TRAIN FOR SUCCESS INC
MEDICATION CALCULATIONS 12 Hr

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PURPOSE

The purpose of this course is to review medication calculations. This course is appropriate for personnel within the healthcare environment/ settings, such as; ARNP, RN, LPN and CNA /HHA who are working in the health care settings, Therapists as well as other students, individuals who would like to review medication calculations. The course includes review of the metric system, converting from grams (g) to milligrams (mg), milligrams to grams, micrograms (µg) to milligrams (mg), milligrams to micrograms. Intravenous (IV) calculations; calculate the drip rate, the Intravenous flow rate, dose of medication to be administered by IV, temperature conversion from Fahrenheit to Centigrade or Celsius and Centigrade or Celsius to Fahrenheit Proper, medication storage and disposal and review of some common Abbreviations .

OBJECTIVES

At the conclusion of this course, the student will be able to:

1. Describe the metric system,
2. Discuss how to convert from grams (g) to milligrams (mg),
3. Describe how to convert from milligrams to grams,
4. Discuss how to convert from micrograms (µg) to milligrams (mg),
5. Describe how to convert from milligrams to micrograms.
6. Describe Intravenous (IV) calculations
7. Discuss how to calculate the drip rate,
8. Describe how to calculate Intravenous flow rate,
9. Discuss how to calculate dose of medication to be administered by IV

METRIC SYSTEM / International System of Units (SI)

The metric system is a system of measuring. It has three main units:

- meter for length
- gram for mass (weight)
- liter for volume

The metric system is a system of units for measurement that was developed in late 18th century France by the chemist Lavoisier.

Multiples and submultiples of metric units are related by powers of 10; the names for these are formed with prefixes. This relationship is compatible with the decimal system of numbers and it contributes to the convenience of metric units.

The most commonly used prefixes for values above the base unit are:

- *hecto-* (hundred),
- *kilo-* (thousand) and
- *mega-* (million);

And the most commonly used for parts of the base value (below the base value) are:

- *deci-* (tenth),
- *centi-* (hundredth) and
- *milli-* (thousandth).

The modern metric system (post 1960) is now widely used throughout the world and is called the International System of Units (SI).

Conversion Tables and Methods to Use when converting from Metric Units to Metric Units (Length)

TERMS AND MEANING

Meter – Length	**Kilo – Thousand**
Liter – Volume	**Milli – Thousand**
Gram – Mass/Weight	**Centi – Hundred**
Celsius – Temperature	**Deci – Ten**

MEASURE OF LENGTHS

10 **millimeters** (mm) =	1 **centimeter** (cm)
10 **centimeters** =	1 **decimeter** (dm) = 100 millimeters
100 **centimeter** =	1 **meter** (m) = 1,000 millimeters
1000 **meters** =	1 **kilometer** (km)

OPERATIONS FOR LENGTH

Example: To get Centimeters from Meters you multiply the Meters by 10

You Have: 31 Meters

You need Centimeters: So, Centimeters = 31 Meters

Multiply the meters by 100: 31m x100 = 3100cm

You need Centimeters: So, Centimeters = 31 Meters

There are 3100 centimeters in 31 meters or 100 centimeters for every meter.

AVAILABLE	DIVIDE OR MULTIPLY	RESULT
millimeters (mm)	Divide by 10 (mm/10)	centimeter (cm)
centimeters (cm)	Multiply by 10 (cm x 10)	Millimeters (mm)
Meters (m)	Multiply by 100 (m x 100)	Centimeters (cm)
Centimeters (cm)	Divide by 100 (cm/100)	Meters (m)
Millimeters (mm)	Divide by 1000 (mm/1000)	Meters (m)

Conversion Tables and Methods to Use when converting from Metric Units to Metric Units (weight)

Gram – Length	**Kilo – Thousand**
Liter – Volume	**Milli – Thousand**
Gram – Mass/Weight	**Centi – Hundred**
Celsius – Temperature	**Deci – Ten**

Measure of Weights

Weight/Mass

1,000 milligrams (mg) =	1 gram
10 centigrams =	100 milligrams (mg)
1 gram (g) =	1,000 milligrams
1,000 grams =	1 kilogram (kg) = 1,000,000 mg
1,000 kilograms =	1,000,000 grams

OPERATIONS FOR WEIGHT

Example: To get Milligrams from grams - multiply the grams by 1000

Available / on hand: 33 grams

You need milligrams: So, milligrams = 33 Grams

Multiply the grams by 1000: 33g x 1000 = 33000mg

You need milligrams: So, milligrams = 33 Grams

There are 33000 milligrams in 33 grams or 1000 milligrams for every gram.

AVAILABLE	**DIVIDE OR MULTIPLY**	RESULT
milligrams (mg)	Divide by 10 (mg/10) Move Decimal one place to Left	centigram (cg)
centigrams (cg)	Multiply by 10 (cg x 10) Move decimal one place to the right	Milligrams (mg)
Grams (g)	Multiply by 100 (g x 100)	Centigrams (cg)
Centigrams (cm)	Divide by 100 (cg/100) Move decimal two places to the left.	Grams (g)
Milligrams (mg)	Divide by 1000 (mg/1000) Move decimal three places to the left.	Grams (g)

REVIEW TABLES

10 **millimeters** (mm) =	1 **centimeter** (cm)
10 **centimeters** =	1 **decimeter** (dm) = 100 millimeters
100 **centimeter** =	1 **meter** (m) = 1,000 millimeters
1000 **meters** =	1 **kilometer** (km)

1 **liter** =	1000 **milliliters**
1 **milliliter** =	1 **cubic centimeter**
1 **liter** =	1000 **cubic centimeters**
1,000 milliliters =	1 **liter** (L)
1000 **liters** =	1 **kiloliter** (km)

1,000 **milligrams** (mg) =	1 **gram**
10 **centigrams** =	100 **milligrams** (mg)
1 **gram** (g) =	1,000 **milligrams**
1,000 **grams** =	1 **kilogram** (kg) = 1,000,000 mg
1,000 **kilograms** =	1,000,000 **grams**

AVAILABLE/ ON HAND	DIVIDE OR MULTIPLY	RESULT
milligrams (mg)	Divide by 10 (mg/10)	centigram (cg)
Centigrams (cg)	Multiply by 10 (cg x 10)	Milligrams (mg)
Grams (g)	Multiply by 100 (g x 100)	Centigrams (cg)
Centigrams (cm)	Divide by 100 (cg/100)	Grams (g)
Milligrams (mg)	Divide by 1000 (mg/1000)	Grams (g)
millimeters (mm)	Divide by 10 (mm/10)	centimeter (cm)
centimeters (cm)	Multiply by 10 (cm x 10)	Millimeters (mm)
Meters (m)	Multiply by 100 (m x 100)	Centimeters (cm)
Centimeters (cm)	Divide by 100 (cm/100)	Meters (m)

Millimeters (mm)	Divide by 1000 (mm/1000)	Meters (m)
milliliters (ml) or CCs	Divide by 10 (ml/10)	centiliter (cl)
centiliters (cl)	Multiply by 10 (cl x 10)	Milliliters (ml)
Liters (L)	Multiply by 1000 (L x 1000)	Milliliters (mL) or CCs
Liters (L)	Multiply by 100 (L x 100)	Centiliters (cl)
Centiliters (cl)	Divide by 100 (cl/100)	Liters (L)
Milliliters (ml) or CCs	Divide by 1000 (ml/1000)	Liters (L)

CONVERT

Multiply by 10 (x 10) - Move decimal one place to the right

Multiply by 100 (x 100) - Move decimal two places to the right

Multiply by 1000 (x 1000) - Move decimals three places to the right

Divide by 10 (/ 10) - Move Decimal one place to Left

Divide by 100 (/ 100) - Move decimal two places to the left.

Divide by 1000 (/ 1000) - Move decimal three places to the left.

EXAMPLES

Changing grams to milligrams

1g =1000mg (the gram is the larger measure; it takes 1000mg to make 1g). To convert grams (g) to milligrams (mg), move the decimal 3 places to the RIGHT.

EXAMPLE:

The physician has ordered 0.25g of MedicationX

You have on hand 125mg MedicationX

Therefore you need to convert grams (g) to milligrams (mg)

Move the decimal 3 places to the RIGHT.

0.250 = 250

Therefore 0.25g = 250mg

EXAMPLE:

The physician has ordered 2.5g of MedicationR .

Supply on hand is 500mg MedicationR.

Move the decimal 3 places to the RIGHT.

2.5 = 2500

Therefore 2.5g = 2500mg

EXAMPLE:

The physician has ordered 1.5g of MedicationB .

Supply on hand is 500mg MedicationB.

Move the decimal 3 places to the RIGHT.

1.5 = 1500

Therefore 1.5g = 1500mg

Changing milligrams to grams

1g =1000mg (the gram is the larger measure; it takes 1000mg to make 1g). To convert milligrams (mg) to grams (g), move the decimal 3 places to the LEFT.

The physician has ordered 15mg of MedicationW .

Supply on hand is 0.03 g MedicationW.

Convert milligrams to grams

Move the decimal 3 places to the LEFT.

15 = 0.015

Therefore 15mg = 0.015g

Changing milligrams to micrograms

1mg =1000 µg (mcg)

Some medications are so powerful that they are administered in minute microgram dosage that is sufficient to give a therapeutic effect.

To multiply by 1000, move the decimal 3 places to the RIGHT.

EXAMPLE

The physician has ordered 0.2mg of MedicationZ .

Supply on hand is 400 µg MedicationZ.

Move the decimal 3 places to the RIGHT.

0.2 = 200

Therefore 0.2mg = 200 µg

Changing micrograms to milligrams

1000 µg (mcg) =1mg

To divide by 1000, move the decimal 3 places to the LEFT.

EXAMPLE

The physician has ordered 200 µg of ABT .

Supply on hand is 0.4mg ABT.

Convert micrograms to milligrams

Move the decimal 3 places to the LEFT.

200 = 0.2

200 µg = 0.2 mg

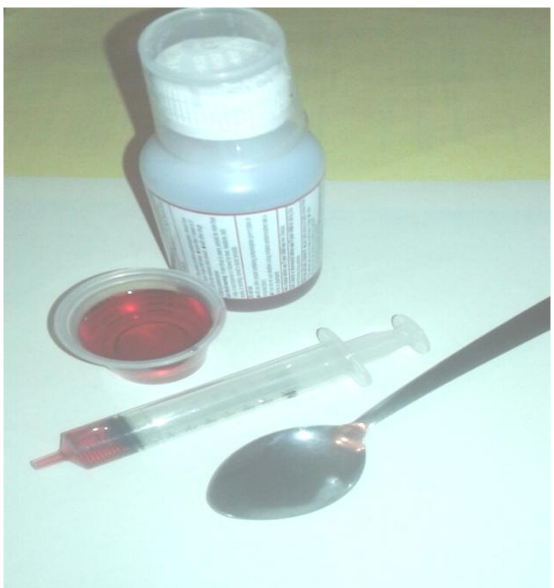
METRIC LIQUID MEASURE

Liquid measurement in the metric system:

Liter (L)

Milliliter (ml)

Cubic centimeter (cc).



EQUIVALENTS

1 ml is the same as 1cc.

1L is the same as 1000ml or 1000cc.

APOTHECARY SYSTEM

Some medication labels may be printed in apothecary as well as the metric measures. Expressed in fractions and in Roman numerals;

Fraction such as ½ , ¼

Roman numerals – made up of letters of the alphabet

i = 1,

V = 5,

X = 10,

L = 50,

C = 100,

D = 500,

M = 1,000.

XL

A letter placed after another of greater value adds and a letter placed before another of greater value subtracts.

XL is equal to 40 (10 from 50)

MX is equal to 1010 (1000 and add 10)

Apothecary GRAIN

GRAIN (gr) – the solid measurement in the Apothecary system.

Apothecary Equivalent: weight

1 scruple = 20 grains (gr)
60 grains = 1 dram
8 drams = 1 ounce
1 ounce = 480 grains
16 ounces = 1 pound (lb)

Apothecary Equivalent: Volume

60 minims = 1 fluidram
8 fluidrams = 1 fluid ounce
1 fluid ounce = 480 minims
16 fluid ounces = 1 pint (pt)

OTHER EQUIVALENTS

1 g = 15.43 grains
1 grain = 64.8 mg
1 mL = 16.23 minims
1 Minim = 0.06 mL
1 oz = 28.35 g
1 lb = 453.6 g (0.4536 kg)
1 kg = 2.2 lb
1 fluid oz (fl oz) = 29.57 mL
1 pint (pt) = 473.2 mL
1 quart (qt) = 946.4 mL
0.1 mg = 1/600 grain (gr)
0.12 mg = 1/500 gr
0.15 mg = 1/400 gr
0.2 mg = 1/300 gr
0.3 mg = 1/200 gr
0.4 mg = 1/150 gr
0.5 mg = 1/120 gr
0.6 mg = 1/100 gr
0.8 mg = 1/80 gr
1 mg = 1/65 gr
1 kg = 1000 g
1 g = 1000 mg
1 mg = 1000 mcg

HOUSEHOLD MEASURES

Teaspoon (tsp)

Tablespoon (T) or tbsp

Ounce: oz

Quart: qt

Pint: pt

WEIGHTS

1 oz = 30 g
1 lb (16 oz) = 480 g
15 grains = 1 g
1 grain = 60 mg

LIQUIDS

1 fl oz = 30 mL
1 cup (8 fl oz) = 240 mL
1 pint (16 fl oz) = 480 mL
1 quart (32 fl oz) = 960 mL
1 gallon (128 fl oz) = 3800 mL

1 teaspoon = 5 mL
1 tablespoon = 15 mL

MASS

1 kg = 1,000 g = 1,000,000 mg = 2.204622621848776 lbs = 35.273368606701936 oz

1 g = 0.002204622621849 lbs = 0.035273368606702 oz = 15.432360734518642 grains

1 lbs = 16 oz = 453.59237 g = 453592.37 mg = 7000 grains

1 oz = 0.062501051329413 lbs = 28350 mg = 28.350 g = 437.5074268236035 grains

VOLUME

1 l = 1000 cm^3 or ml = 0.001 m^3 = 0.035315 ft3 = 0.26417 US gal = 61.024 $inch^3$ = 0.001308 $yard^3$ = 33.81376 fluid oz

1 US gal = 128 fluid oz = 3.7854 l

1 fluid oz = 29.57 ml

1 ml = fluid oz

1 Acre Foot = 325,851 gallons

1 Acre Foot = 43,560 cubic feet

1 Cubic Foot = 7.4805 gallons

LENGTH

1 m = 100 cm = 1,000 mm = 1,000,000 micron = 100,000,000,000 Angstrom

1 m = 3.28083989501312 ft = 39.3700787401575 inches

1 ft = 12 inches = 0.3048 m

1 inch = 2.54 cm

1 cm = 0.3937008 inches

TEMPERATURE

1 C degree = 1.8 F degrees
1 F degree = 5/9 C degrees

Fahrenheit to Centigrade or Celsius: (°F – 32) X 5/9 = °C
Centigrade or Celsius to Fahrenheit: (°C X 9/5) + 32 = °F

MEDICATION CALCULATIONS

D = Desired Dose

Q = Quantity of Solution

H = Strength on Hand

X = Unknown quantity of Drug

EXAMPLE:

Physician has ordered 500 mg of AMOXICILLIN (desired Dose) for the patient and you have 250 mg (Quantity on Hand) tablets (Quantity of medication) on hand.

Solution:

D ÷ H x Q = X

500mg ÷ 250 mg x 1 tablet = 2 tablets

EXAMPLE:

Physician has ordered 1500 mg of liquid Acetaminophen for the patient. Quantity of liquid Acetaminophen is 500 mg in 1 cc.

Solution: 1500 mg ÷ 500 mg x 1cc = 3 cc

WHEN STOCK IS IN PERCENT (%)

The label may state the strength of the medication as a percent.

Percentages are interpreted in the metric system as gram per 100ml.

EXAMPLE

The Physician has ordered lidocaine 30mg for injection prior to a procedure. Quantity in stock is ampule labeled 2%.

Equivalents: 2% means

2g in 100ml

1g =1000mg

2 g =2000mg

Administer 1.5 ml

CONCENTRATION OF A RATIO OF MEDICATION PER ML

Epinephrine vials are also labeled by concentration of a ratio of medication per mL.

Example: a solution may be labeled as 1:100,000. This concentration represents 1000mg/100,000mL or 0.01mg/mL.

Others:

CONCENTRATION	DOSAGE EQUIVALENCE	PERCENT
1:1,000	1mg/mL	0.1%
1:10,000	0.1mg/mL	0.01%
1:100,000	0.01mg/mL	0.001%
1:200,000	0.005mg/mL	0.0005%

IV CALCULATIONS

There are several infusion sets used for delivering I.V. fluids.

These include: primary, secondary and volume-control sets. All three have drip chambers that may be vented or nonvented.

Glass containers are used primarily to infuse substances that are unstable in the plastic containers. For the fluid to flow out of the glass container there has to be a vent in the drip chamber of the tubing. Plastic containers/ bags collapses as the fluid flows therefore no air vent is required.

Infusion sets will deliver 10, 15, 20, or 60 drops per milliliter.
The macrodrip system (10, 15, 20 gtt/ml) should be used when infusing 100 ml/hr or more. The microdrip system (60 gtt/ml) delivers a smaller amount of solution and is used for pediatric patients and adults who need small or closely regulated amounts of I.V. solution.

A microdrip system may come already attached to a Buretrol, or will need to be attached to one. A Buretrol can hold up to 150 ml of fluid at any one time. When used in the pediatric population, no more than 2 hours of fluid are added to the Buretrol at a time. Check the facility policy regarding use of this device. The drop factor is found on the package the tubing comes in.

The primary tubing may be anywhere from 70” to 110” in length. It can have multiple y-sites and a backcheck valve so that medication delivered via the y-site does not flow back into the main fluid. A secondary administration set is shorter in length and is used to deliver either another fluid or a medication.

Some facilities may use a Dial a flow device. The rate of flow is set via a dial that is located on the tubing. Many times I.V. therapy is delivered via an infusion pump or a syringe pump. There are many different pumps on the market. Become familiar with those used in your facility.

If there are no pumps available for use, you will need to calculate the drip rate of the fluid to be delivered.

Drip rate

The drip rate represents the number of drops infused per minute. Here is the formula:

$$\frac{\text{Volume to be delivered x Drip factor}}{\text{Time in Minutes}} = \text{Drip Rate}$$

For example: The patient needs an infusion of 0.9% sodium chloride at 120 ml/hr. The infusion set delivers 10 gtt/ml. What is the drip rate?

$$\frac{120\text{ml/hr x } 10 \text{ gtt/ml}}{60 \text{ minutes}} = 20 \text{ gtt/min}$$

After you have the drip rate, count the number of drops going into the drip chamber for one minute. Adjust the flow with the roller clamp until the appropriate drip rate is reached. Remember, if after dividing, the results are 0.4 or less, round down to the nearest whole number. If the results are 0.5 or more, round up to the nearest whole number.

Flow rate

Flow rate represents the number of milliliters of fluid administered over 1 hour. Formula to use:

$$\frac{\text{Volume ordered}}{\text{Number of hours}} = \text{Flow Rate}$$

For example the order reads; Infuse 2L of D5W over the next 24 hours. What is the flow rate?

$$\frac{2000 \text{ ml}}{24} = 83 \text{ ml/hr}$$

Medication Dosage

To determine the dosage of a medication needed, use the following formula:

$$\frac{\text{Ordered dose} \times \text{amount of ml per Dose}}{\text{Dose on Hand}} = \text{Dose to be given}$$

For example: The order reads give MedicationX 2 mg IVP. The vial contains MedicationX 4 mg/ml. How many ml do you need?

$$\frac{2\text{ mg} \times 1\text{ ml}}{4\text{ mg/ml}} = 0.5\text{ ml}$$

If the patient receiving an infusion of a continuous medication, you will need two calculations to determine the unit dosage per hour: determine the amount of medication per ml and determine the infusion rate.

To determine the amount of medication per ml, use this formula:

$$\frac{\text{Known amount of medication}}{\text{Volume of diluents}} = \text{med/ml}$$

Next, determine the infusion rate using this formula:

$$\frac{\text{Dose per hr desired}}{\text{Concentration per ml}} = \text{ml/hr}$$

For example: The physician orders a Heparin drip at 1,000 units/hr. You have available a 500 ml bag of D5W with 20,000 units of Heparin. How fast should the IV run to deliver the ordered dose?

$$\frac{20{,}000 \text{ units}}{500\text{ml}} = 40\text{units/ml}$$

Then:

$$\frac{1{,}000 \text{ units}}{40 \text{ units}} = 25\text{ml/hr}$$

Or you could use the previous formula to determine how many ml/hr will be needed to deliver the dose ordered.

REVIEW

IV CALCULATIONS

When using an **Infusion Pump**:
Calculation are in - **ml/hr**

Gravity / no pump available:

Choose an infusion set for microdrip or macrodrip rate.

The macrodrip system (10, 15, 20 gtt/ml) should be used when infusing 100 ml/hr or more. (10gtt=1ml, 15gtt=1ml or 20gtt=1ml)

The microdrip system (60 gtt/ml) delivers a smaller amount of solution (60gtt=1ml)

Drip rate

The drip rate represents the number of drops infused per minute. Here is the formula:

$$\frac{\text{Volume to be delivered} \times \text{Drip factor}}{\text{Time in Minutes}} = \text{Drip Rate}$$

NOTE: Time needs to be in minutes (60 minutes =1hr or 1hr =60minutes).

For example: The patient needs an infusion of 0.9% sodium chloride at 120 ml/hr. The infusion set delivers 10 gtt/ml. What is the drip rate?

$$\frac{120\text{ml/hr} \times 10\text{ gtt/ml}}{60\text{ minutes}} = 20\text{ gtt/min}$$ (Use a second hand watch and count the drops)

After you have the drip rate, count the number of drops going into the drip chamber for one minute. Adjust the flow with the roller clamp until the appropriate drip rate is reached. Remember, if after dividing, the results are 0.4 or less, round down to the nearest whole number. If the results are 0.5 or more, round up to the nearest whole number.

NOTE	**If the drip rate is 80gtt/min- Regulate drip until there is 20gtt in 15sec**

Flow rate

Flow rate represents the number of milliliters of fluid administered over 1 hour. Formula to use:

$$\frac{\text{Volume ordered}}{\text{Number of hours}} = \text{Flow Rate}$$

For example the order reads; Infuse 2L of D5W over the next 24 hours. What is the flow rate?

2L = 2000ml

$$\frac{2000\text{ ml}}{24} = 83\text{ ml/hr}$$

Medication Dosage

To determine the dosage of a medication needed, use the following formula:

$$\frac{\text{Ordered dose} \times \text{amount of ml per Dose}}{\text{Dose on Hand}} = \text{Dose to be given}$$

For example: The order reads give MedicationX 2 mg IVP. The vial contains MedicationX 4 mg/ml. How many ml do you need?

$$\frac{2\text{ mg} \times 1\text{ ml}}{4\text{ mg/ml}} = 0.5\text{ ml}$$

If the patient receiving an infusion of a continuous medication, you will need two calculations to determine the unit dosage per hour: determine the amount of medication per ml and determine the infusion rate.

To determine the amount of medication per ml, use this formula:

$$\frac{\text{Known amount of medication}}{\text{Volume of diluents}} = \text{med/ml}$$

Next, determine the infusion rate using this formula:

$$\frac{\text{Dose per hr desired}}{\text{Concentration per ml}} = \text{ml/hr}$$

For example: The physician orders a Heparin drip at 1,000 units/hr. You have available a 500 ml bag of D5W with 20,000 units of Heparin. How fast should the IV run to deliver the ordered dose?

$$\frac{\text{20,000 units}}{\text{500ml}} = \text{40units/ml}$$

Then:

$$\frac{\text{1,000 units}}{\text{40 units}} = \text{25ml/hr}$$

Or you could use the previous formula to determine how many ml/hr will be needed to deliver the dose ordered.

OTHER EXAMPLES:

Order: 150 ml D5W IV q8h

Available: Infusion pump

(Which means answer should be in ml/hr- pump uses ml/hr)

150ml divided by 8hr = ml/hr

$$\frac{150ml}{8hr} = 18.75$$ (round to the nearest whole number)

= 19ml/hr

Order: 250 ml D5 .33NS IV to run at 25ml/hr

Available: Infusion Pump

Infusion Pumps accept ml/hr; therefore set pump at 25ml/hr
(NO CALCULATION REQUIRED)

ORDER: 1000ml D5NS IV to run at 100 ml/hr

NO PUMP AVAILABLE

Available: Macrodrip 20gtt/ml and Microdrip 60gtt/ml

If using the Macrodrip 20gtt/ml:

$$\frac{100\ ml/hr \times 20gtt/ml}{60minutes} = 33.3333 = 33gtt/min$$

If using the Microdrip 60gtt/ml

<u>100 ml/hr x 60 gtt/ml</u> = 100 gtt/min

60minutes

Order: 180 ml D5W .45 NS IV infuse from 12 N- 6 PM

Available: Macrodrip (10gtt/ml) and Microdrip (60gtt/ml) NO PUMP AVAILABLE.
12n – 6 pm is 6hr therefore:

<u>180 ml</u> = 30 ml/hr
6hr

When using Macrodrip (10gtt/ml)

<u>30ml/hr X 10gtt/ml</u> = 5 gtt/min (very slow infusion)

60minutes

When using the Microdrip (60gtt/ml)

<u>30ml/hr X 60gtt/ml</u> = 30 gtt/min (faster infusion)
. 60 minutes

Order: 1000 ml D5W .45NS IV infuse from 4 pm – 12 midnight.

What is the rate of infusion?

<u>1000ml</u> = 125 ml/hr
. 8hr

If no pump is available use : Macrodrip 15 gtt/ml or Microdrip 60gtt/ml

Macrodrip 15 gtt/ml

$\frac{125 \text{ ml/hr} \times 15 \text{ gtt/ml}}{60 \text{ mins}}$ = 31.25 gtt/min (round off = 31 gtt/min).

Microdrip 60gtt/ml

$\frac{125 \text{ ml/hr} \times 60 \text{ gtt/ml}}{60 \text{ mins}}$ = 125 gtt/min

ADDING MEDICATIONS TO IV

Order: 1000 ml D5W with 20 mEq Kcl, infuse IV 10am – 10pm
On hand supply: 40 mEq /20ml Kcl

Step 1:

Physicians order (D); divided by supply on hand (H); multiply by the solution (S)

$\frac{D \times S}{H}$

$\frac{20 \text{ mEq} \times 20\text{ml}}{40 \text{ mEq}}$ = 10 ml

Nurse needs to add 10 ml of Kcl to the IV Bag.

STEP 2:

Available Microdrip 60gtt/ml and macrodrip 20gtt/ml. Choose the tubing (calculate both for practice):

For Microdrip 60gtt/ml:

$$\frac{83\text{ml/hr} \times 60\text{gtt/ml}}{60 \text{ mins}} = 83\text{gtt/min}$$

For macrodrip 20gtt/ml:

$$\frac{83\text{ml/hr} \times 20\text{gtt/ml}}{60 \text{ mins}} = 27.6 \text{ gtt/min round off} = 28 \text{ gtt/min}$$

ABBREVIATIONS

Abbreviation means a shortened form of a word or phrase. Abbreviations can lead to some serious or life threatening errors, therefore there are guidelines in place.

The Joint Commission has set guidelines and rules; all healthcare settings has to standardize abbreviations, acronyms and symbols that they are using. They are also required to adhere to a Do Not Use list.

Some abbreviations and their meanings are listed below.

ABBREVIATION and MEANING
a.c. =Before meals
ACL =Anterior cruciate ligament
ad lib= Freely
a/g ratio = Albumin to globulin ratio
AKA = Above the knee amputation
a.m. =Morning
ASA =Aspirin
b.i.d =Twice a day
BM =Bowel movement
BMP= Basic metabolic panel
BP =Blood pressure
BS =Blood sugar
Ĉ= with
CC= cubic centimeters
Cap =Capsule
C&S = Culture and sensitivity
CVA =Cerebrovascular accident
D.C. =Discontinue
Disp= dispense
DNR =Do not resuscitate
DVT= Deep venous thrombosis
ec = enteric coated
elix = elixir
ETOH =Alcohol
Ext =Extract
fl or fld =Fluid
g. or Gm. or g =Gram
Gr =Grain
gtt. =Drop
h. or hr. =Hour
H&H: = Hemoglobin and Hematocrit
H&P = History and physical examination

hs = At hour of sleep, bedtime
HTN= hypertension /high blood pressure
IM = Intramuscular
I.V. = Intravenous
L = liter
MAR = medication administration record
MEq =Milliequivalent
Min =Minute
Mg =Milligram
ML =Milliliters
NPO =Nothing by mouth
N/V = Nausea or vomiting
NTG =Nitroglycerin
O&P = Ova and parasites
O2 = oxygen
O.D.= Right eye
O.S.= Left eye
O.U.= Both eyes
Oz = ounce
ORIF = Open reduction and internal fixation
P= Pulse
p.c. =After meals
PERRLA = Pupils equal, round, and reactive to light and accommodation
p.m. =Evening
p.o. =By mouth
Post = after
prn =as needed
Pre = before
prn= as needed
q am= every morning
qh= every hour
q2h= every 2 hours
q3h=every 3 hours
q4h= every 4 hours
qid = four times daily
qhs=every night or at bedtime
qpm= each evening
R= respirations
R/O = Rule out
RLQ = Right lower quadrant
RUQ = Right upper quadrant
Š= without
SL = sublingual
SOB =Shortness of breath
Sol =Solution

ss. =One half
Stat =Immediately
SQ = Subcutaneous
Supp= suppository
susp. =Suspension
Syr. =Syrup
T= temperature
tab. =Tablet
Tbsp =Tablespoonful
Tsp = teaspoon
Tid =Three times a day
Tinc =Tincture
TPR= temperature /pulse /respirations
Top =Topically
tsp. =Teaspoon
UA or **u/a**= urinalysis
ung. =Ointment
VS = vital signs
Wt= weight

The Do Not Use List includes some of the following:

Do Not Use **u**, or **for unit**. Mistaken some times for zero. You must write "unit"
Do Not use iu for international unit. Mistaken for IV. Write "international unit"
Do Not Use Q.D., QD, q.d., qd (Daily). Mistaken for each other. Write "Daily".
Do Not Use Q.O.D. QOD, q.o.d., qod (every other day). Write "every other day"
See the complete Do Not Use List (The Joint Commission
http://www.jointcommission.org/assets/1/18/Do_Not_Use_List.pdf**)**

MEDICATION CLASSIFICATIONS

A medication can have several names. There is usually a generic name for a medication and one or more brand names. Generic names for medications are chosen by a variety of official bodies. Drug manufacturers choose the brand names of their products. There can be many brands of a particular medication. The brand names are usually easier to pronounce and easier to remember. For example the generic name: Acetaminophen is often called Tylenol (brand name).

Medication classes

A medication/ drug also belongs to one or more medication/ drug classes. A drug class is a group of drugs that have something in common. They are similar in some way, but they are not identical. Medications can also be classified or grouped according to their function or the system that they treat.

Drugs can be in a class with other drugs because: the drugs are related by their **chemical structure / makeup**.

For example*:* Aspirin is a salicylate. Its full chemical name is acetylsalicylic acid or ASA.

Aspirin can prevent the formation of blood clots by stopping molecules in the blood called platelets from clumping or aggregating. So it belongs to a drug class called anti-platelets or platelet aggregation inhibitors.

Function:

Aspirin is used to reduce fever. Drugs that treat fever are called anti-pyretic drugs.

narcotic analgesics reduce pain

System that they treat such as;

Cardiac medications – refers to the heart
Respiratory / Pulmonary medications - refers to the Lungs etc.

Prescription medications

Prescription medications are categorized through the controlled substance act into five classes or schedules:

SCHEDULE 1 (CLASS I) DRUGS are illegal because they have high abuse potential, no medical use, and severe safety concerns; for example, narcotics such as LSD, Heroin, and cocaine. Marijuana is also included as a Class 1 drug; now it is legal in some states and some states are using it as a medicinal drug.

SCHEDULE 2 DRUGS (CLASS 2) DRUGS have a high potential for abuse and dependence and abuse, an accepted medical use, and the potential for severe addiction. These drugs include opiods based on high dose Fentanyl, codeine, Oxycodone also Methamphetamine and Barbiturates; also included are such drugs as opium, morphine. The main difference between a Schedule, or Class, 1 and 2 is whether or not the drug is deemed to have a valid medical application.

SCHEDULE 3 (CLASS 3) DRUGS have a lower potential for abuse than drugs in the first two categories, accepted medical use, and mild to moderate possible addiction. These medications include Codeine (low dose), steroids, and Hydrocodone-based opiods.

SCHEDULE 4 (CLASS 4) DRUGS have a lower abuse potential than Schedule 3 Drugs with limited potential for addiction and accepted medical use. These include many of the anti-anxiety medications like the Benzodiazepines, sleeping agents, Sedatives, and the mildest of the opiod type medications like Darvon.

SCHEDULE 5 (CLASS 5) DRUGS have a low potential for abuse, accepted medical use, and very limited potential for addiction. Such as; medications with limited amount of narcotics or stimulant medicines for cough, or pain.

PROPER STORAGE OF MEDICATIONS

There are specific directions for stating the appropriate temperature at which medications shall be stored. Research has shown that the storage at a higher or a lower temperature have produced undesirable results. The Pharmacopeia;
a book containing an official list of medicinal drugs together with articles on their preparation, formulas, dosage, use etc. may be accessed at United States Pharmacopeia (USP) / www.usp.org/.

The United States Pharmacopeia and The National Formulary (USP–NF) is a book of public pharmacopeial standards. It contains standards for (chemical and biological drug substances, dosage forms, and compounded preparations), medical devices, and dietary supplements.

Storage definitions, as defined in the General Notices section of the USP-NF, for recommended conditions commonly specified on product labels as follows:

Freezer: The temperature is maintained thermostatically between -20 C and -10 C (-4 F and 14 F).

Cold: Any temperature not exceeding 8 C (46 F).

A refrigerator is a cold place in which the temperature is maintained thermostatically between 2 C and 8 C (36- 46 F).

Cool: Any temperature between 8 C and 15 C (46-59 F). A substance that requires cool storage, alternatively may be stored in a refrigerator, unless otherwise specified by the individual USP monograph.

Room Temperature: The temperature prevailing in a working area.

Controlled Room Temperature: A temperature maintained thermostatically that encompasses the usual and customary working environment of 20 C to 25 C (68-77 F) that allows for brief deviations between 15 C and 30 C (59-86 F) that are experienced in pharmacies, hospitals, and warehouses.

Warm: Any temperature between 30 C and 40 C (86-104 F).

Excessive Heat: Any temperature above 40 C (104 F).

Protection from Freezing: freezing may cause a substance to lose its potency or strength, or alters its characteristics. The container label must have appropriate instructions to protect the substance from freezing.

Safe Medication Storage

- Keep all medications out of reach of children.
- Keep medications out of the reach of anyone who might abuse/ misuse them.
- Be careful if medication looks like water or drink.
- Make sure that medications that need to be in the refrigeration are not stored in an area where they will freeze.
- Make sure the medications are kept separate from food items. A good idea is to place them in a container that separates them.
- Always Store the medication in its original container. Do not mix different medications together in one container. This will make it difficult to identify during an emergency
- Store all medicines in one designated location together. The location should be a dry and cool place.
- Properly dispose of any medication that has expired or that the physician has discontinued.

Proper Disposal of Medications

Federal Guidelines

Discontinued or Unused portions of medications must be disposed of properly to avoid harm. Never flush prescription medications down the sink / drain, or the toilet unless the label or instructions tells you to. The U.S. Food and Drug Administration (FDA) website is an excellent recourse for information regarding proper disposal of medications.

FDA and the White House Office of National Drug Control Policy developed Federal guidelines that are summarized below:

- Follow any specific disposal instructions on the prescription drug labeling or patient information that accompanies the medicine. Do not flush medicines down the sink or toilet unless this information specifically instructs you to do so.
- Take advantage of community drug take-back programs that allow the public to bring unused drugs to a central location for proper disposal. Call your city or county government's household trash and recycling service (see blue pages in phone book) to see if a take-back program is available in your community. The U.S. Drug Enforcement Administration, working with state and local law enforcement agencies, periodically sponsors National Prescription Drug Take Back Days.
- If no disposal instructions are given on the prescription drug labeling and no take-back program is available in your area, throw the drugs in the household trash following these steps.

1. Remove them from their original containers and mix them with an undesirable substance, such as used coffee grounds or kitty litter (this makes the drug less appealing to children and pets, and unrecognizable to people who may intentionally go through the trash seeking drugs).
2. Place the mixture in a sealable bag, empty can, or other container to prevent the drug from leaking or breaking out of a garbage bag.

Over 600,000 pounds of unneeded, unwanted, or expired prescription medications were properly disposed of during the final Drug Enforcement Administration (DEA) National Prescription Drug Take-Back Day, held September 27, 2014.

TAKE EXAM

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