traindicated, to maintain a dilute urine; and removing the catheter as soon as possible. Do not disconnect the system and irrigate the catheter unless obstruction is suspected. *Never* raise the urinary drainage bag above bladder level.
- Force fluids in anyone with a UTI unless contraindicated. Bacteria do not multiply as rapidly in dilute urine. In addition, emptying the bladder frequently allows it to refill with uninfected urine. This decreases the bacterial population of the bladder.
- Teach women to cleanse themselves from the urethral area toward the rectum after voiding or defecating to avoid contamination of the urethral area with bacteria from the vagina and rectum. Also, voiding after sexual intercourse helps cleanse the lower urethra and prevent UTI.

Evaluation

- Observe for improvement in signs of the infection for which drug therapy was given.
- Interview and observe for adverse drug effects.

PRINCIPLES OF THERAPY

Tetracyclines

1. Culture and susceptibility studies are needed before tetracycline therapy is started because many strains of organisms are either resistant or vary greatly in drug susceptibility. Cross-sensitivity and cross-resistance are common among tetracyclines.
2. The oral route of administration is usually effective and preferred. Intravenous (IV) therapy is used when oral administration is contraindicated or for initial treatment of severe infections.
3. Tetracyclines decompose with age, exposure to light, and extreme heat and humidity. Because the breakdown products may be toxic, it is important to store these drugs correctly. Also, the manufacturer's expiration dates on containers should be noted and outdated drugs should be discarded.

Sulfonamides and Urinary Antiseptics

1. With systemically absorbed sulfonamides, an initial loading dose may be given to produce therapeutic blood levels (12 to 15 mg/100 mL) more rapidly. The amount is usually twice the maintenance dose.
2. Urine pH is important in drug therapy with sulfonamides and urinary antiseptics.
   a. With sulfonamide therapy, alkaline urine increases drug solubility and helps prevent crystalluria. It also increases the rate of sulfonamide excretion and the concentration of sulfonamide in the urine. The urine can be alkalinized by giving sodium bicarbonate. Alkalinization is not needed with sulfisoxazole (because the drug is highly soluble) or sulfonamides used to treat intestinal infections or burn wounds (because there is little systemic absorption).
   b. With mandelamine therapy, urine pH must be acidic (<5.5) for the drug to be effective. At a higher pH, mandelamine does not hydrolyze to formaldehyde, the antibacterial component. Urine can be acidified by concomitant administration of ascorbic acid.
3. Urine cultures and sensitivity tests are indicated in suspected UTI because of wide variability in possible pathogens and their susceptibility to antibacterial drugs. The best results are obtained with drug therapy indicated by the microorganisms isolated from each client.

How Can You Avoid This Medication Error?

Trimethoprim-sulfamethoxazole (Bactrim) DS bid is ordered for a client after urologic surgery. He takes no medications and reports an allergy to eggs, nuts, sulfa, and morphine. The unit dose provided from the pharmacy is a tablet containing 160 mg of trimethoprim and 800 mg of sulfamethoxazole. You give him one tablet at 0900 for his morning dose.

Use in Children

Tetracyclines should not be used in children younger than 8 years of age because of their effects on teeth and bones. In teeth, the drugs interfere with enamel development and may cause a permanent yellow, gray, or brown discoloration. In bone, the drugs form a stable compound in bone-forming tissue and may interfere with bone growth.

Systemic sulfonamides are contraindicated during late pregnancy, lactation, and in children younger than 2 months. If a fetus or young infant receives a sulfonamide by placental transfer, in breast milk, or by direct administration, the drug displaces bilirubin from binding sites on albumin. As a result, bilirubin may accumulate in the bloodstream (hyperbilirubinemia) and central nervous system (kernicterus) and cause life-threatening toxicity.

Sulfonamides are often used to treat UTI in children older than 2 months. Few data are available regarding the effects of long-term or recurrent use of sulfamethoxazole in children younger than 6 years of age with chronic renal disease. **Sulfamethoxazole** is often given in combination with trimethoprim (Bactrim, Septra), although trimethoprim has not been established as safe and effective in children younger than 12 years of age.

Some clinicians recommend that asymptomatic bacteriuria be treated in children younger than 5 years of age to decrease risks of long-term renal damage. Treatment is the same as for symptomatic UTI.

Use in Older Adults

A major concern with the use of tetracyclines and sulfonamides in older adults is renal impairment, which commonly