural analysis that these clusters contain all of the endocrine cells of the islets.

- **Embryonic stem cells.** The discovery of methods to isolate and grow human embryonic stem cells in 1998 renewed the hopes for doctors, researchers and diabetic patients and their families that a cure for type 1 diabetes and perhaps type 2 diabetes as well, may be within striking distance. In theory, embryonic stem cells could be cultivated and coaxed into developing into the insulin-producing islet cells of the pancreas. With a ready supply of cultured stem cells at hand, the theory is that a line of embryonic stem cells could be grown as needed for anyone requiring a transplant. The cells could be engineered to avoid immune rejection. Before transplantation, they could be placed into nonimmunogenic material so that they would not be rejected, and the patient would avoid the devastating effects of immunosuppressant drugs. There is also some evidence that differentiated cells derived from embryonic stem cells might be less likely to cause immune rejection. Although having a replenishable supply of insulin-producing cells for transplant into humans may be a long way off, researchers have been making remarkable progress in their quest for it. While some researchers have pursued the research on embryonic stem cells, other researchers have focused on insulin-producing precursor cells that occur naturally in adult and fetal tissues.
  In 2001, several teams of researchers continued the initial embryonic research, continuing to believe in the possibility that human embryonic stem cells could be developed as a therapy for treating diabetes. Recent studies in mice show that embryonic stem cells can be coaxed into differentiating into insulin-producing beta cells, and new reports indicate that this strategy may be possible using human embryonic cells as well. Last year, researchers in Spain reported using mouse embryonic stem cells that were engineered to allow researchers to select for cells that were differentiating into insulin-producing cells.
  - Bernat Soria and his colleagues at the Universidad Miguel Hernandez in San Juan, Alicante, Spain, added DNA containing part of the insulin gene to embryonic cells from mice. The insulin gene was linked to another gene that rendered the mice resistant to an antibiotic drug. By growing the cells in the presence of an antibiotic, only those cells that were activating the insulin promoter were able to survive. The cells were cloned and then cultured under varying conditions. Cells cultured in the presence of low concentrations of glucose differentiated and were able to respond to changes in glucose concentration by increasing insulin secretion nearly sevenfold. The researchers then implanted the cells into the spleens of diabetic mice and found that symptoms of diabetes were reversed.
  - Another researcher, Manfred Ruediger of Cardion Inc. in Erkrath, Germany, use the approach developed by Soria and his colleagues to develop insulin-producing human cells derived from embryonic stem cells. By using this method, the noninsulin-producing cells would be killed off and only insulin-producing cells should survive. This is important in ensuring that undifferentiated cells are not implanted that could give rise to tumors.

Utilizing stem cell research is intriguing and provides a lot of hope for diabetic patients. However, at this time, it is important for researchers to define the protocols, exact mechanisms and potential need for immunosuppressive therapy. Ultimately, type 1 diabetes may prove to be especially difficult to cure, because the cells are destroyed when the body's own immune system attacks and destroys them. The autoimmunity must be overcome if researchers intend to use transplanted cells to replace the damaged ones. Many researchers believe that at least initially, immunosuppressive therapy similar to that used in the Edmonton protocol will be beneficial. A potential advantage of embryonic cells is that, in theory, they could be engineered to express the appropriate genes that would allow them to escape or reduce detection by the immune system. Others have suggested that a technology should be developed to encapsulate or embed islet cells derived from islet stem or progenitor cells in a material that would allow small molecules such as insulin to pass through freely, but would not allow interactions between the islet cells and cells of the immune system. Such encapsulated cells could secrete insulin into the blood stream, but remain inaccessible to the immune system.

Before any cell-based therapy to treat diabetes makes it to the clinic, many safety issues must be addressed. A major consideration is whether any precursor or stem-like cells transplanted into the body might revert to a more pluripotent state and induce the formation of tumors. These risks would seemingly be lessened if fully differentiated cells are used in transplantation. However, before any kind of human islet-precursor cells can be used therapeutically, a renewable source of human stem cells must be developed. Although many progenitor cells have been identified in adult tissue, few of these cells can be cultured for multiple generations. Embryonic stem cells show the greatest promise for generating cell lines that will be free of contaminants and that can self renew. However, most researchers agree that until a therapeutically useful source of human islet cells is

developed, all avenues of research should be exhaustively investigated, including both adult and embryonic sources of tissue [66].

Closing

Although diabetes remains a prevalent chronic disease process, nurses can make an enormous difference in the lives of patients and families dealing with it. According to the American College of Physicians (ACP) (2006), many times physicians do not have the time, resources and appropriate levels of patient participation to effectively treat diabetes. Therefore, patients end up struggling with the understanding and complexity of the disease [4]. The ACP and the American College of Physicians Foundation (ACPF) are concerned about the dangers and enormous cost to America, so in 2006, they collaborated to pursue a three-year project engaging both physicians and patients to improve diabetes care in the United States [4].

In 2010, one can hope to analyze their investigation in hope of finding more educational options for patients and their families when they encounter diabetes. In the meantime, it is important to understand there are enormous treatment modalities and options available for patients. It is just imperative that patients realize the significant role diabetes plays on the body and the complications that arise over time by not adhering to the recommendations. In addition, although a patient may realize the significance, the nurse needs to assess whether the patient is eager to and capable of making the changes.

Table 2: Drugs affecting lipoprotein metabolism [69]:

Drug class	Agents and daily doses	Lipid/Lipoprotein effects	Side effects	Contraindications
HMG CoA reductase inhibitors (statins)	Lovastatin (20-80 mg), Pravastatin (20-40 mg), Simvastatin (20-80 mg), Fluvastatin (20-80 mg), Atorvastatin (10-80 mg), Cerivastatin (0.4-0.8 mg)	LDL-C ↓18-55% HDL-C ↑ 5-15% TG ↓ 7-30%	Myopathy Increased liver enzymes	Absolute: – Active or chronic liver disease Relative: – Concomitant use of certain drugs*
Bile acid sequestrants	Cholestyramine (4-16 g) Colestipol (5-20 g) Colesevelam (2.6-3.8 g)	LDL-C ↓ 15-30% HDL-C ↑ 3-5% TG No change or increase	Gastrointestinal distress Constipation Decreased absorption of other drugs	Absolute: – dysbeta-lipoproteinemia – TG greater than 400 mg/dL Relative: – TG greater than 200 mg/dL
Nicotinic acid	Immediate release (crystalline) nicotinic acid (1.5-3 gm), extended release nicotinic acid (Niaspan ®) (1-2 g), sustained release nicotinic acid (1-2 g)	LDL-C ↓ 5-25% HDL-C ↑ 15-35% TG ↓ 20-50%	Flushing Hyperglycemia Hyperuricemia (or gout) Upper GI distress Hepatotoxicity	Absolute: – Chronic liver disease – Severe gout Relative: – Diabetes – Hyperuricemia – Peptic ulcer disease
Fibric acids	Gemfibrozil (600 mg BID) Fenofibrate (200 mg) Clofibrate (1000 mg BID)	LDL-C ↓ 5-20% (may be increased in patients with high TG) HDL-C ↑ 10-20% TG ↓ 20-50%	Dyspepsia Gallstones Myopathy	Absolute: – Severe renal disease – Severe hepatic disease

Table 3- Insulin preparation [25].

Preparation	Name	Onset (hours)	Peak (hours)	Duration (hours)
Rapid-acting or ultra-shorting acting	Lispro (Humalog)	Less than 15 minutes (typically 5 to 10 minutes)	30 to 60 minutes	3-4
Short-acting	Regular Regular Humulin (R) Regular lletin II Velosulin	0.5-1.0	2-3	4-6
Intermediate-acting	Lente Humulin (L) Lente lletin II NPH Humulin (N) NPH lletin II NPH	2	6-8	12-16
Long-acting	Ultralente (U) Lantus	2 No onset	16-20 No peak	24+ 24
Combinations	Humulin 50/50 Humulin 70/30 Novolin 70/30	0.5 0.5 0.5	3 4-8 4-8	22-24 24 24

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DIABETES MELLITUS

Final Examination Questions

Choose True or False for questions 11 through 20 and mark your answers on the Final Examination Sheet found on page 57 or take your test online at www.elitecme.com.

11. Diabetes has reached epidemic proportions worldwide, making it the second-leading cause of death in the United States.

True False

12. In 2007, there were 23.6 million people in the U.S. living with diabetes.

True False

13. Insulin is a hormone that increases the blood glucose levels any time the blood sugar is low.

True False

14. Type 1 diabetes is a multifactorial disease caused by an autoimmune destruction of insulin-producing pancreatic beta cells.

True False

15. Type 2 diabetes accounts for 10 percent of all cases.

True False

16. Impaired fasting glucose (IFG) is a condition in which the fasting blood sugar level is 100 to 125 milligrams per deciliter (mg/dL) after an overnight fast.

True False

17. The classic signs and symptoms of diabetes in general include the "three polys" (polyuria, polydipsia, and polyphagia).

True False

18. Diabetes is not diagnosed until a fasting blood glucose level is more than 180 mg/dl on two or more occasions.

True False

19. The first-line treatment of all diabetic patients is insulin.

True False

20. The ADA recommends that all diabetics maintain their daily blood glucose levels as follows: preprandial, 70 to 130 mg/dl; and postprandial, less than 180 mg/dl.

True False

NOH11DME11

CHAPTER 3

GERIATRIC ASSESSMENT

(11 CONTACT HOURS)

Learning objectives

- Discuss demographics related to the geriatric population.
- Perform a "first glance" assessment.
- Review the importance of providing culturally appropriate care.
- Assess the nutritional status of the geriatric patient.
- Offer the geriatric patient practical suggestions for maintaining a healthy diet.
- Describe the physiological responses of the elderly adult's body to medications.
- Explain how to facilitate safe management of medication regimens in the older adult.
- Initiate sexual assessment of the geriatric patient.
- Assess the sleep patterns of the older adult.
- Identify strategies for pain assessment in the older adult.
- Identify pain reduction measures for the older adult.
- Assess mental health in the elderly adult.
- Recognize signs and symptoms of elder abuse.
- Describe changes in vision, hearing and sensation that affect the aging adult.
- Describe normal age-related changes in the integumentary system.
- Identify common health problems related to the integumentary system in the older adult.
- Assess the aging adult for potential problems related to cardiovascular functioning.
- Identify lung disorders commonly found in older patients.
- Identify important aspects of assessment of the endocrine system.
- Explain the ways age influences hematologic function.
- Recognize common health problems of the nervous system in the older adult.
- Review age-related issues of the genitourinary system.
- Assess the musculoskeletal system of the geriatric patient.
- Recognize age-related immune system deficiencies related to the aging process.

Introduction

The needs of persons over the age of 65 will continue to place significant demands on the health care system for the foreseeable future. In 2009, it was estimated that nearly 13 percent of the population of the United States was over the age of 65.[10] The number of adults living into late adulthood is increasing dramatically. It is predicted that by 2050, the number of people over the age of 60 in developed countries will reach 416 million. According to the World Health Organization, the fastest-growing segment of this population is persons 80 years of age and older.[6]

Older adults often have one or more chronic illnesses or conditions, such as urinary incontinence, dementia, cardiovascular disease and diabetes mellitus. In fact, nearly 80 percent of older adults have one or more chronic health problems.[5] Although older adults make up the majority of those who use health care services, most are able to live independently in the community. This means, however, that nurses must be quite knowledgeable in the delivery of geriatric services in both inpatient and outpatient settings, including such services as preventive care, risk identification, patient education and promotion of maximum health and wellness.

The health care demands of a dramatically aging population require a workforce of nurses skilled in geriatrics. As a result, there has been a significant increase in the amount and depth of gerontological nursing content in baccalaureate schools of nursing during the past 15 years.[3] There is a corresponding need for continuing education on gerontological nursing for licensed professionals and nursing assistants. Nurses play a critical role in helping older adults to effectively manage health problems, create and maintain safe and healthy living environments, and live lives of dignity and quality.[6] One of the most important ways nurses can do this is to perform a thorough assessment of their geriatric patients. Such assessments require that nurses be astute observers and excellent communicators. A good assessment begins with the nurse's first glimpse of the patient.

Assessment at first glance

Assessment begins with your first glimpse of the patient. So many things can be observed in these first few moments. Start with the patient's appearance. How is the patient dressed? Is the clothing appropriate for the time of year and the weather? Are clothes neat and clean? Do they fit properly? Is the patient clean? Do you smell any unusual odors such as urine, which may indicate incontinence problems, or sweat, which may indicate lack of hygiene? Are the patient's hands and fingernails clean? Is there any evidence of unusual bruising or injury such as lacerations, scars or burn marks?

At first glance, what is the patient's mobility status? Is he ambulating independently or does he require assistance? Does the patient use any assistive devices such as a cane or a walker? Observe the quality of his gait. Is balance maintained without difficulty? Are movements of all extremities without tremors?

How does the patient respond to the nurse's initial greeting? Is the response appropriate? Does the patient speak clearly and distinctly? Are his facial features symmetrical? If not, what abnormalities are present? (For example, is one side of the face drooping or is one eyelid drooping?) Is the patient oriented to person, place and time? Does he maintain eye contact (if culturally appropriate)? Is he able to respond to simple questions such as "How are you feeling today?"

Does the patient wear glasses? Does he seem able to see his surroundings without difficulty? Can the patient hear what you are saying, assuming you are speaking clearly and distinctly and in a normal tone of voice? Does the patient wear hearing aids?

Is the patient alone or is he accompanied by a family member or friend? Observe the interaction between the patient and whoever accompanies him. Does the patient seem comfortable with this companion? Do they interact appropriately? Does the patient give any indication that he is intimidated by his companion?

What, briefly, is the patient's health history? For example, is there a history of heart attack, stroke, diabetes, other conditions? What medications is the patient taking?

What is the patient's cultural and ethnic background? Is English his first language? If not, how well is the patient able to communicate in English? Will an interpreter need to be present during the assessment to facilitate communication?

Remember that you need to adapt your communication to the specific needs of the geriatric patient. Never assume that because a patient is elderly that he will be unable or unwilling to participate actively in his health care regimen. Communicate directly with the patient whenever possible. Don't bypass him or belittle him by talking to family or friends instead. Make sure that, if needed, he has his glasses on and hearing aids in place. And always let him know exactly what you are doing during assessment.[1]

Ask patients how they would like to be addressed. Ask if you may call them by their first names or if they would prefer to be addressed as Mr., Mrs., Ms. Never, ever "talk down" to an elderly patient by calling him or her "sweetie," "dear," or other such names. They are not infants or children and should be treated with respect. Introduce yourself by giving your full name and your title/role. For example, "My name is Andrea Burns. I am a registered nurse, and I will be taking care of you today."

The "first glance" of the patient can provide a great deal of information about the patient's physical, mental and emotional state. Use this first glance as a foundation for the detailed assessment of the geriatric patient.

Cultural considerations

Cultural considerations must be incorporated into geriatric physical assessment. Failure to provide culturally appropriate and competent care can lead to lack of patient compliance, frustration and even hostility. Patients need and expect that their cultural perspectives will be respected.

The shift in minority demographics in the United States has changed significantly in the past 10 years. According to the United States Census Bureau, the 2000 census indicated that the white, non-Hispanic majority was 69.1 percent.[9] In 2008, this percentage had decreased to 65.6 percent.[10]

In May 2007, Census Bureau data suggested that one in three U. S. residents is a minority. In fact, it is predicted that by 2020, people of color will be the majority population.[9]

Cultural sensitivity encompasses many issues. Culture is complex and is made up of thoughts, values, beliefs and traditions of racial, ethnic, religious or social groups.[9] Culture influences moral beliefs, traditions, communication, gender and familial roles, expressions of emotion, family interactions, diet, dress and beliefs about health and wellness. The large number of different cultures that exist in the U.S. make it impossible for all health care providers to have an intimate knowledge of all of them. Here are some suggestions to encompass cultural appropriateness into the assessment process:

- Identify the various cultural populations for which you are most likely to provide health care services.
- Familiarize yourself with appropriate cultural responses for these populations. For example, in Middle Eastern cultures, sexual segregation is often very important, and same-sex caregivers should be assigned whenever possible.
- Investigate the availability of interpreters to facilitate communication if the patient has difficulty communicating in English.
- Develop written patient education materials in the most common languages (in addition to English) that are spoken by your patient populations.
- Remember to be sensitive to dietary practices that are important to cultural and religious viewpoints.
- Remember that expression of emotions may vary from culture. Some cultures are vocal and overt about expressing fear or pain, while others are stoic. All expressions should be respected.
- Identify cultural and religious viewpoints concerning death and dying, life-prolonging interventions (such as feeding tubes), treatment of the body after death and funeral practices.[9]
- Consult appropriate resources to gather information about cultural perspectives. One such resource is *www.ggalanti.com*. This site offers respectful cultural profiles of various populations, resources, articles and related links. When using Web sites, make sure that they treat all cultures with respect. Be wary of and avoid sources that criticize or make jokes about cultures or religious practices.

The age of a person or the generation he was born into also influences the way health care services are perceived. For example, the "traditional" generation, also known as the "veterans," are those adults born between 1922 and 1946 and represent the oldest members who access health care in this country. As a rule, these people are more formal in their approach to life and often preferred to be addressed as Mr., Mrs. or other formal titles. They generally have a strong work ethic and a rigid view of hierarchy and respect for authority. This may make it difficult for them to ask questions or participate actively in their health care plans because they often view health care providers as authority figures.[13]

It is important to encourage questions and facilitate active communication between older adults and health care professionals. When possible, a reliable family member or friend should accompany the older adult to facilitate communication when needed.

Nutritional assessment

Nutritional assessment is much more than an evaluation of the intake of nutrients and the body's ability to effectively use nutrients. It starts with the mouth and oral cavity and includes the patient's ability to taste and smell, the body composition of the older adult, alcohol use, access to food and socioeconomic factors that influence nutritional status.

Assessment of the mouth and oral cavity

Important questions to ask

The ability to eat depends, in part, on a person's teeth. Observe your patient's teeth. Are they his own or does he wear dentures? Are dentures, including partial dentures, clean, and do they fit well? Are his teeth clean? Is there any evidence of chipped, broken or missing teeth and/or dentures? Additional important information that should be obtained about a patient's dental habits includes:

- **How does he take care of his teeth/ dentures?** Is he physically and mentally capable of taking care of his teeth and mouth? Teeth should be brushed and flossed at least twice a day. A soft-bristled toothbrush should be used to properly clean teeth and to avoid damaging gums.[9]
- **How often does he visit a dentist?** The geriatric patient should see a dentist at least annually, with the ideal time frame of every six months. These visits should also include a screening for oral cancers such as cancer of the tongue at each visit.
- **Does the patient use alcohol and/or tobacco products?** Explain to the patient that avoiding these products decreases the risk for oral or lung cancers.[9]
- **Does the patient have bad breath?** What does it smell like? Bad breath (halitosis) may indicate poor oral hygiene or certain disease processes. For example, a fruity smelling breath suggests hyperglycemia.
- **Does the patient report any problems with the oral cavity,** such as painful teeth or gums, bleeding gums, dry mouth, changes in the sense of taste, or problems chewing or swallowing?
- **Does the patient complain of having a dry mouth?** This is the most common oral problem in the elderly adult and can be due to mouth breathing, dehydration, oxygen therapy, various diseases, side effects of medication, and head and neck radiation treatments.

Assessment Tip: *A frequent complication of dry mouth is the fungal infection oral candidiasis, more commonly known as thrush*.

Inspection

Inspect the patient's lips, teeth, tongue, gums, soft and hard palate, buccal mucosa and the back of the throat. Look for any signs of cracks, bleeding, lesions, ulcers, swelling, induration or broken or decayed teeth. If the patient wears dentures, observe how they fit, whether they are clean, and whether there is any evidence of breakage. Look for signs of leukoplakia, which is a white or gray patch that may develop on the tongue, on the floor of the mouth or on the buccal mucosa. Leukoplakia is most commonly found in elderly patients and is due to irritation from teeth or dentures that rub against the inside of the cheeks or gums or chronic irritation from use of tobacco products. Leukoplakia is usually painless and is generally biopsied to rule out oral cancers.[12]

When inspecting the mouth and oral cavity, remain alert to signs and symptoms of oral cancer. These include:[9]

- A lump or thickening of the lip or in the patient's mouth.
- A sore in the mouth or on the lip that does not heal.
- White or red patches on the gums, tongue or buccal mucosa.
- Patient complains that there is always a feeling of something "stuck" in the throat.
- Swelling of the jaw or mouth that changes the way dentures fit.
- Pain in the ear or when chewing or swallowing.
- Changes in the patient's voice.

Assessment Tip: *When inspecting the mouth and oral cavity, make sure that extra light is available to allow good visualization of the tongue, buccal mucosa, lips, teeth and gums*.

It is important to be aware of risk factors for the development of oral problems. Diseases or other factors that cause oral problems will affect the patient's ability to consume food and maintain a state of proper nutrition. Issues and factors that increase the risk for oral problems include:[4,9]

- Diseases such as cancer, HIV and AIDS, diabetes mellitus, stroke, dementia, renal failure and viruses such as herpes simplex.
- Deficiencies of vitamins including B6, B12, folic acid, C, K, A, and niacin.
- Changes that accompany aging, such as thinning teeth enamel, lines and cracks in teeth, thinner and smoother mucosa that loses elasticity, and a decrease production of saliva.

Assessment Tip: *After inspecting the mouth and oral cavity, palpate the lymph nodes in the neck. Lymph nodes should be small, smooth, round and painless. Tenderness may indicate infection. Enlarged, fixed, hard lymph nodes require further evaluation as these signs may indicate a serious problem, such as malignancy. At the same time, observe the neck for any lesions, moles or bulging areas.*

Another important risk factor for oral problems (and corresponding nutritional problems) is lack of money. Elderly adults living on a fixed and/ or inadequate income may not have the money to schedule regular dental visits, or purchase dentures and oral hygiene products. Persons with financial problems should be referred to local dental practices that offer services at reduced rates. They should also be helped to identify

stores where dental supplies may be purchased at minimal costs (such as dollar stores).

Transportation may also be an issue. Find out whether patients have access to public transportation or whether they have family members or friends who are able to help them get to dental visits and purchase oral hygiene supplies. Remember that assessment of the oral cavity and mouth involves much more than physical assessment techniques. Finances, mental acuity, transportation and family/friend assistance play important parts in good dental hygiene.

Taste assessment

After about the age of 70, adults begin to experience a reduced sense of taste, which is called hypogeusia. The ability to perceive the tastes of salt and sweet are most affected. Taste buds are located on the tongue, epiglottis, larynx and the first third of the esophagus.[9]

In addition to the normal changes of aging, many factors contribute to a diminished sense of taste. These include poor dental hygiene, broken teeth or dentures, and dry mouth. There are also quite a few medications that adversely affect taste. These include:[9,14]

- Antibiotics.
- Antidepressants.
- Antihypertensives.
- Anti-cancer drugs.
- Antihistamines.
- Decongestants.
- Muscle relaxants.
- Cholesterol-lowering drugs.
- Drugs used to treat Parkinson's disease.

Assessment Tip: *Not every drug in the preceding classifications necessarily alters taste. Be sure to determine which medications patients are taking and check to see whether these drugs have an impact on the sense of taste.*

Sometimes the sense of taste can be affected by the environment in which a patient eats. Elderly adults who live alone may not be as interested in preparing meals or in eating them compared to the days when they prepared meals for a family and ate food with others. Encourage adults to eat in a comfortable, relaxed surrounding as much as possible and to take the time to enjoy a meal. Help patients to select foods that are easy to prepare, nutritious, and that they like.

Assessing the sense of smell

Problems with the sense of smell (olfactory) are quite common (even more common than problems with taste) in older adults. In fact, about half of adults over the age of 60 experience alterations in their sense of smell.[9] The medical term for reduced sense of smell is hyposmia.[9] A lack of sense of smell can be dangerous. The inability to smell smoke, gas or spoiled food can actually lead to illness or death. If severe enough, hyposmia can reduce appetite to the point that the older adult becomes malnourished.[9]

There are a number of factors that contribute to hyposmia. These include age-related changes, such as reduction in the number of sensory cells, injury to the olfactory mucosa and alterations to the structure of the upper airway hypothalamus and olfactory tract.[9] Other factors include nasal congestion, smoking and drug use.[4]

Sometimes nurses and physicians simply assume that a decreased sense of smell is due to a person's age. But it could also be the result of damage to the olfactory nerve (cranial nerve I). It is important to assess the function of this nerve by first checking to be sure that both nostrils are patent and unobstructed. Then ask the patient to close his eyes. Occlude one nostril and place a familiar, strong-smelling substance (such as coffee, peppermint or orange peel) under his nose and ask him to identify it. Do the same thing with the other nostril. The patient should be able to identify each smell correctly. If olfactory nerve damage is suggested, the patient will need further evaluation.[4]

Assessment tip: *Be sure that you use scents with which the patient is familiar. He can't identify a scent if he has never smelled it before.*

Body composition changes in the older adult

There are a number of changes in body composition in the older adult that can have an impact on nutrition and overall health. One such change is the loss of lean muscle mass that occurs with aging. The loss is due to a reduction in physical activity, hormone production and alterations in nutrition. If caloric intake continues at the rate consumed by a younger adult, the older adult will gain weight in the form of fat, not muscle.[9]

Loss of muscle mass is associated with a reduction in strength and endurance and an increased risk for falls. Research indicates that even a 10 percent loss of muscle mass is linked to increased mortality in older adults.[9]

Other body changes that directly or indirectly influence body composition include:[4,9]

- **Loss of bone mineral density**, which increases the risk for osteoporosis in both men and women. Loss of bone density increases the risk of fractures as well as the risk of falls.
- **Decrease in both the size and number of gastric glands and mucous membranes**, and reduction in gastric acid production, can lead to atrophic gastritis (irritation of the stomach due to atrophy). The decrease in gastric acid production results in a decrease in the acidity of the stomach. Since Iron and vitamin B12 need an acid environment for proper absorption, this lack of acidity can inhibit the absorption of both of these substances.[9]
- **Peristalsis in the intestines slows** as the adult ages. If this is compounded by a lack of fluid and fiber intake, lack of exercise or chronic illnesses, constipation can, and often does, occur.[4,9]
- **Aging diminishes the thirst drive**. Because of this, the fluid intake of older adults is often inadequate. Compounded by the aging kidney's inability to efficiently concentrate urine, this lack of fluid intake often leads to dehydration in geriatric patients. If older patients experience vomiting and/or diarrhea, excessive sweating, or excessive urination due to diuretic therapy, they must be carefully monitored for signs and symptoms of dehydration. Such symptoms include dry skin, poor skin turgor, dark-colored urine, headache, dizziness, dry mucous membranes, increased heart rate and respirations, and confusion.[9]
- **Older adults often experience vision changes** that compromise the sense of sight. These include cataracts, macular degeneration and generalized deterioration of vision. Such changes can make it difficult, and unpleasant, for them to shop, prepare food and, at times, eat. Reduced vision may make it necessary for someone to transport elderly people to the grocery store, help them to purchase food and even prepare it. The nurse may need to put the older adult in touch with services such as Meals on Wheels and community groups that assist elders in these activities. Many public transportation companies offer elder services at reduced rates. Older patients need assistance to access community services that will help them with transportation, shopping and meal preparation/delivery.

Assessment tip**:** *Older adults are often afraid of being incontinent of urine. Because of this fear, they may limit their fluid intake, which further increases the risk for dehydration.*

Socioeconomic impact on nutrition

It is important that socioeconomic factors be included as part of the nutritional assessment of the geriatric patient. These have been mentioned briefly in the preceding sections, but deserve additional emphasis.

Nutritional intake is closely linked to socialization. Where we eat, how we eat, and with whom we eat can have as much of an impact as what we eat. When assessing the social aspects of nutrition, consider the following issues:

- **With whom does the older adult eat?** If he eats with others, is it in a home setting or long-term care setting such as assisted living? If he eats with others, is the atmosphere congenial? For example, if the older adult is living with an adult child, is he made to feel welcome and a part of the family's social interactions? If he eats in a long-term setting, in what type of an environment are meals served? Is the environment conducive to enjoying a meal?
- **If the older adult lives at home, does he have easy access to a grocery store?** Does he drive or does he depend on others to transport him? Is he aware of public transportation options for transportation and how to access them? If needed, is he aware of options such as Meals on Wheels and other similar community services?
- **If the older adult does have access to a grocery store, is he physically capable of shopping and carrying bags of groceries or does he need help?** If he needs help, who is available to help him? Does he have the

visual acuity to read and understand food product labels and prices? Does he have the mental acuity to make appropriate food choices?

Another important aspect of nutritional assessment is the financial impact of food purchase:

- **Does the older adult have enough money to purchase healthy foods?** If not, he may purchase whatever "fits" within his budget, even if such foods are not recommended for his state of health. For example, does he purchase microwave dinners that are high in salt because they are cheap and easy to prepare, even though he is on a limited salt diet?
- **Does the elderly adult need help managing his money?** He may have adequate financial resources but is unable to live within his budget due to uncertainty over prices or decreasing mental acuity. Does he have anyone to help him manage his money? What family or community resources are available to assist him with money management?

If there is not enough money to purchase food, the older adult needs to be referred to agencies that may be able to help or to make referrals. Possible sources are veterans associations, area agencies on aging, church groups and government assistance agencies.

Assessment tip: *Always include socioeconomic evaluation as part of physical assessment. These areas influence every aspect of health. Also note that women are twice as likely as men to live in poverty*.[9]

Nutritional requirements

Nutritional requirements for older adults correlate with the physical changes that accompany aging. There are generally decreased caloric needs due to decreased physical activity. However, the need for vitamins and minerals does not decrease. In fact, based on food intake, there may actually be a need for vitamin supplements.

The U.S. Department of Agriculture (USDA) Food Pyramid is a tool often used by health care professionals and others to plan balanced diets. Nutrition faculty in the Department of Family, Youth, and Community Sciences, IFAS, University of Florida in Gainesville, Florida, have adapted the USDA's MyPyramid in a handout titled "MyPyramid for Older Adults."[15]

This tool is based on an 1,800-calorie diet and should be adapted to the individual needs of each elderly patient. It encourages older adults to choose foods high in fiber to avoid constipation, to drink plenty of fluids to maintain hydration, reduce salt intake, and use fish, nuts and liquid oils instead of saturated fats. Practical suggestions to remain active include going for walks, working in a garden, taking an exercise class at a community center or gym, and playing with pets.[15] These suggestions may be helpful when working with older patients and teaching them about nutritional requirements. Additional examples (based on an 1,800-calorie diet) of good dietary habits include the following.[15] Note that these suggestions should be adapted to the unique needs and health status of each patient.

- Eat 6 ounces of grains per day, such as whole-grain cereals, whole grain breads, rice or pasta. Choose cereals fortified with vitamin B12.
- Eat 2½ cups of vegetables, especially dark-green and orange vegetables, and dried beans and peas.
- Eat 1½ cups of fruit per day.
- Drink 3 cups of milk or other calcium-rich foods daily, such as low fat milk or yogurt or low fat cheeses.
- Eat 5 ounces of lean meat, beans and other sources of protein, such as low-fat meats and poultry, and include fish, eggs, beans and nuts as protein sources. Bake, broil or grill foods rather than fry them.

There are some vitamin requirements specific to the needs of older adults. These include:

- **Vitamin D** is important to maintain bone mineralization and to facilitate proper use of calcium in the body. Inadequate amounts of vitamin D have been linked to increased risk for falls in the elderly. If adults have limited exposure to the sun (e.g. those who reside in long-term care facilities without much time outside), they may be at increased risk for vitamin D deficiency. Good food sources of vitamin D include liver, milk fortified with vitamin D, fish such as salmon, and milk and juices fortified with vitamin D. If vitamin D deficiency is not corrected by diet, older adults may be prescribed vitamin D supplements by a physician.
- **Calcium** intake is important to help maintain or slow loss of bone mineral density. Older adults should have three servings of calcium-rich foods every day.[9,15]
- **Intake of the B vitamins** is very important. Vitamin B6 is necessary to the metabolism of protein and fat, and vitamin B12 is required for the process of cell division and central nervous system functioning. Older adults should be monitored if taking vitamin B supplements. Excess of vitamin B6 can result in toxic side effects leading to sensory neuropathy. [9]

Assessment tip: *Older adults should not simply add vitamins to their diet. Any additions of vitamins, minerals or other supplements should be under the supervision of health care professionals. Fat-soluble vitamins, such as D, E, K and A are stored in the body and not excreted the way water-soluble vitamins are. Taking large amounts of fat-soluble vitamins could lead to toxic levels and adverse effects*.[9]

Alcohol ingestion can have an impact on nutrition, especially for deficiencies of thiamin, riboflavin, foliate and vitamin B6 because alcohol can inhibit nutrient absorption, irritate the stomach and affect metabolism.[9] In cases of significant alcohol use, alcohol may actually be ingested in place of or in preference to food, thus further compounding its negative effects.

In summary, nutritional assessment is critical to identifying problems and correcting them in the older adult. The nurse must evaluate nutritional status carefully, taking into consideration not only the types and quantities of food being ingested, but the social and economic factors that influence nutrition as well.

Pharmacology assessment and the geriatric patient

Mrs. Burns is 80 years old. Her physician prescribed Benicar, 20 mg daily, for hypertension. During a routine checkup, her blood pressure was still significantly elevated. When questioned, Mrs. Burns admitted that she only takes the Benicar four times a week instead of daily. She says she does this to save money and to "make the pills last longer."

Mr. Lord is 70 years old, and has had epilepsy for many years and takes Dilantin to control his condition. He recently had a seizure, the first he has had in many years. During a thorough evaluation, it was discovered that Mr. Lord recently began to take ginseng, an herbal supplement, to "increase my energy. My daughter takes it and says it really helps her. I know it can't hurt me because it's 'natural' and not really medicine," he said. What neither Mr. Lord nor his daughter realized is that ginseng and Dilantin interact, and that ginseng reduces the effectiveness of Dilantin.[14,16]

The preceding scenarios illustrate two common problems with medication adherence among the elderly. Financial concerns may cause an older adult to take less of his medication than prescribed in an attempt to, as Mrs. Burns says, "make the pills last longer." Sometimes it may be difficult to make trips to the pharmacy, especially if the elder's physical or mental health makes driving impossible. Seeking and obtaining transportation may be a problem.

Another issue that is impacting medication compliance with increasing frequency is that of adding herbs or other supplements to medication regimens without the knowledge or consent of health care providers. Many people believe that non-prescription agents such as aspirin, herbal supplements, vitamins and minerals are harmless and can be taken without medical supervision. They do not realize that these agents can interact with prescription drugs and cause adverse effects. They also fail to realize that these agents may be harmful by themselves as well.

When conducting a pharmacologic assessment of the older adult, start by determining what prescription medications they are taking. Reconcile the list of medications, making sure you have the most current information. Find out how much the patient and, if appropriate, a family member knows about the patient's medication regimen. Important questions to ask include:

- **What are the names of the medications you are taking?**

- **When do you take your medications?** Do you take your medications with food or something to drink? What kinds of food and drinks do you take with your medication?
- **What kinds of side effects may occur when you take your medicine?** If side effects take place, what do you do about them?
- **Do you have insurance that covers some of the cost of your medicine?** Do you ever have trouble affording the cost of your medicine?

You also need to find out about other medicines your patient is taking. You need to ask if he takes any medicine that the doctor has not prescribed, such as aspirin, allergy tablets, cold medication and so on. Explain that non-prescription drugs and prescription drugs can interact and cause harmful side effects. Emphasize that he should not take other medicines without his physician's approval.

It is very important to ask if the patient is taking any herbal preparations, vitamins, minerals or dietary supplements (including weight-loss products or nutritional supplements). These agents can cause harmful interactions with each other, alone, and with prescription and non-prescription drugs.

Assessment tip: *Provide simply written instructions about what medications the patient is taking, their actions, when and how to take them, common side effects and what to do if side effects occur. If necessary, a family member or friend should be involved to help the patient adhere to his medication regimen.*

After determining what medications (including non-prescription, vitamins, herbs, minerals and so on.) the patient takes, if he knows how and why to take them and the possibility of side effects, consider the physiological alterations in the body of the older adult that impact on medication effectiveness.

The body's ability to metabolize drugs and use them most effectively decreases with age. Here are some aging body changes that influence the effectiveness of medication in the geriatric patient.[9,14]

- **Body water content**: As the body ages, there is as much as a 15 percent decrease in water content and an increase in body fat. The extra fat means that the effects of fat-soluble drugs may be increased, and the reduction in water content means that water-soluble drugs exist in more concentrated amounts.
- **Liver functioning**: Hepatic (liver) blood flow, liver mass and liver metabolic activity may decrease with age. It is important that liver functioning be assessed if the patient is taking drugs that are metabolized by the liver or if taking drugs that have the potential to damage the liver.
- **Renal functioning**: Renal function also decreases with age, but this decrease varies considerably among older adults. Since the kidneys excrete most drugs, it is important to be aware of kidney functioning and remain alert to possible build-up of potentially toxic levels of drugs.
- **Gastric functioning**: Aging causes a decrease in gastric motility and gastrointestinal absorption surface. These factors may cause a decrease in or delayed absorption of acidic drugs.
- **Vision changes**: Age-related reduction in visual acuity may make it difficult for older adults to read drug labels, thereby increasing the risk for taking the wrong medication.

Assessment tip: *Be sure to include socioeconomic factors when assessing pharmacology factors in elderly adults.*

Sexual Assessment

Mr. Grimes, a 78-year-old retired construction supervisor, arrives at his physician's office for a routine checkup. His blood pressure is unusually high, despite the fact that he was prescribed anti-hypertensives several months ago. When questioned, Mr. Grimes says he "only takes my blood pressure pills a couple times a week." When asked why, he explains that, "since I've been taking those things, I can't satisfy my wife. When I don't take them too often, things are better." Medication side effects can include sexual dysfunction. Such side effects must be discussed with patients at the time of prescription.

Sexuality and sexual functioning are life-long issues for all persons. Health care professionals sometimes forget or disbelieve that these issues are important to geriatric patients. Research shows that interest in sex and sexuality continues throughout the life span.[11] Therefore, it is important that sexual assessment be part of the physical assessment of older adults.

First, be aware of changes in the reproductive tract that occur with aging. In men, sperm production and testosterone levels decrease. The time needed to become aroused and to ejaculate increases, and the refractory period lengthens. The firmness and force of ejaculation decreases.[9] Oral medications for erectile dysfunction, such as sildenafil (Viagra) and tadalafil (Cialis) are often able to compensate for normal age-related changes in the sexual functioning in men.[11]

In women, as estrogen levels decrease, the thickness, elasticity and lubrication of vaginal tissues decreases.[9] These changes may cause intercourse to become painful. Women may avoid sexual intercourse due to such pain. The use of vaginal lubricants can help alleviate dryness and reduce discomfort.[11]

Glandular tissue in the breasts decreases, and there is an increase in the amount of time it takes for arousal to occur.[9] The vagina shortens, labia atrophy and the cervix may descend into the vagina, which causes discomfort. Orgasms may become less intense and less gratifying. Additionally, post-menopausal women generally return to pre-arousal state more quickly than younger women.[11]

In addition to normal age-related changes, cardiovascular disease, depression and diabetes have been associated with sexual dysfunction and/or a decrease in libido.[11] Persons with these conditions should receive sexual counseling as necessary.

Nurses must also be aware of medications that may cause sexual dysfunction. These include certain types of antihypertensives, selective serotonin reuptake inhibitors (SSRIs) used to treat depression, and beta blockers.[11] When performing a pharmacologic as well as a sexual assessment, be sure to explain the potential for these types of side effects.

Sexual assessment requires that a nurse ask patients questions that are highly personal and intimate in nature. If a nurse is uncomfortable with such an assessment, she/he will most likely transmit this discomfort to the patient. The more confident and comfortable the nurse is with sexual assessment, the more at ease will be the patient.[11] The nurse must maintain an objective, non-judgmental attitude and conduct the assessment in a quiet, private area.

One framework that may be used when conducting a sexual assessment is the PLISSIT model.[11] (To view an online video of a nurse demonstrating the use of the PLISSIT model visit *http://links.lww.com/A277)*.

The first step in the model is P: To seek permission to begin the sexual assessment. Asking for permission helps to preserve the patient's dignity and to allow him some control over the assessment process. You might begin by asking the patient, "Mr. Grimes, would it be all right if I asked you some questions about your sexual health?"[11] After permission is obtained, you could proceed by asking, "What kinds of changes have you noticed in your sexual health since you began taking your heart medication?" Make the questions pertinent to your patient's situation. If appropriate, you might ask the patient if he would like his sexual partner to take part in the discussion. Respect his response, whether it is "yes" or "no."

The next step is to provide limited information (LI).[11] For example, if specific medications are linked to the patient's sexual difficulties, information about medication side effects could be provided. Other types of limited information might include discussing normal age-related changes in the reproductive system or the effects of certain diseases on sexual functioning.

Next, offer specific suggestions (SS).[11] This means that you will offer specific suggestions tailored to your patient's situation. For example, if sexual dysfunction is related to painful intercourse due to vaginal dryness, you could recommend the use of vaginal lubricants. If problems are related to medication, referral to the patient's physician or nurse practitioner for possible medication alterations may be indicated.

The final step in the model is intensive therapy (IT).[11] Intensive therapy is indicated when sexual dysfunction requires more than nursing

interventions. For example, if the patient is exhibiting inappropriate sexual behaviors, (e.g. exposing oneself in public) or has suffered from sexual abuse, intensive therapy is indicated.

In summary, sexual assessment is important for persons of all ages. Sexuality and sexual functioning are important throughout the life span. These are highly sensitive subjects and must be handled objectively, with tact and discretion. A barrier to sexual assessment may be the discomfort of the nurse as well as the patient. Use of an assessment model, such as the PLISSIT model, may help to initiate and direct the assessment and increase the comfort of nurse, patient and patient's partner.

Resources specific to the geriatric population that may be helpful to nurses working with older adults include the following Web sites. Information is offered pertaining to sexuality as well as many other issues that impact geriatric nursing practice.

- The website for the Hartford Institute for Geriatric Nursing provides information about best practices and geriatric assessment tools and models. The site may be accessed at: *www.ConsultGeriRN.org.*
- Lippincott's Nursing Center's older adults section provides articles, tools and links to sites that specialize in information about geriatric care. This site may be accessed at *www.nursingcenter.com/AJNolderadults*.
- The American Nephrology Nurses' Association (ANNA) has created a new resource, Spotlight on Older Adults, which contains links, articles, tools and information about continuing education events for nurses specializing in geriatric nursing care. The site is accessed at *www.annanurse.org/aging*.

Assessing sleep patterns

Sleep stages

A good night's sleep is important for health and well-being. There are five recurring stages of sleep: four non-REM (rapid eye movement) stages and the REM (rapid eye movement) stage.[9,17]

The stages of sleep can be described as follows:[9,17]

- **Stage 1**: Characterized as light sleep or drowsiness, this stage lasts for about five to 10 minutes. If awakened, the person may feel as if he has not been asleep at all.
- **Stage 2**: This stage is a period of light sleep from which the person is easily aroused. Brain waves slow, eye movements stop, and heart rate and body temperature decrease. The body prepares to enter deep sleep.
- **Stages 3 and 4**: These stages are known as slow-wave or delta sleep. Sleep is deep, with Stage 4 being more intense than Stage 3.

Stages one through four comprise the period of non-REM sleep and last from 90 to 120 minutes. Each stage lasts from five to 15 minutes.[9,17]

REM sleep is characterized by rapid respiration, increased heart rate and blood pressure, increased brain activity, rapid eye movements and temporary paralysis of limbs. REM sleep is also referred to as dream sleep because dreaming takes place during this stage. It is believed that REM sleep is necessary for psychological restoration, learning, memory and concentration during the day. This stage occurs in cycles about every 90 to 120 minutes following the first four stages.[9,17] The percentage of time spent in REM sleep is greatest during infancy and early childhood and decreases during adolescence and young adulthood with greater increases occurring in old age. [17]

Sleep assessment in the older adult

A common mistaken belief is that the need for sleep decreases with age. In fact, the elderly adult needs about the same amount of sleep as he did as a young person and in middle age.[9] The majority of older adults need between six and 10 hours of sleep each night. Research shows that less than four or more than eight hours of sleep is associated with mortality rates that are higher than those of persons sleeping eight hours.[9]

When asking the older adult about his sleep patterns, try to avoid "yes" and "no" questions, because these usually do not elicit enough helpful information. For example, if you ask, "Do you have trouble sleeping?" many older adults will simply say "no." Here are some suggestions for phrasing questions when assessing sleep patterns.

- **"What time do you usually go to bed?" "What time do you usually get up?"** The answers to these questions will give you an idea whether the patient goes to bed and gets up at about the same time each day. A regular bedtime and awakening time is associated with better sleep patterns.
- **"How many times do you wake up during the night?" "What causes you to wake up?"** This is better than asking the patient whether he sleeps through the night. It requires the older adult to think about his answer. He may assume it's normal to wake up frequently during the night. If he does, this may indicate a health problem.
- **"How many times do you wake up to go to the bathroom during the night?"** The answer to this question can indicate various problems, such as incontinence, enlarged prostate in men or anxiety.
- **"What kinds of things help you to sleep at night?" What kinds of things prevent you from sleeping at night?"** The answers to these questions may provide you with clues to specific physical or mental health problems. For example, a patient may tell you that some nights he wakes up gasping for air or coughing, indicating a possible cardiovascular or nervous system problem.
- **"How many naps do you take during the day?" "How long do you nap?"** Frequent naps or lengthy naps can disrupt a person's nighttime sleep patterns.

The preceding questions are a good baseline for questioning older patients about their sleep. Become familiar with some of the more common sleep problems and how they impact the elderly patient's ability to obtain a good night's sleep. It is estimated that about 5 million older adults in the United States have a serious sleep disorder.[9] Some of the more common problems include the following issues:

- **Anxiety and depression**. These issues can interfere with a person's ability to fall asleep and/or stay asleep.
- **Substance abuse**. Abuse of alcohol, prescription drugs and/or illegal drugs can profoundly disrupt a person's sleep patterns.
- **Excessive intake of caffeine**. Excessive intake of caffeine, especially in the evening, can prevent a person from falling asleep or staying asleep.
- **Pain**. Older adults may deal with chronic pain issues. Pain may be due to arthritis, cancer, nervous system disorders, and so on. Elderly patients who are in physical discomfort take longer to fall asleep, stay asleep or find a comfortable sleeping position.
- **Cardiovascular disease and respiratory disease**. These types of diseases may cause orthopnea and shortness of breath. Asking the patient "How many pillows do you sleep on at night" gives you an indication that he needs to sit up or be propped up to sleep without having difficulty breathing.
- **Dementia**. Older persons with dementia experience more sleep problems than other older persons. Sleep is often fragmented, and nighttime wandering may occur.[9]
- **Urinary issues**. Frequency, nocturia and urgency commonly occur in older adults and increase with age. Older men may experience benign prostatic hypertrophy, which prevents the bladder from emptying completely and often causes the sensation of constantly feeling the urge to void. These issues are compounded by the decreased bladder capacity of the elderly.[9]
- **Sleep apnea**. Sleep apnea is an intermittent, temporary pause in breathing during sleep. This can occur many times throughout the night and lasts about 10 seconds each time it occurs. These interruptions in breathing can lead to hypoxia. Research shows that older adults who suffer from these kinds of hypoxic episodes are more likely to experience sudden death, stroke, angina and exacerbating hypertension.[9] Patients and their sleeping partners should be questioned about the occurrence of the signs and symptoms of sleep apnea, which include heavy, loud snoring; choking, coughing or struggling to breathe while sleeping; extreme sleepiness during the day, headaches in the morning and trouble concentrating.[9]
- **Medications**. A number of medications can interfere with sleep patterns. When providing pharmacology patient education as well as assessing sleep and rest, be sure to familiarize yourself with medications that may disturb a patient's sleep. Some drugs commonly associated with sleep interference include decongestants, antihistamines, beta-blockers and beta-agonists.[9,14]

Assessment tip: *Some antidepressants, such as Elavil and Sinequan, can have sedating effects and should be taken in the evening. But antidepressants such as Zoloft and Paxil have stimulating effects and should be taken in the morning.*[9]

Pain assessment

Pain assessment should be part of the assessment of all geriatric patients. Older adults often live with chronic illnesses and disorders that cause varying degrees of pain. They may also experience more acute types of pain that follow trauma or surgery.

Research shows that about 25 percent-50 percent of older adults who live in the community suffer from some type of pain. That percentage increases to 45 percent-80 percent for older adults who live in long-term care facilities. Research also indicates that older adults are often undertreated for both acute and chronic pain, and some live with untreated pain every day of their lives.[9]

Why is pain undertreated? Some reasons include:[2,9]

- Some health care professionals may be unaware of the prevalence of pain in the older population or may think that some degree of pain is "normal" in the geriatric population.
- Failure of older adults to report pain. They may believe that pain is a "normal" part of the aging process and that nothing can be done to alleviate it. Some older adults may believe that taking pain medication is a sign of weakness or are afraid of becoming dependant on pain relief medications.
- It is difficult to assess pain in patients who have difficulty communicating, such as those persons suffering from various forms of dementia or following a disorder that affects communication, such as stroke.

Assessment tip: *Some older adults may not believe that they have pain, but may admit to discomfort or other unpleasant sensations. When assessing for pain, do not only ask a patient, "Do you have any pain?" Also ask whether they have any discomfort, aching or soreness*.

Pain may be either chronic or acute. Acute pain is due to surgery, medical procedures, injury or trauma.[9] It is often self-limiting with appropriate treatment of the underlying cause. However, some acute pain may become chronic. For example, a back injury may initially cause acute pain, but damage may be severe enough to cause lingering effects.

Chronic pain is "ongoing" pain that is treated but not self-limiting. It may be related to disease processes such as cancer, neurological disorders, degenerative diseases, arthritis, osteoporosis and vascular disease. Older adults (or any adult for that matter) who suffer from chronic pain need a thorough pain treatment plan that not only addresses pain relief but the social and emotional consequences of living with such pain as well.

Assessment tip: *Persons living with chronic pain should also be assessed for depression. Chronic pain can limit mobility, social interaction, interfere with performance of activities of daily living and interfere with sleep and rest*.[9]

There are a number of pain assessment techniques in use. Some require the use of numeric pain rating scales while others rely on pictures that illustrate various degrees of pain. Important issues for the nurse to address when conducting a pain assessment include the following.

- Ask the patient to describe the pain, aching, or soreness he is experiencing. For example is the pain sharp or dull? Is it constant or intermittent? Is it burning or "squeezing?" Does it cause any lack of sensation? Does it cause tingling, numbness, or "pins and needles" feelings? Does the pain stay in one spot or does it radiate?
- When does the pain occur? Is it worse at specific times during the day or at night? If so, what is the patient doing or what is happening in his environment when the pain becomes worse?
- What makes the pain better or less uncomfortable?
- What makes the pain feel worse?
- Are there any other symptoms that occur with the pain, such as nausea or vomiting?
- Does the patient take any medications for his pain? What are they and how often does he take them? How well do these medications work to control your pain? Be sure to ask about ALL medications including prescription, over-the-counter, herbal preparations, minerals, vitamins and other supplements. Remember that some patients don't consider items such as herbal preparations, minerals, vitamins and over-the-counter drugs as "medicine." Are the medications causing any side effects?
- Does the patient do anything specific to alleviate his pain (in addition to medication)? Some patients may drink alcohol or take other drugs (including illegal drugs) to relieve pain. Others may use remedies such as warm milk to induce sleep, relaxation tapes, meditation or prayer. How successful are these interventions?
- What does pain mean to the patient from a cultural and/or religious viewpoint? For example, some patients may believe that pain is punishment for misdeeds. Some cultures value stoicism when confronting pain while others are quite emotionally vocal about expressing pain. Remember to remain objective and respectful of a patient's cultural and religious beliefs about pain and how it is dealt with.

Many patients may be able to participate in completing pain assessment scales. A numeric pain rating scale generally consists of a scale of 0-10 with 0 indicating no pain and 10 indicating the worst possible pain. The degree of pain worsens as the numbers increase.[9] This type of scale requires that the patient be able to understand your explanation of the scale, correlate his pain to a numeric value, and communicate this correlation to you.

A verbal descriptor scale is one that requires the patient to describe his pain from "no pain," to "mild," "moderate," "severe," or "as bad as the pain could be."[9] This requires that the patient be able to understand the descriptive terms used and be able to correlate the terms with his pain, and describe his pain using the given terms without the benefit of visual cues.

A pictorial scale such as the Faces Pain Scale requires that the patient select a visual depiction of pain. For example, the patient is asked to look at a number of different faces that range from a face with an expression of calm or contentment to faces that look increasingly uncomfortable. The patient chooses the face with the expression that best "fits" his current pain experience.[9] This scale does not require the patient to express himself using specific descriptive terms or to understand specific descriptive terms.

Assessment tip: *A family member, friend or reliable caretaker should be involved in the pain assessment if patients are unable or reluctant to communicate their pain experience.*

But what about patients who are unable to understand verbal or visual communications, such as the patient suffering from dementia? Researchers are working to develop valid and reliable pain assessment tools for use with patients suffering from dementia. One such tool is the Pain Assessment in Advanced Dementia (PAINAD) scale, which relies on direct observation of five behavioral indicators of pain.[2]

An overview of the five behaviors used to assess pain includes.[2]

- **Breathing** (does not include mechanical ventilation): Ranges from a score of 0 for normal breathing, a score of 1 for occasional labored breathing or short periods of hyperventilation, to a maximum score of 2 for noisy, labored breathing and prolonged periods of hyperventilation.
- **Negative vocalization**: Ranges from a score of 0 for none, a score of 1 for occasional moaning or groaning, to a maximum score of 2 for loud moaning or groaning, crying, or calling out.
- **Facial expressions**: Ranges from a score of 0 for no expression or an expression of calm or smiling, a score of 1 for frowning or expressions of sadness, to a maximum score of 2 for facial grimacing, frowning, scowling, etc.
- **Body language**: Ranges from a score of 0 for a relaxed body posture, a score of 1 for tenseness, fidgeting, or, if ambulatory, distressed pacing, to a maximum score of 2 for rigid body posture, clenched fists, pushing or striking out, and/or pulling knees up towards chest.
- **Consolability**: Ranges from a score of 0 for needing no consolation, a score of 1 to the need for reassurance by touch or tone of voice, to a maximum score of 2 for being inconsolable.

Scores for each category are totaled with scores ranging from a minimum total of 0 to a maximum total of 10. The higher the total number, the more severe the pain. The Harford Institute for Geriatric Nursing Web site offers a detailed explanation of the scale and may be accessed at *www.ConsultGeriRn.org*. Specific information about the use of the scale may also be found in the publications of the American Medical Directors Association.[18]

A comprehensive pain management treatment plan is important for anyone dealing with pain. A number of complementary and alternative therapies are being used with increasing frequency. These include acupuncture, herbal supplements, massage therapy, chiropractic care, Yoga, meditation, relaxation therapy, biofeedback, and, in some cases where not prohibited, exercise. Any and all complementary and alternative therapies should be initiated and maintained only under the supervision of the patient's primary health care provider.

Most patients dealing with pain participate in some type of medication regimen. Be aware of and help the patient and family prepare for and deal with some common side effects of analgesics.

- Some analgesics, particularly opioid analgesics, slow the intestinal tract and can lead to constipation. Stool softeners, adequate fluid intake, and fruit and vegetable intake should help to alleviate the problem of constipation.[9,14]
- Nausea and vomiting are also fairly common side effects, and an antiemetic may be prescribed for these types of adverse occurrences. Some analgesics cause drowsiness and sedation, and patients should be cautioned against activities that require alertness. In severe pain, morphine may be administered, and pruritis is often associated with its administration. Antihistamines are effective in combating pruritis, but may also cause sedation as a side effect.[9,14]

In summary, a thorough pain assessment must be conducted as part of a thorough geriatric assessment. Remember that pain is often undertreated in this population, particularly in those elderly adults who cannot or will not communicate about their pain. Patients with dementia are at significant risk for having their pain undertreated.

Involve family, friends and caretakers as part of the pain assessment process as well as its treatment. Many of these individuals (including the patients themselves as well as some health care professionals) may hold the mistaken belief that pain is simply part of the aging process and must, to some degree, be tolerated. Help to educate all of these individuals, including colleagues, about the need for adequate assessment and treatment of pain.

Remain alert to the complications of under-treating pain, including depression and social isolation. Also be sure to monitor and to teach the patient about the side effects of medications used to alleviate pain and how to reduce or eliminate such adverse occurrences.

Use a variety of pain assessment techniques including verbal discussion and the use of valid and reliable pain assessment tools. Remain sensitive to the issue of culture and religion and how they influence the expression of pain and compliance with treatment options.

Finally, remember to involve the patient, family and caregivers in pain assessment and management. Often the key to success in managing pain is the cooperation of the patient and of those with whom he is most involved.

Assessing mental health

Mental health and well-being is as important to the older adult as it is to any other population. Unfortunately, some mental health issues, such as depression and anxiety, may be overlooked in elderly adults. The signs and symptoms of these and other mental health problems may be mistakenly attributed to the aging process or dementia, and as a result, a thorough assessment is not done. In fact, only about half of older adults with mental health problems actually receive appropriate mental health services.[19]

Assessment tip: *When assessing mental health, be sure to evaluate the patient for mental disturbances related to medication side effects. Sometimes adverse occurrences are related to alterations in mental status*.

Some health care professionals may hold the mistaken belief that older adults suffer from mental health problems more than younger adults. Actually, older adults demonstrate fewer diagnosable psychiatric disorders than younger persons with the exception of cognitive problems such as Alzheimer's disease, which show age-related increases.[9] Some experts bemoan the fact that many health care professionals are more concerned about a broken bone than a "broken spirit."[7]

The geriatric population can experience a number of mental health problems, just as younger persons do. Although some problems may develop in old age, others may have begun earlier in life (e.g. depression, obsessive-compulsive disorder). Let's look at the normal aging changes that influence mental health and cognition and review some mental health and cognition problems and how they can be identified in the older adult.

Normal age-related changes in mental health and cognition

An older adult's mental health and cognition stay comparatively stable. The alterations that do take place are usually not dramatic enough to cause major problems with activities of daily living. Serious changes and abrupt loss of cognition usually indicate a physical or mental disorder such as Alzheimer's disease or stroke.[9] Some normal age-related changes in mental health and cognition include the following.[9]

- The speed with which information is processed decreases with age. This means that older adults take a longer time to learn new information and require that information be repeated.
- The ability to deal with multiple tasks slows.
- The capability with which the older adult can maintain attention and ignore unimportant information decreases with age.
- The use of language is maintained, but word finding and naming ability decreases with age.
- The ability to use abstract thought and demonstrate mental flexibility are associated with some decline as a person ages.
- The ability to acquire practical experience and wisdom continues until the end of life.

Grief and bereavement

Geriatric patients generally must deal with the loss of loved ones, including spouses, siblings, parents and others. Grief is considered to be a normal response to such losses within a two-year period. Grief that lasts longer than two years is considered to be pathological. However, the length of grief varies with cultural norms. The American Psychological Association's standard of care concerning grief in the older adult encourages the health care professional not to focus on time, but on the way grief is presented. Profound depression, extensive guilt, overwhelming senses of loss, preoccupation with death, difficulty performing activities of daily living and social incapacitation indicate pathological grief and require medical intervention.[9]

Depression

While the prevalence of major depression declines with age, symptoms of depression increase. Eight to 20 percent of older adults living in the community and up to 37 percent in primary care settings experience depressive symptoms.[19] Depressive symptoms are often associated with chronic illness and pain.[9]

Older adults suffering from depression often report numerous somatic complaints, including chronic pain. They may not consider themselves depressed and focus on physical rather than mental symptoms.[9]

Assessment tip: *Older people may feel that it is a sign of weakness to report feelings of depression. They may believe it is more "acceptable" to have a physical illness, thus the focus on physical complaints. Your first clue to depression in older adults may be the reporting of somatic complaints*.

A number of tools for the assessment of geriatric depression are available. One such tool is the Geriatric Depression Scale, which consists of 30 questions (a shortened 15-question version may also be used) that can be answered with "yes" or "no." [9] Examples of questions include:[9]

- Are you basically satisfied with your life?
- Do you feel full of energy?
- Do you feel happy most of the time?
- Do you think that most people are better off than you are?

Criteria for major depression as noted in the Diagnostic and Statistical Manual of Mental

Disorders-IV-TR[20] include:

- Depressed mood or loss of interest or feelings of loss of pleasure.
- Symptoms must last for at least two consecutive weeks and indicate a change from previous mood and functioning.
- At least five of the following: depressed mood, changes in sleep patterns, reduced feelings of interest or pleasure, feelings of guilt or worthlessness, loss of energy or fatigue, inability to concentrate, changes in weight or appetite, psychomotor agitation or retardation, and suicidal thoughts.

The incidence of depression is twice as high in older women than in older men. Some of the possible reasons for this difference is that older women are more likely to experience loneliness, financial problems and a reduction in independence cause by functional disabilities.[9]

Assessment tip: *Depression is a major risk factor for suicide. Adults age 65 and older have the highest suicide rates of all age groups. Suicide is highest among Caucasians, followed by Asians, Hispanics and non-Hispanic blacks. Older adults suffering from alcoholism have a greater risk for suicide as well. Nurses must not only assess for depression but for suicidal ideation*![9]

When evaluating elderly patients for depression, be sure to check on the potential for depressive side effects of certain medications. Medications that can cause depression include:[21]

- Antihypertensives, such as reserpine.
- Hormonal replacement therapy, including estrogen and progesterone.
- Cardiac agents, such as digitalis.
- Analgesics, such as codeine.
- Anti-anxiety agents, including diazepam.

Dementia

Dementia is a syndrome that leads to a decline in multiple cognitive abilities. The presenting signs and symptoms range from mild cognitive impairment to complete incapacitation.

Dementia is both chronic and terminal, because the syndrome progresses to causing the patient to become completely dependent in all aspects of activities of daily living. There is no consistent course, and the rapidity with which the disease will progress cannot be predicted.[9]

According to the Diagnostic and Statistical Manual of Psychiatric Disorders – Text Revision (4th edition[20], the diagnostic criteria must include both a decline in memory and at least one of the following:

- The ability to understand spoken or written language and to generate understandable speech.
- The ability to recognize or identify objects (assuming such ability is not impaired by other disease processes).
- The ability to perform motor activities (assuming such activities are not impaired by other disease processes).
- The ability to think abstractly, make appropriate judgments, and plan and execute complex tasks.
- The decline in cognitive ability must be of a severity to interfere with normal activities of daily living.

There are a number of types of dementia, with the most common being Alzheimer's disease (AD). It is responsible for about 50 percent to 70 percent of cases and has a subtle onset. The exact etiology of AD is unknown, but researchers believe that genetic and environmental components may play a role in its development.[9]

There are three stages of dementia: mild, moderate, and severe. Six aspects of cognition are evaluated to determine staging. These six aspects are memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. Diagnosis is based on assessment of these aspects because there is not a definitive diagnostic study or studies that can confirm diagnosis.[9]

Treatment is aimed at slowing the progression of the dementia and improving cognitive function. Medications such as Namenda and Exelon are currently used to treat cognitive impairment. Alternative therapies, such as ingestion of ginkgo biloba and various vitamins and minerals, are under investigation.[9]

Assessing for elder abuse

Mrs. Dash is an 80-year-old female who lives with her daughter, son-in-law and three grandchildren. She was recently hospitalized for a total hip replacement and infection of the surgical wound. After discharge, she returned to her daughter's home. A visiting nurse arrives this morning to assess Mrs. Dash's wound and perform a dressing change. Mrs. Dash lives in a self-contained apartment attached to the main house via a short hallway. Her daughter provides Mrs. Dash with housecleaning services and brings her meals three times a day. Mrs. Dash's apartment is spotlessly clean. Mrs. Dash is dressed in a clean housedress, and is wearing make-up and jewelry. She does not make eye contact with the visiting nurse and has a sad expression on her face. Her daughter is present and interacts with the visiting nurse, asking if her mother is "healing." She does not interact with Mrs. Dash. One of the grandchildren stops in to ask for a ride to a sports event. The grandchild does not interact with Mrs. Dash, but rolls her eyes and mutters something about "that old woman is more trouble than it's worth." Mrs. Dash's daughter prepares to leave and casually says, "So long, Mom," and leaves without looking back. Mrs. Dash looks at the visiting nurse and says sadly, "They take care of me, but no one really cares about me. There is no love. They don't like me." Mrs. Dash is suffering from emotional neglect, sometimes characterized as a form of elder abuse.

When nurses hear the term "elder abuse," they often picture an older adult who is bruised, in poor physical condition and may be dressed in dirty clothing. But there are many forms of abuse, not all of them readily apparent. Elder abuse can take place in any setting: the patient's home, an acute-care hospital or long-term care facility. It occurs among all socioeconomic groups. As nurses, we must be aware of the various types of abuse and how to protect the elderly adult from the effects of abuse.

Physical abuse

Physical abuse is defined as the use of physical force to intentionally inflict physical injury or pain. Actions such as hitting, pushing or shaking are forms of physical abuse.[9]

Signs of physical abuse include bruising, fractures, abrasions, lacerations and cuts. But it can be difficult to distinguish accidental injury from physical abuse. The elderly adult's skin contains only small amounts of subcutaneous fat, and blood vessels are thin and fragile.[22] This makes the older person susceptible to accidental bruising, which can be difficult to distinguish from physical abuse. However, research shows that 90 percent of accidental bruising occurs on the extremities. Accidental bruises rarely, if ever, occur on the neck, ears, genitals, buttocks or soles of the feet.[22]

Low bone density and the existence of osteoporosis place the elderly at high risk for fractures. To date, no particular pattern of abuse fractures has been identified.[22] The location, frequency and health history of the older adult with fractures must be evaluated to identify suspected abuse.

When evaluating abrasions, lacerations and cuts, it is important to describe them accurately. Many nurses refer to any wound as a laceration. When documenting these kinds of trauma, it is important to be accurate.[22]

- **Abrasion**: A scraping injury that can occur if the elder is pulled or dragged across a surface (e.g. a carpet) that abrades the skin.[22]
- **Laceration**: Full-thickness splitting open of the skin with ragged edges that occurs when the individual is traumatized by blunt force.[22]
- **Cut**: An incision made by a sharp object that has smooth, clean edges.[22]

Sexual abuse

Sexual abuse is defined as any type of nonconsensual sexual intimacy.[9] Examples include rape, molestation, sexual harassment, unwanted touching, sodomy, coerced nudity and nonconsensual explicit sexual photography. Signs and symptoms of sexual abuse include:[9,22]

- Bruises around the genital area and/or breasts.
- Unexplained vaginal or anal bleeding.
- Unexplained occurrence of venereal disease or genital infections.
- Torn, stained or bloody undergarments.
- Elder's verbal report of sexual abuse.

Emotional or psychological abuse

Emotional or psychological abuse is defined as infliction of distress, anguish or sadness via verbal and/or non-verbal acts.[9] Examples of elder emotional or psychological abuse include yelling, threatening, swearing, name calling, insults, intimidation and humiliation. Other

forms of emotional abuse include isolating the older adult from family and friends, preventing him from pursuing his regular social activities (e.g. attending church, visiting a senior citizen's center), isolating him from others in the home, and/or giving the older adult the "silent treatment" and not providing any affection.[23]

Signs and symptoms of emotional or psychological abuse include sadness, emotional upset or agitation, withdrawal and verbal reporting of emotional abusive behaviors.[9,22,23]

Neglect

Neglect is defined as the failure to fulfill or refusal to fulfill obligations to an elder such as safety, shelter, affection, food, water, clothing, hygiene, medicine or comfort.[9,22,23] Neglect may be on the part of a spouse, family member, friend or caregiver. Additionally, the elderly adult may also initiate self-neglect, which occurs when the elder himself disregards such needs as hygiene, food, safety and so on, because of mental or physical impairments or because he chooses not to take care of himself.[9,22,23]

Signs and symptoms of neglect include malnutrition, dehydration, poor personal hygiene, untreated health problems, unsanitary or unsafe living conditions, history of being left alone or choosing to be alone, and reports of being neglected.[22,23]

Abandonment

Abandonment is the desertion of an elderly person by someone who is responsible for providing care to the elder or who has physical custody of the elder.[9,23] In such cases, the elder is simply deserted or abandoned at a hospital (e.g. emergency department), long-term care facility, shopping center or other public location.[9] In addition to being abandoned, the elderly adult may also exhibit signs and symptoms of other types of abuse.

Financial or material abuse

Financial or material abuse is defined as illegal or improper use of an older adult's money, property or other assets. The person committing this abuse does so for personal or monetary gain or benefit.[9] Examples of this type of abuse include unexplained disappearance of personal items, unusual withdrawals of money from savings or checking accounts, or changes in property ownership. As a result of financial losses, elders may not be able to pay bills or buy food and medicine.

Risk factors for elder abuse

Elder abuse can occur within all socioeconomic, cultural and intellectual groups. However, research shows that certain characteristics surface most commonly among abuse victims. These include:[9,23]

- **Sex**: Women are more likely to be victims of elder abuse than men.
- **Age**: Victims of elder abuse are likely to be more than 75 years of age.
- **History of violence**: Victims of elder abuse are more likely to be prior victims of abuse, such as child abuse or spousal or intimate partner abuse. If the elder abuse victim was himself an abuser (e.g. abused his children), he is more likely to be a victim of elder abuse committed by those he abused in the past.
- **Functional status**: Elders whose physical and/or mental status is impaired are more likely to be abused.
- **Poor social network**: Elders who have fewer than three significant others are more likely to suffer abuse.
- **Economic status**: Elders who are poor are more likely to be abused.
- **Education**: Older adults who have less than an eighth-grade education are more likely to be abused.
- **Minorities**: Members of minority groups have statistically higher rates of elder abuse.

Characteristics of abusers

Some common characteristics of abusers include the following.[9,23]

- **Sex**: Abusers are more likely to be men.
- **Substance abuse**: Abusers are more likely to have a history of substance abuse, including alcohol abuse.
- **Mental health**: Abusers are more likely to suffer from mental illness.
- **Family status**: Elders are more likely to be abused by members of their own families.
- **Social network**: Abusers have a poor social network and are more likely to be dependent on the elder for financial or shelter or other needs.
- **Caregiver stress**: Caregivers who are overwhelmed by the burden of caring for the older adult may end up abusing the person for whom they are caring.
- **Cycle of family violence**: Caregivers may have been abused by the elder they are now abusing.

Screening for elder abuse

Evaluate signs and symptoms that may indicate abuse. Monitor those who provide care for elderly adults. Do they show signs and symptoms of stress and difficulty coping? Is there a history of abuse in the elder or caregiver's family?

There are a number of elder assessment screening tools available for use. The Hartford Institute for Geriatric Nursing recommends the Elder Assessment Instrument (EAI) as a screening tool in the clinical setting.[9] This is a 40-item tool used to determine whether the elderly patient needs to be referred for suspected elder abuse.[9]

Elders are often reluctant to report abuse. They may be afraid of retaliation by the abuser. They may believe that they have done something to deserve the abuse or feel guilty about being an abuser themselves at some point in their lives. Abused elders may also be reluctant to report abuse if they are dependent on the abuser for care, shelter or financial help.

Assessment tip: *The elder and the suspected abuser should be interviewed separately. This may reveal inconsistencies in reported histories or explanations of signs and symptoms of abuse. If the suspected abuser refuses to allow separate interviews, the suspicion of abuse increases*.[8,9]

Nurses must be aware of local elder abuse/mistreatment reporting laws. Many states have mandatory reporting laws, and health care professionals must report suspected cases of elder abuse.[9] Know your organization's policies and procedures regarding the reporting of elder abuse, and familiarize yourself with contact information for local departments on aging and adult protective services. For state reporting numbers, visit the National Center on Elder Abuse Web site at *www.ncea.aoa.gov* or call the Eldercare Locator at 1-800-677-1116.

Assessment tip: *You don't need to prove that abuse is occurring. You do need to report your suspicions. The experts in abuse will follow up to investigate your suspicions*.

Overview of assessment of body systems

Basic physical assessment techniques, such as inspection, palpation and percussion, are similar for all age groups. This overview of the assessment of body systems focuses on those issues that are particular to the geriatric population.

Vision, hearing and touch

Vision

The first step in assessing the vision of an older adult is observation. Elderly persons who have stained clothing, poorly combed hair or excessive or poorly applied makeup may have vision impairment.[9] A Snellen chart may be used to assess visual acuity, or you may ask the patient to read from a newspaper or other printed material with various size prints.

Assessment tip: *Be sure that the patient is wearing his glasses or contact lens when assessing vision. Assess vision with and without corrective lenses. It is estimated that 92 percent of persons over 70 wear glasses, 18 percent also use a magnifying glass for close work, and 14 percent of persons 70-74 have difficulty seeing even with corrective lenses. Thirty-two percent of persons over 85 have trouble seeing even with corrective lenses*.[9]

There are a number of normal age-related changes pertaining to the appearance of the eye and vision. These include the following issues.[4,9]

- The eyebrows gray and thin, as do the eyelashes. Skin around the eye wrinkles as subcutaneous tissue atrophies. Orbital fat decreases, giving the eyes a sunken appearance, and eyelids sag.
- The eye becomes less sensitive to feelings of pain and discomfort. This can cause the patient to be unaware of infections or injuries to the eye.
- The lenses thicken and harden, which reduces accommodation and brings a decrease in near-vision (presbyopia). The lens begins to appear "yellowish" and rather opaque. Visual acuity starts to decrease starting about the age of 50. This decrease becomes more rapid after the age of 70.
- The eye begins to lose its ability to adapt to changing degrees of light. Thus, as the adult ages, he needs more light to see objects in shadow or in dim light.

- The eye's ability to adapt to a darkened room decreases with age. It takes more time for the eye to accommodate to darkness.
- The elder's pupils become sluggish as the pupils decrease in size and become less responsive with age.

Assessment tip: *As always, include medication evaluation as part of your assessment. Some drugs, such as Tamoxifen and thiazide diuretics, can interfere with vision*.[9,14]

There are several visual problems that are commonly seen in the older adult. Nurses must be aware of these problems and their signs and symptoms so that appropriate referrals may be made.

- **Cataracts**: Cataracts are the most common causes of correctable vision loss.[24] A cataract is an opacity of the lens that develops gradually without pain. It decreases the amount of light able to reach the retina, thus inhibiting vision. The patient experiences painless, gradual blurring and loss of vision; may see halos around objects; and have difficulty distinguishing colors. The pupil of the eye appears hazy. Cataracts are the leading cause of blindness in the world. Surgery is the treatment of choice, and prognosis is usually good. Risk factors include increased age, diabetes, eye trauma, long-term use of corticosteroid medications, smoking and alcohol use, and Caucasian race.[4,9,24]
- **Glaucoma**: This is a group of disorders characterized by an increase in intraocular pressure (IOP) that can damage the optic nerve. Untreated glaucoma can lead to peripheral vision loss and blindness. Its onset can be slow and insidious (chronic open-angle glaucoma) or abrupt (angle-closure glaucoma), which is a medical emergency. Treatment includes medications and/or laser therapy. Risk factors include IOP; being older than 60 years of age; a family history of the disease; personal history of hypertension, diabetes, myopia, or migraines; and African-American ancestry.[4,9,24]
- **Age-related macular degeneration (ARMD)**: ARMD is the leading cause of blindness in persons over the age of 65. It is the atrophy of the macular region of the retina. The dry form of ARMD is characterized by retinal pigment degeneration and is slow and progressive and associated with a mild vision loss. The wet form involves the leakage of blood or serum from blood vessels beneath the retina. It is not as common as the dry form but is responsible for the majority of severe vision loss associated with ARMD. The primary symptom is a change in central vision, such as distortion of straight lines or bland areas that appear in the center of printed pages. There is no treatment for the dry form, but the wet form may be treated with laser treatments or injections.[4,9,24]
- **Diabetic retinopathy**: This is a microvascular disease of the eye associated with diabetes. The ocular microvascular system is damaged, and transport of oxygen and nutrients to the eye is inhibited. Patients experience a gradual vision loss. Treatment consists of laser therapy.[9]

Hearing

Hearing loss is quite common in the elder patient. It is estimated that more than 30 percent of older persons between 65 and 74 have some degree of hearing loss. This percentage increases to 66 percent in persons over 75. In addition to age, risk factors for hearing loss include smoking, history of middle ear infections, tumors, the buildup of ear wax and long-term exposure to loud noises.[9]

Normal aging changes that influence hearing include:[9]

- The skin of the external ear wrinkles and sags.
- Cerumen is drier and harder and tends to accumulate in the ear more than in younger adults.
- Loss of nerves and sensory organs associated with hearing.

Assessment tip: *When assessing hearing, be sure to assess for the presence of excessive ear wax, which may hinder hearing*.

Hearing is assessed in the same ways as with other adult age groups. The use of a tuning fork and covering one ear and whispering two-syllable words toward the uncovered ear are two of the ways to assess hearing.

Assessment tip: *As with all assessment evaluations, be sure to review the patient's medications to determine whether any of them may affect hearing*.

Tinnitus is a common problem in older adults. It is a ringing sound in the ear and can happen with or without accompanying hearing loss. The problem may be self-limiting or chronic. Tricyclic antidepressants may be prescribed as part of the treatment as well as relaxation techniques, biofeedback and counseling to deal with the discomfort.[9]

Touch

The sense of touch or physical sensation decreases with age. This is because nerve impulses are conducted at a slower rate in the elderly. There is also a reduction in the function of peripheral nerves. Medications used to calm or sedate may also contribute to a decrease in the sense of touch.[9]

These physiological changes lead to a decreased ability to perceive pain and temperature, which, in turn, can increase the risk for injury. For example, the older adult may not perceive the temperature of water in the bathtub or shower to be too hot, increasing the risk for burns. If the sense of pain is diminished, the elderly patient may not be aware that he has injured himself after falling or other types of blunt trauma.

The sense of touch is also important in conveying affection, and in some cultures, to communication in general. A loss of physical sensation may be detrimental emotionally as well as physically.

Assessment tip: *Some diseases, such as diabetes mellitus, can cause peripheral neuropathies that add to the loss of the sensation of touch*.[9]

One of the simplest ways to assess touch is to use a wisp of cotton. Patients close their eyes and are asked to indicate when they feel the sensation of touch. The nurse touches parts of the body, such as the face, the arms, the legs and the back. Additional techniques are to touch various areas of the body with a pin alternating with a wisp of cotton. The patient is asked to say whether he feels a sharp sensation (when touched with a pin) or dull (with the cotton wisp).[9,24]

Some nurses find it helpful to use objects of various sensations, such as sand paper, a piece of silk or fur and ask the patient if he feels a rough or a soft sensation. Tubes of hot and cold water may be placed against the patient's skin as he is asked to state whether he feels a cold or a hot object.[9,24]

Assessment tip: *Teach older adults to examine their skin, especially over bony prominences, the soles of their feet and between fingers and toes for open or broken areas of skin. Because of the decrease in the sensation of touch, open areas may not be noticed until they are severe and/or infected*.

The integumentary system

The integument, or the skin, is the body's largest organ and consists of three layers: the epidermis, the dermis and subcutaneous layers. The epidermis is the outermost layer of the skin and has up to five layers (depending on the specific part of the body). The dermis is the second layer of the skin, is made up of connective tissue, has an abundant blood supply, and lymph and neurosensory receptors. It supports and nourishes the dermis. The subcutaneous layer lies below the dermis, attaches to muscles and gives shape to the body and provides a protective cushion for bones and internal organs. There are also a number of accessory structures that are part of the integumentary system. These are the hair, nails, sebaceous glands (which produce sebum for skin lubrication) and eccrine glands that produce sweat. [4,9]

The skin is very important to health and wellness. It is responsible for:[9]

- Regulation of body temperature.
- Regulation of body fluids.
- Provision of a barrier to infection and promotion of the immune system.
- Production of vitamin D synthesis.
- Provision of sensory reception.

There are a number of age-related changes that affect how the integumentary system functions. Nurses need to be aware of these changes not only for their impact on physical health, but on self-perception and self-esteem as well.

- **Thickness and elasticity**: Both decrease with age, which leads to the appearance of wrinkles and causes the skin to sag, especially the skin of the face, neck and

upper arms. Smoking is associated with an increase in wrinkling of the skin.[9]

- **The epidermis**: The epidermis thins, and moisture is lost. The skin begins to have a dry and rough appearance. The rate of cell growth is decreased, which leads to an increased risk for infection. This decrease combined with a lack of moisture makes the skin more susceptible to damage. Liver or "age" spots appear and the number of moles and freckles may increase. The cosmetic aspects of these changes may have a negative impact on the older adult's self-image and self-esteem.[4,9]
- **The dermis**: Beginning in a person's 30s, the dermis begins to decrease in thickness and effectiveness. The connective tissue decreases in function, which causes a loss of skin turgor that progresses with age. The capillaries thin, which leads to bruising. There is an accompanying reduction in sensation that increases the risk for injuries such as burns, infections and pressure sores.[4,9]
- **Subcutaneous layer of skin**: This layer increases in some parts of the body and decreases in others, resulting in changes in fat distribution. It thins in the face, neck, hands and lower legs. With age, fat distribution becomes more pronounced in the abdomen and thighs in women, and in the abdomen in men.[9]
- **Hair and nails**: The color of the hair becomes gray or white and becomes thin. There is a loss of axillary and pubic hair, and alopecia, or baldness, appears. Men generally experience more obvious loss of hair from the head than do women. Balding may have a significant impact on self-esteem. Women may also begin to experience the growth of facial hair on their faces. Nails become dull, and yellow or gray. They become thick and break or split easily.[4,9]
- **Damage from sun exposure**: Persons who spend a lot of time in the sun, whether because of their occupations or simply from their desire to acquire a deep, dark tan, are at risk for a number of health problems, particularly skin cancer. It is estimated that more than 90 percent of skin cancers are related to exposure to the sun. The cumulative effects of years of sun exposure increase the amount of age-related changes, such as wrinkles and freckles, and often make people appear older than they really are. Damage done by the sun is not reversible.[9]

Assessment tip: *Some drugs increase a person's sensitivity to sunlight. Some examples are antibiotics, antihistamines, antidepressants and antiarrhythmics. As always, educate patients about the risk for sun sensitivity if they are on medications that increase this problem*.[9]

Skin cancer is a common problem among older adults. It is important that nurses recognize potentially malignant lesions and initiate appropriate follow-up and treatment. Skin cancer is the most common type of cancer in the United States. Its effects range from mild, easily curable lesions, to devastating, life-threatening malignancies.

Basal cell carcinomas: Basal cell cancer is the most common type of skin cancer in Caucasians. It is primarily due to sun exposure.[9] Fortunately, if diagnosed early, basal cell cancer has a cure rate of 95 percent.[24] When assessing the patient's skin, be alert to the presence of basal cell cancers. This type of skin cancer can occur on any exposed surface of the skin, but is most common on the face, head, neck, nose, and ears.[9]

There are three types of basal cell cancers. They are:[24]

- **Noduloulcerative lesions**: Usually found on the face, these lesions are small, smooth, ink and translucent papules. As they grow, their centers become depressed with firm, elevated borders. They seldom metastasize, but if untreated they can become infected or lead to hemorrhage if they move into large blood vessels.
- **Superficial basal cell lesions**: Commonly found on the chest and back, these cancers are oval or irregular in shape, lightly pigmented and have clearly defined, slightly elevated threadlike borders. They look scaly and may be mistaken for psoriasis or eczema. These lesions are associated with ingestion or exposure to arsenic-containing substances.
- **Sclerosing basal cell lesions**: These lesions are waxy, yellow to white plaques and do not have clearly defined borders. They are most often found on the head and neck and appear in patches.

Report suspicious lesions for medical follow-up. Diagnosis is based on appearance and biopsy. Treatment involves careful excision and possibly chemotherapy and/or radiation, depending on the extent of the lesion.[24]

Squamous cell cancer is the second most common type of skin cancer in Caucasians and the most common type of skin cancer in persons with dark skin.[9] It is an invasive tumor that has the potential to metastasize. Clues to the existence of squamous cell cancer are changes in existing skin lesions (e.g. moles, warts) or the appearance of a new lesion that ulcerates and fails to heal. This type of skin cancer, if diagnosed and treated early, has a high cure rate. But if it spreads, it can lead to disability or death.[24]

Squamous cell cancer often develops on the face, ears and dorsa of the hands and forearms. Risk factors for this type of skin cancer include sun overexposure or overexposure to X-rays, radiation therapy, chronic irritation of the skin, and ingestion of arsenic-containing substances. It is most commonly found in fair-skinned white men older than 60 years of age.[24]

Diagnosis is based on appearance and biopsy. Treatment includes excision, and if the tumor is extensive, radiation therapy, or possibly chemotherapy.

Malignant melanoma is the most serious of all skin cancers and is responsible for more than 75 percent of all deaths due to skin cancers. Melanoma lesions may grow from an existing mole or appear as a new lesion. In appearance, melanoma lesions grow and become brown, black or multicolored. They develop nodules or plaques with irregular black outlines. Melanomas may crust or bleed and are usually larger than 6 mm in diameter.[9]

Appearance and biopsy confirm diagnosis. These lesions are treated with surgical resection that may include removal of the lymph nodes. Chemotherapy may also be part of the treatment plan, depending on the size and extent of the lesion.[24]

Part of your assessment should include patient education regarding the prevention of skin cancers. Advise patients to avoid exposure to the sun, especially between the hours of 10 a.m. and 4 p.m. Sunscreen should be used year-round, and clothing should cover the arms and legs when spending time in the sun. A broad-brimmed hat should be worn to protect the face and scalp. Patients should perform regular skin checks to monitor the appearance of new lesions or changes in old ones. Be sure to explain the potential for photosensitivity that some medications can cause. Encourage that patient to have an adequate intake of vitamin D, because this vitamin may actually lower the risk of certain cancers.[24]

Older adults are also susceptible to skin breakdown and skin infections. Because of the fragility of the elderly person's skin and decreasing sensation, older adults are at high risk for skin breakdown. A slight cut may go unnoticed until it becomes infected. Sitting or sleeping for long periods of time in one position may lead to redness and even breakdown of the skin over bony prominences. Persons who rely on wheelchairs for their mobility are at particular risk for skin breakdown over the sacrum and gluteal areas.

Teach patients how to prevent or reduce their risk for skin breakdown. Here are some points to include in your teaching.

- **Eat a nutritious diet**. Proper nutrition helps all body systems to maintain a healthy balance.
- **Encourage adequate hydration**. Older adults dehydrate easily and need adequate amounts of fluid. Discourage excessive intake of caffeine and alcohol.
- **Avoid sitting or lying in one position for extended periods**. Change positions frequently. If using a wheelchair for mobility, change your position by lifting the weight off the buttocks several times every hour.
- **Massage bony prominences such as the heels, hips and elbows**. Use moisturizing lotion. Use gentle motions. Vigorous massage may bruise or tear the skin. Avoid lotions with large amounts of perfume because these can further dry the skin.
- **Examine the skin for reddened areas, cuts, abrasions, and lacerations**. Seek medical attention for such areas that fail to heal, bleed, swell, become red and warm

to the touch, or drain pus or foul-smelling discharge.
- **Avoid having bath or shower water too hot**. Older persons' skin burns easily.
- **Examine the skin for changes in moles, lesions, and freckles**. Note any newly developing moles, lesions or freckles.
- **Avoid wearing clothing that is too tight or rubs or irritates the skin**. This can lead to skin breakdown.
- **Avoid wearing shoes that are too tight or too loose**. Tight shoes can damage the skin. If shoes are too loose, they may rub up and down with walking, which can also cause skin irritation.
- **Avoid wearing jewelry or watches that rub and irritate the skin**.

Assessment tip: *Help elders to identify a family member, close friend or caregiver to help perform skin examination and skin care as needed. It may not be possible to examine the entire body without help*.

The cosmetic skin changes due to aging may cause a negative change in body image in the older adult. Monitor older adults for signs of depression or unrelieved stress and anxiety related to appearance. Never assume that because a patient is "old," he may not be concerned about his physical appearance. Remember that pride in appearance is a life-long trait and should be considered when working with patients of all ages.

The cardiovascular system

Cardiovascular disease is the No. 1 cause of death in the United States. Nurses, when assessing the geriatric patient's cardiovascular system, should not only be alert to normal aging changes and pathology, but also to opportunities to teach patients ways to enhance their cardiovascular health throughout the life span.

> *Mr. Lewis is 80 years old. He is hypertensive, has an elevated cholesterol, and suffered a moderately significant myocardial infarction one year ago. He takes his medication on schedule but does not follow his recommended low-fat, low-cholesterol diet. Mr. Lewis arrives at his physician's office for a routine check-up. His nurse performs the initial assessment and reviews his lab work, which indicates his cholesterol is still higher than normal, even though he takes his medication as prescribed. Mr. Lewis explains: "I eat bacon and eggs every morning. I'm not supposed to, but I've eaten bacon and eggs every morning for 60 years and I'm not changing now. Those egg substitutes are terrible!" Should the nurse re-emphasize the importance of eliminating his morning breakfast eggs as recommended by the dietician? Or is there a compromise that can be reached with her geriatric patient?*

This scenario illustrates one of the challenges of geriatric nursing practice. The nurse knows the clinical importance of adhering to his diet. But sometimes a compromise must be reached. As part of cardiovascular assessment (and patient education), the nurse must be able to work with, not in opposition to, her patient's pursuit of health and wellness. Mr. Lewis may not be willing to eliminate eggs from his diet, but would he be willing to reduce the number of times a week he eats eggs? How much input has he had in his plan of care? What options has he been offered? Remember that the patient is the most important partner in the establishment of, and adherence to, an effective treatment plan.

Age-related changes in the cardiovascular system

It can be challenging to distinguish between disease pathology and normal aging changes in the cardiovascular system. A decrease in cardiac tolerance may be due to disease or simply an effect of the aging process.

However, age does not necessarily equate with cardiac health. A middle-aged person who eats a diet high in saturated fat, smokes and leads a sedentary lifestyle may very well have poorer cardiac functioning than an elderly person who has maintained an active lifestyle, exercises and eats a "heart healthy" diet. Here are some normal cardiovascular changes that are associated with aging.[4,9]

- Heart valves lose elasticity and stiffen, thus decreasing cardiac conductivity.
- Left ventricular wall thickens.
- Increased potential for postural hypotension.
- Increased risk for arrhythmias.
- Arterial elasticity decreases, which increases the risk for systolic hypertension and left ventricular hypertrophy.
- Increased risk for "silent" heart attack.
- Decreased blood perfusion to vital organs and the periphery of the body. This is due to arterial "stiffening," and may make it difficult to palpate some peripheral pulses.
- Veins thicken, allowing for increased valvular reflux (backflow of blood) and increasing the risk for varicosities and dependency edema after sitting or standing for long periods of time.
- Decreased cardiac ability to handle stressful activities, such as shoveling snow.

Assessment tip: *You may hear bruits (swishing or blowing sounds) over arteries such as the carotid arteries in elderly patients who have atherosclerosis. Pay special attention to this finding because there is a high incidence of stroke associated with bruits.*[4]

Although the preceding normal aging changes must be acknowledged, nurses should not expect older adults to experience a debilitated cardiac system because of aging alone. By remaining physically active, not smoking, maintaining a normal weight, eating a healthy diet, and controlling blood pressure and cholesterol, geriatric patients can lead healthy lives and maintain a healthy cardiac status. However, chest pain, abnormal fatigue and significant sleep disturbances are not normal and may indicate cardiac pathology. Let's review some of the more common cardiac problems seen in elderly persons: hypertension and myocardial infarction (heart attack).

Hypertension

About 25 percent of American adults have hypertension. Untreated, high blood pressure can lead to stroke, heart attack, blindness and renal dysfunction. It increases the workload of the heart, which can lead to heart failure and pulmonary edema.[24]

The National Institutes classify blood pressure based on stages as follows.[4,24]

Systolic	Diastolic	Stage
<120 mm Hg	<80 mm Hg	Normal
120-139 mm Hg	Or 80 to 89 mm Hg	Pre-hypertension
140 to 159 mm Hg	Or 90 to 99 mm Hg	Hypertension Stage 1
>160 mm Hg	Or > 100 mm Hg	Hypertension Stage 2

Assessment tip: *A systolic blood pressure greater than 140 mm Hg is a more significant cardiovascular disease risk factor than diastolic blood pressure*.

If blood pressure readings indicate hypertension, make sure that the cuff size is appropriate for the patient's arm circumference and that the cuff is properly applied. Check blood pressure in standing, sitting and supine positions. Ask the patient whether he drank beverages containing caffeine or if he is stressed or emotionally upset, which can cause an elevated reading. Do not initiate treatment based on one reading, especially if dietary or emotional factors influence readings.[4,24]

Patient education for older adults should include these items:[24]

- Maintain a healthy weight.
- Reduce salt intake.
- Stop or do not start smoking.
- Initiate a medically approved exercise program.
- Increase potassium, especially if taking potassium-depleting diuretics. Fruits and vegetables are good sources of potassium.
- Reduce stress. A consult concerning methods of relieving stress (counseling, relaxation techniques, etc.) may be necessary.

Assessment tip: *Remember that the patient must be a partner in developing treatment regimens! His cooperation is essential if treatment and patient education are to be effective*.

Heart attack

Most nurses are aware of the signs and symptoms of heart attack. Many patients are aware of them as well. Most clinicians and even laypersons think of crushing, substernal chest pain; jaw pain; pain that radiates to the left arm, neck, jaw or shoulder; sweating; nausea; vomiting; and some respiratory discomfort as typical presenting symptoms.[24] However, these typical symptoms may not be present. In fact, women often present with atypical symptoms. Let's review the atypical symptoms as part of the assessment process

because such signs and symptoms may not be as familiar as the typical symptoms.

Women and heart attack

After a woman experiences menopause, she is at as much risk as men. Women are typically older than men when they present with symptoms of cardiovascular disease. This is because, prior to menopause, estrogen seems to offer some protection against cardiovascular disease. Therefore, the earliest presenting age of symptoms is generally older, but this depends on the age of the woman when she experienced menopause.

One in four women die of heart disease in the United States. (One in 30 die of breast cancer). Twenty-three percent of women die within one year after having their first heart attack, and within six years of having a heart attack, approximately 46 percent of women become disabled with heart failure. About 66 percent of women who have heart attacks fail to make full recoveries.[9]

These statistics illustrate how important it is for older women to be assessed for heart disease. Part of this assessment is to identify those atypical symptoms of heart attack in women, who are more likely to experience:[9,24,25]

- Indigestion or "gas-like" pain.
- Feelings of "tightness" in chest.
- Fullness or pressure in the chest.
- Discomfort in the back, neck, stomach or jaw.
- Dizziness.
- Shortness of breath.
- Nausea.
- Cold sweat.
- Unexplained feelings of weakness and extreme fatigue.
- Pain or discomfort between the shoulder blades.
- Sense of impending doom.

Women may also experience the typical symptoms the same as men. But their atypical symptoms are just as significant as those experienced by men. It is imperative that nurses teach their female patients about the symptoms women are likely to experience when having a heart attack. If they do not recognize signs and symptoms indicating a medical emergency, they may delay or refuse to seek help. In fact, findings from recent research show that women wait an average of 22 minutes longer than men to seek help when having a heart attack.[9] This delay can cause serious complications, including death. The sooner treatment is initiated, the better are the chances of reducing damage to the heart and resulting complications.

In summary, cardiac status in older adults does not necessarily deteriorate enough to adversely affect health and well-being. Leading a "heart-healthy" life can promote cardiac wellness throughout the life span.

The respiratory system

As with the cardiovascular system, it can be difficult to distinguish normal age-related changes from pathology in the older person's respiratory system. The following changes in lung physiology and structure occur with normal aging and can influence the effectiveness of respirations.[9]

- Decrease in lung elasticity, reducing the ability of the lungs to recoil.
- Decreased airway clearance, cough reflex and laryngeal reflex.
- Chest muscles are decreased in strength; chest wall stiffens.
- Ciliary action decreases, which increases the risk of respiratory infection as well as aspiration.
- Decreased ability of the lungs to respond to elevated levels of carbon dioxide.
- Immune system antibody production decreases, thus increasing susceptibility to lung infections.

Assessment tip: *Smoking contributes to all forms of lung disease. Help patients to quit smoking. Be aware of smoking cessation programs that patients can access.*

Here are some patient education items to help patients avoid or reduce the risk for lung disease.[9,24]

- Stop smoking!
- Avoid contact with family and friends if they are ill.
- Wash hands frequently. Carry antibacterial hand wash and use it when in public.
- Receive the pneumonia vaccine if not contraindicated.
- Drink plenty of fluids to maintain hydration and keep lung secretions moist.
- Take 10 deep breaths every hour to expand lungs.

Let's look at some lung diseases that are often found in older patients and treatment issues impacted by age.

Pneumonia

Pneumonia, an acute infection of the lungs, is among the leading causes of death in the United States.[24] Prognosis is usually good for persons with normal lung function. However, age-related changes in the respiratory system can make it difficult for elderly patients to recover.

Currently the vaccination for pneumonia is recommended for all individuals aged 65 and older and for all adults who are dealing with chronic illnesses or have suppressed immune systems. The vaccine is about 80 percent effective, but effectiveness does decrease over time. [9]

Patients who are immobile after surgery, have limited mobility due to physical deterioration or who lead sedentary lifestyles are at risk for lung disease. Encourage patients to change position, become and stay ambulatory, and take frequent deep breaths. As always help patients access smoking cessation programs if they smoke!

Assessment tip: *A word about influenza. Encourage elderly patients to be vaccinated against the flu annually. They may think that it is not a serious illness, but it can be fatal, especially in those of advanced age!*

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is chronic airway obstruction that is the result of emphysema, chronic bronchitis, asthma or any combination of these diseases.[24] Smoking is probably responsible for more than 90 percent of diagnosed cases of COPD.[9] Other contributing factors include chronic respiratory infections, air pollution and inflamed lung tissues.[24]

COPD also compromises cardiac function, placing strain on the right ventricle, which is responsible for pumping blood into the lungs.[9] Older patients are particularly vulnerable to compromised cardiac function as a result of COPD.

The earliest clue to the presence of COPD is an early morning cough that produces clear sputum. Periods of wheezing may occur if the patient has a "cold." As the disease progresses, shortness of breath develops and becomes progressively worse.[9,24] The usual progression of COPD looks like this:[9]

- There are usually no symptoms within the first 10 years after the patient starts to smoke.
- At about 10 years after starting to smoke, the patient develops a chronic cough that produces a clear sputum.
- At the age of 40 or 50, the patient begins to exhibit dyspnea.
- At about the age of 50, patients begin to be vulnerable to respiratory infections with progressively longer recovery times.
- As COPD progresses, shortness of breath occurs with the most minor activities, such as making a bed.

Assessment tip: *Elderly patients who suffer from COPD often have calluses on their elbows. This is the result of leaning over tables to stretch out their upper body so that more air can enter and leave the lungs during respiration.[9,24] Be alert for this sign. Watch for signs that your patient is attempting to stretch out his torso to facilitate breathing.*

Lung cancer

Lung cancer is the most common cause of cancer deaths in men and women. The most current available statistics show that in 2004, lung cancer was responsible for more deaths than breast cancer, prostate cancer and colon cancer combined.[9,24] Once more predominant in men, lung cancer rates in women are rapidly increasing as the incidence of female smokers increases.

Lung cancer is largely preventable.[24] Smoking is the biggest risk factor for developing the disease. The pollutants in tobacco smoke cause progressive lung cell degeneration. Lung cancer is about 10 times more common in smokers than non-smokers, and 80 percent of patients with lung cancer are smokers.[24]

Symptoms of lung cancer mimic symptoms of other lung diseases. Chronic cough, shortness of breath, coughing up blood, fatigue, weight loss and frequent lung infections are common symptoms.[9,24] Older patients may undergo surgical removal of the tumor, part of the lung,

or the entire lung depending on the extent of the tumor and the patient's general condition. Radiation and chemotherapy may also be necessary.[9,24]

Pulmonary embolism

Pulmonary embolism is not a disease but a complication of primarily hospitalized patients. It occurs when part of the pulmonary arterial bed is obstructed by a dislodged thrombus, an air bubble, or tissue fragment of lipids.[9,24] Pulmonary embolism results in about 100,000 deaths every year and is the third leading cause of death in the United States.[9] Symptoms of pulmonary embolism include rapid respirations, dyspnea, chest pain, hypoxia, decreased cardiac output and possibly shock.[9,24]

Risk factors for pulmonary embolism include immobility, surgery, obesity, clotting disorders, dehydration, atherosclerotic changes in the elderly person's circulatory system and atrial fibrillation.[9] Many of these risk factors are found in the elderly population as part of normal aging changes. Teach your patients how to avoid this complication, especially if you know they are facing upcoming surgery.

- Teach and facilitate the patient's ability to perform active range of motion exercises.
- If the patient is unable to perform active range of motion, teach caregivers how to perform passive range of motion exercises.
- Facilitate the administration of low-dose anticoagulant therapy.
- Implement compression stockings as appropriate.
- Encourage early postoperative ambulation.
- Teach patients to change position and move lower extremities frequently

Smoking cessation

Since smoking cessation is so critical to the prevention of and reducing the effects of lung disease, it is worthwhile to spend some time discussing ways to facilitate the process.

Some older adults (and some health care professionals as well) may believe that if they have smoked most of their lives, it will do no good to stop now. This is not true! The effects of smoking can actually begin to reverse themselves. If older adults stop smoking, their risk of heart attack, stroke and cancer goes down. Circulation improves and so does lung function. Eliminating tobacco products can also help to keep diseases such as COPD and bronchitis from getting worse.[9]

Some older adults may think that they are more likely to return to smoking after they have quit. In fact, research shows that older smokers are much more likely than younger smokers to stay away from tobacco products. Older smokers also seem to know more about the health benefits of quitting smoking.[9]

How can you help older patients to stop smoking? Here are some suggestions.

- Involve the patient's family, friends and/or caregivers. It is not easy to quit smoking, and the support of significant others in the patients' lives can be a big help.
- Find out if the patient lives with or has frequent contact with people who smoke. It is very difficult to stay away from tobacco products if constantly in the company of others who are smoking. If possible, the patient may be able to avoid the company of others who smoke.
- Consult with the patient's physician or nurse practitioner about prescription and non-prescription aids for smoking cessation.
- Keep an objective, non-judgmental attitude. Stopping smoking is difficult, and feeling that nurses and other health care professionals disapprove of them or their behaviors only makes the process more difficult. Patients need encouragement and support to stop smoking.
- Find out about reputable smoking cessation programs in the community and on the Internet. Support groups can be very helpful. Many older adults often explore the Internet and seek out health information online. There are many excellent health resources on the Web. However, there are also many fraudulent, inaccurate sources of information. Familiarize yourself with websites that are good sources of information and support for those trying to quit smoking. Older adults who have limited access to transportation or who have limited mobility may rely on the Internet for information and communication with others. Be able to guide them towards reliable online sources of smoking cessation programs.

The endocrine system

The endocrine system is responsible for managing the body's metabolic functioning. The endocrine glands manufacture and release hormones that trigger cellular responses and actions.[9]

Normal age-related changes in the endocrine system include:[9,24]

- Decreased pancreatic secretion of insulin.
- Decreased body sensitivity to insulin, which causes changes in blood glucose levels.
- The peripheral tissues of the body become resistant to insulin. This resistance is especially evident in persons who are obese.
- Changes in thyroid function that can cause systemic problems.

The normal age-related changes in the endocrine system most predominantly affect the body's use of insulin and the ability of the thyroid to function. Therefore, let's look at the effects of diabetes mellitus and thyroid malfunction.

Diabetes mellitus

Diabetes mellitus (DM) is quite prevalent, and its incidence is increasing in people who are over the age of 65. This increase is especially evident in persons who belong to racial and ethnic minorities.[9]

Type 1 DM is usually an autoimmune disease and most often affects children and young adults. Type 2 DM most often begins as insulin resistance because of changes in the endocrine system and is linked to old age, family history and obesity. The incidence of type 2 DM is increasing in the geriatric population.[9,24]

Risk factors for DM 2 include the following factors:[9,24]

- Over 45 years of age: risk increases with age.
- Obesity.
- Inactive lifestyle.
- Hypertension.
- Family history of DM.
- Elevated cholesterol.
- Persons of African American, Hispanic, Pacific Islander, Asian American, and Native American origin.
- Impaired glucose tolerance.

Signs and symptoms include fatigue, polyuria dehydration, thirst, poor skin turgor, dry mucous membranes and unexplained weight loss.[24] Older patients with DM may most often exhibit the following.[9,24]

- Excessive thirst: This is a cardinal symptom. However, older adults may not report excessive thirst because the thirst mechanism functions less effectively in older adults than in younger adults.
- Excessive hunger.
- Blurred vision.
- Vaginal infections.
- Frequent urinary tract infections in women.
- Skin infections.
- Difficulty healing.

Assessment tip: *To help prevent urinary tract infections, encourage older patients to drink cranberry juice, which is believed to stop bacteria from sticking to the lining of the bladder*.[9]

The treatment regimen for DM in older adults is similar to that of younger adults. There are a few issues that deserve special emphasis in the older population, however. These include the following:[9,24]

- **Meticulous foot care**: The older person must be taught (or his caregiver taught) to examine his feet for any open areas, cracks or evidence of compromised skin integrity. Feet should be washed and carefully dried every day. Special attention should be given to the areas between the toes, which are harder to keep dry. Socks should be changed daily and be kept clean and dry. Referral to a podiatrist is appropriate. Older persons with DM should not cut their own toenails because of the risk of cutting the skin of the feet, thus increasing the risk of infection, and should visit a podiatrist regularly to have their toenails cut and feet evaluated. Shoes should be fit by someone who is familiar with the problems of DM. If cost is an issue, refer patients for financial counseling. Nurses should be aware of podiatrists in the community who make special arrangements for older persons in financial difficulty. Teach the patient never to walk barefoot.
- **Checking blood glucose**: Evaluate the older adult's ability to perform blood glucose monitoring and evaluate the results. As

necessary, teach other family members or caregivers to perform this task.

- **Medications**: Teach patients, families and/or caregivers about the medications the patient is taking and the potential for side effects.
- **Diet**: The dietician should be involved in helping the patient understand dietary implications. If the patient is unable to adhere to dietary restrictions, programs such as Meals on Wheels may be initiated.
- **Signs and symptoms**: Teach patients, family members and caregivers the signs of hyperglycemia and hypoglycemia and what to do in the event of occurrences.
- **Blood pressure**: Help the patient to adhere to blood pressure management regimen. If he is not hypertensive, teach him ways to avoid developing high blood pressure.
- **Exercise**: In conjunction with the patient's physician, physical therapy and others, nurses must help the patient to design an exercise program appropriate for his state of health and wellness.

Management of DM is a lifelong endeavor. The nurse must help the patient, family and caregivers to adapt to the lifestyle modifications necessary for the maintenance (or achievement) of a maximum state of health and well-being. The elderly patient may have difficulty adjusting to some aspects of the ongoing nature of DM management. Physical limitations may prevent him from performing foot care or administering insulin, if needed. Nurses need to make sure that the patient has adequate resources and support systems to help him manage his care.

Thyroid problems

The incidence of thyroid disorders increases with age. As a person ages, the thyroid slowly loses its ability to function and begins to atrophy. It becomes more nodular, and the occurrence of thyroid nodules and hypothyroidism increases significantly with age. The thyroid antibody levels rise with age, which makes it difficult to determine whether such elevation is pathological or part of the aging process. Hyperthyroidism rates are similar for younger persons and older adults, but the disease may produce less obvious symptoms in the elderly, making diagnosis problematic. The incidence of hypothyroidism is quite a bit higher in women compared to men in all age groups, and is higher in the elderly who live in long-term care facilities than older persons who live in the community.[9]

Some important points about hyperthyroidism in the older adult are:[9,24]

- Hyperthyroidism is harder to diagnosis in the elderly compared to younger people because older adults present fewer signs and symptoms. Additionally, their symptoms may be different than those of younger persons.
- The predominant symptoms of hyperthyroidism in older people are rapid heart rate, weight loss, fatigues, apathy, changes in sleep patterns, mood changes, changes in bowel movements, visual disturbances and weakness. The thyroid is usually not enlarged nor is it easy to palpate. By contrast, the predominant symptoms in younger persons are nervousness, anxiety, heat intolerance, sweating and an enlarged thyroid.
- About 27 percent of older persons who have hyperthyroidism present with some type of cardiac symptoms such as atrial fibrillation, chest pain, angina and even heart failure. These symptoms may be mistaken for active cardiac disease, and the actual cause, hyperthyroidism, may be overlooked or not even considered.

Nurses need to be aware of conditions, such as hyperthyroidism, that mimic other conditions common in the elderly population. Treatment of hyperthyroidism in older adults generally consists of ingesting radioactive sodium iodide instead of surgery. If treatment results in hypothyroidism, thyroid replacement therapy is intitiated.[9,24]

Hypothyroidism is rather common. Here are some points about hypothyroidism in the elderly population.[9,24]

- The older person who is diagnosed with hypothyroidism is typically a female over the age of 50.
- Older persons who have hypothyroidism present with fewer symptoms than do younger people. Generally, their symptoms are rather non-specific and can be attributed to a variety of other health problems.
- The symptoms of hypothyroidism most often noted in older people include mental deterioration, new patterns of incontinence, reduction in mobility and difficulty coping.
- Untreated hypothyroidism may lead to hypertension and hyperlipidemia, both of which are common in the elderly population. A life-threatening complication of untreated hypothyroidism is myxedema coma, a life-threatening medical emergency. In myxedema coma, mental confusion deteriorates to stupor and coma and significant electrolyte imbalances. Emergency intensive care hospitalization is required if this potentially lethal complication develops.

The goal of treatment of hypothyroidism in the older adult is to alleviate symptoms and return the thyroid-stimulating hormone (TSH) to normal levels. However, TSH replacement must be done with caution because an increase in levels may trigger significant cardiac problems.[9]

In summary, thyroid problems in the older patient are often difficult to diagnose. Presenting signs and symptoms may be subtle and mimic a variety of diseases and disorders commonly found in this population. It is important to rule out conditions such as heart disease and to determine whether two or more problems co-exist simultaneously.

Unfortunately, because of the vagueness of clinical presentation, thyroid disorders are often overlooked in the elderly patient. Nurses have excellent opportunities to serve as advocates for patients and to remain aware of the possibility of thyroid disease when they perform geriatric assessment. If thyroid disease is suspected, nurses should advocate for laboratory assessment of thyroid hormone levels.

Some of the nurse's responsibilities include the provision of careful patient education. Patients will most likely be on some type of medication for the remainder of their lives. They need to understand the importance of taking their medication as prescribed. They also need to be aware of the signs and symptoms of hyper- and hypothyroidism. Patient education efforts should focus on disease management and adherence to treatment regiments.

The hematologic system

The main function of the hematologic system is the ability of the circulating blood to transport oxygen and nutrients to the body's internal organs and peripheral tissues and to remove carbon dioxide and waste products.[9]

There are a number of age-related changes that occur in the hematologic system. These include the following:[4,9,24]

- As the body ages, the bone marrow's ability to manufacture red blood cells (RBS) swiftly in the event of blood loss or disease slows. This does not usually have a major impact on health and wellness unless the blood loss or disease process is extensive.
- Hemoglobin and hematocrit values are slightly decreased, but should remain within normal ranges.
- There is a reduction in the number of stem cells.
- There is a decreased production of intrinsic factor, which can trigger pernicious anemia.
- Cellular immunity decreases.
- The functional ability of the lymphocytes decreases.

The most common hematologic disorder is anemia. Although common in older adults, anemia is not a normal age-related change, contrary to what some health care professionals may believe. Anemia is a sign of disease, and if it occurs, it cannot be successfully treated until the underlying cause is addressed.[9,24]

Anemia exists when there is an inadequate amount of hemoglobin to meet the body's needs. It is defined as a reduction in the number of circulating RBCs. This reduction can be due to loss of blood, an abnormally high rate of RBC destruction, or an inadequate or impaired production of RBCs.[9]

There are several types of anemia. Some of those most commonly found in elderly patients are as follows:

Pernicious anemia

Pernicious anemia is characterized by a decreased gastric production of hydrochloric acid and a deficiency of intrinsic factor.[24] Factors that contribute to this problem are small bowel disease, infection, excessive use of antacids, overgrowth of intestinal bacteria and a strict vegetarian diet.[9] The incidence of pernicious anemia increases with age. As people age, the body's ability to absorb vitamin B12 diminishes.

This vitamin is necessary for RBC growth.[24]

Signs and symptoms of pernicious anemia include:[24]

- Cardinal signs of weakness, sore tongue, and numbness and tingling of the extremities.
- Lips, gums and tongue seem to be bloodless.
- Patients are quite vulnerable to infections.
- The sclera and skin may be jaundiced.
- GI symptoms may include nausea, vomiting, weight loss, diarrhea, flatulence and constipation. The tongue may become inflamed, and the gums may bleed.
- Neurologic symptoms: Weakness, poor coordination, ataxia, dizziness and loss of bowel and bladder control.
- Cardiovascular symptoms: Reduced hemoglobin levels, decreased cardiac output, rapid heart rate and arrhythmias.
- Musculoskeletal symptoms: Scissors gait may develop as a late sign if pernicious anemia goes untreated.

Pernicious anemia is treated with a high dose of parenteral vitamin B12 replacement therapy. This triggers rapid regeneration of RBCs. After hemoglobin levels return to normal and the patient's condition stabilizes, vitamin B12 can be administered monthly at maintenance level doses. Since the patient must continue to receive vitamin B12 injections for the rest of his life, he, a family member, or caregiver should learn to administer the injections.[24]

Folic acid deficiency anemia

Folic acid deficiency anemia is a common, slowly progressive anemia seen in not only the elderly but in infants, adolescents, pregnant and lactating women, alcoholics, and people with cancer or intestinal diseases. Folic acid deficiency may be due to poor diet, impaired absorption, and prolonged use of certain medications such as anticonvulsants and estrogens.[24]

Assessment tip: *Older adults living alone or who are impaired physically and mentally may lack essential nutrients in their diets. Remember that part of nutritional assessment should include screening for anemia*.

Typical symptoms of folic acid deficiency anemia include fatigue, shortness of breath, fainting, irritability, nausea, anorexia and headache. Treatment consists of the administration of folic acid supplements and correction of underlying causes. Supplements may be given orally or parenterally.[9,24]

Assessment tip: *Teach elderly patients about foods that are high in folic acid to help prevent folic acid deficiency anemia. Such foods include liver, orange juice, whole grains, beans, nuts and dark green leafy vegetables*.[9]

Hemolytic anemia

Hemolytic anemia is due to the premature destruction of RBCs (hemolysis). The body attempts to compensate for this destruction by increasing production of immature RBCs in the bone marrow. Hemolytic anemia becomes more common with aging. Infections, malignancies, trauma burns and exposure to toxic substances can cause this type of anemia. Drugs associated with its development include ibuprofen, aspirin, acetaminophen, insulin, some antibiotics and sulfonamides.[9,14]

The focus of treatment is folic acid supplements, because folic acid is depleted with increased bone marrow production of RBCs. Correction of underlying causes must also be accomplished. In addition to supplement administration, the patient's diet should be rich in foods high in folic acid such as beans, nuts, whole grains and green leafy vegetables.[9]

Malignancies of the hematologic system

Malignancies of the hematologic system are associated with overproduction of lymphoid and myeloid cells linked with bone marrow failure. They are characterized by the accrual of large numbers of white blood cells (WBC) in the bone marrow, liver, spleen, lymph nodes and central nervous system.[9]

Acute leukemia

Acute leukemia is a proliferation of the precursors of WBCs in bone marrow or lymph tissue. They accumulate in bone marrow, body tissues and peripheral blood. With treatment, children between the ages of 2 and 8 have the best chance of survival (about 50 percent). Adults, however, generally survive about only about one year after diagnosis, even with treatment.[24]

Onset in children is quite dramatic. In older adults, the onset is more gradual, with presenting symptoms of weakness, pallor and acute confusion. The liver, spleen and lymph nodes are found to be enlarged upon palpation. Persons of advanced age have a poor prognosis. Treatment involves the administration of various combinations of drugs to inhibit WBC production. Bone marrow transplant is rarely initiated in persons over the age of 65. Infections are a leading cause of death in older patients, who, even with treatment, relapse within one year.[9]

Chronic lymphocytic leukemia

Chronic lymphocytic leukemia (CLL) is a progressive disease that is common in the elderly. It is characterized by uncontrollable spread of abnormal lymphocytes in blood, bone marrow and lymphoid tissue. Almost all patients diagnosed with CLL are over the age of 50.[24]

Typical symptoms include fever, fatigue, malaise and lymph node enlargement. As the disease reaches advanced stages, fatigue, weight loss, bone pain and liver or spleen enlargement become apparent. Treatment consists of chemotherapy and radiation. Curiously enough, early treatment is not associated with increased survival. Thus, treatment is not initiated in older persons until they manifest weight loss, night sweats, fever or enlarged lymph nodes.[9]

Lymphomas

Hodgkin's disease is a malignancy of the lymphoid tissue characterized by painless, progressive enlargement of lymph nodes, spleen and other lymphoid tissue. This disease is most common in young adults, but its incidence peaks in two age groups: persons who are between 15 and 35 and people over 50.[24]

It is believed that there is a viral connection associated with the development of Hodgkin's disease, with the Epstein-Barr virus as the focus of attention. Risk factors include a family history of infectious mononucleosis and an immune system that is compromised.[24]

Symptoms include painlessly enlarged lymph nodes, persistent fever, night sweats, fatigue, weight loss, pruritis and anemia. The disease is treated with radiation, chemotherapy, or both and depends on the stage of the disease. Older adults usually receive chemotherapy for six to eight months.[9,24]

Non-Hodgkin's lymphoma is a malignancy of lymphoid tissue but is not diagnosed as Hodgkin's disease. It is more systemic in nature than Hodgkin's disease, and prognosis is usually poorer. Normal lymphoid tissue is replaced by cancerous cells. This compromises the immune system and leads to infections.[9,24]

The first symptoms of the disease are usually swelling of the lymph glands, enlarged tonsils and adenoids, and painless, rubbery nodes in the cervical supraclavicular areas. Fatigue, malaise, weight loss, fever and night sweats may also be present.[24]

The cause of non-Hodgkin's lymphoma is unknown, but a viral link is suspected. Persons with impaired immune system abnormalities or those taking phenytoin seem to be at increased risk to develop the disease.[9] Treatment includes chemotherapy and, in localized cases, radiation. Another option is the administration of monoclonal antibodies, specifically rituximab.[24]

Both types of lymphoma may be curable, depending on the stage of the malignancy, with radiation and aggressive chemotherapy. However, older adults may not be able to tolerate such intense treatment. The geriatric patient may need assistance with activities of daily living as he undergoes treatment for the disease, which may take six months or longer.[9]

Patients should also take every precaution to avoid infection. They should avoid crowds, and family members and friends who are ill, even with minor infections such as colds, should not come into contact with the patient.

The nervous system

The nervous system consists of two systems: the central nervous system and the peripheral nervous system. The central nervous system consists of the brain and the spinal cord. It is responsible for the integration of all nervous system activities.[9]

Parts of the brain include the cerebrum, the brain stem, the cerebellum, the limbic system and the reticular activating system (RAS).[4] The cerebrum contains the nerve center that controls intelligence and motor and sensory function. The brain stem serves as the relay center for messages between the various parts of the

nervous system. The cerebellum is responsible for maintaining muscle control, balance and coordination. The limbic system initiates the basic human drives such as hunger, emotional and sexual arousal and aggression. The RAS assesses all incoming sensory information and sends it to the appropriate areas of the brain for interpretation. It is also imperative for maintaining consciousness.[4,9]

The brain is divided into the right and left hemispheres, which are further divided into four lobes: frontal, temporal, parietal and occipital.[9] It is important to know the functions of the various lobes because damage to one or more locations affect various body system functions.

- The frontal lobe is responsible for personality, judgment, abstract reasoning, some aspects of language (Broca's area), motor function, problem solving, reasoning and memory.[4,9]
- The temporal lobe is responsible for language comprehension (Wernicke's area), some memory recall and hearing.[4,9]
- The parietal lobe integrates sensory information such as temperature and taste. It also interprets, size, shape, texture and distance.[4,9]
- The occipital lobe interprets visual stimuli.[4,9]

The spinal cord reaches from the first cervical vertebrae to the lower border of the first lumbar vertebrae. The spinal cord is the major pathway for messages that travel back and forth between the brain and the body's peripheral areas.[4]

The peripheral nervous system is composed of the cranial nerves, spinal nerves, the somatic and autonomic nervous system, and the reflex arc. There are 12 pairs of cranial nerves that transmit motor and/or sensory communications between the brain or brain stem and the head and neck.[4] There are 31 pairs of spinal nerves that transmit messages to and from various regions of the body.[4,9] The somatic nervous system functions as the link between the brain via the spinal cord to muscles and sensory receptors. The autonomic nervous system is responsible for maintaining homeostasis.[9]

It can be a challenge to differentiate between normal aging changes of the central nervous system and pathology. The impact of aging on the nervous system varies quite a bit among elderly adults. Experts recommend that health care professionals "not treat normal aging changes as disease. A common myth is that cognitive decline is inevitable."[9] There are some age-related changes in memory and attention, but older adults retain the ability to learn new things and live independently as long as neurological disease and pathologies do not occur.[9]

Here are some normal age-related changes of the nervous system.[4,9]

- Decrease in size and weight of the brain.
- Decrease in number of neurons.
- Decrease in short-term memory.
- Decrease in blood flow to the brain.
- Decrease in coordination.
- Decrease or absence of deep tendon reflexes.
- Decrease responses and movements.
- Increase in pain threshold.
- Increase in incidence of physiologic tremor.
- Decreased reaction time.
- Sleep disturbances become more common, including insomnia and loss of REM sleep.
- Incidence of mood disorders and depression increase.

Normal age-related changes may mimic pathological changes. Here are some common diseases of the nervous system seen in elderly persons.

Parkinson's disease

Parkinson's disease is a chronic, progressive disease characterized by progressive muscle rigidity, involuntary tremor, akinesia and dementia. Complications include aspiration pneumonia, infection, injury from falls, urinary tract infections and compromised skin integrity. Parkinson's disease in found in two out of every 1,000 people. It usually develops after the age of 50, but can occur in children and young adults.[24]

The cause of Parkinson's disease is not known, but research suggests that exposure to environmental toxins or genetic predisposition may play significant parts in its development. Studies of the pathophysiology of the disease show that a dopamine deficiency inhibits the affected brain cells from functioning normally.[23] There are no definitive diagnostic tests. Diagnosis depends on age, history and presenting signs and symptoms.[4,9] Nursing assessment may be critical to the diagnosis of this and other diseases that occur in the elderly adult.

There is no cure for Parkinson's disease. Treatment focuses on symptom relief and maximizing function for as long as possible. Drug therapy generally includes levodopa, a dopamine replacement; physical therapy; and in very severe cases, stereotactic neurosurgery or the controversial treatment of fetal cell transplantation.[24]

Assessment tip: *Dosages of anti-Parkinson drugs may need to be decreased in elderly patients because of inability to tolerate higher doses of such medications. Patients must be taught to recognize medication side effects, such as orthostatic hypotension, irregular heartbeats, anxiety or confusion*.[24]

Transient ischemic attack (TIA) or "mini-stroke"

> *Mrs. Stevens is 80 years old, She lives with her husband, who is 81 and dealing with prostate cancer. During an appointment with his oncologist, Mr. Stephens tells the nurse practitioner that he is worried about his wife. He says, "I think there might be something wrong with my wife. Sometimes she acts like she doesn't know what's going on. Her speech gets really funny, and she can hardly walk. It only lasts for a few minutes, and then she is OK. But I don't think this is good."*

Mr. Stephens is right to be concerned about his wife. Transient ischemic attack (TIA), often referred to as a "mini-stroke," is a neurologic deficit caused by microemboli that temporarily interrupt blood flow in the cerebral circulation. This interruption causes symptoms that correlate with the area of the brain affected and may include double vision, slurring speech, trouble walking, falling and dizziness. The effects last from seconds to hours and resolve spontaneously. There is not permanent damage from TIAs, but their occurrence is considered to be a warning sign of impending stroke. Incidence increases significantly after the age of 50 and is greatest among men and African-Americans.[9,24]

The occurrence of TIAs indicates a need for meticulous assessment and actions to prevent the occurrence of stroke.

Cerebrovascular accident (stroke)

Stroke is an abrupt impairment of cerebral circulation. This impairment interrupts the flow of oxygen to the brain, which can cause serious damage to brain tissue. Depending on the location and extent of damage, the patient can be left with serious disabilities that may affect all aspects of daily living.[24]

There are three major types of stroke.[9,24]

- **Thrombosis**: The most common cause in middle-aged and elderly adults, thrombosis causes ischemia in brain tissue affected by diminished circulation.
- **Embolism**: The second most common cause of stroke, embolism is due to the occlusion of a blood vessel by a fragmented clot, tumor, fat, or air.
- **Hemorrhage**: The third most common cause of stroke, hemorrhage is due to a sudden rupture of a cerebral artery.

Signs and symptoms depend on the location of the stroke and may include speech impediments, paralysis or weakness of the extremities, disorientation, vision disturbances, headaches, vomiting and coma.[24]

The sooner the patient receives emergency medical intervention, the better the chances for survival. Emergency administration of medications includes:[24]

- Tissue plasminogen activator to dissolve clots in non-hemorrhagic stroke. It must be administered within three hours of symptom onset.
- The antiplatelet drug ticlopidine may be effective in preventing stroke and in reducing the risk for future strokes in patients who have already suffered one.
- Corticosteroids may be administered to reduce cerebral edema and anticonvulsants given to prevent seizures.

Patients will need long-term follow-up and rehabilitation.

Measures to reduce the risk for stroke include:[24]

- Participate in a regular exercise program.
- Stop smoking.
- Monitor blood pressure and take anti-hypertensives as ordered.
- Reduce salt intake.
- Reduce the intake of saturated fats.
- Eat at least two servings of fish per week.

- Eat five or more servings of fruit and vegetables every day.
- Eat six or more servings of grain products every day.

Seizures disorders

Seizures occur when there is an acute, abnormal release of electrical activity in the brain. Seizures may be partial or focal or generalized. Focal seizures include a brief change in level of consciousness characterized by a blank stare, rolling of the eyes and/or a brief change in level of consciousness. Generalized seizures can include muscular jerks of the extremities or entire body, incontinence, difficulty breathing, apnea and loss of consciousness.[9,24]

The nurse should assess when and how often seizures occur and what occurs during seizures. Some adults may have had seizures for many years due to problems such as epilepsy. They may also develop epilepsy in old age. Adults over 75 are twice as likely to develop new-onset epilepsy than all adult age groups less than 65 years of age.[24]

Nurses should find out what, if anything, triggers seizures and what treatment measures are in place to control the occurrence of seizures. Patient education should stress the importance of adherence to treatment regimens and how to avoid injury in the event of seizures. Family members and caregivers must be involved in patient education as well.

The gastrointestinal system

The gastrointestinal system undergoes quite a few changes with aging. These changes can have significant impact on a person's nutritional status and general health and well-being. The gastrointestinal (GI) system is responsible for digestion, absorption, secretion and motility.[9]

Normal age-related changes in the GI system include:[9]

- Decrease in salivary secretion and the number of taste buds.
- Decreased esophageal mobility.
- Decreased size and weight of the liver.
- Decreased rate of fat, mineral and vitamin absorption.
- Tooth enamel and dentin erode.
- Increased incidence of gastroesophageal reflux.
- Increased incidence of constipation.
- Delay in gastric mobility and emptying.

Assessment tip: *Many medications can add to the age-related changes in the GI system. These include antidepressants, antihistamines, antihypertensives, calcium channel blockers, diuretics and laxatives*.[9,14]

These changes contribute to a number of common age-related disorders in the geriatric patient.

Dysphagia

Dysphagia is the most common esophageal problem in older adults.[9] It is characterized by trouble with any part of the mechanism of swallowing foods or liquids. This problem inhibits adequate nutritional intake and can adversely affect the older adult's health and well-being.

When assessing swallowing, the nurse should be aware of factors than increase the risk of dysphagia.[4,9]

- Reports of dysphagia from patients, families, or caregivers.
- Observation of drooling or dribbling.
- Observation that patient has trouble controlling food or liquids in the mouth.
- Facial drooping or facial paralysis.
- Changes in mental acuity that affect eating.
- Slurred speech.
- Coughing.
- Pocketing food in mouth.
- Changes in voice quality (e.g. weak voice, hoarse voice) when eating.
- Existence of neurologic problems and/or muscle disorders.

Underlying causes, such as tumors, dementia, neurologic diseases and so on, should be identified and corrected or treated. Here are some tips to help reduce dysphagia.[9,24]

- Be sure that the patient is seated comfortably in an upright position.
- Encourage a calm, pleasant atmosphere during meals.
- Avoid extensive conversation. Allow patient to concentrate on eating and swallowing.
- Plan meals with patient's food preferences in mind.

Constipation

Constipation affects up to 20 percent of older adults in the community and between 50 percent and 75 percent of those living in long-term care facilities.[9] Factors that contribute to constipation in the elderly include lack of adequate fluid intake, lack of adequate fiber in the diet, and side effects of medications.

Here are some tips to reduce constipation:[4,9]

- If constipation is due to medications, consult with physician or nurse practitioner about possible changes in medication regimen.
- Increase fluid intake unless contraindicated.
- Increase fiber intake.
- Increase whole grain, fruits and vegetables intake.
- Participate in exercise as tolerated.
- Add stool softeners or laxatives under medical supervision.

Assessment tip: *Patients need to be evaluated for possible serious cause of constipation, such as impaction or bowel obstruction. Be alert to additional symptoms, such as severe abdominal pain, nausea and vomiting, which may indicate bowel obstruction, or a lump or thickening in the lower abdomen, indicating a growth or tumor*.

Fecal incontinence and diarrhea

When evaluating diarrhea, determine the quality of diarrhea. For example, are the stools loose but formed, or watery? Is the diarrhea accompanied by cramps, frequency and/or urgency? How many times a day does diarrhea occur? Diarrhea may be due to viral, bacterial or parasitic infection; medications; tumors; or stress. Treatment measures include identifying and correcting underlying causes and medications to relieve symptoms.

Fecal incontinence may accompany diarrhea or exist with normal quality bowel movements. It may be due to cognitive impairment, tumors or muscle weakness. Correction of underlying causes is necessary, and a bowel-training program is often indicated.

Assessment tip: Bloody stools or passage of blood is a medical emergency and requires immediate evaluation and intervention!

Gastroesophageal reflux disease

Gastroesophageal reflux disease (GERD) is the backflow of gastric and/or duodenal contents into the esophagus. GERD is due to problems with deficient pressure of the lower esophagus, Symptoms range from none at all to heartburn of varying degrees of severity, and pain that radiates to the neck, jaws and arms. The patient may awaken during the night with coughing and a mouthful of saliva.[24]

Many patients, and even health care professionals, may believe that these symptoms are trivial and unlikely to indicate a serious health problem. In reality, GERD may be responsible for 1,700 deaths annually in the United States.[9] Complications include esophageal ulcer, hemorrhage, esophageal stricture, hoarseness, esophagitis and inflammation of the esophagus that can predispose the patient to the development of adenocarcinoma.[9]

Certain medications and substances can increase the risk of GERD. These include antichoinergics, caffeine and alcohol, nicotine, beta blockers, potassium supplements, and non-steroidal anti-inflammatory agents.[9,14]

Treatment of GERD focuses on relief and control of symptoms and promotion of esophageal healing.[9] Lifestyle changes are the first line of treatment and include the following:[9,24]

- **Diet**: Avoid caffeine, chocolate, spicy foods, carbonated beverages, orange juice, tomato juice, alcohol and other beverages that stimulate the production of gastric acid. Reduce fat content in diet.
- **Positioning**: Avoid lying down for at least two hours after eating. Sleep with the head of the bed elevated six to eight inches. Avoid lying on right side, which encourages reflux.
- **Weight**: Achieve or maintain normal weight.
- **Tobacco products**: Avoid use of tobacco products.
- **Stress**: Participate in stress reduction efforts.
- **Alcohol**: Reduce or avoid the intake of alcohol.
- **Medications**: Ask about possible alterations in medical regimen.
- **Clothing**: Avoid clothing that fits tightly.
- **Exercise**: Do not exercise within one hour after meals.
- **Hydration**: Drink six to eight ounces of water with medications.

If lifestyle changes do not control GERD, medications may be necessary. These include:[14,24]

- Promotility agents that improve lower esophageal sphincter tone and stimulate upper GI motility.
- Proton pump inhibitors and histamine receptor antagonists to reduce gastric acidity.
- Over-the-counter antacids, which may reduce symptoms but may cause side effects such as diarrhea, constipation and acid-base disturbances.

In severe cases, surgery may be necessary to control symptoms, prevent complications and stop hemorrhage.

Assessment tip: *Stress the importance of lifestyle changes as the first line of treatment for GERD. Such changes are also helpful to promote overall health and, if effective, can reduce or eliminate the need for medications and/or surgery*.

Peptic ulcers

It is estimated that 10 percent of adults in the United States have peptic ulcer disease. Hospitalization, morbidity and mortality rates for peptic ulcer disease are higher in older adults as compared to younger persons.[9]

Peptic ulcers are defined as circumscribed lesions in the mucus membrane and can be located in the lower esophagus, stomach, pylorus, duodenum, or jejunum. Most peptic ulcers (about 80 percent) are located in the duodenum. Gastric ulcers are most common in middle-aged and elderly men. Risk factors for peptic ulcer development include chronic use of nonsteroidal anti-inflammatory drugs, alcohol and tobacco products.[24]

Ulcer development is caused by infection with Helicobacter pylori and pathologic hypersecretory disorders. Gastric acid is believed to contribute to the development of infection.[24]

Assessment tip: *Blood type seems to influence peptic ulcer development. Gastric ulcers are more common in people with type A blood, and duodenal ulcers are more common in people with type O blood*.[24]

Signs and symptoms include heartburn and indigestion, bloating, abdominal distention, and nausea. Specific symptoms are as follows. Duodenal ulcers cause heartburn, localized mid-epigastric pain that is relieved with eating, weight gain because patients eat to relieve pain, and an unusual sensation of hot water bubbling at the back of the throat. Gastric ulcers cause heartburn and indigestion, pain with eating since food causes the gastric wall to stretch, thus causing pain, and feelings of fullness and bloating.[24]

Treatment includes antibiotic therapy, analgesics and drugs to reduce gastric acid production.[24]

Colorectal cancer

Colorectal cancer is the most common cancer that develops after the age of 65.[9] Early diagnosis and treatment is associated with improvement in survival. Routine colonoscopies are the best diagnostic tool for early diagnosis.

Signs and symptoms may not appear until the disease is advanced. They include overt or covert bleeding; change in quality and/or quantity of bowel movements; black, tarry stools; cramps; urgent need to defecate when first getting up in the morning; feelings of fullness or incomplete evacuation of stool; and blood or mucus in the stool. [9,24]

Treatment depends on the extent of the tumor and the stage of the disease. It can include simple removal of the tumor, removal of part of the intestine, radiation and/or chemotherapy. A colostomy may be needed. This could be temporary or permanent.[24]

Assessment tip: *Elderly adults may assume that symptoms of colorectal cancer are due to aging changes and not report them. Educate patients, families and caregivers about the signs and symptoms of this type of cancer and the importance of appropriate preventive screening*.

The genitourinary system

The genitourinary system is composed of the kidneys, ureters, bladder, and urethra, and the reproductive organs. Since this system is so broad in scope, this section concentrates on those issues most closely associated with the aging process. Age-related changes associated with kidneys, ureters, bladder and urethra include the following:[4,9]

- Nighttime production of urine increases and ability to concentrate urine decreases.
- Blood flow to the kidneys decreases.
- Glomerular filtration rate decreases.
- Bladder capacity is decreased.
- Bladder contractility increases.
- Risk of overflow incontinence and urinary retention increases in men.
- Detrusor becomes unstable in women, causing an increased potential for incontinence.
- Prostate increases in size in men.
- Half-life of drugs is prolonged due to a reduction in renal function.

Assessment tip: *Assess for signs of drug toxicity due to changes in excretion ability of the kidneys*.[9]

Common age-related problems of the kidneys and related structures include the following:[9,24]

Urinary incontinence

Urinary incontinence affects over 13 million adults.[9] It is of considerable concern to older adults, who are often ashamed and embarrassed by the problem. They may not seek help for this problem because they assume it is a normal part of the aging process. Be sure to assess the older patient for urinary incontinence, because this is a problem that can be treated, reduced, and sometimes eliminated.

There are several types of urinary incontinence.[9]

- Stress incontinence occurs when urine is involuntary expelled when a person laughs or coughs. The muscles of the pelvic floor or urethral sphincter are not strong enough to control the loss of urine.
- Overflow incontinence occurs when the bladder muscles stretch beyond their ability to contract or when the urethra is blocked.
- Urge incontinence occurs when there are strong, unexpected contractions of the bladder muscles and the internal sphincter cannot hold the urine in the bladder.
- Functional incontinence is due to a cause not associated with the urinary system. For example, the older adult may not be able to get to a bathroom in time to avoid incontinence or he may be physically unable to reach a bathroom by himself. Another example is that of the adult whose cognition is impaired and who does not recognize the need to void.

Treatment interventions include bladder training. Bladder training involves training the bladder to hold gradually increasing amounts of urine by extending the time between trips to the bathroom. Pelvic floor exercises, also referred to as Kegel exercises, may also be helpful. These exercises involve tightening the bladder muscles and releasing them in patterns of 15. A general exercise program may also help to strengthen appropriate muscles. Bladder irritants such as spicy foods, carbonated beverages, caffeine, and alcohol, may be avoided.[9] There are also a number of protective undergarments that can be worn to protect clothing, stop odor and decrease embarrassment.

Urinary tract infections

Older adults are especially vulnerable to urinary tract infections (UTI). UTIs in older adults are often asymptomatic. Antibiotic therapy may be prescribed, although, in some asymptomatic cases, no treatment may be initiated.[9]

Assessment tip: *In elderly adults, the most common symptoms of UTI are often lethargy and changes in mental status*.[24]

Tips to prevent UTIs include:[24]

- Maintain adequate hydration. Cranberry juice may have some properties that fight infections.
- Void promptly when the urge to urinate occurs. Don't wait a long time between voiding.
- Wipe from front to back after going to the bathroom.
- Avoid using products such as douches and perfumes and scented powders over the genital areas as these can irritate the urethra.

Benign prostatic hyperplasia

Benign prostatic hyperplasia (BPH) affects about half of men between 51 and 60 years of age and 90 percent of men over 80.9 Signs and symptoms include decreased urinary stream and force, feeling of incomplete bladder emptying, frequency and urgency, dribbling, incontinence, difficulty initiating voiding, and, at times, hematuria.[24]

The only effective treatment is surgical removal of the prostate tissue. Such tissue is always biopsied to rule out malignancy.

Malignancies

Bladder cancer is fairly common in older adults, with men nearly four times as likely as women to develop this malignancy. Symptoms are similar to UTI. The first symptom is often painless

hematuria.[24] As with other cancers, treatment depends on the stage of the disease and its exact location. Chemotherapy, surgery and radiation may be part of treatment plan.

The incidence of prostate cancer in men is even higher than that of bladder cancer.[9] Symptoms are usually not evident until the disease is advanced. That is why it is so important to have a prostate examination as part of the annual physical exam. Symptoms include lower back pain, difficulty initiating urination, dribbling, retention of urine, and hematuria.[24] Radiation is used to treat locally invasive lesions. Surgery and hormone therapy also may be used in conjunction with radiation therapy.[24]

Issues related to reproductive organs

Age-related changes in the reproductive system include:[9]

- Decreased libido.
- Breast tissue atrophies.
- Diminished ejaculation in men and the need for more time and stimulation to reach arousal.
- Increased incidence of erectile dysfunction in men.
- Drastically decreased estrogen levels in women, which leads to vaginal dryness and possibly painful sexual intercourse.
- Increase in facial hair in women.
- Increased length of time for arousal in women.

These changes do not prevent older adults from having a satisfying sex life. It is important to assess sexuality as part of physical assessment. For more detailed information about sexual assessment and interventions see the section on Sexual assessment presented earlier in this education program.

Common gynecological malignancies in older women

Uterine, breast and ovarian malignancies are more common in older women than in younger women. Uterine cancer is the most common gynecological cancer in older women.[9] The most common symptom is bleeding from the vagina after menopause. Other signs and symptoms include weight loss and pain, but these do not appear until the disease is advanced.[24]

Treatment includes surgery, which is generally a total abdominal hysterectomy. Hormonal therapy, radiation therapy and chemotherapy in various combinations are generally part of the treatment regimen. [24]

Seventy-five percent of ovarian cancer cases occur in women over 55. Unfortunately, prognosis is often poor, especially in older women. There is no screening test at this time. However, the CA-125 blood test for tumor markers does exist. It is not recommended as a screening tool because there are no data to support the hope that such screening would decrease mortality.[9]

Ovarian cancer is the leading cause of gynecological deaths in the United States.[24] Symptoms are generally vague and include abdominal discomfort, dyspepsia, feeling of being bloated, urinary frequency, abdominal distention and weight loss.[9,24]

Treatment includes removal of the uterus, ovaries, fallopian tubes and omentum. Aggressive therapy is usually indicated, including chemotherapy and sometimes radiation.[24]

According to the American Cancer Society, breast cancer affects approximately one in every 14 women over 60 years old. Risk factors include: age, family history of breast cancer, early menarche and late menopause, ingestion of hormonal contraceptives, use of hormonal replacement therapy for more than five years, never having been pregnant, had first pregnancy after the age of 30, personal history of breast cancer, regular use of alcohol, history of ovarian cancer and exposure to low-level ionizing radiation.[9,24]

Recent controversy over screening recommendations from various health care groups has led to some confusion about the value of screening. In general, recommendations include yearly mammograms for women over the age of 40, monthly self-breast examination, and yearly breast examination by a health care professional.[9] There is some question about the value of mammography for the very old woman. Screening techniques and their value should be discussed with the woman's health care provider.

Treatment of breast cancer includes a variety of options based on the stage of the disease. For localized tumors without metastasis, lumpectomy and radiation are often the treatments of choice.[24] However, a growing number of women are choosing to have mastectomies to avoid the need for adjunct therapy and to decrease the chances of recurrence. Some women with unilateral breast cancer and some with a strong family history or the presence of genetic markers are choosing to have bilateral mastectomies to reduce their risk for developing the disease in the unaffected breast or to prevent the occurrence of the disease at all. Radiation and/or chemotherapy may also be part of the treatment regimen. Treatment options should be discussed at length with the woman's health care team. Ultimately, she must make the choice (e.g. lumpectomy, mastectomy or even refusal to have surgery) herself. It is important that health care providers maintain an objective attitude. Breast cancer triggers not only fear of death but also the fear of disfigurement. Women are usually quite concerned with the cosmetic effects of breast cancer treatment. Reconstruction options should be presented to women undergoing mastectomy.

Assessment tip: *Lymphedema is a potential complication of lymph node removal. The patient must be taught to exercise her arm(s) and hand(s) to avoid the development of this potentially debilitating complication.*

The musculoskeletal system

The musculoskeletal system includes the bones, muscles, ligaments, bursae and joints. The bones or skeleton provides the forma and support of the body. Muscles move the various body parts. Joints, the areas where two bones are attached, provide stability and facilitate mobility.[9]

Changes in the musculoskeletal system may have adverse effects on mobility and decrease the independence of older adults. Normal age-related changes include:[4,9]

- Decreased range of motion of some joints.
- Loss of bone mass.
- Loss of height.
- Joint degeneration.
- Arthritic changes of the joints.
- Problems maintaining balance.
- Problems with the feet, such as corns, bunions and calluses.
- Muscles atrophy.
- Bones become stiffer and brittle.

These changes increase the risk of the following problems.

Osteoporosis

Osteoporosis is a metabolic bone disorder and is the most common metabolic disease, affecting half of all women during their lifetimes. Although its occurrence is higher in women, men are also affected by the disease.[9,24]

Osteoporosis occurs when the rate of bone resorption increases while the rate of bone formation decreases, leading to a loss of bone mass. The exact cause is unknown, but prolonged negative calcium imbalance is probably a contributing factor. The most common presenting symptom is back pain. A loss of height is common, and the risk of fractures and falls is high.[24]

There is no cure for osteoporosis. The goals of treatment are to slow or prevent loss of bone, avoid fractures and reduce pain. Calcium and vitamin D supplements may also be recommended.[9,24]

Assistive devices such as walkers or canes may be used to provide stability when walking. Patients should be taught safety precautions and measures to avoid falls.

There are steps that can be taken to reduce the risk of osteoporosis. These steps may also be part of the treatment regimen for the disease. These steps include:[24]

- **Ingest adequate amounts of calcium and vitamin D**. Postmenopausal women and all women and men over the age of 65 should ingest 1,500 mg of calcium and at least 800 international units of vitamin D on a daily basis. Vitamin D is necessary for the absorption of calcium and enhances muscle strength. Some older adults may understand the need for calcium supplements but fail to realize the need for vitamin D. Patient education should include an explanation of the need for adequate amounts of calcium as well as vitamin D on a daily basis.
- **Alcohol intake should be limited**. Having more than two alcoholic drinks per day may decrease the formation of bone. Alcohol may also adversely affect the body's ability to absorb calcium.

- **Limit the intake of caffeine**. No more than two to three cups of beverages containing caffeine should be consumed per day. Some patients may assume that caffeinated beverages means "coffee." They should be taught that chocolate, colas and teas also contain caffeine.
- **Participate in an appropriate exercise program**. Exercise helps to slow the rate of bone loss and increase bone strength. Weight-bearing exercises are important to help increase bone strength. Exercise programs should be designed and implemented under the supervision of the geriatric patient's health care provider.

Osteoarthritis

Osteoarthritis is the most common form of arthritis. It is a chronic disease that causes deterioration of the cartilage of the joints and development of new bone at the joints. Symptoms often begin after the age of 40 and progress with age.[24]

Signs and symptoms include a deep, aching joint pain, morning stiffness, weather-related aching pain, joint instability and poor posture.[24]

Treatment is aimed at symptom relief and minimizing disability. Joint replacement surgery may be necessary. Assistive mobility devices and anti-inflammatory medications are also used.[24]

Falls

Falls are certainly not a disease condition. But they are a significant health problem of older adults. In fact, falls are the leading cause of death in persons over the age of 65.[24] As age increases, so does the risk of falls and the death rate from falls.

Fall prevention is a key goal of gerontological nursing. Some tips to prevent falls include:

- Make sure patients wear glasses as needed. Assess the home environment for adequate lighting.
- Assess the home for safety. Remove small area and "scatter" rugs, which may cause the older adult to trip.
- Are there stairs in the older person's home? If so, are there safety rails to support the older adult as he ascends and descends the stairs?
- Does the patient use assistive devices for mobility? If so, are they appropriate to the older adult's needs? If he does not use such devices, does he need them?
- Is the older adult alert and oriented? If not, is there someone in the home to help him with safety issues?
- Does the adult get adequate amounts of sleep? Does he seem to be tired or fatigued? Lack of rest and/or fatigue or weakness increase the risk of falls.

Assessment tip: *More than 95 percent of hip fractures are the result of falls. Hip fractures are associated with complications such as permanently decreased mobility and death.*[9]

The immune system

The immune system is responsible for defending the body against infection. The immune system must recognize the normal components of the body and differentiate between these components and foreign substances that are potentially harmful. There are three types of immunity. Natural immunity is "natural" to the body and not produced by an immune response (e.g. an immune response triggered by a vaccine). A human is born with natural immunity. Examples of natural immunity include immunity to diseases that affect animals but not humans. Natural passive immunity is natural immunity that comes as a mother's antibodies cross the placental barrier to the fetus. This type of immunity is only temporary and generally lasts for the first three to six months of the infant's life.[4,9]

Acquired active immunity occurs as a result of the body's response to a foreign substance. For example, if a person has the mumps, his body responds by developing protection against future infections of the virus that causes mumps. Vaccines also cause the body to develop acquired active immunity. Booster vaccines may be necessary to maintain immunity.[4,9]

Acquired passive immunity is acquired when a serum that contains specific antibodies is given to a person who is vulnerable to a particular disease. For example, gamma globulin may be administered to prevent the development of hepatitis A.[9]

The components of the immune system include organs and tissues rich in lymphocytes. The two primary lymphocytes are B cells and T cells. These cells are found throughout the body, but are predominant in the lymph nodes and spleen. They possess receptors that respond to specific antigens.[26] Antigens are substances (usually proteins) that are recognized by the body as foreign and can produce an immune response. This response involves producing antibodies to attack the foreign substance. Antibodies are specific to the antigens that trigger them.[26]

The older person's immune system is not as effective as that of a younger person. However, exercise, diet and emotional well-being all contribute to boosting the immune system and enhancing health and wellness. Specific age-related immune system changes include:[4,9]

- Reduction in the rate and strength of the immune response.
- The number of available B cells decreases.
- The manufacture of antibodies that fail to differentiate between the person's own body and foreign substances increases. This makes the older adult more vulnerable to autoimmune disease development.
- There is an overall decrease in cellular immunity.

As part of the assessment of the immune system, the nurse must recognize those factors that can have an impact on the immune system.

- First, as with most body systems, a person's general state of health and wellness impacts the effectiveness of the immune system. A nutritious diet, adequate rest and relaxation, and social interaction with family and friends all contribute to good health. Patients should also be encouraged to have preventive screenings as recommended by their health care providers.
- Research suggests that the regular exercise may slow the rate or even prevent age-associated decline in the immune system. Benefits of regular exercise include reduced risk for infection, enhanced vaccine efficiency, increased rate of healing after infection and improvement in the performance of activities of daily living. Older adults may find that the practice of moderate, slow-movements, such as those performed in tai chi, a Chinese exercise of ancient origin, have a positive impact on cardiovascular and respiratory function as well as mental acuity, balance, muscle strength, flexibility and immune system response.[24]
- Stress reduction is important to most, if not all, aspects of health. Stress related to living alone, the death of loved ones, financial concerns and/or concerns about dealing with chronic illness all may have an impact on health. Additionally, many older adults are providing caregiver services to a spouse or other elderly significant others. This, too, is a stressful situation. Stress can elevate heart and respiratory rates, blood pressure, and adversely affect emotional stability and ability to concentrate. It may also have a negative effect on the immune system. The relationship between stress and the effectiveness of the immune system is currently the focus of a number of research endeavors.[24]
- The effects of long-term and chronic illness can have an adverse effect on the ability of the immune system to function. Both physical and mental health problems can have a negative impact on the immune system. Since the immune system is interrelated with many other body systems, problems in one system can affect one or more other systems.

There are a number of diseases related to defective immune system responses. Here are some that are common in the elderly population.

Hypersensitivity problems

Mrs. Slater is 68 years old. She recently retired from her job and is looking forward to spending more time with her family and friends. Mrs. Slater lives in Florida, where the climate allows her to spend time gardening year round. Mrs. Slater has a lengthy history of coughing and becoming slightly short of breath when working in her garden, especially in the spring, when her garden is in full bloom. She also sneezes and her eyes water. These symptoms, especially the cough and shortness of breath, have slowly, insidiously become worse with age. She has always attributed such symptoms to "allergies," but at her husband's insistence, she visits their family doctor for evaluation. Mrs. Slater is indeed allergic to some environmental substances, such as pollen,

but she also has asthma, a frequently under-diagnosed problem in older adults.

Mrs. Slater's situation illustrates what is referred to as a hypersensitivity problem. Hypersensitivity problems are excessive immune responses that occur when the immune system has an excessive response to various triggers.[9]

Hypersensitivity disorders or responses are classified as type 1 through type IV. Classification depends on which immune system activity causes tissue damage.[26] A hypersensitivity response does not usually occur with the first exposure to the antigen that eventually causes a symptomatic response. As the body encounters the antigens on a recurring basis, the excessive immune response results in hypersensitivity reactions.[9,26]

- **Type 1 hypersensitivity disorders** are immediate, usually occurring within 15 to 30 minutes after the person is exposed to an antigen (or allergen). These disorders are referred to as anaphylactic, immediate, atopic or IgE-mediated reactions. Sometimes, as in the case of anaphylactic reactions, the type 1 hypersensitivity reaction may be life-threatening. Other examples include reactions to insect stings, food and drug reactions, and some cases of urticaria (hives).[9,26]
  Assessment tip: *Asthma is a common type 1 hypersensitivity reaction that is often both under-diagnosed and under-treated in older adults*.[9]
- **Type II hypersensitivity disorders** are referred to as cytotoxic, cytolytic or complement-dependent cytotoxicity reactions.[26] They also occur within 15 to 30 minutes of exposure and include such problems as transfusion reactions, drug reactions and autoimmune hemolytic anemia.[9]
- **Type III hypersensitivity disorders** are referred to as immune complex disease reactions.[26] They are characterized by the body's failure to remove antigen-antibody complexes from the circulation and tissues.[9] Examples of type III disorders include reactions that are associated with infections such as hepatitis B and bacterial endocarditis, cancers, and autoimmune disorders such as systemic lupus erythematosus (SLE).[9,26] Rheumatoid arthritis also is thought to be a type III disorder that affects older adults.[9]
- **Type IV hypersensitivity disorders** are referred to as delayed or cell-mediated hypersensitivity reactions.[26] Tissue damage occurs due to a delayed T-cell reaction to an antigen. Reactions after exposure take place within one day to two weeks, but may be even slower in older adults.[9] Examples of type IV hypersensitivity disorders include dermatitis from a latex allergy, sarcoidosis, tuberculin reactions and transplant rejections.[9,26]

Immunodeficiency disorders

Mr. St. John is a 75-year-old retired construction worker who is infected with the human immunodeficiency virus (HIV). His infection has been traced to a blood transfusion Mr. St. John received many years ago. He has difficulty dealing with the disorder and says he is "ashamed." He is doing well on his treatment regimen, and his wife of 50 years is supportive. But Mr. St. John needs help dealing not only with the physical components of HIV infection but with its emotional consequences as well.

Infection with HIV is often underreported and under-diagnosed in the elderly population. Although the average age of patients who are first identified as HIV positive is progressively increasing, both older adults and some health care workers seem to lack knowledge about the potential for HIV infection in the elderly population. Older persons who have had multiple sexual partners in their youth continue to have multiple partners as they age. Unfortunately, many older adults have unprotected sex, believing that since the risk of pregnancy is no longer an issue among older couples, there is no need for protection.

The rates of sexually transmitted disease are increasing among persons who live in retirement communities. This also includes an increase in the incidence of HIV infection in this population.[9]

When HIV was first recognized as a serious health problem, the primary means of transmission of the virus in older adults was via blood transfusion. But today, the risk of infection seems to be primarily due to intravenous drug use and sexual activities. As a result of the increasing incidence of HIV infection, the Centers for Disease Control (CDC) recommends that routine HIV testing should be initiated in all health care settings for persons between the ages of 13 to 64.[9]

Assessment tip: *When assessing the health status of an older adult, the nurse should provide patient education regarding sexually transmitted diseases, including HIV. Such education is often automatic when working with younger patients. Age should not preclude the nurse from offering this type of education to her geriatric patients*.

Vulnerability to infections in the older adult

As the immune system undergoes age-related changes that reduce its effectiveness, nurses need to be aware that older patients are at increased risk of infection. This risk includes viral infections such as influenza; bacterial infections, such as pneumonia; and infections following surgery or other open wounds. Even a slight laceration may result in a serious infection.

Because of its prevalence, it is appropriate to discuss pneumonia as a problem of particular concern among the elderly. The prognosis is generally good for persons with normal respiratory function and intact immune systems. However, among the elderly, who may have a compromised immune system or are dealing with chronic disease or disorders, pneumonia is a leading cause of death in people over the age of 65. Not only is it the most common hospital-acquired infection (nosocomial infection), but it also has the highest mortality rate of such infections.[9]

To add to the problem of pneumonia among older adults, the signs and symptoms of the disease in this population are often atypical. The cardinal signs of fever, chest pain, chills and shortness of breath may be subtle and not obviously apparent. Persons over the age of 65 are urged to receive pneumococcal vaccine.[9,24]

Assessment tip: *Older adults who live alone in the community seem to be at particular risk for not being diagnosed until pneumonia has reached an advanced stage.[9] This could be that the symptoms are so subtle that the patient may assume he has a cold or simple viral infection. Teach older patients to be aware of the prevalence of pneumonia and to recognize the signs and symptoms as they appear in the older population. When possible, teach family members, friends and caregivers about the signs and symptoms that indicate pneumonia. The earlier the disease is recognized, the more prompt and effective the treatment*.

Summary

Nurses working with geriatric patients have unique opportunities to promote health and wellness throughout a long and hopefully productive life span. Although basic assessment techniques of interview, observation, auscultation, percussion, and palpation are similar for all age groups, the unique aspects of geriatric assessment require that the nurse have an in-depth understanding of how the body ages and a respect for older patients and their wealth of life experiences.

Nurses also have unique opportunities to teach their colleagues about the older population and to dispel myths about this age group. All health care professionals should understand that "old" does not equate with "sick." Most older adults live independently and enjoy their lives. Too many people believe that older adults are inactive physically, mentally and sexually. Nothing could be further from the truth.

The people in this age group deserves the respect and support of the health care profession. They also deserve the opportunity to access health care services provided by professionals who understand how the body ages and want to serve as advocates for older adults. Work with your older patients to not only promote their health and well-being, but to also promote community awareness of the contributions older adults have made, and can continue to make, to their families, friends and communities.

(Final examination questions on next page)

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GERIATRIC ASSESSMENT

Final Examination Questions

Choose True or False for questions 21 through 30 and mark your answers on the Final Examination Sheet found on page 57 or take your test online at www.elitecme.com.

21. According to the World Health Organization, the fastest-growing segment of this population is persons 80 years of age and older.

True False

22. Members of the traditional generation prefer a more informal environment and prefer that young health care providers automatically address them by their first names.

True False

23. A frequent complication of dry mouth in the older adult is the fungal infection oral candidiasis, more commonly known as thrush.

True False

24. As the body ages, there is as much as a 15 percent decrease in water content and an increase in body fat. The extra fat means that the effects of fat-soluble drugs may be increased.

True False

25. When assessing the sleep patterns of older adults it is important to know what medications they are taking. Advise them to take antidepressants such as Zoloft that have a sedating effect in the evening.

True False

26. Your first clue to depression in older adults may be the reporting of somatic complaints.

True False

27. Persons who commit elder abuse are more likely to be women.

True False

28. A normal finding when assessing the skin of an older adult is the presence of a multicolored lesion with nodules and irregular black outline.

True False

29. Atypical symptoms of heart attack in women include complaints of indigestion and discomfort in the back, neck, stomach or jaw.

True False

30. To cure osteoporosis, patients should be advised to take vitamin E supplement as well as calcium supplements.

True False