PHARMACEUTICAL CALCULATIONS

METRIC SYSTEM

Prefix	Symbol	Numerical Value	Interpretation
Kilo	**K**	1000	One thousand times
Hecto	**H**	100	One hundred times
Deca	**D**	10	Ten times
Deci	**d**	0.1	Tenth part of
Centi	**c**	0.01	Hundredth part of
Milli	**m**	0.001	Thousandth part of
Micro	**μ or mc**	0.000001	Millionth part of
Nano	**n**	0.000000001	Billionth part of

Apothecaries System of Weights		Apothecaries System of Liquids	
1 scruple	20 grains	1 fluidram	60 minim
1 dram	3 scruples (ɜ)	1 fluidounce	8 fluid dram (fl.dr.)
1 ounce	8 drams (ʒ)	1 pint	16 fluid ounce (fl.oz)
1 pound	12 ounces (℥) or 5760 grains	1 quart	2 pint (pt.)
		1 gallon	4 quart (qt.)

Avoirdupois Measurement of Weights				
1 ounce (oz)	437.5 gr.	1 pound (lb)	16 oz	7000 gr.

Household System		Length	
1 tsp	60gtt	1 inch	2.54cm
1 tbsp	3 tsp	1 meter	39.37 inch
1 oz	2 tbsp	**Weigth**	
1 tea cupful	6oz	1 kg	2.2 lb (avoir)
1 glassful/cup	8oz	1 lb (avoir) 16oz	454 g
1 pint	2 cups = 16oz	1 lb (apoth) 12oz	373 g
1 quart	2 pint	1 g	15.34 gr
1 gallon	4 quarts	1 gr	65 mg

Volume			
1 mL	20gtt	1 mL	16.23 minims
1 tsp	5mL	1 tbsp	15mL
1 cup	240mL	1 fluid ounce	29.57mL
1 pint	473mL	1 gallon	3785mL

Temperature	Percentage of Error
9˚C = 5˚F - 160 Kelvin = ˚C + 273.15	$\%E = \frac{Error}{Quantity\ Desired}\ x\ 100$

Sensitivity Requirement

$$\boldsymbol{Smallest\ quantity = \frac{Maximum\ potential\ error\ or\ sensitivity}{Percentage\ error}\ x\ 100}$$

Dosage based on:

AGE:		WEIGHT:	
• Cowling's Rule	$\boldsymbol{CD = \frac{Age + 1}{24}\ x\ AD}$	• Clark's Rule for Infants & Neonates	$\boldsymbol{CD = \frac{Weight\ in\ lb}{150lb}\ x\ AD}$
• Young's Rule	$\boldsymbol{CD = \frac{Age}{Age + 12}\ x\ AD}$		
• Fried's Rule for Infants	$\boldsymbol{CD = \frac{Age\ in\ months}{150}\ x\ AD}$	**BSA:**	
		• Approximate BSA	$= \frac{4w+7}{w+90}$; **W in Kg**
I = Height in inches P = Weight in pounds		• Exact BSA	$\sqrt{\frac{I\ x\ P}{3131}} = \sqrt{\frac{C\ x\ K}{3600}}$
C = Height in centimeters K = Weight in kilograms		• Patient Dose	$\frac{BSA\ (m^2)}{1.73m^2}\ x\ Drug\ Dose$

		Unit
DENSITY	$D = \frac{mass}{volume}$	g/mL
SPECIFIC GRAVITY		No unit
Solids **heavier** than and **insoluble** in water	$sp.gr. = \frac{wt.\ of\ substance}{wt.\ H2O\ displaced}$	
Solids **heavier** than and **soluble** in water	$\frac{wt.\ of\ displaced\ oil}{sp.gr.\ oil} = \frac{wt.\ of\ salt\ in\ air}{sp.gr.\ of\ salt}$	
Solids **ligther** than and **insoluble** in water	$sp.gr. = \frac{wt.\ on\ air}{wt.\ on\ H2O}$	
OSMOLARITY	$\frac{mg}{MW\ (in\ \frac{mg}{mmol})}$	mOsm/L

MOLARITY	$M = \frac{n}{L}$	$n = \frac{g}{g/mol}$	$n = \frac{mg}{mg/mol}$	$MW = \frac{g}{mol}$
MOLALITY	$m = \frac{n}{L}$	**NORMALITY**	$N = \frac{\frac{g}{(MW/f)}}{L}$ c	

TOTAL PARENTERAL NUTRITION	**TDE = RME x AF x SF**

Harris-Benedict Equation			
Male	RME = [66.67 + (13.75 x W) + (5 x H) – (6.76 x A)	W in kg	A in years
Female	RME = [655.1 + (9.56 x W) + (1.86 x H) – (4.68 x A)	H in cm	

Total Daily Expenditures

Activity Factors		Stress Factors	
Patient Conditions	Factor	Patient Conditions	Factor
Normal, healthy activity	1.5	Mild stress (non surgical px)	1.2 - 1.4
Confined to bed	1.2	Moderate stress (severe infection)	1.5 -1.75
Out of bed	1.3	Severe stress (px w/ sever burns)	1.75 - 2.0

RME requirement

RME		AA requirement	
Mildly stressed	25 kcal/kg/day	Mildly stressed (Average healthy adult)	0.75g/kg
Moderately stressed px	35 kcal/kg/day		
Post operative px	45 kcal/kg/day	Moderately stressed px	0.9g/kg
Hypercatabolic px	60 kcal/kg/day	Severely stressed px	1.25g/kg

TPN Component

Lipid	9 kcal/g	Dextrose (hydrous)	3.4 kcal/g
Medium chain FA	8.3 kcal/g	30% Fat emulsion	3.0 kcal/mL
Alcohol	5.6 kcal/g	20% Fat emulsion	2.0 kcal/mL
Glycerol	4.3 kcal/g	10% Fat emulsion	1.1 kcal/mL
Dextrose (anhydrous)	4 kcal/g	FLUID	1.2 kcal/mL
Amino acid	4 kcal/g		

CALORIC REQUIREMENT

Infant	100 kcal/kg/day	Teenager	35-60 kcal/kg/day
Children	80-100 kcal/kg/day		

PROTEIN

Unstressed px	0.8 g/kg/day	Infant	2.3 g/kg/day
Mildy stressed px	0.8 g-1g/kg	Children	1.5-2 g/kg/day
Renal dialysis px	1.2 g/kg	Teenager	1-1.5 g/kg/day
Moderately stressed px	1.1-1.5 g/kg		
Severely stressed px (critical illness/trauma)	1.5-2 g/kg		
Severely burned px	3 g/kg		

LIPID

(20-40% total daily calories)	9kcal/g	10% Lipid emulsion	11 kcal/g
		20-30%	10 kcal/g

FIBER			
Women	21-25g	Men	30-38g
14g/1000 calories			
Sources of calories	CHO, CHON (AA), LIPIDS		
FAT is restricted to less than 60% (30-40%) of the total daily calories administered			
Amino acid administration may also depend on the px condition			

Steps in TPN Preparation	
1. Determine TDEE	4. Carbohydrate
2. Protein	5. Fluid
3. Lipid	

PHARMAECONOMICS	
$Selling\ Price = Cost + Profit$	$\%\ Gross\ Profit = \frac{Profit}{Selling\ price}\ x\ 100$
$Proof\ Strength = 2\ x\ \%\ (v/v)$	$Proof\ Gallon = \frac{WG\ x\ \%}{50\%}$
	$Proof\ Gallon = \frac{WG\ x\ PS}{100}$

IDEAL BODY WEIGHT	
Male	$\boldsymbol{IBW = 50kg + 2.3kg\ per\ 1\ inch\ above\ 5ft\ of\ px\ height}$
	$\boldsymbol{IBW = 110lb + 5lb\ per\ 1\ inch\ above\ 5ft\ of\ px\ height}$
Female	$\boldsymbol{IBW = 45.5kg + 2.3kg\ per\ 1\ inch\ above\ 5ft\ of\ px\ height}$
	$\boldsymbol{IBW = 100lb + 5lb\ per\ 1\ inch\ above\ 5ft\ of\ px\ height}$

CREATININE CLEARANCE	
Cockcroft Gault Equation	$CrCl = \frac{(140 - A(in\ yrs.)x\ W\ (in\ kg)}{Sr\ Cr\ in\ \left(\frac{mg}{dl}\right) x\ 72}\ x\ 0.85\ if\ F$
Jelllife Equation	$CrCl = \frac{98 - 0.8\ (Age\ in\ yrs\ ) - 20}{Sr\ Cr\ in\ \left(\frac{mg}{dl}\right)}\ x\ 0.9\ if\ F$

ADVERSE DRUG REACTIONS

NARROW THERAPEUTIC DRUGS			
W	Warfarin	**D**	Digoxin
H	Heparin	**A**	Anticonvulsant
A	Aminoglycoside		
T	Theophylline		

CONTRAINDICATED DRUGS ON G6PD PATIENTS	
S	Sulfonamide
A	Antimalarials
M	Methyldopa

PREGNANCY CATEGORY			
	ANIMALS	**HUMANS**	**Risk**
A	Yes	Yes	No
B	Yes	No	No
C	Yes	No	Yes
D	Yes	Yes	Benefit >> Risk
X	Yes	Yes	Risk >> Benefit

POLYMORPHISM	
NaCl	Cubic
Rhombic	Iodine
Tetragonal	Urea
Hexagonal	I_2 form
Monoclinic	Sucrose
Triclinic	H_3BO_3
Cocoa Butter	β-stable
Chromphenicol	B

TYPES OF ADR		
A	**Augmented**	Common, predictable, dose-dependent
B	**Bizzare**	Rare, unpredictable, not related to pcol action
C	**Continous**	Long-term effect; related to dose & duration of tx
D	**Delayed**	Dose-related; manifest after long exposure
E	**End of Use**	Sudden termination/discontinuous/withdrawal of drugs
F	**Failure of Therapy**	Inappropriate

DRUG INTERACTIONS			
DRUG-FOOD INTERACTIONS			
Quinolones (Tetracycline)	+	Calcium	Complexation = ↓ absorption
Spirinolactone	+	Potassium (Banana)	Hyperkalemia
Bisacodyl (act in base)	+	Milk	Premature release (GI irritation)
MAO PITD (Phenelzine, Isocarboxazid, Tranylpromine, Dopamine)	+	Tyramine	Hypertensive crisis
Oral Hypoglycemic Agents/ Isoniazid	+	Histamine (Tropical fishes, Tuna, Tulingan)	Flushing tachycardia
Cephalosporin	+	Alcohol	Disulfiram-like rxn (flushing, tachycardia)
Drug	+	Grape fruit juice	Enzyme inhibitor (↓ Drug metab)
CNS depressant	+	Caffeine	Antagonism
Warfarin	+	Vit. K (Green leafy Veg.)	Antagonism
DRUG-HERBAL INTERACTIONS			
Digoxin	+	St.John's Worth	Enzyme Induction (↑drug metab)
Sedative	+	Valerian	Additive Sedative Hypnotic
Warfarin/Heparin/ LMW Heparin	+	Garlic, Ginger, Feverfew	Additive Antiplatelates Ginseng → procoagulants Ginko → antiplatelets
Warfarin	+	Ginseng	↓ platelet effect

DRUG-LAB INTERACTIONS			
Vit.C	+	Glucose test	False (+) result
Allopurinol	+	Blood Cholesterol test	False (+) increase in cholesterol level
Rifampicin			Red orange
Chloroquine			Straw-colored
Fava beans			red

DRUGS TO BE TAKEN					
w/ FOOD (↑ Abs)	**DiPaPa GAMMIT**	w/o FOOD (↓Abs)		**PAPA NIA CEE QT**	
D	Dicoumarol	**P**	Penicillamine	**C**	Captopril
P	Propoxyphene	**A**	Alendronate	**E**	Erythromycin
P	Phenytoin	**P**	Penicillin	**E**	Ethanol
G	Griseofulvin	**A**	Aspirin	**Q**	Quinolone
A	Acarbose	**N**	NSAID	**T**	Tetracycline
M	Metoprolol	**I**	Isoniazid		
M	Morphine	**A**	Acetaminophen		
I	Itraconazole				
T	Theophylline				

Enzyme Inducers ↑ Drug metabolism, ↓ Therapeutic effect		**Enzyme Inhibitors** ↓ Drug metabolism, ↑ Therapeutic effect			
G	Griseofulvin	**S**	Sodium Valproate	**F**	Fluconazole
P	Phenytoin	**I**	Isoniazid	**A**	Alcohol (Acute)
P	Phenobarbital	**C**	Cimetidine	**C**	Ciprofloxacin
A	Alcohol (Chronic)	**K**	Ketoconazole	**E**	Erythromycin
R	Rifampicin			**S**	Sulfonamide
C	Carbamazepine	**C**	Chloramphenicol	**+** Grape Fruit juice	
S	Smoking/Sulfonylurea	**O**	Omeprazole		
+ Quinidine **+** St.John's Worth		**M**	Metronidazole	**+** Oranges	
GP PARCS		**SICKFACES.COM**			

PHARMACODYNAMIC INTERACTION			
Additive (1+1 = 2)			
Alcohol/ Chloral hydrate/ 1st gen Antihistamine	+	CNS depressant (Barbiturates, Benzodiazepines)	Sedative
Loop Diuretics (High ceiling; imbalance of otic fluids)	+	Aminoglycosides (Kanamycin, Amikacin, Niamycin)	Ototoxicity
B-blocker	+	Non DHP CCBs	Heart block
Diuretics (except K-sparing Antibiotics, Na-K AtPase inhibitor)	+	Digitalis	Hypokalemia
Antidepressant	+	Azithromycin	Prolonged QT Interval (Torsades de Pointes)
Promethazine	+	OTC antihistamine + TCA	Anticholinergic
Synergistic (1+1 = ≥2)			
Sulfamethoxazole	+	Trimetoprim	-cidal
Alcohol	+	CCl_4	
Pyrethroids	+	PBO (Piperonyl butoxide)	
Potentiation (O+1=2)			
Amoxicillin	+	Clavulanic acid	(Co-Amoxiclav Augmentin)
Ampicillin	+	Sulbactam	Unasyn
Piperacillin	+	Tazobactam	Piptaz,Tazosyn
Levodopa	+	Carbidopa	Sinemet, Tidomet
Antagonism (1+1=0)			
Nor (Epi)	+	Phenoxybenzamine	
OHAs (↓ glucose)	+	Antipsychotic (typical)	(↓dopa)
Levodopa (↑dopa)	+	Antipsychotics (typical)	(↓dopa)
Anti-HTN	+	NSAIDS	Vasoconstrictor Urinary retention
Electrolyte Concentration			
Li salt	+	Hyponatremia	Li toxicity
Digoxin	+	Hypokalemia (diuretic)	Digitalis toxicity
ACEi (↑K)	+	K^+ sparring (↑K)	Hypokalemia

DOSAGE FORMS

CLASSIFICATION FOR POWDERS	
Very Coarse	Sieve No. **8**
Coarse	Sieve No. **20**
Moderately Coarse	Sieve No. **40**
Fine	Sieve No. **60**
Very Fine	Sieve No. **80**

PEG OINTMENT	
MW < 600	**Liquid**
MW > 1000	**Solid**
MW 600-1000	**Semi-solid**

SUPPOSITORIES					
Feature	**RECTAL**		**VAGINAL**	**URETHRAL**	
Shape	Bullet or Torpedo		Globular or Ovoid/Cone	Pencil-like	
Weight	Adult: 2g	Child: 1g	5g	Male:4g	Female 2g
Size	Adult: 32mm	Child: 16mm	varies	Male: 140mm	Female: 70nm
Use	BOTH		LOCAL	LOCAL	

GLYCEROGELATIN	
Glycerin	40%
H_20	35%
Gelatin	15%
Drug	10%

SOLUBILITY	
Very Soluble	<1
Freely Soluble	1-10
Soluble	10-30
Sparringly soluble	30-100
Slightly soluble	100-1,000
Very slightly soluble	1,000-10,000
Insolube	>10,000

FLAVORED SYRUP	
Orange	Acidic pH for drug
Cherry	
Cocoa	Bitter
Raspberry	Saline medicaments
Glycyrrhiza	
Acacia	urea
Eriodictyon	alkaloid

HLB SYSTEM	
Anti-foaming agent	1-3
W/O emulsifier	3-6
Wetting agent	7-9
O/W emulsifier	8-18
Detergent	13-16
Solubilizer	15-20

EXTRACTION	
Maceration	Soaking
Digestion	Maceration w/ gentle heat
Infusion	Maceration in hot/cold H_2O
Decoction	Boiling in H_2O
Percolation	Column; liquid added at the top

CLINICAL PHARMACY

LAXATIVE		
Stimulant/ Irritant	• Senna (Senokot) • Bisacodyl	• Castor oil • Lactulose
Bulk-forming	• Psyllium (Metamucil)	
Emollient/ Stool softener	• Docusate	• PEG
Osmotic/ Saline	• $MgSO_4$ (Epsom salt)	• Na Phosphates (Fleet)
Lubricant	• Mineral oil	• Glycerin

MEDICATION ERROR		
Ala pa naman	A	Capacity to cause harm
Buti naagapan	B	Error; did not reach the pxx
Chos	C	Error; no harm
Dapat imonitor	D	Error; monitoring
Temporary Entervention	E	Error; temporary harm can be treated
HosFital	F	Error; Hospital stay
Grabe permanent	G	Error; permanent harm
Naghihingalo	H	Error; near death
Iyak/Ililibing	I	Error; Death

CHRONIC KIDNEY DISEASE			
1	GFR	>90 ml/min	
2	Mild	60-89 ml/min	
3A	Moderate	45-59 ml/min	
3B	Moderate	30-44 ml/min	
4	Severe	15-29 ml/min	Explore Renal Replacement Therapy
5	End Stage	>15 ml/min	

ELEMENTS AND THEIR IMPORTANT FUNCTION IN THE BODY	
Na	Fluid status
K	Excitability of nerves, muscle, heart
Cl	Acid-base balance
Mg	Co-factor for enzymes
Cu	Lys oxidase (Collagen cross-linking)
Mg	Kinases
Mn	Arginase (urea cycle)
Mo	Xanthine oxidase (purine metab)