

Lynn D. Phillips

# IV Therapy Flash Cards



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**Lynn D. Phillips, RN, MSN, CRNI®**

Butte College Nursing Instructor



F.A. Davis Company • Philadelphia

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# Table of Contents:

<b>Section 1:</b> Infection Control Related to IV Therapy	1–27
<b>Section 2:</b> Fluid, Electrolytes, and Parenteral Solutions	28–55
<b>Section 3:</b> Equipment	56–78
<b>Section 4:</b> Technique/Maintenance Peripheral IVs	79–100
<b>Section 5:</b> Technique/Maintenance Central IVs	101–113
<b>Section 6:</b> Complications	114–136
<b>Section 7:</b> Infusion Modalities	137–146
<b>Section 8:</b> Transfusion Therapy	147–160
<b>Section 9:</b> Nutritional Support	161–165
<b>Section 10:</b> IV Therapy Bonus Cards, Illustration Credits	166–170

## Guide to Pronunciation:

Pronunciations are spelled phonetically; pronunciations, diacritical marks (long and short vowels), and stressses on syllables (' for primary and " for secondary) follow *Taber's Cyclopedic Medical Dictionary*. See “Features and Their Use” in the dictionary for more information.

## Dedication

To my mother, Margie Schuetz, thank you for your unconditional love.

## Acknowledgments

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Infusion Nurses Society

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# **Getting the Most Out of Your IV Therapy Flash Cards**

## **Purpose of Flash Cards**

You're on your way to mastering IV therapy vocabulary! Using these flash cards will develop your ability to focus and achieve deep memory learning. They will help you not only learn the terminology, but they will help you relate those terms to the nursing content you are studying. It is important to make a connection between the term, its meaning, and how it functions in the language of nursing. So I designed the flash cards to allow you to see the word, read the word (out loud is best), use the word, and associate the word with other related concepts.

## How to Use Flash Cards

This set of flash cards is unique because it gives you opportunities to actively associate each word or phrase with your studies. Here are some strategies I recommend to get the most out of the time you spend with the cards. But these are not the only ways they can be used; see if you can think of others that better suit your learning style.

1. Write the word on a separate piece of paper and recite the word out loud.
2. Work with a partner, take turns saying words out loud to each other, and recite their definitions. Check your achievement by turning over the cards to see if you provided the correct definitions.
3. Draw a picture of the word on a separate piece of paper if you are having trouble remembering it. This is called concept mapping—an example is on the back of this card.
4. On the back of each card is a “notes” area that you can use to include associated concepts from a textbook or lecture. Example:  
*✓Notes: Phlebitis = occurs frequently from mechanical or chemical irritation to the vein.  
Must anchor IV securely*
5. To review for a test, mix up the sections, and use these same strategies as above to test your understanding of all the words and concepts.

**DavisPlus Web Site:** On the DavisPlus Web site  DavisPlus, you will find additional terms and definitions. Visit <http://davisplus.fadavis.com> to access this content.

### **Concept Mapping**

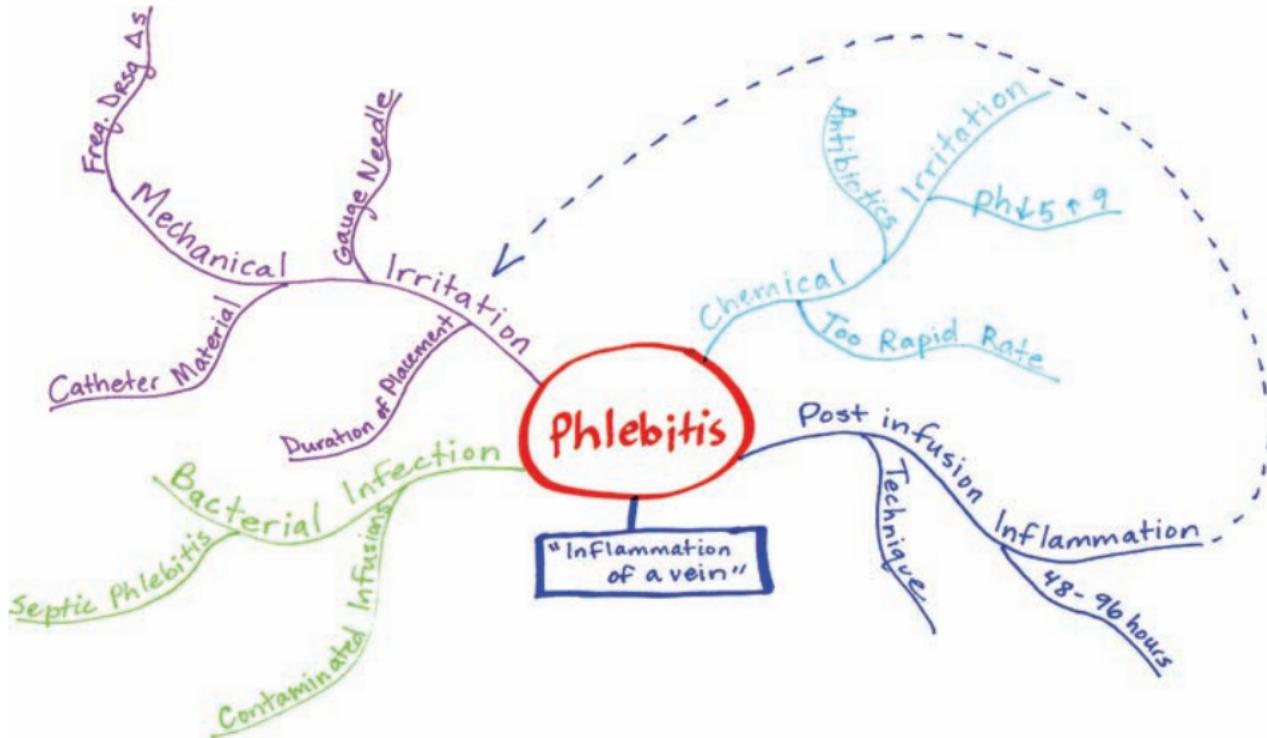
Concept mapping is a thinking tool that reflects externally what is going on in your brain. Each map is unique to the student creating the map. The steps are simple and can be used for any nursing content.

1. Write the word on a blank piece of paper.
2. Create stems off the word using different colors, and curve the stems leading from the central word.  
Note: The brain connects better with free flowing curves rather than straight lines.
3. Write words on the stems that connect ideas to the center word. (Narrow-tip colored marking pens work great.)
4. Write one word on each stem and make the stem the length of the word.
5. Draw smaller branches coming off each large stem, again the length of the word you are going to write, and only one word per branch.

6. Draw pictures if you wish, adding them next to the appropriate stem. Search for images online or create your own drawings. The brain connects to the word or term through pictures.

*Lynn Phillips*

## Concept Mapping Sample



**aerobic**

(ĕr-ō'bĭk)

## 1. INFECTION CONTROL

### DEFINITION:

Taking place in the presence of oxygen. Concerning an organism that lives and reproduces in the presence of oxygen.



### KEEP IN MIND:

Aerobic organisms are generally found on the surface of a wound.

### APPLICATION:

The physician ordered an *aerobic* culture of the wound.

### NOTES:

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# airborne precautions

(ār'born prē-kō'shěnz)

## 2. INFECTION CONTROL

### DEFINITION:

Microorganisms carried by the air. Precautions used in addition to standard precautions for illnesses transmitted by airborne droplet nuclei.

### APPLICATION:

The patient with active pulmonary tuberculosis was admitted to a private room with negative air pressure with 6–12 air changes per hour as part of *airborne precautions*.

### NOTES:

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### KEEP IN MIND:

Airborne precautions are used to control the spread of infections that are transmitted on air currents. Airborne infections include tuberculosis, varicella (chickenpox), and rubeola (measles). Airborne precautions include standard and contact precaution guidelines, along with placing the patient in a private room with a negative air pressure. The health-care workers (HCWs) must wear a special N95 respirator to care for patients with pulmonary tuberculosis. Only immune HCWs can care for patients with rubeola or varicella.

**anaerobic**

(ĕn"ĕr-ō'bĭk)

### 3. INFECTION CONTROL

#### DEFINITION:

Taking place in the absence of oxygen. Concerning an organism that lives and reproduces in the absence of oxygen.



#### KEEP IN MIND:

Anaerobic organisms are found in deep wounds, tunnels, and cavities.

#### APPLICATION:

The nurse collected the wound sample from deep in a tunneled portion of the wound for an *anaerobic* culture.

#### NOTES:

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# antibodies

(ăn'tĕ-bĕd'ĕz)

## 4. INFECTION CONTROL

### DEFINITION:

A substance produced by B lymphocytes in response to a unique antigen. Antibodies neutralize or destroy antigens.



### KEEP IN MIND:

Antibodies also are called immunoglobulins and are part of the body's plasma proteins.

### APPLICATION:

*Antibodies* are proteins that target antigens and destroy them using the following four methods: phagocytosis, neutralization, agglutination, and activation of complement and inflammation.

### NOTES:

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antigen

(ăn'tĭ-jĕn)

## 5. INFECTION CONTROL

### DEFINITION:

A protein marker on the surface of cells that identifies the cell as self or nonself; identifies the type of cell and stimulates the production of antibodies.



### KEEP IN MIND:

Antigens on the body's own cells are called autoantigens. Antigens on all other cells are called foreign antigens.

### APPLICATION:

The combination of an *antigen* with its specific antibody is called antigen-antibody reaction.

### NOTES:

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bacteristatic

(băk-tēr'ē-stăt'ik)

## 6. INFECTION CONTROL

### DEFINITION:

Inhibiting the growth of bacteria.



### KEEP IN MIND:

Many anti-infective and cleaning/disinfecting agents prevent the growth and reproduction of some bacteria.

### APPLICATION:

The cephalosporin anti-infectives are considered *bacteristatic*.

### NOTES:

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# bactericidal

(băk"tĕr-ĭ-sī'dăl)

## 7. INFECTION CONTROL

### DEFINITION:

Capable of killing bacteria.



### KEEP IN MIND:

Disinfectants destroy pathogens and are bactericidal. Chlorine bleach is capable of killing bacteria, spores, fungi, and viruses on surfaces. Bactericidal drugs are used for their selective toxicity on certain bacterial cells.

### APPLICATION:

Penicillin is considered an anti-infective that is *bactericidal*.

### NOTES:

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# blood borne pathogens

(blōd born păth'ō-jěnz)

## 8. INFECTION CONTROL

### DEFINITION:

Those microorganisms carried in blood and body fluids that are capable of infecting other persons.



### KEEP IN MIND:

The common blood borne pathogens include hepatitis B virus, hepatitis C virus, and HIV.

### APPLICATION:

Standard precautions are used for all hospitalized patients to prevent the spread of *blood borne pathogens*.

### NOTES:

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# **bloodstream infection (BSI)**

(blōd'strēm" īn-fĕk'shŭn)

## 9. INFECTION CONTROL

### DEFINITION:

An infection that flows through the circulatory system.



### KEEP IN MIND:

The average rate of catheter-related BSIs is 1.5 to 6.8 per 1000 catheter days.

### APPLICATION:

*Bloodstream infections* related to placement of a central venous access device (CVAD) in the early stages are caused by bacterial contamination during the initial catheter insertion.

### NOTES:

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# Centers for Disease Control and Prevention (CDC)

(sĕn'tĕrz for dĕ-zĕz' kŏn-trōl' and prē-vĕn'shŭn)

## 10. INFECTION CONTROL

### DEFINITION:

A division of the U.S. Public Health Service that investigates and controls various diseases, especially those that have epidemic potential. Located in Atlanta, Georgia.



### KEEP IN MIND:

The CDC includes Center for Infectious Diseases, Center for Environmental Health, Center for Health Promotion and Education, Center for Prevention Services, Center for Professional Development and Training, and Center for Occupational Safety and Health.

### APPLICATION:

In 2002, the *Centers for Disease Control and Prevention* published guidelines for prevention of intravascular catheter-related infections.

### NOTES:

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# chain of infection

(chān of īn-fĕk'shŭn)

## 11. INFECTION CONTROL

### DEFINITION:

The process by which infections spread.



### KEEP IN MIND:

Chain of infection is made up of six links, all of which must be present for infection to be transmitted from one individual to another.

1. Infectious agent
2. Reservoir
3. Portal of exit
4. Mode of transmission
5. Portal of entry
6. Susceptible host

### APPLICATION:

Health-care workers must either clean their hands with an alcohol-based solution or wash with soap and water frequently to assist in breaking the *chain of infection*.

### NOTES:

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# colonization

(kəl'ō-nī-zā'shən)

## 12. INFECTION CONTROL

### DEFINITION:

The growth of microorganisms, especially bacteria, in a particular body site.



### KEEP IN MIND:

The microorganisms become resident flora; in this state, the microorganisms may grow and multiply but do not cause disease.

### APPLICATION:

The culture taken from the nurse's fingernails showed colonization of *Staphylococcus aureus*.

### NOTES:

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# contact precautions

(kōn'täkt" prē-kō'shĕnz)

## 13. INFECTION CONTROL

### DEFINITION:

Techniques used in addition to standard precautions that decrease infection by microorganisms transmitted through direct contact with the patient or patient-care items.



### KEEP IN MIND:

A private room is preferable, but patients may be placed with others infected with the same organism. Hospital workers must wear gloves when entering the room, gowns if close to patient. Stethoscopes and other noncritical patient-care equipment should be dedicated to single-patient use.

### APPLICATION:

The patient with a diagnosis of *Clostridium difficile* (*C. difficile*) was placed on *contact precautions*.

### NOTES:

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# droplet precautions

(drōp'lēt prē-kō'shēnz)

## 14. INFECTION CONTROL

### DEFINITION:

Infection due to inhalation of respiratory pathogens suspended in liquid particles exhaled from someone already infected.



### KEEP IN MIND:

Droplet precautions are used when the pathogen can be spread via moist droplets (sneezing, coughing, talking). Droplets can spread infection by direct contact with mucous membranes or through indirect contact such as touching a bedside table.

### APPLICATION:

*Droplet precautions* include the use of a mask and eye protection when working within 3 ft of a patient, in addition to standard and contact precaution guidelines.

### NOTES:

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# dissemination

(dī-sěm'ī-nā"shūn)

## 15. INFECTION CONTROL

### DEFINITION:

Shedding of microorganisms from an individual into the immediate environment or movement of microorganisms from a confined site (skin) to the bloodstream and other parts of the body.



### KEEP IN MIND:

Cultures of air samples, surfaces, and objects reveal dissemination of microorganisms.

### APPLICATION:

The outpatient clinic, with its recent outbreak of staphylococcus, cultured all asymptomatic staff for *dissemination* of the organism.

### NOTES:

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**endogenous**

(ĕn-dĕj'ĕ-nŭs)

## 16. INFECTION CONTROL

### DEFINITION:

Produced or originating from within a cell or organism.



### KEEP IN MIND:

Nosocomial infections can originate from clients themselves.  
Most nosocomial infections come from endogenous sources.

### APPLICATION:

The most common *endogenous* organism is *Staphylococcus aureus*.

### NOTES:

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**exogenous**

(ĕks-ĕj'ĕ-nŭs)

## 17. INFECTION CONTROL

### DEFINITION:

Originating outside an organism.



### KEEP IN MIND:

Exogenous sources of nosocomial infections occur from hospital environment or hospital personnel.

### APPLICATION:

The patient acquired a nosocomial infection from an *exogenous* source, the intensive care nurse's hands.

### NOTES:

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## 1. extrinsic contamination

(ĕks-trĕn'sĭk kŏn-tăm'"ĕ-nă'shŭn)

## 2. intrinsic contamination

(ĕn-trĕn'zĭk kŏn-tăm'"ĕ-nă'shŭn)

## 18. INFECTION CONTROL

### DEFINITIONS:

1. Contamination with bacteria during preparation or administration.
2. Contamination introduced during manufacturing.



### KEEP IN MIND:

Most BSIs related to contaminated infusates are related to the duration of uninterrupted infusions through the same administration set and the frequency with which the set is manipulated.

### APPLICATION:

The IV therapy-related BSI was traced to *extrinsic contamination* from improperly administered IV solution.

### NOTES:

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# hand hygiene

(hănd hī'jēn)

## 19. INFECTION CONTROL

### DEFINITION:

A general term that applies to hand washing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis.



### KEEP IN MIND:

The goal of using specific hand hygiene products is to maintain normal barrier function.

### APPLICATION:

The transmission of healthcare-associated pathogens from one patient to another via the hands of health-care workers requires a sequence of events. *Hand hygiene* breaks the sequence of events.

### NOTES:

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# healthcare-associated infections (HAIs)

(hĕlth'kār ă'sō-sē-ā'"tĕd ĭn-fĕk'shŭnz)

## 20. INFECTION CONTROL

### DEFINITION:

Infections that patients acquire during the course of receiving treatment for other conditions or that health-care workers (HCWs) acquire while performing their duties within a health-care setting.



### KEEP IN MIND:

The term nosocomial infections has been replaced with the term healthcare-associated infections.

### APPLICATION:

In hospitals alone, *healthcare-associated infections* (HAIs) account for an estimated 2 million infections, 90,000 deaths, and \$4.5 billion in excess health-care costs annually (CDC, 2006.)

### NOTES:

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host

(hōst)

## 21. INFECTION CONTROL

### DEFINITION:

The organism from which a microorganism obtains its nourishment.



### KEEP IN MIND:

A susceptible host is any person who is at risk for infection.

Intact skin is the best defense against infection.

### APPLICATION:

The frail, 90-year-old man had impaired defenses due to pneumonia and, therefore, was a compromised *host*.

### NOTES:

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# immunosuppression

(im'ü-nö-sü-prĕsh'ün)

## 22. INFECTION CONTROL

### DEFINITION:

Prevention of or interference with the development of immunologic response; may be artificially induced by chemical, biologic, or physical agents, or may be caused by disease.



### KEEP IN MIND:

Persons who acquire an infection because of a deficiency in any of their multifaceted host defenses are referred to as compromised hosts. Persons with major defects related to specific immune responses are referred as immunosuppressed.

### APPLICATION:

*Immunosuppression* can occur in patients receiving chemotherapy.

### NOTES:

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# leukopenia

(loo"kō-pē'nē-ă)

## 23. INFECTION CONTROL

### DEFINITION:

Any condition in which the number of leukocytes in the circulating blood is lower than normal, the lower limit of which is generally regarded as  $4000/5000 \text{ mm}^3$ .



### KEEP IN MIND:

Infection, together with neutropenia, is regarded as an emergency situation. Precautions are usually initiated when the patient's absolute neutrophil count (ANC) is lower than 1000. The ANC can be calculated with the following formula:  $\text{ANC} = \text{total WBC} \times (\% \text{ segs} + \% \text{ of bands})$ .

### APPLICATION:

The immunocompromised patient was admitted with *leucopenia* and placed on neutropenic precautions.

### NOTES:

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reservoir

(rĕz'ĕr-vwôr)

## 24. INFECTION CONTROL

### DEFINITION:

Living or nonliving material in or on which an infectious agent multiplies and develops and is dependent on for its survival in nature.



### KEEP IN MIND:

Second link in the chain of infection. The exit site from reservoir is important in transmission of infection.

### APPLICATION:

The patient with a staphylococcus infection in the wound was the *reservoir* for transmission by wound drainage.

### NOTES:

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# susceptible host

(sŭ-sĕp'tĭ-bl hōst)

## 25. INFECTION CONTROL

### DEFINITION:

Person with inadequate defenses against an invading pathogen. The host is the organism from which a parasite obtains its nourishment.



### KEEP IN MIND:

Once a pathogen gains entry into a host, three factors determine whether the person develops infection. First, the virulence of the organism; second, the number of organisms transmitted; and third, the ability of the host's defenses to prevent infection.

### APPLICATION:

The client with AIDS is a *susceptible host* for opportunistic infectious organisms.

### NOTES:

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# transient flora

(trĕns'zē-ĕnt flōr'ă)

## 26. INFECTION CONTROL

### DEFINITION:

Microorganisms that are picked up, usually on the skin, and can be removed fairly easily with hand hygiene.



### KEEP IN MIND:

Alcohol-based products are more effective than standard hand washing to remove transient skin flora.

### APPLICATION:

The nurse used a 15-second, vigorous scrub to remove *transient skin flora* prior to insertion of an intravascular device.

### NOTES:

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**virulence**

(vĬr'ū-lĕns)

## 27. INFECTION CONTROL

### DEFINITION:

Relative power and degree of pathogenicity possessed by organisms to produce disease.



### KEEP IN MIND:

The ability of an organism to induce disease is called its virulence or invasiveness.

### APPLICATION:

The microorganism's ability to produce disease includes *virulence*, dose (number of organisms available to infect), susceptible host, and dissemination.

### NOTES:

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# 1. acidosis

(ăs'ĕ-dō'sēs)

# 2. alkalosis

(ăl'ĕ-kă-lō'sēs)

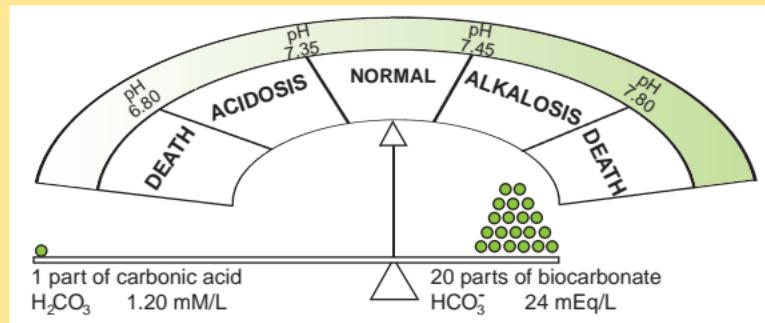
## 28. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. An actual or relative increase in the acidity of blood due to an accumulation of acids or an excessive loss of bicarbonate. The hydrogen ion concentration of the fluid is increased, lowering the pH. A pH less than 7.35.
2. An actual or relative increase in blood alkalinity due to an accumulation of alkalis or reduction of acids. A pH above 7.45.



### KEEP IN MIND:



### APPLICATION:

The body maintains the plasma pH within the narrow normal range of 7.35 to 7.45. It does so by means of chemical buffering mechanisms utilized by the kidneys and by the lungs to prevent *acidosis* or *alkalosis*.

# active transport

(ĕk'tĭv trĕns"pôrt)

## 29. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

The process by which a cell membrane moves molecules against a concentration or electrochemical gradient. Metabolic work is required.



### KEEP IN MIND:

Active transport occurs to move other ions (such as calcium or hydrogen) from areas of lesser concentration to areas of greater concentration. Energy expenditure must occur for the movement to occur.

### APPLICATION:

The sodium-potassium pump, which is located in the cell membrane, in the presence of adenosine triphosphate (ATP) actively moves sodium from inside the cell into the extracellular fluid (ECF) by *active transport*.

### NOTES:

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# 1. anion

(ăn'ī-ōn)

# 2. cation

(kăt'ī-ōn)

## 30. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. An ion (electrolyte) carrying a negative charge; the opposite of cation.
2. An ion (electrolyte) carrying a positive charge; the opposite of anion.



### KEEP IN MIND:

An anion is attracted by and travels to the anode (positive pole). A cation is attracted by and travels to the cathode (negative pole).

### APPLICATION:

The unit of measure for *anions* and *cations* is milliequivalents per liter (mEq/L).

### NOTES:

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# Chvostek's sign

(vōs'těks sīn)

## 31. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A sign elicited by tapping the facial nerve about 2 cm anterior to the earlobe, just below the zygomatic process; the response is a spasm of the muscles supplied by the facial nerve. A positive Chvostek's sign is a symptom of hypocalcemia or hypomagnesemia.



### KEEP IN MIND:

Chvostek's sign also can be observed as unilateral twitching.

**\*NOTE:** Refer to Bonus Card 170 for picture of Chvostek's sign.

### APPLICATION:

The patient postoperative for thyroidectomy began to have signs of hypocalcemia including numbness of the fingers, cramps in the muscles of the legs, and positive *Chvostek's sign*.

### NOTES:

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**colloid**

(kōl'oyd)

## 32. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A substance (e.g., blood, plasma, albumin, dextran) that does not dissolve into a true solution and is not capable of passing through a semipermeable membrane.



### KEEP IN MIND:

Colloid solutions contain protein or starch molecules that remain distributed in the extracellular space and do not form “true” solutions.

### APPLICATION:

Albumin 25% (a *colloid* solution) was ordered to maintain blood volume for the 24-year-old male, auto accident victim prior to administration of packed cells.

### NOTES:

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# crystalloid

(krɪ'stäl-oyd")

## 33. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A substance that forms a true solution and is capable of passing through a semipermeable membrane.



### KEEP IN MIND:

Crystallloid solutions, such as 5% dextrose in water or 0.9% sodium chloride, move between the three fluid compartments in the body based on osmolality of the solution.

### APPLICATION:

Many *crystallloid* solutions contain dextrose as the carbohydrate, calorie source.

### NOTES:

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# extracellular fluid (ECF)

(ĕks"tră-sĕl'ū-lär floo'īd)

## 34. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

Fluid located outside the cell, comprised of interstitial and plasma fluid.



### KEEP IN MIND:

Extracellular fluid (ECF) is subdivided into intravascular fluid (plasma) and interstitial fluid (fluid lying between the cells or tissue fluid). Also part of the ECF is transcellular fluids.

### APPLICATION:

The patient admitted to the ED after a gunshot wound to the right shoulder, had *extracellular fluid* volume deficit due to the blood loss.

### NOTES:

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# 1. fluid volume deficit (FVD)

(floo'īd vōl'ūm děf'ī-sǐt)

# 2. fluid volume excess (FVE)

(floo'īd vōl'ūm ēk'sēs)

## 35. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. A deficiency. Hypovolemia. An equal proportion of loss of water and electrolytes from the body.
2. The state of exceeding what is normal. Hypervolemia. Retention of both water and sodium in similar proportions to normal ECF.



### KEEP IN MIND:

FVD has defining characteristics such as weight loss over a short period of time, decreased skin and tongue turgor, dry mucous membranes, urine output <30 mL/hr in adults, weak rapid pulse, and slow capillary refill. FVE has defining characteristics such as weight gain over a short period of time, peripheral edema, distended neck veins, slow-emptying peripheral veins, moist rales in lungs, polyuria, and bounding full pulse.

### APPLICATION:

The student nurse created a table identifying the characteristics of *fluid volume deficit* and *fluid volume excess* to study for the examination.

# hydrating solution

(hī'drāt-ĕng sō-lū'shŭn)

## 36. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A solution of water, carbohydrate, sodium, and chloride used to determine the adequacy of renal function.



### KEEP IN MIND:

Hydrating solutions are used to assess kidney function. Kidney function must be determined prior to administering potassium infusions.

### APPLICATION:

The client was admitted to the emergency department for intractable vomiting and 3 days of diarrhea. An IV was started with a 5% dextrose in 0.45% sodium chloride, a *hydrating solution*, to determine kidney status and begin hydration before replacement of potassium chloride.

### NOTES:

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# 1. hypotonic

(hī"pō-tōn'īk)

# 2. hypertonic

(hī"pěr-tōn'īk)

# 3. isotonic

(ī"sō-tōn'īk)

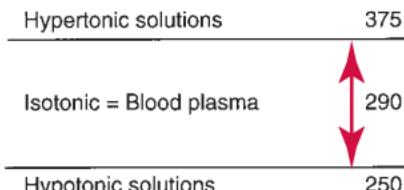
## 37. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. Solutions that have a lower osmolality than body fluids. Below 250 mOsm.
2. Solutions that have a higher osmolality than body fluids. Above 375 mOsm.
3. Solutions that have the same osmolality as body fluids. Between 250 and 375 mOsm.



### KEEP IN MIND:



### APPLICATION:

Intravenous parenteral solutions are classified as either *hypotonic*, *isotonic*, or *hypertonic* solutions based on the osmolarity of the solution.

# 1. hypercalcemia

(hī"pĕr-kăl-sē'mĕ-ă)

# 2. hypocalcemia

(hī"pō-kăl-sē'mĕ-ă)

## 38. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. An excessive amount of calcium in the blood.
2. Abnormally low blood calcium.

### APPLICATION:

The patient receiving six units of blood post trauma was evaluated for *hypocalcemia*.

### NOTES:

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### KEEP IN MIND:

Hypercalcemia is caused by hyperparathyroidism, lithium therapy, malignancies including solid tumors and hematological malignancies, hyperthyroidism, and milk-alkali syndrome.

Hypocalcemia occurs transiently in patients with severe sepsis, severe pancreatitis, burns, and renal failure. It also may result from multiple transfusions of citrated blood, parathyroidectomy, malabsorption, and medications.

# 1. hyperkalemia

(hī"pěr-kă-lē'mē-ă)

# 2. hypokalemia

(hī"pō-kă-lē'mē-ă)

## 39. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

1. An excessive amount of potassium in the blood.
2. An abnormally low concentration of potassium in the blood.



### KEEP IN MIND:

Hyperkalemia usually is caused by inadequate excretion of potassium or the shift of potassium from tissues. Hypokalemia results from deficient potassium intake or excess loss of potassium due to vomiting, diarrhea, or fistulas; metabolic acidosis; diuretic therapy; aldosteronism; excess adrenocortical secretion; renal tubule disease; and alkalosis.

### APPLICATION:

Patients receiving diuretics must have laboratory potassium values evaluated periodically for *hypokalemia* due to loss of potassium in the urine.

### NOTES:

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# 1. hypermagnesemia

(hī"pĕr-măg'ně-sē'mē-ă)

# 2. hypomagnesemia

(hī"pō-măg'ně-sē'mē-ă)

## 40. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

1. Increase in magnesium in the blood. Above 2.1 mEq/L.
2. Decreased magnesium in the blood. Below 1.3 mEq/L.



### KEEP IN MIND:

Hypermagnesemia is clinically accompanied by a severe decrease in neuromuscular transmission and depression of skeletal muscle function. The common causes include renal failure and magnesium administration for therapeutic purposes. Hypomagnesemia is clinically accompanied by increased neuromuscular irritability. The common causes include gastrointestinal losses, alcoholism, and refeeding after starvation.

### APPLICATION:

The preeclampsia patient in labor and delivery receiving magnesium sulfate must be monitored for *hypermagnesemia* including fetal heart tones.

### NOTES:

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# 1. hypernatremia

(hī"pěr-nă-trē'mē-ă)

# 2. hyponatremia

(hī"pō-nă-trē'mē-ă)

## 41. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

1. An increased concentration of sodium in the blood. Above 145 mEq/L.
2. A decreased concentration of sodium in the blood. Below 135 mEq/L.



### KEEP IN MIND:

More than 95% of the body's physiologically active sodium is in the ECF. In contrast, the intracellular concentration of sodium is small. Sodium does not easily cross the cell wall membrane. The primary role is in controlling water distribution as well as ECF volume. In general, a loss or gain of sodium is accompanied by loss or gain of water.

### APPLICATION:

*Hyponatremia* is the most frequent electrolyte disorder seen in clinical practice.

### NOTES:

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# 1. hypervolemia

(hī"pěr-vō-lē'mē-ă)

# 2. hypovolemia

(hī"pō-vō-lē'mē-ă)

## 42. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. An increased volume of circulating blood usually due to retention of sodium and water in the ECF.
2. A decreased blood volume that may be caused by internal or external bleeding, fluid losses, or inadequate fluid intake.



### KEEP IN MIND:

Fluid volume imbalances may occur alone or in combination with other imbalances. Fluid volume excess is also referred to as hypervolemia, and fluid volume deficit is also referred to as fluid volume deficit.

### APPLICATION:

Nurses can help to prevent *hypovolemia* or *hypervolemia* by identifying patients who have the highest risk for developing either fluid volume deficit (older adults, infants and children), and conditions associated with fluid loss (e.g., vomiting, fever); or fluid volume excess by monitoring intake and output and observing patients for signs and symptoms of fluid overload.

### NOTES:

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# i ons

(ī'ōnz)

## 43. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

An atom or group of atoms that has lost one or more electrons and has a positive charge, or has gained one or more electrons and has a negative charge.



### KEEP IN MIND:

In aqueous solution, ions are called electrolytes because they permit the solution to conduct electricity.

### APPLICATION:

The unit of measurement for *ions* is usually milliequivalents per liter (mEq/L), or can be expressed as millimoles per liter (mmol/L) as is chemical activity of the electrolytes. Milligrams per 100 mL express the weight of the solute per unit volume.

### NOTES:

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# interstitial fluid

(ɪn"tĕr-stĭsh'ĕl floo'ĭd)

## 44. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

Fluid that surrounds the cells.



### KEEP IN MIND:

Also called tissue fluid. The electrolyte content of interstitial fluid is not measured in clinical situations; however, it is essentially the same as that of plasma, except that it contains less proteinate.

### APPLICATION:

The extracellular fluid is divided into plasma space, approximately 5% of total body weight, and *interstitial fluid* approximately 15% of body weight.

### NOTES:

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# intracellular fluid (ICF)

(ɪn"tră-sĕl'ū-lär floo'ɪd)

## 45. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

The fluid within the tissue cells.



### KEEP IN MIND:

The bulk of body fluid is located within the body's intracellular fluid (ICF); this fluid is contained within the body's more than 100 trillion cells.

### APPLICATION:

*Intracellular* fluid accounts for approximately 40% of total body weight.

### NOTES:

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# maintenance solution

(mān'tē-nănts sō-lū'shŭn)

## 46. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

Fluids that provide all nutrients necessary to meet daily patient requirements. Usually, water, glucose, sodium, and potassium.



### KEEP IN MIND:

Water has priority in maintenance therapy.

### APPLICATION:

The patient, NPO for laparoscopic cholecystectomy, received intravenous *maintenance solutions* until discharge from the outpatient surgery center.

### NOTES:

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# 1. metabolic acidosis

(mět"ă-bōl'īk ăs"ī-dō'sīs)

# 2. metabolic alkalosis

(mět"ă-bōl'īk ăl"kă-lō'sīs)

## 47. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITIONS:

1. The clinical disturbance in bicarbonate deficit characterized by a low pH and a low plasma bicarbonate concentration.
2. The clinical disturbance in bicarbonate excess characterized by a high pH and a high plasma bicarbonate concentration.



### KEEP IN MIND:

Metabolic acidosis can be produced by a gain of hydrogen ion or a loss of bicarbonate. Metabolic alkalosis can be produced by a gain of bicarbonate or a loss of hydrogen ion.

### APPLICATION:

A patient presented to the ED with vomiting for the past three days. His blood gases were pH- 7.56,  $\text{Paco}_2 = 49 \text{ mm/Hg}$ ,  $\text{HCO}_3 = 40 \text{ mEq/L}$ . The patient has uncompensated metabolic alkalosis. The following set of blood gases were found in a young man admitted to the ED wth Kussmaul breathing and an irregular pulse. pH = 7.32,  $\text{Paco}_2 = 15 \text{ mm Hg}$ ,  $\text{HCO}_3 = 6 \text{ mEq/L}$ . This patient has uncompensated *metabolic acidosis* due to the very low  $\text{HCO}_3$  level.

# oncotic pressure

(ĕng-kĕt'ĕk prĕsh'ĕr)

## 48. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

The osmotic pressure exerted by colloids (proteins), as when albumin exerts oncotic pressure within the blood vessels and helps to hold the water content of the blood in the intravascular compartment.



### KEEP IN MIND:

Also referred to as colloid osmotic pressure. Movement of fluid through the capillary wall into the tissues depends on two forces: hydrostatic pressure and oncotic pressure which is exerted by nondiffusible plasma proteins. Oncotic pressure is greater than hydrostatic pressure in the venous end of the capillary; fluids re-enter the capillary at the venous end.

### APPLICATION:

AThe patient with 60% second degree burns has damage to capillary beds and decreased plasma proteins to maintain *oncotic pressure*.

### NOTES:

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# osmosis

(ōz-mō'sīs)

## 49. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

The passage of water from a lower to higher concentration through a semipermeable membrane that separates solutions of different concentrations.



### KEEP IN MIND:

The solvent, usually water, passes through the membrane from the region of lower concentration of solute to that of higher concentration, thus tending to equalize the concentrations of the two. The rate of osmosis is dependent primarily upon the difference in osmotic pressures of the solutions on the two sides of a membrane, the permeability of the membrane, the electric potential across the membrane, and the charge upon the walls of the pores in it.

### APPLICATION:

Administration of 0.45% sodium chloride (a hypotonic solution) will move by *osmosis* from the plasma compartment into the interstitial and cellular compartments.

### NOTES:

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# osmolarity/osmolality

(ōs"mō-lär'ē-tē/ōs"mō-läl'ē-tē)

## 50. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A measure of solute concentration; the concentration of a solution in terms of osmoles of solutes per liter of solution. The term osmolarity is used to refer to solutions outside of the body. Osmolality refers to solutions within the body.



### KEEP IN MIND:

The normal osmolality of body fluid is between 285 and 295 mOsm (milliosmoles).

### APPLICATION:

The *osmolarity* of 5% dextrose in 0.45 % sodium chloride is 406 mOsm.

### NOTES:

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## 51. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

pH

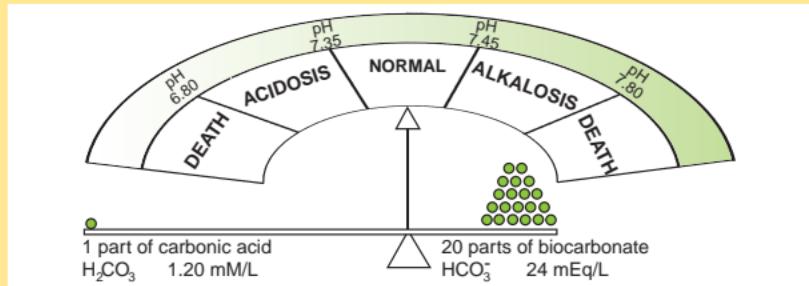
## 51. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A measure of the hydrogen ion concentration of a solution.



### KEEP IN MIND:



Because the pH scale is logarithmic, there is a 10-fold difference between each unit.

### APPLICATION:

The blood gas results reflected a *pH* of 7.48, a alkalotic condition.

### NOTES:

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# plasma volume expander

(plăz'mă völ'ūm ēk-spăn'dĕr)

## 52. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A high-molecular weight compound in a solution suitable for intravenous use.



### KEEP IN MIND:

Examples of plasma volume expanders include Dextran and Hetastarch. Used to restore circulatory dynamics and treat perioperative shock.

### APPLICATION:

The patient in postanesthesia recovery required Dextran 40 in 0.9% sodium chloride as a *plasma volume expander* due to blood loss in the operating room.

### NOTES:

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# replacement therapy

(rē-plās'měnt thĕr'ă-pē)

## 53. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

Replenishment of losses when maintenance cannot be met and patient is in deficient state.



### KEEP IN MIND:

Usually patient is in acute distress from loss of gastrointestinal fluids, hemorrhage, low platelet count, or starvation. Replacement is calculated over 48 hours.

### APPLICATION:

The patient receiving chemotherapy required *replacement therapy* of platelets at the outpatient infusion center due to a platelet count of 50,000.

### NOTES:

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# 1. respiratory acidosis

(rĕs'-pĕră-tōr'ē ăs'"ī-dō'sĭs)

# 2. respiratory alkalosis

(rĕs'-pĕră-tōr'ē ăl'"kă-lō'sĭs)

## 54. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

1. A state of excess carbon dioxide in the body (hypercapnia).
2. A state of excessive loss of carbon dioxide from the body.



### KEEP IN MIND:

Respiratory acidosis ( $\text{H}_2\text{CO}_3$  excess) can be either acute or chronic; the acute imbalance is particularly dangerous. Respiratory acidosis is always due to inadequate excretion of  $\text{CO}_2$  resulting in increased plasma  $\text{CO}_2$  levels. Respiratory alkalosis ( $\text{H}_2\text{CO}_3$  deficit) is always due to hyperventilation, this causes excessive “blowing off” of  $\text{CO}_2$ .

### APPLICATION:

A patient is hypoventilating because of a respiratory depressant drug overdose, with a pH below the normal range (<7.35); therefore this is acidosis and the  $\text{Paco}_2$  is 80, far above normal. This is uncompensated *respiratory acidosis*.

### NOTES:

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# Trousseau's sign

(troo-sōz sīn)

## 55. FLUID, ELECTROLYTES, AND PARENTERAL SOLUTIONS

### DEFINITION:

A carpopedal attitude of the hand elicited when the blood supply to the hand is decreased or the nerves of the hand are stimulated by pressure; elicited within several minutes by applying a blood pressure cuff inflated above systolic pressure. Positive Troussseau's indicates hypocalcemia or hypomagnesemia.



### KEEP IN MIND:

To elicit a Troussseau's sign, use a blood pressure cuff and place it on the arm, inflate the cuff to 10 mm/Hg for 3 minutes, and observe for carpopedal spasm.

**\*NOTE:** Refer to Bonus Card 170 for picture of Troussseau's sign.

### APPLICATION:

The student nurse taking the postoperative thyroidectomy patient's vital signs noted a carpopedal attitude of the hand and fingers when the blood pressure pump was inflated. She reported this to the instructor who explained the need to report this *Troussseau's sign* to the physician.

### NOTES:

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# cannula

(kăñ'ū-lă)

## 56. EQUIPMENT TERMS

### DEFINITION:

A flexible tube that may be inserted into a duct, cavity, or blood vessel to deliver medication or drain fluid. It may be guided by a sharp, pointed instrument (stylet).



### KEEP IN MIND:

Also called a catheter. Refer to card 72 for over-the-needle catheter (cannula) information.

### APPLICATION:

The infusion nurse chose a #20 *cannula* to begin the infusion of 5% dextrose and 0.45% sodium chloride in the cephalic vein.

### NOTES:

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# check valve

(chěk vălv)

## 57. EQUIPMENT TERMS

### DEFINITION:

A device that functions to prevent retrograde solution flow; also called a back check valve.



### KEEP IN MIND:

Check valves are inline components of many primary administration sets. The check valve is an important feature when secondary IV lines are in place for intermittent infusions.

### APPLICATION:

The *check valve* stopped the back flow of the secondary infusion of gentamicin into the primary 5% dextrose in 0.45% sodium chloride.

### NOTES:

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# drip chamber

(drĭp chām'bĕr)

## 58. EQUIPMENT TERMS

### DEFINITION:

Area of IV administration set usually found under the spike where the solution collects and drips into the tubing.



### KEEP IN MIND:

This chamber is a pliable, enlarged clear plastic tube that contains the drop orifice. It is connected to the tubing.

### APPLICATION:

The *drip chamber* had a micro-drip in the drop orifice delivering 60 drops per milliliter.

### NOTES:

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# drop factor

(drōp făk'tōr)

## 59. EQUIPMENT TERMS

### DEFINITION:

The number of drops needed to deliver 1 mL of fluid.



### KEEP IN MIND:

Drop factors vary per manufacturer. Primary macrodrip is 10, 15, and 20 gtt/mL. Pediatric sets are microdrip at 60 gtt/mL, and blood sets are 10 gtt/mL.

### APPLICATION:

The administration set package stated that the blood administration set *drop factor* was 60 gtt/mL.

### NOTES:

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# elastomeric pump

(ĕ'lăs-tō'mĕr-ĕk pŭmp)

## 60. EQUIPMENT TERMS

### DEFINITION:

A portable infusion device with a balloon made of soft, rubberized material capable of being inflated to a predetermined volume.



### KEEP IN MIND:

An elastomeric reservoir or balloon works on flow restrictions. When filled, the balloon exerts positive pressure to administer the medication with an integrated flow restrictor that controls the flow. Elastomeric pumps come in a variety of sizes ranging in volume from 50 to 500 mL.

### APPLICATION:

The home-care nurse brought the 50-mL *elastomeric pump* to the client with instructions for the family on delivery of the medication via the pump every 6 hours.

### NOTES:

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# electronic infusion device (EID)

(ē-lĕk-trōn'ĭk īn-fū'zhŭn dī-vīs')

## 61. EQUIPMENT TERMS

### DEFINITION:

An automated system of introducing a fluid into a vein. The device may have programmable settings that control the amount of fluid to be infused, rate, low-volume notification level, and a keep-vein-open rate.



### KEEP IN MIND:

Often called an IV pump. They allow delivery of drops per minute or milliliters per hour.

### APPLICATION:

The *electronic infusion device* was set for 100 milliliters per hour as a primary infusion.

### NOTES:

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**filter**

(fɪl'tər)

## 62. EQUIPMENT TERMS

### DEFINITION:

A device for eliminating certain elements, such as particles of certain size, in a solution.



### KEEP IN MIND:

A membrane filter is one that is made up of a thin film of colloidion, cellulose acetate, or other material, available in a wide range of defined pore sizes; the smaller pore sizes are capable of retaining all the known viruses.

### APPLICATION:

A 0.22 micron *filter* is used to filter microbes and air from a primary administration set.

### NOTES:

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**gauge**

(gāj)

## 63. EQUIPMENT TERMS

### DEFINITION:

A standard of measurement.



### KEEP IN MIND:

The gauge of over-the-needle catheters is in even numbers (14, 16, 18, 20, 22, and 24).

Metal needles are odd numbered (19, 21, 23, and 25). The gauge of the catheters refers to the opening size of the bevel.

### APPLICATION:

The nurse starting an infusion used a #20 gauge 1 inch over-the-needle catheter placed in the cephalic vein.

### NOTES:

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**hub**

(hǔb)

## 64. EQUIPMENT TERMS

### DEFINITION:

Female connection point of an IV cannula where the tubing or other equipment attaches.



### KEEP IN MIND:

All hubs for infusion equipment should be Luer-Lok design.

The Luer adapter is a device that makes connections between syringes and injection ports, administration sets, and catheters in a manner that prevents the threads on the Luer adapter from slipping.

### APPLICATION:

The *hub* of the infusion device has threads to lock the syringe in place during a flush.

### NOTES:

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infuse

(ɪn-fū'zāt)

## 65. EQUIPMENT TERMS

### DEFINITION:

Any liquid introduced into the body.



### KEEP IN MIND:

Infusates include all crystalloids and colloids, blood and blood products.

### APPLICATION:

The *infusate* of albumin was completed within 2 hours.

### NOTES:

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# locking device (PRN device)

(lōk'īng dī-vīs')

## 66. EQUIPMENT TERMS

### DEFINITION:

A capped resealable diaphragm that may have a Luer-Lok or Luer-Slip connection. This diaphragm can be accessed multiple times. Also called PRN device or saline lock.



### KEEP IN MIND:

The lock is part of administration sets, available as separate connectors to convert continuous infusions to intermittent devices.

### APPLICATION:

The order from the physician stated to convert the continuous infusion of 0.9% sodium chloride to an intermittent infusion using a *locking device* (or saline lock).

### NOTES:

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**lumen**

(lū'měn)

## 67. EQUIPMENT TERMS

### DEFINITION:

The space within a tubular structure, such as an artery or catheter.



### KEEP IN MIND:

Several types of peripheral infusion devices are available with single- and double-lumen catheters.

### APPLICATION:

The dual-*lumen* peripherally inserted central catheter dressing was scheduled to be changed 24 hours after insertion.

### NOTES:

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# macrodrop

(măk'rō-drōp")

## 68. EQUIPMENT TERMS

### DEFINITION:

In IV therapy, an administration device that is used to deliver measured amounts of IV solution. Large drops of fluid.



### KEEP IN MIND:

The size of the drops is controlled by the fixed diameter of a plastic delivery tube. Different macrodrips deliver 10, 15, or 20 drops per milliliter of solution.

### APPLICATION:

The outpatient surgicenter routinely uses *macrodrip* administration sets as part of the presurgery infusion set.

### NOTES:

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**microdrop**  
(mī'krō-drōp")

## 69. EQUIPMENT TERMS

### DEFINITION:

In IV therapy, an administration device for delivering small, measured amounts of IV solutions (60 drops = 1 mL) at specific flow rates.



### KEEP IN MIND:

Also called a pediatric drip, or 60-drop tubing. Microdrips deliver small amounts of solution over time.

### APPLICATION:

The ICU nurse added a *micro-drip* administration set to the solution of heparin in order to titrate the delivery of the medication in small amounts.

### NOTES:

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# multichannel pumps

(mĕl"tī-chĕn'ĕl pĕmpz)

## 70. EQUIPMENT TERMS

### DEFINITION:

Electronic infusion device that delivers multiple drugs or solutions simultaneously or intermittently from bags, bottles, or syringes.



### KEEP IN MIND:

Multichannel pumps are now being designed with medication safety systems.

### APPLICATION:

*Multichannel pumps* are used in critical care areas for delivery of multiple solutions and medications.

### NOTES:

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# needleless systems

(nē'děl-lěs sīs'těmz)

## 71. EQUIPMENT TERMS

### DEFINITION:

A device for administering intravenous solutions that permits intravascular access without the necessity of handling a needle.



### KEEP IN MIND:

These systems were developed to reduce the number of needle stick injuries related to traditional intravenous administration of fluids and medications.

### APPLICATION:

The infusion clinic converted to a new *needleless system*.

### NOTES:

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# over-the-needle catheter

(ō'ver nē-děl kăth'ě-těr)

## 72. EQUIPMENT TERMS

### DEFINITION:

A flexible tube that enables passage of fluid from or into a blood vessel. Consists of a needle with a catheter sheath.



### KEEP IN MIND:

Most common peripheral infusion device. The point of the needle extends beyond the tip of the catheter. After venipuncture, the needle (stylet) is withdrawn. ONCs are sized by even numbers.

### APPLICATION:

A # 20 gauge *over-the-needle catheter* was used to initiate the infusion on the adult waiting for outpatient surgery.

### NOTES:

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# patient-controlled analgesia (PCA)

(pā'shēnt kōn-trōl'ēd än-ăl-jē'zē-ă)

## 73. EQUIPMENT TERMS

### DEFINITION:

A drug delivery system that dispenses a preset intravascular dose of a narcotic analgesic when the patient pushes a switch on an electric cord.



### KEEP IN MIND:

The device consists of a computerized pump with a chamber containing a syringe of drug. The patient administers a dose of narcotic when the need for pain relief arises. A lockout interval automatically inactivates the system if a patient tries to increase the amount of narcotic within a reset period.

### APPLICATION:

The physician ordered morphine via *patient-controlled analgesia* postoperatively for the 62-year-old client with hip resurfacing.

### NOTES:

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# injection port

(ĕn-jĕk'shŭn pôrt)

## 74. EQUIPMENT TERMS

### DEFINITION:

Resealable devices designed to accommodate needleless access for administration of solutions or medications into the vascular system.



### KEEP IN MIND:

Injection ports serve as an access into the tubing and are located at various points along the administration of medication. Needleless systems are used to access the port. Ports are located along primary administration sets or stand-alone devices connected as locking devices.

### APPLICATION:

The *injection port* was cleaned with an alcohol swab using a twisting motion prior to delivery of the IV medication.

### NOTES:

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# primary administration set

(prī'mă-rē ad-mīn-ĕ-strā'shūn sĕt)

## 75. EQUIPMENT TERMS

### DEFINITION:

Device used for delivery of large volume parenterals.



### KEEP IN MIND:

Available in microdrip or macrodrip drop factor. Tubing is long and used to deliver 500 to 1000 mL infusions over a period of time.

### APPLICATION:

The student nurse, gathering equipment for the initial intravenous infusion, chose a *primary macrodrip administration set* and the prescribed solution.

### NOTES:

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**radiopaque**

(rā-dē-ō-pāk')

## 76. EQUIPMENT TERMS

### DEFINITION:

Material used in IV catheter that can be identified by radiographic examination.



### KEEP IN MIND:

Most infusion catheters are radiopaque to ensure radiographic visibility.

### APPLICATION:

The catheter embolized after insertion and was detected on radiographic examination because of the *radiopaque* quality of the catheter.

### NOTES:

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# secondary administration set

(sěk'ǒn-där'ē ăd-mǐn-ǐ-strā'shǔn sět)

## 77. EQUIPMENT TERMS

### DEFINITION:

Administration set that has short tubing used for delivery of 50 to 100 mL of infusion attached to primary administration set for intermittent delivery of medications.



### KEEP IN MIND:

Usually 3 to 36 inches in length.  
Always attached to a needleless adapter into an injection port immediately distal to the back check valve of the primary tubing.

### APPLICATION:

The student nurse chose the appropriate *secondary administration set* to administer the piggyback medication.

### NOTES:

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# syringe pumps

(sīr-inj' pŭmpz)

## 78. EQUIPMENT TERMS

### DEFINITION:

Piston-driven infusion pumps that provide precise infusion by controlling the rate by drive speed and syringe size.



### KEEP IN MIND:

The system pushes the plunger to deliver fluid or medication at a rate of 0.1 to 99.9 mL/h. Some models have program modes capable of administration in mg/kg per minute, mcg/min, and mL/h. The syringe is usually filled in the pharmacy and stored until use.

### APPLICATION:

The *syringe pump* technology was applied to patient-controlled analgesia pumps.

### NOTES:

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# basilic vein

(bă-sĭl'ĭk vān)

## 79. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Vein that arises from the ulnar side of the dorsal venous network of the hand; it curves around the medial side of the forearm, communicates with the cephalic vein through the median cubital vein and passes up the medial side of the arm to join the axillary vein.

### APPLICATION:

The *basilic vein*, located at the median cubital site, is one vein used for insertion of peripherally inserted central catheters.

### NOTES:

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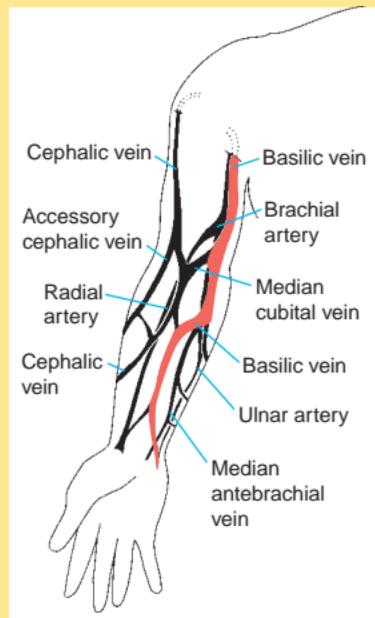
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### KEEP IN MIND:



# cannulation

(kăñ"ū-lā'shŭn)

## 80. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Insertion of an over-the-needle catheter.



### KEEP IN MIND:

Step number 9 of the 15 Steps.  
Actual insertion of the catheter  
through the skin and substruc-  
tures into the vein.

\*NOTE: Refer to Bonus Card  
166 (back), Phillips 15 Steps.

### APPLICATION:

The nurse can use the direct or  
indirect method of *cannulation*  
technique for insertion of over-  
the-needle catheters.

### NOTES:

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# cephalic vein

(sĕ-făl'ĭk vān)

## 81. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Vein arises at the radial border of the dorsal venous area of the hand, passes upward in front of the elbow and along the lateral side of the arm; it empties into the upper part of the axillary vein.

### APPLICATION:

The *cephalic vein* above the radial border above the wrist is a common site to initiate initial IV therapy.



### KEEP IN MIND:

Image rights not available.

### NOTES:

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# chlorhexidine

(klor-hĕk'sĭ-dēn)

## 82. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

A bisbiguanide used as a topical disinfectant.



### KEEP IN MIND:

As a site prep, 2% chlorhexidine gluconate and 70% isopropyl alcohol significantly reduces microbial counts over a 24-hour period.

\***NOTE:** Refer to Bonus Card 166 (back), Phillips 15 Steps.

### APPLICATION:

A skin prep for 20 seconds with *Chlorhexidine (gluconate)* should be used prior to insertion of the peripheral catheter.

### NOTES:

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# digital veins

(dīj'ē-tăl vānz)

## 83. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Veins that are located on the lateral and dorsal portions of the fingers.

### APPLICATION:

The *digital vein* of the thumb is a site for initiation of infusion therapy for the elderly when hydrating fluids are needed without additives and other access is limited as a result of dehydration.

### NOTES:

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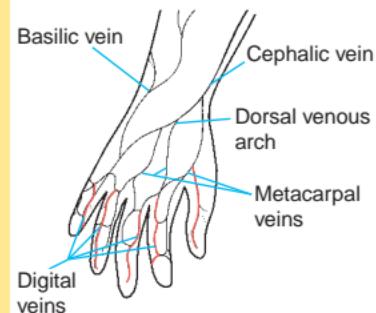
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### KEEP IN MIND:



**distal**

(dĭs'tăl)

## 84. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Farthest from the center, from a medial line, or from the trunk.



### KEEP IN MIND:

The fingers are the most distal point in the peripheral area for infusion therapy.

### APPLICATION:

The IV placed in the lower cephalic vein had infiltrated and the nurse was aware that she could not initiate infusion therapy *distal* to that site.

### NOTES:

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## 85. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

**dermis**

(dĕr'mĭs)

## 85. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

The layer of the skin lying immediately under the epidermis; the true skin.



### KEEP IN MIND:

The corium dermis is composed of fibrous connective tissue made of collagen and elastin, and contains numerous capillaries, lymphatics, and nerve endings. In it are hair follicles and their smooth muscle fibers, sebaceous glands and sweat glands, and their ducts.

### APPLICATION:

The epidermis and *dermis* of the 80-year-old woman upon assessment were very thin; therefore, the nurse had to use special techniques in initiating infusion therapy.

### NOTES:

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# drop factor

(drōp făk'tōr)

## 86. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

The drop rate of the infusion administration set to be used is called the drop factor.



### KEEP IN MIND:

Drop factors vary depending on the size of the drop orifice. Common drop factors are: Primary sets: 10, 15, or 20. Pediatric/micro drip sets: 60. Blood administration sets: 10.

**\*NOTE:** Refer to the back of Bonus Card 167 for examples of rate calculations.

### APPLICATION:

The nurse in the rural clinic needed to set up an infusion to gravity using a primary administration set with a *drop factor* of 15 at a rate of 125 mL per hour. A formula was needed to set the drip rate.

$$\frac{\text{Drop factor} \times \text{mL/hour}}{60 \text{ (minutes)}} = \text{drop per minute}$$

### NOTES:

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# endothelium

(ĕn"dō-thē'lē-ŭm)

## 87. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

A form of squamous epithelium consisting of flat cells that line the blood and lymphatic vessels, the heart, and various other body cavities.



### KEEP IN MIND:

Derived from mesoderm.  
Endothelial cells are metabolically active and produce a number of compounds that affect the vascular lumen and platelets.

### APPLICATION:

The intima of the vein is lined with *endothelium* and can be damaged with poor venipuncture technique.

### NOTES:

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# epidermis

(ĕp"ĭ-dĕr'mĭs)

## 88. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

The outermost layer of the skin.



### KEEP IN MIND:

The epidermis is less sensitive than underlying structures. The epidermis is the first line of defense against infections.

### APPLICATION:

The nurse performed a 20-second prep with antimicrobial solution of the *epidermis* prior to insertion of the catheter.

### NOTES:

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# flushing

(flŭsh'ĭng)

## 89. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

To irrigate with fluid.



### KEEP IN MIND:

0.9% sodium chloride is used for maintenance of intermittent infusion devices. Flush with 0.9% sodium chloride to ensure and maintain patency. For peripheral IVs, flushing protocol dictates: flush with 2–3 mL at least every 12 hours. Flushing should be done prior to medication administration and post administration of intermittent devices.

**\*NOTE:** Refer to Bonus Card 169 for Flushing Guidelines.

### APPLICATION:

The nurse prepared the morphine, 5 mg to be given IV push over 5 minutes, along with two prefilled *flushing* solutions—one for prior to administration of the medication into the intermittent infusion device and one for post administration.

### NOTES:

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# metacarpal veins

(mĕt"ă-kăr'păl vānz)

## 90. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Veins located on the dorsum of the hand over the five long bones formed by the union of digital veins.

### APPLICATION:

The *metacarpal vein* of the right hand was used to initiate infusion of 5% dextrose and 0.45% sodium chloride without additives for hydration for the client with gastroenteritis.

### NOTES:

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### KEEP IN MIND:

Image rights not available.

# median cubital veins

(mē'dē-ăñ kū'bĕ-tăl vānz)

## 91. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Veins that pass across the anterior aspect of the elbow from the cephalic vein to the basilic vein; commonly, this vein is replaced by intermediate basilic and intermediate cephalic veins.

### APPLICATION:

The phlebotomist used the cephalic portion of the *median cubital veins* to withdraw blood for analysis.



### KEEP IN MIND:

Image rights not available.

### NOTES:

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These veins are often used for venipuncture for blood withdrawal and in emergency cases for access.

# midline catheter

(mĕd'līn kăth'ĕ-tĕr)

## 92. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Catheter with tip placement level with the axillary vein, and distal to the shoulder.



### KEEP IN MIND:

This catheter measures 3.1 to 8 inches in length with the distal tip dwelling in the basilic, cephalic, or brachial vein.

### APPLICATION:

The nurse inserted a *midline catheter* to support the infusion of the peripheral nutritional support over a period of 7 days.

### NOTES:

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**palpation**  
(păl-pă'shŭn)

## 93. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Examination by application of the hands or fingers to the external surface of the body to detect the outline of a vein.



### KEEP IN MIND:

Palpate the vein by moving the tips of the fingers down the vein to observe how it refills.

**\*NOTE:** Refer to front of Bonus Card 166, step 5 of Phillips 15 Steps, for palpation of veins to determine site selection.

### APPLICATION:

The nurse, prior to venipuncture, used *palpation* of the veins of the hand and lower arm to determine which vein would be most appropriate for infusion therapy.

### NOTES:

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## 94. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

prime  
(prīm)

## 94. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Process of running the fluids in an IV bag through the tubing so that there is no air in the tubing.

### APPLICATION:

The administration set was *primed* prior to insertion into the electronic infusion device.



### KEEP IN MIND:

Image rights not available.

### NOTES:

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**proximal**

(prōk'sĭm-ăl)

## 95. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Nearest the point of attachment, center of the body; or point of reference.



### KEEP IN MIND:

The upper cephalic vein (above the median cubital) is the most proximal point of insertion of a catheter for peripheral infusion therapy.

### APPLICATION:

The IV site in the hand appeared reddened and the patient complained of pain at the site. The nurse discontinued the infusion and catheter, and restarted the infusion *proximal* to the previous infusion site.

### NOTES:

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## skin receptors:

### 1. mechanoreceptors

(měk'"ă-nō-rē-sěp'torz)

### 2. thermoreceptors

(thěr'"mō-rē-sěp'torz)

### 3. nociceptor

(nō'"sē-sěp'tor)

### 4. chemoreceptors

(kē'"mō-rē-sěp'torz)

## 96. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITIONS:

1. A receptor that receives mechanical stimuli, such as pressure from sound or touch.
2. A free nerve ending that is a receptor for painful stimuli.
3. A sensory receptor that is stimulated by a rise in body temperature.
4. A sense organ or sensory nerve ending that is stimulated by, and reacts to, certain chemical stimuli and that is located outside the central nervous system.



### KEEP IN MIND:

There are five types of sensory receptors, four of which affect parenteral therapy. Sensory receptors transmit along afferent fibers. Mechanoreceptors, palpation of veins; thermoreceptors, application of heat or cold; nociceptors, the puncture of vein for insertion of the cannula; chemoreceptors, decrease circulating blood volume.

### APPLICATION:

Application of the physiology of *nociceptors* must be considered prior to venipuncture to decrease the discomfort of initiation of infusion therapy.

### NOTES:

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# tangential lighting

(tăñ-jĕn'shŭl lĭt'ĭng)

## 97. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Indirect lighting used to illuminate the blue of veins.



### KEEP IN MIND:

This technique can be used for dark skinned individuals and those with altered skin surfaces.

**\*NOTE:** Refer to Bonus Card 166, step 5 of Precannulation, use tangential lighting to determine site selection.

### APPLICATION:

*Tangential lighting* was used with a small flashlight to illuminate the veins of the lower arm and, thus, assist with access of the vein.

### NOTES:

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# 1. tunica adventitia

(tū'nī-kă ād"věn-těsh'ē-ă)

# 2. tunica media

(tū'nī-kă ūmē'dē-ă)

# 3. tunica intima

(tū'nī-kă ūm'ětě-mă)

## 98. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Layers of tissue that form the walls of veins and arteries.



### KEEP IN MIND:

Tunica adventitia: The outermost layer consists of connective tissue that surrounds and supports a vessel. Tunica media: composed of muscular and elastic tissue with nerve fibers for vasoconstriction and vasodilation. Tunica intima: innermost layer has one thin layer of cells referred to as the endothelial lining.

### APPLICATION:

The nurse must keep in mind that the *intima* of the vein is fragile and that good venipuncture technique is important to prevent damage to this third layer of the vein.

### NOTES:

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# transdermal analgesia

(trăns-dĕr'măl än-ăl-jē'zē-ă)

## 99. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

Analgesia delivered through the dermis or skin.



### KEEP IN MIND:

Use of anesthetics either on the skin or injected into the dermal layer prior to venipuncture to decrease the pain of venipuncture. Lidocaine 1% (plain) by intradermal route; transdermal by EMLA cream or ELA Max cream topically applied 30 minutes prior to venipuncture.

**\*NOTE: Refer to Bonus Card 166 (back) for step 8 of Phillips 15 Steps. Analgesic is used prior to site preparation, allowed to take effect, and then the nurse should continue with step 9.**

### APPLICATION:

The nurse provided *transdermal analgesia* with EMLA cream covered with occlusive dressing 30 minutes prior to venipuncture.

### NOTES:

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# **transparent semipermeable membrane dressing (TSM)**

(trăns-păr'ěnt sěm'"ē-per'mē-ă-bl měm'brān drěs-ěng)

## 100. TECHNIQUES/MAINTENANCE PERIPHERAL IVS

### DEFINITION:

A transparent wound covering made of polyurethane that enables health-care providers to visually inspect the site under the dressing. The dressing allows water vapor to escape from the wound but does not permit liquids or bacteria to enter.



### KEEP IN MIND:

Transparent semipermeable membrane dressings should be applied aseptically and changed every 72 hours or when the catheter is changed. Do not use ointment of any kind under a TSM dressing.

**\*NOTE:** Refer to Bonus Card 166, (back), step 10 of Phillips 15 Steps.

### APPLICATION:

After the #20 over-the-needle catheter was stabilized, a *TSM* dressing was applied and labeled with the time of venipuncture, date, size catheter, and nurse's initials.

### NOTES:

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# central venous catheter (CVC)

(sĕn'trăl vĕ'nŭs kăth'ĕ-tĕr)

## 101. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Catheter inserted into the central circulation for infusion therapy; the tip located in the superior vena cava. All central lines are central venous catheters (CVCs).



### KEEP IN MIND:

CVCs are indicated for infusion therapy longer than 7 days.

### APPLICATION:

The new bundles for prevention of catheter-related bloodstream infections include assessing the client early for placement of a CVC.

### NOTES:

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# external jugular

(ĕks-tĕr'năl jŭg'ū-lăr)

## 102. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

The vein located on the exterior aspect of the neck.



### KEEP IN MIND:

External jugular access can be used for external jugular peripherally inserted central catheters (EJ PICCs) and external jugular peripheral intravenous catheters (EJ PIVs).

### APPLICATION:

In an acute care setting, nurses who are proficient in infusion therapy may insert a peripheral IV by accessing the *external jugular*.

### NOTES:

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# flushing CVC

(flŭsh'ĭng)

## 103. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

To wash out with a full stream of fluid.

### APPLICATION:

The nurse *flushed* the peripherally inserted central catheter with 5 mL of preservative-free sodium chloride in a 10-mL syringe and followed the flush with 5 mL of 10 units/mL of heparin using a push-pause method.

### NOTES:

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### KEEP IN MIND:

For central catheters the following protocol is recommended. Central catheters should be flushed with a minimum of 5 mL of sodium chloride using a single-use 10-mL syringe. Lock the device with 5 mL of 10 unit/mL of heparin. For ports use 3–5 mL of 100 units/mL heparin to lock device.

**\*NOTE:** Refer to Bonus Card 169 (back), Flushing Guidelines.

# Groshong® valve

(Grō'shōng vălv)

## 104. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Flaplike structure resembling a valve that retards or prevents a reflux of fluid or blood.



### KEEP IN MIND:

Used at the terminal end of central venous catheters and implanted ports to prevent reflux of blood. The Groshong® has a two-way valve placed near the distal end that restricts backflow of blood, but it can be purposefully overridden to obtain venous blood samples. This valve eliminates the need for flushing with heparin. The valve is open inward, minimizing the risks of blood backing up the catheter lumen.

### APPLICATION:

The *Groshong® valve* feature is included in many types of central lines—PICC, tunneled, and ports.

### NOTES:

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# Hickman catheter

(Hɪk'măñ kăth'ĕ-tĕr)

## 105. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Long-term, tunneled, Silastic catheter inserted surgically.



### KEEP IN MIND:

Prototype for a variety of tunneled catheters currently on the market.

### APPLICATION:

The *Hickman catheter* was placed so the client could receive chemotherapy over the next 8 months.

### NOTES:

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# implanted port

(im'plănt-ĕd pôrt)

## 106. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Catheter surgically placed into a vessel, body cavity, or organ and attached to a reservoir, which is placed under the skin.



### KEEP IN MIND:

Implanted ports must be accessed with special needles that are noncoring.

\***NOTE:** Refer to Bonus Card 169 (back) for picture of port.

### APPLICATION:

The *implanted port* was accessed with a safety needle that uses a noncoring needle.

### NOTES:

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# infraclavicular

(ɪn"fră-klă-vik'ū-lär)

## 107. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Positioned below the clavicle.



### KEEP IN MIND:

This site on the right or left is used for insertion of implanted ports or percutaneous catheters.

### APPLICATION:

The *infraclavicular* insertion site was inspected for redness and drainage per shift with documentation of visual inspection.

### NOTES:

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# ports (injection):

## 1. distal port

(dĕs'tăl pôrt)

## 2. medial port

(mĕ'dē-ăl pôrt)

## 3. proximal port

(prök'sim-ăl pôrt)

## 108. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITIONS:

1. The lumen located farther from the catheter tip.
2. The center lumen of a triple lumen catheter.
3. Lumen nearest the tip.

### APPLICATION:

The *proximal port* of the central line triple lumen was labeled “use for blood sampling only.”

### NOTES:

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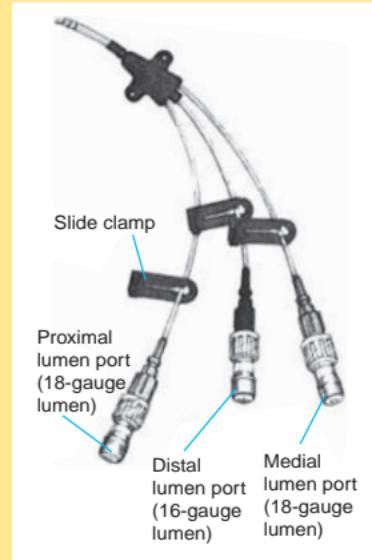
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### KEEP IN MIND:



# peripherally inserted central catheter (PICC)

(pěr-if'ěr-ăl-lē' īn-sěr'těd sěn'träl kāth'ě-těr)

## 100. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Catheter inserted into the superior vena cava through a peripheral vein; usually cephalic and basilic at the median cubital area.



### KEEP IN MIND:

The PICC is a percutaneous line that may have single or multiple lumens with a range in lengths from 33 to 60 cm and diameters of 14 to 25 gauges. The PICC is placed by a nurse certified in PICC placement. X-ray verification of placement is required before the line can be used.

**\*NOTE:** Refer to Bonus Card 169 (back) to see a picture of PICC placement.

### APPLICATION:

The IV team placed the *PICC* in the right cephalic vein and verified confirmation of the tip in the superior vena cava prior to starting the client on total parenteral nutrition.

### NOTES:

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**polyurethane**  
(pōl'ē-yür'ē-thān)

## 110. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Medical grade resins, widely varying in flexibility, used in chemical-resistant coatings and adhesives used to make catheters for venous access.



### KEEP IN MIND:

A polyurethane catheter is commonly used because of the material's versatility, malleability (tensile strength and elongation characteristics), and biocompatibility.

### APPLICATION:

The *polyurethane* catheter was also coated with chlorhexidine/silver sulfadiazine on the internal and external luminal surfaces as a means of reducing catheter-related bloodstream infections (CRBSI).

### NOTES:

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# pulsatile flushing (push-pause)

(pūl'sā-tīl flūsh'īng) (poosh-pāwz)

## 111. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Rapid succession of pulsatile push-pause—push-pause movements that create turbulence within the catheter lumen that causes a swirling effect to move any debris.



### KEEP IN MIND:

Use this technique for flushing central lines with preservative-free sodium chloride. This technique is not used for locking the device with heparin.

### APPLICATION:

The nurse administered the medication into the PICC and flushed the catheter with 5 mL of preservative-free sodium chloride in a 10-mL syringe using a *push-pause* technique.

### NOTES:

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# silicone elastomer

(sīl'ī-kōn ē'lăs-tō'mĕr)

## 112. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

A polymer of organic silicon oxides, which may be a liquid, gel, or solid depending on the extent of polymerization; used in surgical implants and as a coating on the inside of glass vessels for blood collection.



### KEEP IN MIND:

Some VADs are made of silicone elastomer (Silastic), which is soft and pliable. This material is biocompatible. Silicone has a high degree of thrombogenicity because of surface tackiness. Fibrin sheath formation can occur when particulate matter is present.

### APPLICATION:

The peripherally inserted central catheter was made of *silicone elastomer*.

### NOTES:

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# vascular access device (VAD)

(văs'kū-lär ăk'sĕs dĕ'vēs)

## 113. TECHNIQUES/MAINTENANCE CENTRAL IVS

### DEFINITION:

Access device inserted into a main vein or artery, or bone marrow and used primarily to administer fluids and medication, monitor pressures, and collect blood.



### KEEP IN MIND:

VADs are all access devices (peripheral catheters, central venous catheters, arterial lines, and intraosseous access devices) that have access to the circulatory system.

### APPLICATION:

The hospital distributed a memo requesting that those nurses interested in being on the VAD committee contact the infusion therapy department.

### NOTES:

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# acute hemolytic transfusion reaction

(ă-kūt' hē"mō-līt'ik trāns-fū'zhūn rē-ăk'shūn)

## 114. COMPLICATIONS

### DEFINITION:

Blood transfusion reaction in which an antigen-antibody reaction in the recipient is caused by an incompatibility between red blood cell antigens and antibodies causing the destruction of red blood cells, resulting in liberation of hemoglobin.



### KEEP IN MIND:

Cause of this complication is usually clerical error or breakdown in identification of matching blood component with recipient. ABO incompatibility.

### APPLICATION:

The nurse hung the unit of red blood cells and per protocol stayed with the patient for the first 5 minutes. The patient complained immediately of flank pain and burning sensation along vein. The nurse stopped the infusion, disconnected the infusion, and hung fresh tubing and saline while calling for assistance. The physician determined that the patient had an *acute hemolytic transfusion reaction* due to clerical error in the laboratory.

# air embolism

(ār ēm'bō-līzm)

## 115. COMPLICATIONS

### DEFINITION:

A sudden obstruction of a blood vessel caused by air introduced into the circulation.



### KEEP IN MIND:

Rare but lethal complication. Especially involving VADs. Causes include: Allowing solution container to run dry and then adding a new bag without clearing air from the administration set. Loose connections that allow air to enter the system. Poor technique in dressing and administration set changes.

### APPLICATION:

The nurse, following protocol for the central line dressing and administration cap change, had the patient hold his breath while disconnecting the cap in order to prevent *air embolism*.

### NOTES:

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# catheter malposition

(kăth'ĕ-tĕr măl-pō-zĕ'shŭn)

## 116. COMPLICATIONS

### DEFINITION:

Position of the central line catheter outside the superior vena cava.



### KEEP IN MIND:

Refer to central line term catheter malpositioning where tip of catheter advances into a venous tributary or does not reach the superior vena cava.

### APPLICATION:

The advanced practice infusion nurse read the x-ray to verify placement and noted that the *catheter was malpositioned* in the right atrium. The radiologist confirmed that the catheter needed to be repositioned.

### NOTES:

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# circulatory overload (fluid overload)

(sĕr'ĕkū-lă-tōr'ē ō'ver-lōd)

## 117. COMPLICATIONS

### DEFINITION:

Increased blood volume, usually caused by transfusions or excessive fluid infusions that increase the venous pressure.



### KEEP IN MIND:

This can result in heart failure, pulmonary edema, and cyanosis. Also called hypervolemia.

### APPLICATION:

The nurse noted that the patient was short of breath with wet lung sounds and increased peripheral edema; upon inspection of IV solution, she noted that 0.9% sodium chloride was infusing and the order had read 0.45% sodium chloride. The nurse immediately slowed the infusion and contacted the physician for new solution order to prevent further *circulatory overload*.

### NOTES:

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# extravasation

(ĕks-trăv"ă-sā'shŭn)

## 118. COMPLICATIONS

### DEFINITION:

The escape of fluid from its physiologic contained space into surrounding fluid.



### KEEP IN MIND:

Extravasation is often referred to as infiltration of irritating or vesicant substances into the surrounding tissue. A vesicant causes the formation of blisters, with subsequent sloughing of tissues.

### APPLICATION:

The antidote for *extravasation* of dopamine is 5 to 10 mg phentolamine mesylate by intradermal administration.

### NOTES:

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# fibrin sheath

(fī'brĭn shēth)

## 119. COMPLICATIONS

### DEFINITION:

Covering on the end of a catheter with a whitish, filamentous protein formed by the action of thrombin on fibrinogen. The fibrin is deposited as fine interlacing filaments which entangle red and white blood cells and platelets forming a clot.

### APPLICATION:

The nurse had difficulty aspirating blood from the central line and suspected a *fibrin sheath* covering the Hickman catheter.

### NOTES:

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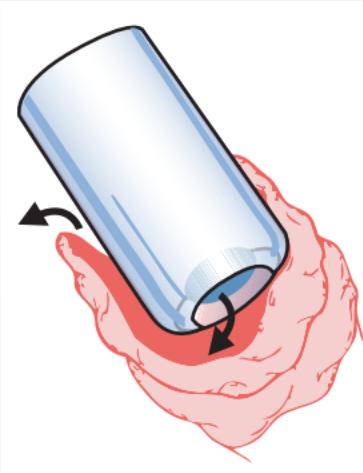
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### KEEP IN MIND:



Also called a fibrin sleeve.

# graft-versus-host disease (GVHD)

(grăft vĕr'sŭs hōst dĭ-zēz')

## 120. COMPLICATIONS

### DEFINITION:

Immunological injury suffered by an immunosuppressed recipient of a bone marrow transplant. The donated lymphoid cells (the “graft”) attack the recipient (the “host”), causing damage, especially to the skin, liver, and gastrointestinal tract.



### KEEP IN MIND:

GVHD occurs in about 50% of allogeneic bone marrow transplants. It may develop in the first 60 days after transplantation or many months later (chronic GVHD). Creates scleroderma-like changes on skin and organs.

### APPLICATION:

The immunocompromised client was at risk for *graft-versus-host disease*.

### NOTES:

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# hematoma

(hē'"mă-tō'mă)

## 121. COMPLICATIONS

### DEFINITION:

A swelling comprising a mass of extravasated blood confined to subcutaneous tissue caused by break in a blood vessel.



### KEEP IN MIND:

Symptoms include ecchymoses, swelling, inability to advance catheter, and resistance during flushing.

### APPLICATION:

The nurse inserted the #20 over-the-needle catheter into the vein of an elderly 80-year-old female with the immediate formation of a *hematoma*.

### NOTES:

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# hemothorax

(hē'mō-thō'răks)

## 122. COMPLICATIONS

### DEFINITION:

Blood in the pleural cavity caused by a rupture of blood vessels.



### KEEP IN MIND:

Complication during insertion of central line.

### APPLICATION:

The physician inserted the central line and upon x-ray verification of placement noted the patient had developed a *hemothorax*.

### NOTES:

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# hypothermia

(hī"pō-thĕr'mē-ă)

## 123. COMPLICATIONS

### DEFINITION:

A low core body temperature.



### KEEP IN MIND:

Hypothermia can occur from rapid transfusion of cold blood. Blood warmers can be used for rapid or massive transfusions. Guidelines from the manufacturers of specific fluid/blood warmers should be adhered to when using any warmer.

### APPLICATION:

The nurse in post-anesthesia recovery (PAR) set up the blood warmer in anticipation of infusion of additional blood components to the trauma patient to prevent *hypothermia*.

### NOTES:

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# infiltration

(ɪn'fɪl-trā'shün)

## 124. COMPLICATIONS

### DEFINITION:

The accumulation of an external substance within tissue.



### KEEP IN MIND:

Infiltration is usually due to solutions seeping from vessel into the tissue space causing swelling.

\***Note:** Refer to Bonus Card 168 (back) for Infiltration Rating Scale.

### APPLICATION:

Upon inspection of the IV site, the nurse noted edema and the site was cool to touch; the *infiltration* was rated at a grade 2.

### NOTES:

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# local infection

(lō'kăl īn-fĕk'shŭn)

## 125. COMPLICATIONS

### DEFINITION:

An invasion of microorganisms that penetrate the tissues of a specific bodily area, then grow and exert their effect there.



### KEEP IN MIND:

Local infections are usually related to contamination of the hands of the health-care practitioner while starting the infusion, a contaminated catheter or infusate. Symptoms include redness and swelling at the site, possible exudate of purulent material, and elevated temperature.

### APPLICATION:

The catheter site was not rotated for more than 96 hours and it was noted that there was purulent material under the transparent dressing. The nurse cultured the site and catheter in anticipation of a *local infection*.

### NOTES:

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# phlebitis

(flě-bī'tīs)

## 126. COMPLICATIONS

### DEFINITION:

Inflammation of a vein.  
Common causes include  
chemical or mechanical  
irritation of vein.



### KEEP IN MIND:

\*Note: Refer to Bonus Card 168 for Phlebitis Rating Scale.

### APPLICATION:

Upon assessment of the infusion site, the patient complained of pain at the access site, and it was noted that there was a red streak extending up the vein and the nurse felt a palpable cord along the vein. The catheter was discontinued and a 3+ *phlebitis* was reported to the physician.

### NOTES:

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# pinch-off syndrome

(pĕnch ĕff sĕn'drōm)

## 127. COMPLICATIONS

### DEFINITION:

CVC compressed by the clavicle and the first rib; results in mechanical occlusion.



### KEEP IN MIND:

Can result in complete or partial catheter transection and embolization. Infraclavicular pain or swelling is present.

### APPLICATION:

The nurse encountered difficulty in aspiration of blood and resistance when the subclavian catheter was flushed, along with the patient complaining of infraclavicular pain. The nurse suspected *pinch-off syndrome*.

### NOTES:

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# pneumothorax

(nū-mō-thō'răks)

## 128. COMPLICATIONS

### DEFINITION:

The presence of air or gas in the pleural cavity between the lung and chest wall.



### KEEP IN MIND:

Caused during insertion of central catheter by puncturing the pleural covering of the lung; often treated by insertion of chest tube.

### APPLICATION:

Upon insertion of the central line the patient complained of chest pain and dyspnea; a crunching sound on auscultation was heard. X-ray confirmed a *pneumothorax* post central line insertion.

### NOTES:

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# pulmonary edema

(pǔl'mō-ně-rē ē-dē'mă)

## 129. COMPLICATIONS

### DEFINITION:

Accumulation of extravascular fluid in lung tissues, usually in the alveoli.



### KEEP IN MIND:

Often caused by administration of high percentages of sodium chloride or fluid overload. The treatment would include: decrease IV flow rate, place patient in high Fowler's position, keep warm, monitor vital signs, and administer oxygen as ordered. Consideration should be given to a microdrip administration set.

### APPLICATION:

The patient presented with signs of *pulmonary edema* including shortness of breath, 3+ pitting edema of the extremities, and moist lung sounds.

### NOTES:

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# refeeding syndrome

(rē-fēd'īng sǐn'drōm)

## 130. COMPLICATIONS

### DEFINITION:

The potentially fatal metabolic response of a starved individual to feeding, either enteral or parenteral. The correction of electrolyte imbalances is imperative before gradual refeeding to prevent hypophosphatemia, rhabdomyolysis, and other life-threatening complications.



### KEEP IN MIND:

Occurs in initial phases of TPN.

### APPLICATION:

*Refeeding syndrome* can be avoided by initiating TPN slowly, then gradually increasing the rate while carefully monitoring the patient's response and serum electrolyte levels.

### NOTES:

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# septicemia

(sĕp-tĕ-sĕ'mĕ-ă)

## 131. COMPLICATIONS

### DEFINITION:

The presence of pathologic microorganisms in the blood.



### KEEP IN MIND:

Signs and symptoms are dramatic and include fluctuating fever, profuse sweating, nausea and vomiting, diarrhea, abdominal pain, tachycardia, hypotension, and altered mental status.

### APPLICATION:

The patient was transferred from the medical-surgical unit to intensive care with *septicemia*, unknown source.

### NOTES:

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# speed shock

(spēd shōk)

## 132. COMPLICATIONS

### DEFINITION:

A severe disturbance of hemodynamics in which the circulatory system fails to maintain adequate perfusion of vital organs due to sudden flooding of vital organs with medication.



### KEEP IN MIND:

Speed shock is caused by rapidly administering IV push substances, causing the concentration of medication in the plasma to reach toxic proportions, flooding the organs rich in blood (heart and brain). Syncope, shock, and cardiac arrest may result.

### APPLICATION:

The nurse drew up the meperidine and administered the medication rapidly through the patient's injection port; the patient responded with syncope and shock symptoms from the *speed shock*.

### NOTES:

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# superior vena cava (SVC) syndrome

(soo-pē'rē-or vē'nă kā'vă sīn'drōm)

## 133. COMPLICATIONS

### DEFINITION:

Obstruction of the superior vena cava or its main tributaries causing edema and engorgement of the vessels.



### KEEP IN MIND:

Symptoms include progressive edema of the face, neck, arms; nonproductive cough and dyspnea; bluish looking venous stars may be found in the early phases, overlying the large veins to which they are tributary, but they tend to diminish in size and disappear after collateral circulation has been established. Interventions include: Notification of physician, radiographic confirmation of SVC syndrome, and may include anticoagulant therapy. Catheter may or may not be removed.

### APPLICATION:

The client with an implanted port upper chest was peppered with a bluish venous star-shaped design; the nurse suspected *superior vena cava syndrome*.

### NOTES:

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# thrombosis

(thrōm-bō'sīs)

## 134. COMPLICATIONS

### DEFINITION:

Clotting within a blood vessel that may cause interruption of blood flow.



### KEEP IN MIND:

The clot may cause obstruction or become attached to the vessel without obstructing the lumen. The thrombosis can result from mechanical or nonthrombotic obstructions (42%). Interventions would be to discontinue the catheter, apply cold compresses to site, and assess for circulatory impairment.

### APPLICATION:

*Thrombosis* can develop within or around the catheter or in the surrounding vessel.

### NOTES:

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# thrombophlebitis

(thrōm'bō-flē-bī'tīs)

## 135. COMPLICATIONS

### DEFINITION:

Venous inflammation with thrombus (clot) formation.



### KEEP IN MIND:

Denotes a twofold injury; thrombosis and inflammation. Thrombophlebitis is related to: use of veins in legs for infusion therapy; use of hypertonic or highly acidic infusion solutions. Symptoms include sluggish flow rate, edema in the limbs, tender and cordlike vein, site warm to touch, visible red line above venipuncture site. Interventions would include discontinuation of catheter, physician consultation, and comfort provided by application of warm compresses.

### APPLICATION:

The patient received 20 mg of potassium chloride via secondary infusion over 3 hours; the nurse assessed the vein for *thrombophlebitis* formation post infusion.

### NOTES:

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# venospasm

(vē'nō-spăzm)

## 136. COMPLICATIONS

### DEFINITION:

Sudden constriction of the vein.



### KEEP IN MIND:

Usually caused by infusion of cold or irritating substances into the vein. Flow rate decreases, patient complains of pain at infusion site. Apply warm compresses, slow infusion.

### APPLICATION:

The nurse began the transfusion and the patient almost immediately complained of severe pain at the infusion site. The nurse suspected *venospasm*.

### NOTES:

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## 137. INFUSION MODALITIES

**bolus**

(bō'lüs)

## 137. INFUSION MODALITIES

### DEFINITION:

Concentrated medication or solution given rapidly over a short period of time; may be given by direct IV injection or IV drip.



### KEEP IN MIND:

The term bolus or IV push does not indicate an appropriate injection rate. Consult reliable drug references or confer with a pharmacist to obtain protocol for the length of time needed to administer the ordered dose.

### APPLICATION:

The physician ordered a *bolus* of 10 mEq of potassium chloride, which needed to be administered over a minimum of 1 hour according to the drug reference and diluted in 50 to 100 mL of infusate.

### NOTES:

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# chemical incompatibility

(kěm'ík-ăl īn'"kōm-păt-ĕ-bil'ĭ-tē)

## 138. INFUSION MODALITIES

### DEFINITION:

Not suitable chemically to be combined or mixed with another chemical.



### KEEP IN MIND:

Alteration in integrity or potency of the active ingredient in the medication. The most common cause of chemical incompatibility is the reaction between acidic and alkaline drugs resulting in a pH level that is unstable for one of the drugs.

### APPLICATION:

The medication was reconstituted with the wrong solution resulting in a *chemical incompatibility*.

### NOTES:

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**epidural**

(ĕp'ĕ-dûr'ăl)

## 139. INFUSION MODALITIES

### DEFINITION:

On or outside the dura mater.



### KEEP IN MIND:

Area used for regional medication administration, produced by injection of local anesthetic or medication into the peridural space.

### APPLICATION:

The *epidural* route for adjunct pain management was started in the operating room for postoperative patient pain control post pancreatic tumor resection.

### NOTES:

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# intermittent drug infusion

(ɪn"tĕr-mĕt'ĕent drŭg ɪn-fu'zhŭn)

## 140. INFUSION MODALITIES

### DEFINITION:

Delivery of therapeutic agent at specific intervals.



### KEEP IN MIND:

Delivery of medications such as antibiotics at intervals to maintain blood levels. Usually administered in 50 to 150 mL of solution by secondary infusion, or through a locking intermittent device over 15 minutes to 1 hour.

### APPLICATION:

Ceftazidime (Fortaz) 1 gram in 100 mL of 0.9% NaCl was administered by *intermittent drug infusion* preoperatively.

### NOTES:

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# intraperitoneal (IP)

(ɪn"tră-pĕr'ɪ-tō-nē'äl)

## 141. INFUSION MODALITIES

### DEFINITION:

Route by which medication is administered directly into the peritoneal cavity.



### KEEP IN MIND:

One intracavitory drug administration route that involves the administration of therapeutic agents directly into the peritoneal cavity.

### APPLICATION:

The purpose of *intraperitoneal* therapy for the patient with ovarian cancer was to increase the concentration of an antineoplastic agent at the tumor site and enhance its penetration and cell kill while limiting systemic effects.

### NOTES:

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**intraspinal**

(ɪn"tră-spī'năl)

## 142. INFUSION MODALITIES

### DEFINITION:

Within the spinal canal.



### KEEP IN MIND:

Intraspinal is the term used to encompass both epidural and intrathecal spaces surrounding the spinal cord.

### APPLICATION:

*Intraspinal* medication delivery via the epidural route can be used for acute, chronic, or cancer pain management.

### NOTES:

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# intrathecal (IT)

(ɪn"tră-thē'kăl)

## 143. INFUSION MODALITIES

### DEFINITION:

Within the subarachnoid or subdural space.



### KEEP IN MIND:

The intrathecal space is surrounded by the epidural space and separated from it by the dura mater; the intrathecal space contains cerebrospinal fluid. The epidural and intrathecal spaces share a common center, the spinal cord.

### APPLICATION:

The anesthesiologist set up the *intrathecal* opioid infusion by implanted infusion pump for the cancer patient to provide adequate pain relief.

### NOTES:

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# intravenous push (IVP)

(ɪn-tră-vē'nūs poosh)

## 144. INFUSION MODALITIES

### DEFINITION:

Medication delivered rapidly within the vein.



### KEEP IN MIND:

Direct administration of medication or solution via syringe. The purpose is to achieve rapid serum concentrations of the medications. Follow guidelines from the manufacturer when administering medication by IV push.

### APPLICATION:

The nurse administered the morphine sulfate 5 mg by *IV push* over 5 minutes.

### NOTES:

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# physical incompatibility

(fɪz'ɪ-kăl īn"kōm-pă"tĭ-bĭl'ĭ-tē)

## 145. INFUSION MODALITIES

### DEFINITION:

An undesirable change that is visually observed.



### KEEP IN MIND:

Also called pharmaceutical incompatibility. Can occur when one drug is mixed in a syringe or bag with another agent to produce a product that is unsafe for administration. Precipitation may be visible as haze, gas bubbles, or cloudiness.

### APPLICATION:

Calcium in a drug or solution may cause *physical incompatibility* with some added medications.

### NOTES:

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# therapeutic incompatibility

(thĕr-ă-pū'tĭk īn'kōm-pă'"tĭ-bil'ĭ-tē)

## 146. INFUSION MODALITIES

### DEFINITION:

Undesirable effect occurring within a patient as a result of two or more drugs being given concurrently.



### KEEP IN MIND:

Occurs most frequently when two drugs are administered and one antagonizes the effect of the second. Response to medication may go unnoticed until patient fails to show the expected clinical response to the drug.

### APPLICATION:

The peak blood level drawn for chloramphenicol did not show a therapeutic response. Due to the administration of an additional antibiotic, the physician concluded there was *therapeutic incompatibility* between the two drugs and one was discontinued.

### NOTES:

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# ABO system

(ā-bē-ō sīs'tēm)

## 147. TRANSFUSION THERAPY

### DEFINITION:

Blood group of antigens that reside on structurally related carbohydrate molecules.



### KEEP IN MIND:

The ABO antigens and antibodies are the most significant for transfusion practice.

### APPLICATION:

The patient was typed and cross-matched for *ABO* and Rh type.

### NOTES:

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# agglutinin

(ă-gloo'tĕ-nĭn)

## 148. TRANSFUSION THERAPY

### DEFINITION:

An antibody that causes clumping or agglutination of the cells that stimulate the formation of the agglutinin.



### KEEP IN MIND:

An antibody has the same name as the antigen with which it reacts. For example, anti-A reacts to antigen A.

### APPLICATION:

In the test tube, the laboratory technician mixed blood to cross-match and assess for any *agglutinin* formation.

### NOTES:

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# agglutinogen

(ă-gloo-tĕn'ō-jĕn)

## 149. TRANSFUSION THERAPY

### DEFINITION:

An antigenic substance that stimulates the formation of specific agglutinin, which, under certain conditions, causes agglutination of cells.



### KEEP IN MIND:

Also referred to as antigens.

### APPLICATION:

The ABO system is the most important *agglutinogen* located on the red blood cell (RBC) membranes.

### NOTES:

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# antibody

(ăn'tī-bōd'ē)

## 150. TRANSFUSION THERAPY

### DEFINITION:

A substance produced by B lymphocytes in response to a unique antigen. Each antibody (Ab) molecule combines with a specific antigen to destroy or control it.



### KEEP IN MIND:

All antibodies except natural antibodies are made by B cells stimulated by a foreign antigen, typically a foreign protein polysaccharide.

### APPLICATION:

*Antibodies*, also called agglutinins, within the blood system are proteins that react with an antigen.

### NOTES:

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antigen

(ăn'tĕ-jĕn)

## 151. TRANSFUSION THERAPY

### DEFINITION:

A protein or oligosaccharide marker on the surface of cells that identifies the cell as self or nonself; identifies the type of cell and stimulates the production of antibodies by B lymphocytes.



### KEEP IN MIND:

Antigens on the body's own cells are called autoantigens. Antigens on all other cells are called foreign antigens.

### APPLICATION:

*Antigens*, also called agglutinogens, are located on the RBC membranes.

### NOTES:

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# autologous donor

(aw-tōl'ō-gūs dō'nōr)

## 152. TRANSFUSION THERAPY

### DEFINITION:

Originating within an individual, especially a factor present in tissues or fluids.



### KEEP IN MIND:

Donation of a unit of blood to be reinfused to the individual donating the blood. Recipient receives his or her own blood back postoperatively.

### APPLICATION:

The patient called the blood bank to set up an appointment for *autologous donation* of a unit of blood 1 month prior to scheduled surgery.

### NOTES:

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# designated donor

(dĕ'zĭg-nāt'ĕd dō'nōr)

## 153. TRANSFUSION THERAPY

### DEFINITION:

Use of blood or components from a specific donor for a specific patient.



### KEEP IN MIND:

Examples of a designated donor would include: The patient with an antibody to a high-incidence antigen or a combination of antibodies that makes it difficult to find compatible blood; the patient awaiting a kidney transplant from a living donor, or the multitransfused patient whose family members can provide components.

### APPLICATION:

The 6-year-old boy received a unit of *blood donated by his father, who was blood type identical*; the unit was *designated* to the specific child after surgery.

### NOTES:

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# **fresh frozen plasma**

(fresh frō'zen plăz'mă)

## 154. TRANSFUSION THERAPY

### DEFINITION:

Collection of the fluid portion of the circulating blood by separation and freezing the plasma within 8 hours of collection.



### KEEP IN MIND:

It is an aqueous solution of 91% water that contains protein, carbohydrates, and serum. Plasma does not contain red blood cells. May be stored up to 1 year at 18°C.

### APPLICATION:

The *fresh frozen plasma* was thawed and transfused into the patient with dilutional coagulopathy within 6 hours.

### NOTES:

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# homologous donor

(hō-mōl'ō-güs dō'nōr)

## 155. TRANSFUSION THERAPY

### DEFINITION:

Blood donation of serum or tissue derived from members of a single species.



### KEEP IN MIND:

Blood donated by someone other than the recipient. Most transfusions depend on homologous sources and are provided by volunteer donors.

### APPLICATION:

The blood drive on campus was to increase the pool of *homologous* donors.

### NOTES:

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# human leukocyte antigen (HLA)

(hyū'mān loo'kō-sīt ān'tī-jēn)

## 156. TRANSFUSION THERAPY

### DEFINITION:

Any of several members of a system consisting of the gene products of at least four linked loci and a number of sub loci on the sixth human chromosome that have been shown to have a strong influence on human allo-transplantation, transfusion in refractory patients, and certain disease associations.



### KEEP IN MIND:

Important in transfusion therapy because HLA antigens of the donor unit can induce alloimmunization in the recipient. HLA incompatibility is a possible cause of hemolytic transfusion reactions.

### APPLICATION:

*HLA* matching and leukocyte depletion of the donor unit help to decrease *HLA* alloimmunization.

### NOTES:

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# packed red blood cells

(päkt rěd blěd sělz)

## 157. TRANSFUSION THERAPY

### DEFINITION:

A blood product consisting of concentrated cells, most of the plasma having been removed.



### KEEP IN MIND:

Given to the patient who needs red blood cells but not increased fluid volume. Volume approximately 250 mL, and raises hemoglobin 1 gram/unit, and hematocrit 3%, same as whole blood.

### APPLICATION:

The patient was typed and cross-matched for 4 units of *packed red blood cells*.

### NOTES:

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platelets

(plāt'lětz)

## 158. TRANSFUSION THERAPY

### DEFINITION:

An irregularly shaped, disc-like cell that functions in clotting.



### KEEP IN MIND:

Platelets live up to 12 days in the blood, do not have a nuclei, and are unable to reproduce. Normal platelet counts are 150,000 to 300,000 mcg/L.

### APPLICATION:

The patient received a single pheresis unit of random donor *platelets*.

### NOTES:

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# Rh factor

(Rh făk'tör)

## 159. TRANSFUSION THERAPY

### DEFINITION:

An antigen present on the surface of erythrocytes. When Rh factor is present, also called (D), an individual's blood type is designated Rh+ (Rh positive); when the Rh antigen is absent, the blood type is Rh- (Rh negative).



### KEEP IN MIND:

An individual with Rh- blood receives a transfusion of Rh+ blood, anti-Rh antibodies form. Subsequent transfusions of Rh+ blood result in serious transfusion reactions.

### APPLICATION:

A pregnant woman who has an *Rh factor* of Rh- delivered a Rh+ fetus, therefore she received RhoGAM to prevent Rh antibody production after delivery.

### NOTES:

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# whole blood

(hōl blüd)

## 160. TRANSFUSION THERAPY

### DEFINITION:

That drawn from a selected donor under aseptic precautions.



### KEEP IN MIND:

Whole blood is composed of RBCs, plasma, white blood cells (WBCs), and platelets. The volume of each unit is approximately 500 mL and consists of 200 mL of RBCs and 300 mL of plasma. Whole blood is never a preferred treatment, but is available for consideration.

### APPLICATION:

The patient with massive blood loss from a crushing injury to his lower body received type O negative *whole blood* initially upon admission to the ED.

### NOTES:

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# cyclic therapy

(sī'klĭk thĕr'ă-pē)

## 161. NUTRITIONAL SUPPORT

### DEFINITION:

A regimen of delivery of dextrose, amino acids, and fat over a reduced time frame, usually 12 to 18 hours versus a 24-hour infusion.



### KEEP IN MIND:

Patients requiring long-term parenteral nutrition use this mode of delivery during their sleep so they can be free of infusion during the day.

### APPLICATION:

The quality of life for the teenager who needed total parenteral nutrition was achieved by use of *cyclic therapy*.

### NOTES:

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# fat emulsion

(făt ē-mü'l'shün)

## 162. NUTRITIONAL SUPPORT

### DEFINITION:

A combination of liquid, lipid, and an emulsifying system suitable for intravenous use because the lipid has been broken into small droplets that can be suspended in water. Solution has limited ability to be mixed with other solutions.



### KEEP IN MIND:

Also called lipids. Linoleic, D-linolenic, and arachidonic acid are necessary for formation of other products in the body, and because the body does not synthesize them, they are classed as essential fatty acids.

### APPLICATION:

The 500-mL glass container of *fat emulsion* (lipids) was administered over 12 hours by secondary infusion on a daily basis.

### NOTES:

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# peripheral parenteral nutrition (PPN)

(pĕr-if'ĕr-ăl păr-ĕn'tĕr-ăl nū-trĭ'shŭn)

## 163. NUTRITIONAL SUPPORT

### DEFINITION:

Intravenous support supplied via the peripheral veins to patients whose nutritional requirements cannot be fully met via the enteral route.



### KEEP IN MIND:

An amino acid–dextrose solution (usually 10%) and a lipid emulsion (10% to 20%) are delivered into a peripheral vein through a catheter.

### APPLICATION:

The home care client was placed on 7 days of *peripheral parenteral nutrition* while awaiting bowel resection.

### NOTES:

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# total parenteral nutrition (TPN)

(tō'täl pär-ĕn'tér-äl nü-trĕ'shün)

## 164. NUTRITIONAL SUPPORT

### DEFINITION:

The intravenous provision of dextrose, amino acids, emulsified fats, trace elements, vitamins, and minerals to patients who are unable to assimilate adequate nutrition by mouth.



### KEEP IN MIND:

TPN must be delivered by central line because of the osmolarity of the solution.

### APPLICATION:

The client with 30% burns over the head and chest area was placed on *total parenteral nutrition* by central line to maintain calories for healing.

### NOTES:

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# total nutrient admixture (TNA)

(tō'tāl nū'"trē-ěnt ăd'miks-tū'r)

## 165. NUTRITIONAL SUPPORT

### DEFINITION:

Combination of amino acids, dextrose, and fats in one container.



### KEEP IN MIND:

Also called all-in-one solutions or three-in-one solutions, or trimix solutions. The formula is provided in a large (banana) container that infuses over 24 hours.

### APPLICATION:

The home care client received *total nutrient admixture* with careful monitoring for bloodstream infections.

### NOTES:

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### PRECANNULATION

**Step 1: Obtain authorized prescriber's order or review standardized procedure**

**Step 2: Hand hygiene—15 to 20 seconds**

Alcohol-based hand rub

If hand visibly dirty or contaminated, use soap, water, and vigorous scrub

**Step 3: Gather equipment and preparation**

Check integrity of solution

Check integrity of administration set

Gather venipuncture and dressing supplies

**Step 4: Patient assessment, psychological preparation and patient identification**

Provide privacy

Evaluate the patient's preparedness for IV procedure

Check patient identification, using two identifiers

Things to know—Assessment

Patient's medical diagnosis

History of chronic disease

History of vasovagal reaction during venipuncture

Previous experiences with vascular access devices

Cultural considerations

Assess both arms and hands prior to choosing appropriate vein

Choose the lowest best vein

Identify allergies

**Step 5: Apply tourniquet, site selection, and vein dilation**

Factors to consider:

Patient receiving anticoagulation therapy

Presence of disease or previous surgery (poor venous return)

Presence of shunt for dialysis

## CANNULATION

### Step 6: Needle selection

16 gauge: Trauma

18–20 gauge: Infusion of hypertonic or isotonic solutions, or blood products

22–24 gauge: Pediatric patients

22 gauge: Fragile veins in elderly

### Step 7: Gloving

Standard precaution requires gloves to be worn during placement of an IV catheter

### Step 8: Site preparation

Recommended to use 2% chlorhexidine gluconate; use 15–20 second scrub with friction; allow to dry

### Step 9: Vein entry: Direct or indirect

Direct: One-step method

Indirect: Two-step method

### Step 10: Catheter stabilization and dressing management

Catheter should be stabilized in a manner that does not interfere with visualization of site

Dressing: Transparent semipermeable membrane dressing (TSM)

Use stabilization device that is recommended by INS and CDC

## POSTCANNULATION

### Step 11: Labeling of site, and administration set

Insertion site: Venipuncture site should be labeled with  
Date and time  
Type and length of catheter  
Nurse's initials  
Administration set  
Label according to agency policy: Date on which administration set must be changed  
Solution container  
Place a time strip on parenteral solutions  
Any additive must have a clear label applied to bag

### Step 12: Equipment disposal

Standard of practice: Needles and stylets shall be disposed of in nonpermeable tamper-proof containers  
Dispose of all paper and plastic equipment in biohazard container

### Step 13: Patient education

Patient must receive information on all aspects of their care  
Inform regarding any limitations of movement or mobility  
Explain all alarms if EID is used  
Instruct to call for assistance

### Step 14: Rate calculation

See Rate Calculation Bonus Card 167.

### Step 15: Monitoring and documentation

Document all aspects of procedure  
Document routine assessments of site every 4 hours  
Follow flush protocol if intermittent locking device in place  
Change IV site along with administration set every 72 hours  
IV solutions may only hang 24 hours

## 167. IV THERAPY BONUS CARD

## RATE CALCULATION

### COMMON DROP FACTORS

$$\left. \begin{array}{l} 10 \text{ gtt} = 1 \text{ mL} \\ 15 \text{ gtt} = 1 \text{ mL} \\ 20 \text{ gtt} = 1 \text{ mL} \\ 60 \text{ mcg/} \text{gtt} = 1 \text{ mL} \end{array} \right\} \begin{array}{l} \text{Macrodrops} \\ \text{Microdrops} \end{array}$$

1. To calculate volume/hour

$$\text{Total volume} \div \text{Administration time} = \text{mL (volume)} \div \text{hour}$$

$$\text{Example: } 1000 \text{ mL} \div 8 \text{ hours} = 125 \text{ mL/hour}$$

2. To calculate drops/minute (gravity)—Macrodrip infusion

$$X \text{ gtt/min} = \frac{\text{hourly volume} \times \text{gtt factor of tubing}}{\text{Time in minutes (60)}}$$

$$\text{Example: } \frac{125 \text{ mL/hour} \times 15 \text{ (gtt factor)}}{60 \text{ (minutes)}} = 31 \text{ gtt/min}$$

3. To calculate drops/minute microdrop infusion  
(note: EIDs are microdrip mL/hour versus gtt/min)

$$\frac{\text{hourly volume} \times 60 \text{ mcg/} \text{gtt tubing}}{60 \text{ (time in minutes)}} = \text{mL/hour}$$

$$\text{Example: } \frac{100 \text{ mL/hr} \times 60}{60 \text{ (minute)}} = 100 \text{ mL/hour}$$

4. To calculate secondary infusion (infusions less than 1 hour)

$$\frac{\text{mL/hour} \times \text{microdrop set (60)}}{\text{hours volume (varies)}} = \text{mL/hour}$$

$$\text{Example: } \frac{50 \text{ mL} \times 60}{5 \text{ minutes}} = \frac{30,000}{15} = 200 \text{ mL/hour}$$

(will deliver the ordered 50 mL in 15 minutes)

Grade	Clinical Criteria
0	No clinical symptoms
1	Erythema at access site with or without pain
2	Pain at access site, with erythema and/or edema
3	Pain at access site with erythema and/or edema, streak formation, and palpable venous cord
4	Pain at access site with erythema and/or edema, streak formation, palpable venous cord >1 inch in length, purulent drainage

Source: Revised Standards of Practice. (2006). Cambridge, MA: Infusion Nurses Society; with permission.

INFILTRATION SCALE				
Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
No symptoms	Skin blanched	Skin blanched	Skin blanched and translucent	Skin blanched and translucent
	Edema <1 inch	Edema 1 to 6 inches	Gross edema >6 inches	Skin tight, leaking
	Cool to touch	Cool to touch	Cool to touch	Gross edema >6 inches
	With or without pain	With or without pain	Mild to moderate pain	Deep, pitting tissue edema
			Possible numbness	Circulatory impairment
				Moderate to severe pain
				Infiltration of any amount of blood product, irritant, or vesicant

Source: Revised Standards of Practice (2006). Cambridge, MA: Infusion Nurses Society; with permission.

## 169. IV THERAPY BONUS CARD

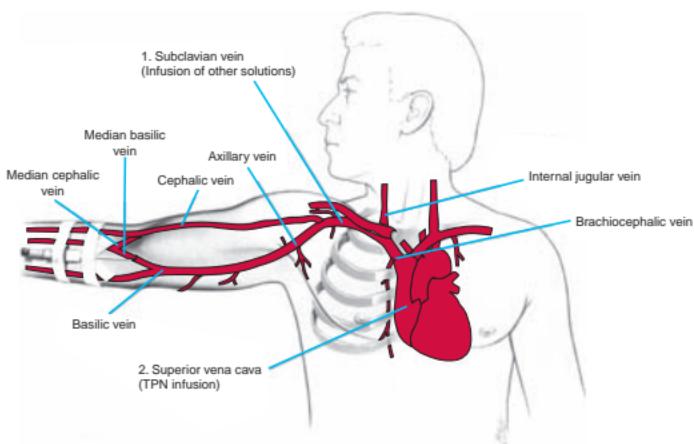
## FLUSHING GUIDELINES

Device	Intermittent	Blood Administration	Blood Draw	Flushing with NO Therapy	Heparin Locking
Peripheral Catheters (PIV)	Minimum 2 mL	Preadmin 2 mL Postadmin 10 mL	NA	At least q12 hours	NA
Midline	Minimum 3 mL	Preadmin 3 mL Postadmin 10 mL	NA	At least q12 hours	3 mL 10 units/mL heparin
Peripherally Inserted Central Catheter (PICC)	Minimum 5 mL	Preadmin 5 mL Postadmin 10 mL	Predraw 5 mL Postdraw 10 mL	Nonvalved—at least q 24 hours Valved—at least weekly	5 mL 10 units/mL heparin
Nontunneled	Minimum 5 mL	Preadmin 5 mL Postadmin 10 mL	Predraw 5 mL Postdraw 10 mL	Nonvalved—at least q 24 hours Valved—at least weekly	5 mL 10 units/mL heparin
Tunneled	Minimum 5 mL	Preadmin 5 mL Postadmin 10 mL	Predraw 5 mL Postdraw 10 mL	Nonvalved—at least 1–2 times per week Valved at least weekly	5 mL 10 units/mL heparin
Port	Minimum 5 mL	Preadmin 5 mL Postadmin 10 mL	Predraw 5 mL Postdraw 10 mL	Accessed Nonvalved—at least 1–2 times per week Valved—at least weekly Deaccessed—at least monthly	3–5 mL 10 units/mL heparin

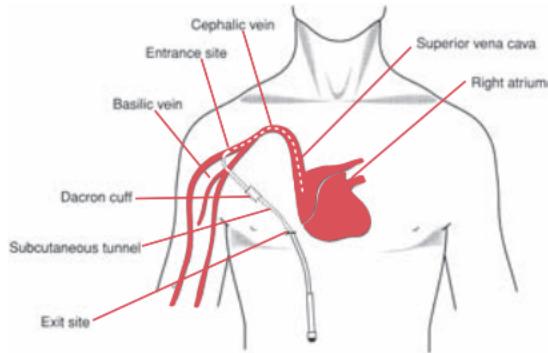
Source: Infusion Nurses Society. (2008). Flushing Protocols, with permission.

## 169. IV THERAPY BONUS CARD

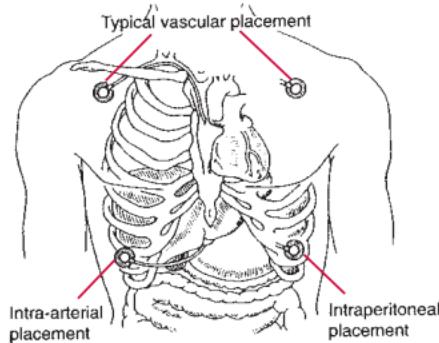
### PICC, TUNNELED CATHETER, AND PORT PLACEMENTS



Example of peripherally inserted central catheter (PICC).



Example of tunneled catheter placement.



Example of port placement.

## 170. IV THERAPY BONUS CARD

### CHVOSTEK'S SIGN AND TROUSSEAU'S SIGN



Example of positive Chvostek's sign.



Example of positive Trousseau's sign.

## 170. IV THERAPY BONUS CARD

## ILLUSTRATION CREDITS

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