HIGH-YIELD
MED REVIEWS

2022

NAPLEX

A COMPREHENSIVE *RAPID REVIEW*

Over 650 Focused Topics!

Also Includes Reviews on:

- ✓ Calculations & Must Know Equations
- ✓ Biostatistics & Literature Evaluation
- ✓ Federal Laws & Regulations
- ✓ Special Topics in Phamacy Practice

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BONUS ACCESS:
ONLINE PRACTICE EXAM &
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A COMPREHENSIVE
D REVIEW

Expert Faculty:
- Each author with real experience in pharmacy education & training
- Represent both outpatient & inpatient clinical practice
- Have advanced credentials

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NAPLEX Comprehensive Rapid Re

Total Pages in Book = 1,020
Total Focused Topics Covered = 660+

Total Introductory Topics in Pharmacy = 80
Total Drug Classes Reviewed = 288
Total Disease State Rapid Reviews = 297

INFECTIOUS DISEASES

INFECTIOUS DISEASES (Cont.)

MUSCULOSKELETAL

NEUROLOGY

PART 3: DISEASE STATE RAPID REVIEWS

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HIGH-YIELD
MED REVIEWS

PART 1

INTRODUCTORY TOPICS

RAPID REVIEW

PHARMACOKINETICS & PHARMACODYNAMICS

GENERAL CONCEPTS

Easy to read format for studying:
- Bullets
- Concise study facts
- Clinical examples for relevance & application

- Pharmacokinetics has to do with the movement of
  - ADME, Cmax, Cmin, Half-life, Duration of A
- Pharmacodynamics has to do with what drugs do o
  - Parameters: ED50% (reflects potency), LD5
- General principles:
  - Load doses (LD) achieve steady state concentrations (Css)

PHARMACOKINETICS

- **Absorption**
  - The bioavailability (F) is the fraction of drug administered that actually made it into the body.
    - Drugs given by mouth are usually < 100% or have a F that is < 1.0
  - Drugs needing an acidic environment to be absorbed = itraconazole capsules (not solution), posaconazole, atazanavir, erlotinib, dasatinib
  - Gut edema and loop diuretics → furosemide (most impacted) vs. bumetanide or torsemide (least impacted)
- **Distribution**
  - Protein binding:
    - The free fraction (or unbound) of drug exerts the pharmacologic effect
    - Clinical Example of Relevance:
      - Methimazole 0% vs propylthiouracil (PTU) 80% where PTU is less likely to get into breastmilk and possibly safer in post-partum period
      - Phenytoin risk of toxicity can occur with low albumin levels → requires the "free phenytoin" level to be checked for accuracy
  - Volume of distribution (Vd) = does NOT determine which tissue it goes just tells you the drug is leaving the central or vascular compartment and going into "tissue". The tissue it distributes into is influenced by the drug itself (molecular size, shape, etc).
    - E.g., Drug with large Vd that goes into muscle = Digoxin → selective for cardiac muscle → clinical relevance = dosed based on lean body mass
    - E.g., Drug with large Vd that goes into fat = benzodiazepines → lipophilic molecules → clinical relevance = can deposit into fat, pass through BBB to get into CNS
    - E.g., Dosing variations based on Vd = vancomycin (Vd 0.7 L/kg) use actual BW vs. gentamicin (Vd = 0.25 L/kg) use ideal or adjusted BW
    - E.g., Differences in dosing of gentamicin in pediatrics vs adult …. Why would a pediatric patient receive more per kg/dose
    - Site of action → prostate infection → must get into the prostate → clinical example: fluoroquinolones and trimethoprim/sulfamethoxazole both penetrate the prostate and cover organisms that cause prostatitis, thus they are the drugs of choice
  - Transporters:
    - Influx cell membrane transporters (e.g., OATP) help drugs to come inside of the cell
    - Efflux cell membrane transporters remove drug from inside of the cell. The most common is P-glycoprotein (P-gp) which is also prone to drug-drug interactions.
      - Clinical Example of Relevance: Amiodarone use with digoxin → must reduce dose by 50%
- **Metabolism**
  - Phase I – Oxidation / reduction reactions mainly by CYP45o enzymes located in liver (most common location), GI tract, kidney.
    - Metabolic reactions can active or inactivate drugs
    - Prodrugs (drugs that need to be activated by CYP450) = clopidogrel, codeine, cyclophosphamide, hydrocodone, iphosphamide, nabumetone, prasugrel
      - Drugs that need to be activated further for a greater effect: Loratadine, losartan, tramadol
  - Phase II – Conjugation by non-microsomal enzymes to aid increasing water solubility and elimination

Reconstitution and IV Infusion Rates

- A 21-year-old patient is treated for a sexually transmitted disease (Neisseria gonorrhoeae) with ceftriaxone 500 mg administered as a single intramuscular injection.
  - After finding the reconstitution instructions in the prescribing information, you are to add 1.0 mL of sterile water to the 500 mg vial yielding a final concentration of 350 mg/mL (note that the concentration changed!).
  - To give the prescribed dose of 500 mg, what is the volume of ceftriaxone solution to be administered?
    - Arranging the proportion relationship:
      - x mL / 500 mg = 1 mL / 350 mg
      - Solving for x, x mL = 500 mg x 1 mL / 350 mg = 1.4 mL.

- In practice, you could not quickly and accurately measure 1.42857143 mL.
  - Using a 3mL syringe, the sensitivity is only a single decimal point, so we must round up or down, following the principles of rounding rules:
    - If the digit to be eliminated is less than 5, round down to eliminate it though changing the preceding digit. (4.54 to 4.5)
    - If the digit to be eliminated is 5 or greater, round up by increasing the preceding digit by 1 (4.55 to 4.6)
  - Round at the end of multiple-step calculations, not at the beginning or middle.
  - Knowing how many decimals to include depends on the clinical scenario.

- Reconstruction of Crotalidae polyvalent immune fab (CroFab).
  - For the initial treatment of a North American Pit Viper envenomation, the dose is 4 vials diluted in a final volume of 250 mL normal saline and administered over 1 hour.
    - First, reconstitution of each vial with 18 mL of normal saline, yielding a final volume of 20 mL per vial (CroFab is dosed in the number of vials, not a SI based unit of measure).
    - The total volume to add to be further diluted is
      - x mL / 4 vials = 20 mL / 1 vial
      - solving for x mL = 20 mL x 4 vials / 1 vial
      - x mL = 80 mL.
    - To correctly dilute this volume of 80 mL to a final total volume of 250 mL of normal saline, we first must withdraw volume from the normal saline.
      - Normal saline IV bag, there is 25 mL of overfill in the 250 mL product
        - (275 mL + 80 mL) - x mL = 250 mL
        - Solving for x mL = (275 mL + 80 mL) - 250 mL = x mL
        - x mL = 105 mL.
          - Therefore, before adding the drug, we must FIRST remove 105 mL and then add the 80 mL of CroFab.
        - With the final product appropriately labeled, the 250 mL total volume is administered over 1 hour.
        - We must now determine the IV infusion rate in mL per minute to program the IV pump
          - 250 mL / 1 hour x 1 hour / 60 minutes = 4.2 mL/minute.

IV Drip Rates by Drop

- No IV pump available in the scenario; infusion rates are calculated using IV drip counters.
  - IV infusion using a drip counter
  - Between 10 to 60 drops equals 1 mL.
    - By counting the number of drops per minute, an infusion rate in mL/minute can be determined.
- A provider in an acute care hospital and receive a call from an EMS paramedic, transferring a critically ill patient to your facility.
  - They need assistance determining the appropriate infusion rate for an epinephrine drip they compounded using 1 mg of epinephrine in 1000 mL normal saline.
  - Agreeing that the desired dose is 5 mcg/minute, how many drops per minute should the paramedic observe using a 20 gtt/mL infusion set?
    - 1 mg / 1000mL x 1000 mcg / 1 mg = 1000 mcg / 1000 mL,
    - Final concentration of 1 mcg / 1 mL.
    - The desired dose is 5 mcg/minute in volume is x mL / 5 mcg = 1 mcg / 1 mL
    - x = 5 mL, or 5 mL/minute
    - Finally determining the number of drops per minute:
      - x drops / 5 mL = 20 drops / 1 mL
      - x drops = 20 drops x 5 mL / 1 mL
      - x = 100 drops per minute.
        - Therefore, you instruct the paramedic to adjust the drip rate to count 100 drops per minute.

CALCULATIONS – PATIENT WEIGHTS & NUTRITION

1. **Patient Weight**
    a. Ideal Body Weight
        i. Female
        ii. Male
    b. Adjusted Body Weight
    c. BMI
    d. BSA
        i. Gehan and George Method
        ii. Du Bois Method
        iii. Mosteller Method
2. **Nutrition**
    a. Kcal
        i. Carbohydrate
        ii. Lipid
        iii. Protein

Ideal body weight (IBW)

- **Devine formula:**
    - Male = 50 + 2.3 (every inch over 60 inches)
    - Female = 45.5 + 2.3 (every inch over 60 inches)
- In patients shorter than 60 inches (5 feet), the formula cannot function.
    - Male = 50 + 2.3 (every inch under 60 inches)
    - Female = 45.5 + 2.3 (every inch under 60 inches)
- A common application using IBW is calculating creatinine clearance using the Cockroft-Gault equation:
    - Creatinine Clearance (Cockroft-Gault) = (140 - Age) / (72 x Serum creatinine) x weight (x 0.85 if female)
        - Actual body weight is commonly used for patients with weights below their IBW.
            - In patients who are obese, adjusted body weight (AdjBW) in calculating CrCl.
                - The commonly accepted threshold is if TBW is greater than 130% IBW, use AdjBW with the following formula:
            - AdjBW = IBW + [0.4(TBW - IBW)]
- **Example – Application:** 70-year-old female patient who is admitted for community-acquired pneumonia.
    - The admitting provider places an order for enoxaparin 30 mg subcutaneously daily based on the computer calculated CrCl of 29 mL/minute.
    - Determine the appropriate dose of enoxaparin for this patient (TBW 110 kg, Height 74 inches, Serum creatinine 1.3 mg/dL).
        - IBW = 45.5 - (2.3 x [62-60])
        - IBW = 50.1
        - CrCl = (140 - Age) / (72 x Serum creatinine) x IBW (x 0.85 if female)
        - CrCl = (140 - 70) / (72 x 1.4) x 50.1 x 0.85
        - CrCl= 29.6 mL/minute
            - Based on this calculation, the dose of enoxaparin is appropriate. However, we did not consider that her TBW is significantly higher than her IBW (more than 130%). Therefore, we must re-calculate CrCl using the AdjBW.
        - AdjBW = IBW + [0.4(TBW - IBW)]

- AdjBW = 50.1 + [0.4(110-50.1)]
- AdjBW = 74.1 kg
- CrCl = (140 - Age) / (72 x Serum creatinine) x AdjBW (x 0.85 if female)
- CrCl = (140 - 70) / (72 x 1.4) x 74.1 x 0.85
- CrCl= 43.7 mL/minute

- Now that we've used the patient's adjusted body weight, we can see that perhaps enoxaparin 30 mg is not appropriate, and we should be using enoxaparin 40 mg.

Body Mass Index (BMI)

- Another method to describe a patient mass for drug dosing purposes is using BMI.
- BMI can be calculated using either SI (metric) or Apothecary units:
  - BMI = weight in kg / height in m^2
  - BMI = [weight in lb / height in $inches^2$] x 703
- Less than 18.5 = Under weight
- Between 18.5 to 24.9 = Normal weight
- Between 25 and 29.9 = Overweight
- Between 30 and 24.9 = Obese
- Over 35 = Extremely or morbidly obese

- BMI may not necessarily be used for drug dosing, but it is considered a limited dosing metric as comparable BMIs often can be misleading to body composition.
- For example, a patient with a BMI of 25.6 kg/m^2 would be considered overweight.
  - Patient A is 6'4" and 210 lb, and muscular (picture a football player).
  - Patient B is 5'0" and 135.3 lbs patient.
    - Using the same dose based on BMI for these patients would likely lead to different clinical outcomes if one never went to look at the patient.

Body surface area (BSA)

- Body surface area, on the other hand, is used often in dosing certain chemotherapeutic agents.
- With these characteristically toxic agents, particularly cytotoxic chemotherapeutics, their low therapeutic index and significant variability in therapeutic effect or narrow therapeutic/toxic window.
- BSA can be used as a method to reduce this variability.

- BSA in meter squared (m^2) = √[(height in cm x weight in kg)/3600]

- High dose methotrexate, doses at or above 500 mg/m^2, is dosed based on BSA.
  - This methotrexate, used for various hematologic and solid tumor malignancies, is considered otherwise lethal unless appropriately reversed by leucovorin or glucarpidase promptly.

- Example: You receive the following medication order methotrexate 876.61 mg IV infusion but no accompanying orders for leucovorin or glucarpidase. The patient for which this order was received is 66 years old, weighing 66 kg, and is 66 inches tall. Is this dose above or below 500 mg/m^2?
  - To solve this question, we need to determine the patient's BSA and then divide the ordered methotrexate dose by BSA.

CALCULATIONS – ELECTROLYTES

Must know formulas & equations:
- We show you how to apply them

Corrected Electrolyte Calculations

- Corrected calcium = Measured Ca + (0.8[4.0-Albumin g/dL])
- Corrected sodium = Measured Na + ({1.6[measured glucose -100]}/100)
- Corrected sodium = Measured Na + (0.2 x triglyceride level)
- Corrected potassium = Measured K - (0.6[{7.4 - measured pH}/0.1])
- Corrected calcium = Measured Ca + (0.8[4.0-Albumin g/dL])

- A 48-year-old male with liver failure has a measured calcium of 6.9 mg/dL(normal 8.6 to 10.3 mg/dL), and serum albumin of 1.8 g/dL. Calculate the corrected calcium.
  - Corrected calcium = Measured Ca + (0.8[4.0-Albumin g/dL])
  - Corrected calcium = 6.7 + (0.8[4.0-1.8 g/dL])
  - Corrected calcium = 8.66 mg/dL
    - So instead of beginning calcium replacement, you inform the team that this patient's calcium is actually normal.

- A 22-year-old female, presenting with DKA and the following labs: Serum sodium 128 mEq/L, glucose 883 mg/dL. What is the corrected sodium?
  - Corrected sodium = Measured Na + ({1.6[measured glucose -100]}/100)
  - Corrected sodium = 128 + ({1.6[883 -100]}/100)
  - Corrected sodium = 140.5 mEq/L
    - So instead of beginning hyponatremia interventions, you inform the team that this patient's sodium is actually normal.
- In the same patient, an arterial blood gas provides the following data: pH 6.98, HCO3 12 CO2 28; some additional electrolytes were also provided on the ABG including a potassium measurement of 4.8 mEq/mL.
  - The team is beginning an insulin drip on the patient and decide to not include the potassium replacement component of the order. To verify this is the best intervention, calculate the corrected potassium.
    - Corrected potassium = Measured K - (0.6[{7.4 - measured pH}/0.1])
    - Corrected potassium = 4.8 - (0.6[{7.4 - 6.98}/0.1])
    - Corrected potassium = 2.28 mEq/L
      - You inform the team that in addition to initial volume resuscitation, potassium replacement should take place with careful observation of the pH and glucose before beginning insulin (which may further worsen hypokalemia).

Sodium Deficit in Hyponatremia

- Estimates the total amount of sodium that needs to be replaced in hyponatremia patients.
- Hyponatremia is a very dangerous clinical scenario that can induce seizures that are very difficult to treat, potentially leading to neurologic injury without intervention.
- Furthermore, if hyponatremia is corrected too quickly can also cause neurologic injury, potentially leading to death.
- Calculating the sodium deficit is the first step in determining how much to replace serum sodium.

- An 82-year-old female (65 kg) presents with altered mental status and serum sodium of 118 mEq/mL (the albumin was 4.0 g/dL). What is the sodium deficit if we want to correct 12 mEq/mL in the first 24 hours?
  - Sodium deficit = 0.6 x weight in kg x (desired sodium - actual sodium)
  - Sodium deficit = 0.6 x 65 kg x ([118+12] - 118)
  - Sodium deficit = 468 mEq
    - Therefore, this patient requires 468 mEq of sodium in the first 24 hours to increase the serum sodium by 12 mEq/mL.
      - From our previous discussions, we can calculate how much sodium chloride 3% IV solution is required to do this. We know that sodium chloride 3% has 513 mEq of sodium per liter solution.
      - 1000 mL / 513 mEq = x mL / 468 mEq
      - X mL = 1000 mL x 468 mEq / 513 mEq
      - X = 912.3 mL
        - This patient requires 912.3 mL of sodium chloride 3% IV over the next 24 hours to increase the serum sodium by 12 mEq/mL.
      - But because this patient is exhibiting neurologic sequela of hyponatremia, we would want to correct 50% of the deficit in the first 4 hours, then the remainder over the next 20 hours.
        - NaCl 3% dose of 912.3 mL in 24 hours to increase sodium by 12, so in other words, 76 mL of NaCl increases serum sodium by 1 mEq/L.
        - If we want 50% of the sodium corrected in 4 hours, then 1 mEq/L / 76 mL = 6 mEq/L / x mL
        - X mL = 76 mL x 6 mEq/L / 1 mEq/L
        - X = 456 mL
      - So in the first 4 hours, we must infuse 456 mL (or a rate of 114 mL/hour), with the remainder (912.3 mL - 456 mL) of 456.3 over the next 20 hours (rate of 22.82 mL/hour).

Water Deficit in Hypernatremia

- Water deficit = 0.6 x weight in kg x [(Serum sodium/140) -1]
  - The water deficit is a similar concept to what we've been discussing but applies to patients with high serum sodiums, typically dehydrated patients.
  - In this scenario, we would like to determine their water, or "free-water" deficit to be administered over 24 hours.

Fractional Excretion of Sodium (FENa)

- In some patients where the cause of oliguria and/or acute kidney injury are unclear, calculating their fractional excretion of sodium can help identify common causes to add to the differential diagnosis.
- However, the FENa should only be used in patients where the oliguric AKI occurs without any of the following: diuretic use, chronic kidney disease (CKD), urinary tract obstruction, or acute glomerular disease.
- To calculate FENa, we use the following formula:
  - Fractional Excretion of Sodium = [(Urine NA / Serum NA) / (Urine Cr / Serum Cr)]x100

- For a patient with the following findings, calculate their FENa: Serum sodium 135 mEq/L, serum creatinine 1 mg/dL, urine sodium 222 mEq/L, urine creatinine 55 mg/dL.
  - FENa = [(Urine Na / Serum Na) / (Urine Cr / Serum Cr)]x100
  - FENa = [(222 mEq/L/ 135mEq/L) / (55 mg/dL / 1 mg/dL)]x100
  - FENa = 3.0%
    - This suggests the patient may have "intrinsic" renal injury because the FENa is between 1 to 4%
    - Above 4% would suggest post-renal injury and below 1% would suggest a pre-renal injury.

High-Yield General Concepts

matter?

n influences the likelihood or degree of potential bias which may impact the internal

esigned randomized control trials have the least potential for bias followed by cohort s, then case-controlled studies, cross-sectional studies and then case reports and qualitative studies being at the spectrum where the potential for biases highest.

Tables & graphics added throughout to aid in studying

"Potential" for Bias

Lower

Higher

Study Design	Best Use for Design	Ability
Experimental		
Clinical Trial	• Evaluating a treatment or intervention	• Causality
Observational		
Cohort Study	• Determine the incidence or natural history of a disease	• Associations
Case-Control	• Ideal for rare diseases	
Cross-Sectional	• Determining the prevalence • Useful at assessing need	
Case-Reports or Case-Series	• Generating awareness and/or hypotheses	• Hypothesis Generating
Qualitative Study	• When concerned about understanding human behavior & their experience	• Human reasoning

- The overall desired endpoint or patient population to be studied may be influenced by the study design to be best utilized.
  - **RCTs**
    - Best utilized when evaluating a treatment or intervention that wants to determine causality with a high level of internal validity and low risk for bias.
      - RCTs offer her the greatest control confounders that are known to compromise internal validity.
  - **Cohort Study Designs:**
    - Are best utilized for determining the incidence of her natural history of a disease to look for associations.
  - **Case-Control Studies**
    - Are ideal for rare diseases looking for associations.
  - **Cross-Sectional studies**
    - Are best in helping to determine the prevalence while looking for associations.
  - **Case Reports & Case Series**
    - Are generally to increase awareness about something and are usually utilized for generating hypothesis that can lead to additional studies.
  - **Qualitative Studies**
    - Are mostly concerned about understanding human behavior and experiences that lead to assessments on human reasoning.
- **Study design factors that contribute to bias or compromises and internal validity:**
  - Prospective vs. retrospective
  - Randomization

- Blinding of the intervention
  - Double blinding is preferred to reduce changes in behavior by the patient and the researcher
- Utilization of a double dummy intervention
  - Useful at preventing the disclosure of study group assignment in a blinded study
- Single versus multicenter involvement
  - Multicenter involvement helps to dilute any potential bias from a single center that might occur from local or geographic practice patterns or clinician bias
- Active or placebo-controlled arms
- Control of appropriate confounders
- Influenced by the sponsor
  - More likely to be an issue with any subjective data being collected
- Conflicts of interest by the investigators themselves

Descriptive Study Designs

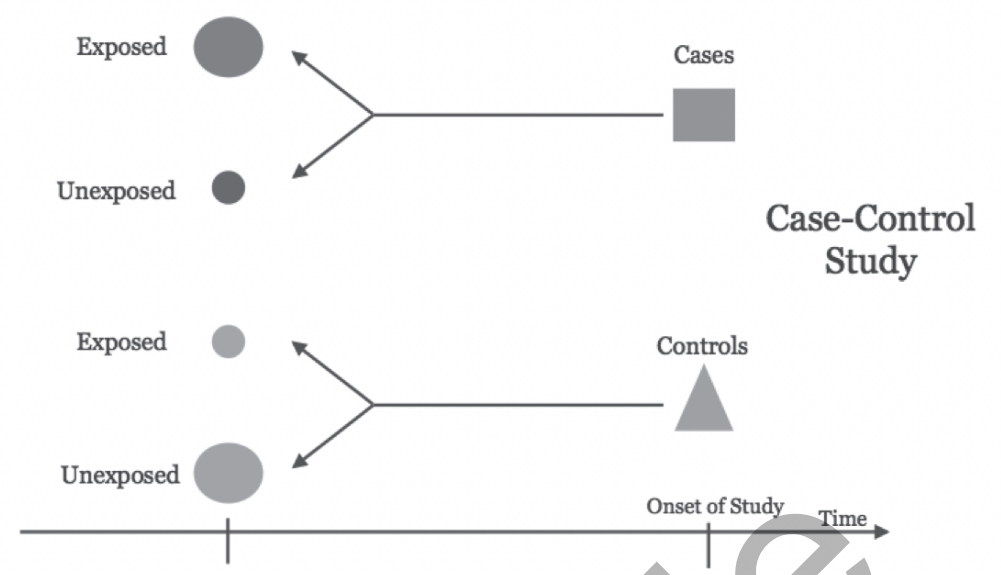
- **Description:**
  - Documents a clinical experience that highlights something observed in 1 or a few cases
  - Can generate hypothesis and begin the search for explanations for further study
- **Types of Publications:**
  - Case reports
  - Case series
  - Cross-sectional (surveys or nonanalytical)
  - Qualitative studies
- **Disadvantages:**
  - Cannot provide data for determining an association or causality
  - Usually do not change clinical practice
  - High risk for potential bias

Observational Study Designs

Case-Control Study

- **Description:**
  - A study design where the investigator identifies and selects patients who have the endpoint or outcome of interest (i.e., “cases”) and also patients without the endpoint or outcome of interest (i.e., “controls”) and looks back in time to identify exposures or characteristics that are linked to the cases.
  - Case-control studies are retrospective.

- **Study Diagram:**



- **Advantages:**
  - Less expensive
  - Easier to do and take less time compared to most prospective studies
  - Can be useful when obtaining follow-up data that is difficult to obtain due to the nature of population being studied.
  - When disease being studies is either rare or when there is a long period of time between exposure to the time of manifesting the outcome, this study design can be more efficient.
  - Depending on the exposure and outcome of interest, this design may be the only ethical way to evaluate something.
- **Disadvantages:**
  - Potential recall bias
  - Subject to selection bias
  - Generally, do not allow investigators to calculate an incidence or absolute risk
- **Application:**
  - A case-control study may be able to show an association between an exposure and outcome, but it cannot explain causation.
- **High-Yield Board Exam Secrets:**
  - Test questions will utilize words or terminology's that include:
    - "Back in time", "retrospectively" evaluated for "risk factors"
    - Went back to look for "exposure"
    - Evaluation of a "rare event" or "rare disease"
  - **Question Secret:**
    - Question will NOT ask for prevalence or incidence because time and endpoints have already occurred.

Cohort Study

- **Description:**
  - A study design that identifies and selects two groups of patients out of a population of interest and places them into one of two cohorts, one cohort who are exposed to an intervention and another cohort have not been exposed that intervention. They are then followed over time to see if they develop the outcome of interest at various time points.

Types of Study Groups / Samples

- **Questions to Ask About Who Was Studied**
  - How many study groups or study arms are there?
    - If two or more then will need consider statistical analysis for multiple groups
  - Are the patients in the study in one or more group or is this a cross-over study?
    - If yes, then the study is dealing with patients with "related groups"
      - This means the patients will serve as their own controls
    - If no, then you have "independent groups" which means the patients in each study group are technically different patients
  - Once the type of study groups being studied is known, then determine the type of data that is reflected in the endpoint of the study or outcome in question:
    - Nominal, ordinal, or continuous (see more below for details)
  - Knowing the type of groups and data helps to govern the choice of statistical analysis that should be done (see table below)
- **Summary of Group Types:**
  - **Related Groups**
    - Reflect the same patients in ALL study groups or study arms
    - Examples:
      - Cross-over studies
      - Retrospective Study of all patients at the start and end of the study
      - Studies using the same person but topical application in two locations (e.g., left vs right eye)
  - **Independent Groups**
    - The study groups or study arms are made up of different patients (biologically different individuals that do *NOT* cross-over).
    - Examples:
      - RCT
      - Cohort Study
      - Case-Controlled Study

Distribution of Sample Data

Nonparametric Statistical Analysis

- **Definition:**
  - Refers to the use of statistical tests or methods when the data being studied comes from a sample or population of people that does not follow a normal distributed.
- **Characteristics:**
  - Assumes patient population being studied is not normally distributed (i.e., as seen with outliers)
  - Type of data: Nominal or Ordinal.
    - *Nominal*:
      - When numbers are assigned to characteristics for the purpose of data classification. Do not have a sense of order or rank.
    - *Ordinal*:
      - When numbers are assigned to data that a sense of rank or order, but the magnitude of difference between those numbers is not known.
  - The usual central measure is a median
- **Example Nonparametric Statistical Tests:**
  - Mann-Whitney test (assumes 2 independent groups (i.e., not related) being studied)

- Kruskal-Wallis test (assumes > 2 independent groups being studied/compared)
- Spearman (correlation test)

Parametric Statistical Analysis

- **Definition:**
  - Refers to the use of statistical tests or methods when the data being studied comes from a sample or population of people that is normally distributed.
- **Characteristics:**
  - Assumes patient population being studied is normally distributed
  - Assumes the variance is homogeneous
  - Type of data: interval or ratio. Sometimes referred to as continuous variables/data.
    - *Interval scale data*:
      - When numbers have units that are of equal magnitude as well as rank order on a scale *without* an absolute zero
    - *Ratio scale data*:
      - When numbers have units that are of equal magnitude as well as rank order on a scale *with* an absolute zero
  - The usual central measure is a mean
- **Example Parametric Statistical Tests:**
  - T-test (assumes 2 independent groups (i.e., not related) being studied)
  - One-way ANOVA (assumes > 2 independent groups being studied/compared)
  - Pearson (correlation test)

Type of Data

Nominal Data

- **Definition:**
  - When numbers are assigned to characteristics for the purpose of data classification arbitrarily and without any regard to order.
- **Characteristics:**
  - The numbers selected or assigned to a variable are arbitrary.
    - Thus, the data descriptors are considered "categorical" or "dichotomous."
  - Data endpoints are assigned these arbitrary numbers without any regard to order or rank.
  - Data follows a binomial distribution in many cases because the endpoint is treated as a "yes or no" or "either did or did not…"
    - As such there cannot be an average or a mean value/result
- **Applicable Measure of Data Variability:**
  - Mode
  - Frequency
  - Note: There is no mean, median, standard deviation.
    - Example: If the endpoint or main outcome is mortality then at the end of the study the patient/subject in the study is either dead or alive. The patient cannot be in between or almost dead or possibly dead.
      - It is a categorical designation of being one or the other, thus you cannot have an average or mean or even a median.
- **Examples of Nominal Data:**
  - *Achievement of a desired clinical goal (e.g., a blood pressure of < 130/80)*:
    - Yes, the patient goal was achieved is assigned the number 1
    - No, the patient goal was NOT achieved is assigned the number 2

LITERATURE EVALUATION

Reporting Guidelines for Publishing

- Published standards and criteria for how a particular publication type is to be submitted for publication and ultimately reported in a journal.
- **The desired goals include:**
  - Improvement in the quality of reporting
  - Improving the transparency of information
  - Standardize the format of a particular publication type to be more effective and efficient when being appraised by readers.

Publication Type	Guideline	Reference
Randomized control trial	CONSORT	BMJ 2010;340:c332.
Observational study	STROBE	BMJ 2007;335:806-8.
Systematic review	PRISMA	BMJ 2009;339;b2535
Cochrane review	Cochrane Handbook	Cochrane-org
Case reports	CARE	J Clin Epi 2014;67:46-51.
Qualitative research	SRQR; COREQ	Acad Med 2014;89:1245.
Diagnostic–prognostic studies	STARD TRIPOD	BMJ 2015;351:h5527.
Quality improvement studies	SQUIRE	MID: 26369893
Economic evaluations	CHEERS	BMJ 2013;346:f1049
Animal preclinical studies	ARRIVE	PLoS Biol 2010;8:e1000412.
Study protocols	SPIRIT PRISMA-P	PMID: 23295957 PMID: 25554246

Critical Appraisal Tools

- The desired objectives for critical or "systematic" appraisal of the literature is to determine if the published paper have results that are:
  - Trustworthy or valid
  - Relevant
- **Tools to assess for risk of bias:**
  - GRADE is now used for assessing guidelines and RCTs in a systematic review/meta-analysis
  - For Non-RCTs = ACROBAT-NRIS (A Cochrane Risk of Bias Assessment Tool
  - Free online tools: Critical Appraisal Skills Programme (CASP)

Publication Type	Guideline
Guidelines	GRADE AGREE
Systematic review	PRIMSA AMSTAR
Randomized control trial	CASP
Cohort study	CASP
Diagnostic study	QAUDAS-2 QAREL
Qualitative research	CASP
Clinical prediction rule	CASP

FEDERAL LAW & REGULATIONS – REGULATORY AGENCIES

Overview of Regulatory Bodies

- **Food & Drug Administration (FDA):**
  - Enforces the federal Food, Drug, and Cosmetic Act
    - Also enforces the Drug Quality and Security Act (DQSA) which includes:
      - The Compounding Quality Act that defines outsourcing compounders and creates a registration program that is voluntary
      - The Drug Supply Chain Security Act (DSCSA) that helps track products throughout distribution using a nationalmayb electronic system
  - Sets labeling requirement for:
    - Food
    - Prescription medications
    - Over-the-counter drugs and cosmetics
    - Sets standards for investigational drug studies and product approval
    - Regulates and oversees the manufacturing and marketing of drugs
- **Drug Enforcement Administration (DEA):**
  - Enforces federal laws related to controlled substances act (CSA)
  - Relates to:
    - Manufacturing
    - Distribution
    - Dispensing of legal products
  - Investigates and prepares prosecution of activities that violate the CSA
- **Occupational Safety and Health Administration (OSHA):**
  - Formed from the Occupational Safety and Health Act of 1970
  - Ensures working environment and conditions are safe by setting the standards and then ensuring they are being met
  - Conducts period work site inspections
- **National Institute for Occupational Safety & Health (NIOSH):**
  - Responsible for "conducting research" and making recommendations for the "prevention" of work-related injury and illness
  - Comes from the same legislation as OSHA
- **Centers for Disease Control and Prevention:**
  - This is the U.S. health protection agency whose purpose is to save lives and protect people from health, safety, and security threats within the U.S., and abroad.
  - Examples of guidelines:
    - Infection control
    - Hand-hygiene
    - Standard or universal precautions
    - Safe injection practices

Other Standards – USP

- **United States Pharmacopeia:**
  - A non-governmental organization
  - Sets standards for drugs, dietary supplements, and other healthcare products
    - Published in the United States Pharmacopeia and National Formulary
      - Example, USP Chapter 795 set standards for nonsterile compounding, USP Chapter 797 sets standards for pharmaceutical compounding of sterile productions, and USP Chapter 800 sets standards for handling hazardous drugs
  - Goals:

- Advance public health by ensuring the quality of medications, ingredients in foods, and other products
- Promote safe and proper use of medications
- Verifying ingredients in dietary supplements

Summary

- The U.S. healthcare system has a number of regulatory bodies formed by federal laws that are intended to improve the safety and quality of the environments and delivery of services to the public.
- Healthcare organizations and participants involved in the provision of healthcare related services must comply and ensure standards are being met in order to operate and receive funding.

FEDERAL LAW & REGULATIONS – HEALTH SYSTEM ACCREDITATION & CERTIFICATION

- **Health-System Practice:**
  - Governed and regulated by a number of organizations and accrediting bodies
  - Also includes professional organizations that help set standards of practice (i.e., within pharmacy, nursing, etc).
  - Benefits:
    - Participation in programs paying for healthcare such as:
      - Insurance companies
      - Government agencies
    - Attract good healthcare staff
    - May be exempt from other inspections
  - Government & Non-government agencies look for these accreditations and compliance to allow an institution to participate in government programs.
    - These are called "Conditions of Participation (CoPs)"
    - Government agencies include Medicare and Medicaid
    - Nongovernment agencies include Kaiser

- **Accrediting Bodies:**
  - **Joint Commission (JCAHO)**
    - The primary accrediting organization for the operation of hospitals
    - Set Standards for hospitals and healthcare organizations
      - Performance expectations
        - Provide details for healthcare professionals to make decisions on to best accomplish any standard but not a "cook-book" approach
    - Also developed National Patient Safety Goals (NPSG)
    - Example standards:
      - Medication management
      - Infection control
      - Patient care
      - Medical records
      - Safety and security
      - Education
      - Performance improvement
      - Environment of care
    - The Joint Commission visit and preparation:
      - The Joint Commission's Accreditation Survey Activity Guide for Healthcare Organizations
      - Comprehensive Accreditation Manual for Hospitals: The Official Handbook (CAMH)
  - **Center for Improvement in Healthcare (CIHQ)**
    - An accrediting organization for the operation of hospitals.
  - **Healthcare Facilities Accreditation Program (HFAP)**
    - An accreditation for the operation of hospitals set by the accrediting organization from American Osteopathy Associations (AOA).
- **Summary:**
  - Healthcare systems have a number of accreditations and/or certifications that it must obtain and maintain in order to not only operate but to ensure a certain level of quality and safety is being provided while also being able to receive payment for services rendered.
  - We have accreditations, certifications and then regulatory agencies that enforce various laws to help regulate healthcare activities.

FEDERAL LAW & REGULATIONS – PARENTERAL DRUG THERAPY

Basic Terminology

- **Parenteral Therapy:**
  - Medications in dosage forms that are meant to be injected through the skin and into a tissue compartment or vascular space instead of being administered by mouth or alimentary canal.
- **Rationale for Parenteral Therapy:**
  - Patient is unable to swallow
  - Alimentary (enteral) canal is unable to be used or not functioning correctly
  - To by-pass first pass metabolism
  - Lack of oral bioavailability
  - Time-sensitive onset of drug action needed
  - Compliance or adherence

Dosage Formulations

- **Parenteral Dosage Formulation Terminology:**
  - **Ampul**
    - A glass container containing a single-use of medication
    - The glass container is gently broken at one end and may require the use of a needle filter to extract contents to avoid glass particles being pulled into injection device.
  - **Vial**
    - A plastic (usually) or glass container with a rubber gromet sealed closure at the top surrounded by a metal ring
    - Can be a single-use or multi-dose vial
  - **Vehicle**
    - The liquid that contains the medication that is dissolved, suspended or emulsified
    - The most common liquid is sterile water for injection (USP) but can also sometimes include:
      - Ethanol
      - Oils
  - **Total Parenteral Nutrition (TPN)**
    - Also referred to as hyperalimentation
    - Used for patients unable to consume nutrients and calories enterally

Administration Considerations

- **Considerations for preparation and dispensing:**
  - Try to dispense or have admixtures that are ready-to-use
  - Have a standardized process for compounding medications in sterile manner and free of distractions
  - Label IV admixtures in a standard format
  - Ensure competency of those preparing the medication
- Special considerations “prior to” administration of parenteral therapy:
  - Double checks in place
  - Have standardized IV medication administration recommendations to minimize distractions or interruptions
  - Personnel competency to administer the IV medications
  - Limit number of steps to prepare IV medications
  - Establish plans for antidotes and on-going monitoring procedures
  - Standard Precautions

- Guidelines that are meant to protect the healthcare worker who has occupational exposure to blood borne pathogens or bodily fluids.
- All bodily fluids should generally be considered infectious

Routes of Administration

- **Epidural:**
  - This is the space just above the dura matter of the brain and spinal cord but inferior to the ligamentum flavum
  - This where the CSF fluid is located
  - Should be administered by strict aseptic technique given access to the CNS
- **Intra-arterial (IA):**
  - Generally, this route is NOT advised and can lead to serious complications to the end organ of that artery
  - Examples
    - Directly administered tPA for clots for conditions such as:
      - STEMI
      - Acute ischemic stroke
      - Submassive or massive PE with hemodynamic instability
      - Acute peripheral arterial occlusion
- **Intra-articular:**
  - Administration of the medication directly into the joint space
  - Strict aseptic technique should be following to avoid risk of introducing bacterial into the joint which can lead to a septic joint
  - In some cases, extraction of some fluid may be required to avoid inserting too much fluid into the space
    - May also have a volume limitation based on the size of the joint space available
- **Intradermal:**
  - Administration of the medication directly into the superficial layer of the skin between the dermis and epidermis
  - Absorption is slower than SubQ or IM
  - Limited volume of administration to ~ 0.1 mL
  - Examples for use:
    - Tuberculin skin test for TB evaluation
    - Vaccines or IgG (e.g., rabies)
- **Intraosseous (IO):**
  - Administration of the medication directly into the bone marrow
  - Easy to insert and set up
  - Absorption is rapid and similar to IV
  - No significant limitation of volume of administration
  - Can be painful. Consider premedication with IO lidocaine
  - Examples for use:
    - ACLS / Codes
    - Unable to obtain IV access and emergency treatment needed
  - Note:
    - Avoid use of a bone that is injured
    - Apply infusions under a pressure bag
- **Intrathecal:**
  - Administration of the medication directly into the spinal canal or subarachnoid space
  - Difficult to do and more invasive
  - Requires strict aspect technique
  - Examples:
    - Anesthesia
    - Chemotherapy

HIGH-YIELD
MED REVIEWS

PART 2

DRUG CLASS
RAPID REVIEW

CARDIOVASCULAR – VAUGHAN WILLIAMS CLASS IA

Drug Class Reviews
- Concise content with clinical context
- Key sections of must know content
  - Mechanism of action
  - Primary or net benefit of drug class
  - Relevant class effects
  - Tables for easier studying
  - Doses for clinical context
  - Renal or hepatic dosing considerations
  - CYP450 or drug interaction pathways
  - Dosage formulations

High-Yield Basic Pharmacology

- **Mechanism of Action**
  - Sodium channel blockers - slows cardiac con
    refractory periods.
  - By depressing conduction and prolong refractor
    normal conduction by blocking both directions
    - Orthodromic conduction is antegrade
    - Antidromic conduction is retrograde co

Primary Net Benefit

- Disopyramide and quinidine are rarely used clinically, but procainamide still has a role in the acute management of supraventricular arrhythmias and ventricular arrhythmias.

Vaughan Williams Class Ia - Drug Class Review
High-Yield Med Reviews

Mechanism of Action: *Sodium channel blockers - slows cardiac conduction, decreases cardiac automaticity, and increases refractory periods.*

Class Effects: *Terminates or slows pathologic conduction contributing to arrhythmias*

Generic Name	Brand Name	Indication(s) or Uses	Notes
Disopyramide	Norpace	▪ Ventricular arrhythmias	▪ **Dosing (Adult):** – Patients weight less than 50 kg: ▪ Oral loading dose 200 mg ▪ Maintenance dose 100 mg q6h (IR), or 200 mg q12h (CR) – Patients weight 50 kg or greater ▪ Oral loading dose 300 mg ▪ Maintenance dose 150 to 200 mg q6h (IR), or 300 mg q12h (CR). ▪ Maximum dose of 400mg q6h) ▪ **Dosing (Peds):** Immediate release only – IR 1.5 to 7.5 mg/kg/dose q6h ▪ Maximum 1,600 mg/day ▪ **CYP450 Interactions:** Substrate CYP 3A4 ▪ **Renal or Hepatic Dose Adjustments:** – Controlled release ▪ Not recommended if GFR less than 40 mL/minute – Immediate release ▪ GFR 10 to 50 mL/minute 100 to 200 mg every 12 to 24 hours ▪ GFR less than 10 mL/minute 100 to 200 mg every 24 to 48 hours ▪ **Dosage Forms:** Oral (IR capsule, ER capsule)

Vaughan Williams Class Ia - Drug Class Review High-Yield Med Reviews			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Procainamide	Pronestyl	▪ Supraventricular arrhythmias ▪ Ventricular arrhythmias	▪ **Dosing (Adult):** – IV loading dose of 10 to 17 mg/kg infusion at 20 to 50 mg/minute (maximum 1g) – IV 100 mg bolus every 5 minutes (maximum 1g) ▪ Administration endpoints – QRS interval widening by 50% of its original width – Maximum dose of 1 g – Hypotension – IV continuous infusion 1 to 4 mg/minute ▪ **Dosing (Peds):** – IV loading dose 10 to 15 mg/kg over 30 to 60 minutes. – IV infusion of 20 to 80 mcg/kg/minute (maximum 2,000 mg/24 hours) ▪ **CYP450 Interactions:** Substrate of CYP 2D6 ▪ **Renal or Hepatic Dose Adjustments:** ▪ For continuous infusion only – Reduce total dose by 25% to 50% ▪ GFR 10 to 50 mL/minute ▪ Dialysis ▪ Child-Pugh score of 8-10 – Reduce total dose by 50% to 75% and follow NAPA levels. ▪ GFR less than 10 mL/minutes ▪ Child-Pugh score greater than 10 ▪ **Dosage Forms:** IV solution
Quinidine	Quinaglute, Quinidex	▪ Supraventricular arrhythmias ▪ Ventricular arrhythmias	▪ **Dosing (Adult):** – Quinidine sulfate- initial dose 200 to 400 mg/q6h. – Quinidine gluconate- initial dose 324 to 648 mg q8h ▪ **Dosing (Peds):** Quinidine sulfate- 7.5 mg/kg q6h ▪ **CYP450 Interactions:** Substrate of CYP 3A4, 2C9

Clinical Knowledge Sections:
- The authors provide you with clinical pearls from years of experience

High-Yield Clinical Knowledge

- **Conduction and Refractoriness**
  - By depressing conduction and prolong refractoriness, class 1a agents can convert a reentry arrhythmia to normal conduction by blocking both directions of electrical flow.
    - Orthodromic conduction is antegrade conduction through the AV node.
    - Antidromic conduction is retrograde conduction through the AV node.

- **Disopyramide**
  - Due to calcium channel blocking properties, disopyramide produces the most negative inotropic effects among the Class 1a agents.
    - Disopyramide, more specifically its active metabolite, produces the most anticholinergic effects among the Class 1a agents, as well as possessing calcium channel blocking effects.
    - Its active metabolite (N-despropyldisopyramide) is produced by hepatic mono-N-dealkylation.
  - R-disopyramide possesses a sodium channel blocking effect, whereas S-disopyramide has pharmacologic actions similar to quinidine.
  - Should not be used in HFrEF patients
    - Produces more negative inotropy than either procainamide or quinidine
- **Procainamide**
  - Least likely to cause hypotension among the Class 1a agents since procainamide lacks alpha-adrenergic blocking properties.
  - Procainamide therapy can be monitored using serum concentrations, with a normal therapeutic range of 4 to 12 mcg/mL.
    - Additionally, NAPA concentrations (normal range of 10 to 20 mcg/mL) should be followed, particularly in acute overdoses/toxicity and CKD patients
    - NAPA is eliminated renally, with an elimination half-life of 6 to 10 hours, much longer than the parent procainamide half-life of 3 to 4 hours.
- **Quinidine**
  - Anticholinergic adverse events are expected, including dry mucous membranes and flushed skin.
  - Rarely used due to cardiotoxicities, including syncope, QT prolongation, and Torsade de Pointes can occur at normal therapeutic doses.
    - Cinchonism, occurring from acute or chronic quinidine overdose, consists of abdominal pain, diarrhea, tinnitus, and altered mental status
- **Disopyramide And Quinidine Induced Hypoglycemia**
  - Can induce insulin release from pancreatic islet cells via potassium channel blockade.
- **Slow Acetylators And Procainamide**
  - Patients who are "slow acetylators" are at higher risk of early development of procainamide-induced lupus syndrome.
    - The parent compound, not NAPA, causes this syndrome.
      - Subjects with procainamide-induced lupus who were exposed to NAPA alone had their lupus-like symptoms resolve.
- **Procainamide Dosing Regimens**
  - Drug references list various loading doses for procainamide and titration parameters.
    - Acceptable dosing, including infusion loading doses of 10 to 17 mg/kg infusion at 20 to 50 mg/minute, 100 mg IV bolus every 5 min
    - The therapeutic endpoint for these dose
      width, a maximum dose of 1 g is reached

Board Exam Essentials:
- **We went a step further for you**
- **Must know content further drilled down to make studying easier for the exam**

HIGH-YIELD BOARD EXAM ESSENTIALS

- **CLASSIC AGENTS:** Disopyramide, procainamide, quinidine
- **DRUG CLASS:** VW Class 1a
- **INDICATIONS:** Supraventricular arrhythmias, ventricular arrhythmias
- **MECHANISM:** Slows cardiac conduction decreases cardiac automaticity and increases refractory periods primarily by blocking the opening of sodium channels with intermediate recovery from the blockade.
- **SIDE EFFECTS:** Negative inotropy (disopyramide), ANA antibody (procainamide), cardiotoxicity (quinidine)
- **CLINICAL PEARLS:** Disopyramide and quinidine are rarely used clinically, but procainamide still has a role in the acute management of supraventricular arrhythmias and ventricular arrhythmias.

CARDIOVASCULAR – VAUGHAN WILLIAMS CLASS IB

High-Yield Basic Pharmacology

- **Mechanism of Action**
  - Block inward sodium current by blocking inactivated sodium channels, preventing myocardial reentry and subsequent dysrhythmias.

Primary Net Benefit

- Lidocaine may be as effective as amiodarone for shock-refractory ventricular fibrillation or pulseless ventricular tachycardia, avoiding numerous potential drug interactions and adverse events.

Vaughan Williams Class Ib - Drug Class Review **High-Yield Med Reviews**			
Mechanism of Action: *Block inward sodium current by blocking inactivated sodium channels, preventing myocardial reentry and subsequent dysrhythmias.*			
Class Effects: *Increases the effective refractory period and prolongs the action potential.*			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Lidocaine	Xylocaine	▪ Ventricular arrhythmias	▪ **Dosing (Adult):** – IV or IO (intraosseous) 1 to 1.5 mg/kg bolus. ▪ Maximum 3 mg/kg – IV continuous infusion 1 to 4 mg/minute ▪ **Dosing (Peds):** – IV or IO (intraosseous) 1 to 1.5 mg/kg bolus. ▪ Maximum 3 mg/kg – IV continuous infusion 20 to 50 mg/kg/minute ▪ **CYP450 Interactions:** Substrate of CYP 1A2, 2A6, 2B6, 2C9, 3A4 ▪ **Renal or Hepatic Dose Adjustments:** No specific dose adjustment but follow GX/MEGX concentrations. ▪ **Dosage Forms:** Solution for injection. Numerous other dosage forms exist, but not for antiarrhythmic indications.

Vaughan Williams Class Ib - Drug Class Review High-Yield Med Reviews			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Mexiletine	Mexitil	▪ Ventricular arrhythmias	▪ **Dosing (Adult):** – Oral loading dose 400 mg (optional) – Oral maintenance dose 150 to 200 mg q8h to q12h ▪ Maximum dose 1.2 g/day ▪ **Dosing (Peds):** – Initial oral dose of 6 to 8 mg/kg/day in 2 or 3 divided doses ▪ Maximum dose 15 mg/kg/day or 1.2 g/day, whichever is less ▪ **CYP450 Interactions:** Substrate of CYP 1A2, 2D6. Inhibits CYP 1A2 ▪ **Renal or Hepatic Dose Adjustments:** – None recommended, but elimination half-life is doubled in the setting of hepatic failure. ▪ **Dosage Forms:** Oral (capsule)

High-Yield Clinical Knowledge

- **Lidocaine**
  - Lidocaine undergoes significant first-pass metabolism, resulting in oral bioavailability of 3%.
    - While this absorption prevents oral use for antiarrhythmic or analgesic effects, it is sufficient to precipitate toxicity, particularly in children.
      - Therapeutic monitoring of lidocaine consists of following the plasma lidocaine concentration and the toxic and active metabolite monoethylglycinexylidide (MEGX).
  - **Mexiletine**
    - Developed as an analog of lidocaine, but with the desire to permit oral therapy. By specifically reducing first-pass hepatic metabolism, mexiletine can be thought of as orally available lidocaine.
      - It is used clinically in combination with other antiarrhythmics such as sotalol, which can improve efficacy while limiting dose-related toxicities of either agent.
- **Mexiletine Tremors**
  - A common complaint that may affect compliance is the development of tremors in patients taking mexiletine. However, this effect may be minimized by simply having the patient take mexiletine with food.
- **Neuropathic Pain Management and Opioid-sparing**
  - To reduce chronic opioid use, numerous agents have been investigated for their potential opioid-sparing effects. Mexiletine has been proposed as an agent for chronic neuropathic pain management in patients where opioid-sparing therapies may be useful.
- **Lidocaine Therapeutic Monitoring**
  - CYP3A4 metabolizes lidocaine to two metabolites, glycine xylidide (GX) and the aforementioned MEGX.
  - MEGX is less potent of a sodium channel blocker but has a much longer half-life.
    - Target lidocaine levels are 1.5 to 5.0 mcg/mL
      - Heart failure, hepatic impairment, beta-blockers, and patients receiving prolonged infusions of lidocaine should be kept at the lower end of the therapeutic range to prevent toxicity.

HIGH-YIELD BOARD EXAM ESSENTIALS

- **CLASSIC AGENTS:** Lidocaine, mexiletine
- **DRUG CLASS:** VW Class 1b
- **INDICATIONS:** Chronic treatment to prevent ventricular tachycardia (VT) and ventricular fibrillation (VF), Acute treatment of VF or pulseless VT
- **MECHANISM:** Block inward sodium current by blocking inactivated sodium channels with rapid kinetics, preventing myocardial reentry and subsequent dysrhythmias.
- **SIDE EFFECTS:** Tremors, headache, seizures
- **CLINICAL PEARLS:**
  - Due to the sodium channel blockade within the ventricular myocyte there is QRS widening on the ECG with higher doses.
  - Lidocaine is not absorbed when taken by mouth, thus mexiletine is the pro-drug of lidocaine and can be given by mouth.
  - Patients on IV lidocaine infusions can be transitioned to mexiletine by administering 200 mg of mexiletine when the lidocaine infusion is stopped.

ENDOCRINE – ANTIDIABETIC AGENTS – INSULIN – LONG-ACTING / BASAL

High-Yield Basic Pharmacology

- **Mechanism of Action**
  - Replaces endogenous insulin due to pancreatic beta-cell deficiency or insufficiency; insulin normally regulates carbohydrate, protein, and fat metabolism, stimulates hepatic glycogen synthesis, decreases lipolysis, and increases uptake of triglycerides.

Primary Net Benefit

- Improves glycemic control by replacing insulin and reducing fasting glucose.

Basal Insulin Drug Class Review **High-Yield Med Reviews**			
Mechanism of Action: *Replaces endogenous insulin due to pancreatic beta-cell deficiency or insufficiency.*			
Class Effects: Decrease A1c 1.5-2%, hypoglycemia, weight gain/edema, injection site reactions			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Insulin Degludec	Tresiba (U-100, U-200)	▪ Treatment of T1DM and T2DM in adult and pediatric patients	▪ **Dosing:** Approx. 1/3-1/2 total daily dose in basal insulin; dosing should be patient specific. – T1DM: 0.4-1 units/kg/d total daily insulin dose – T2DM: 0.1-0.2 units/kg/d total daily insulin or 10 units daily ▪ **Dosing (Peds):** 0.4-1 units/kg/d in insulin-naïve depending on developmental stage and history ▪ Start 80% of current basal dose when converting to degludec ▪ **CYP450 Interactions:** N/A ▪ **Renal or Hepatic Dose Adjustments:** N/A ▪ **Dosage Forms:** U-100 pen, U-200 pen, U-100 vial
Insulin Detemir	Levemir	▪ Treatment of T1DM and T2DM in adult and pediatric patients	▪ **Dosing (Adult):** Approx. 1/3-1/2 total daily dose in basal insulin; dosing should be patient specific. – T1DM: 0.4-1 units/kg/d total daily insulin dose – T2DM: 0.1-0.2 units/kg/d total daily insulin or 10 units daily ▪ **Dosing (Peds):** ≥2 yo – 0.4-1 units/kg/d depending on developmental stage and history ▪ **CYP450 Interactions:** N/A ▪ **Renal or Hepatic Dose Adjustments:** N/A ▪ **Dosage Forms:** U-100 pen, U-100 vial

Basal Insulin Drug Class Review High-Yield Med Reviews			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Insulin Glargine	Basaglar (U-100) Lantus (U-100) Semglee (U-100) Toujeo (U-300)	▪ Treatment of T1DM and T2DM in adult and pediatric patients	▪ **Dosing (Adult):** Approx. 1/3-1/2 total daily dose in basal insulin; dosing should be patient specific. – T1DM: 0.4-1 units/kg/d total daily insulin dose – T2DM: 0.1-0.2 units/kg/d total daily insulin or 10 units daily ▪ **Dosing (Peds):** ≥6 yo – 0.4-1 units/kg/d total daily dose depending on developmental stage and history ▪ **CYP450 Interactions:** N/A ▪ **Renal or Hepatic Dose Adjustments:** N/A ▪ **Dosage Forms:** U-100 pen (Basaglar, Lantus, Semglee), U-300 pen (Toujeo, Toujeo Max), U-100 vial (Lantus, Semglee)
Insulin NPH	Humulin N Novolin N	▪ Treatment of T1DM and T2DM in adult and pediatric patients	▪ **Dosing (Adult):** Approx. 1/3-1/2 total daily dose in basal insulin; give 2/3 NPH in AM, 1/3 in PM; dosing should be patient specific. – T1DM: 0.4-1 units/kg/d total daily insulin dose ▪ May consider lower to avoid hypoglycemia – T2DM: 0.1-0.2 units/kg/d total daily insulin or 10 units daily or divided BID ▪ **Dosing (Peds):** 0.4-1 units/kg/d total daily dose depending on developmental stage and history ▪ **CYP450 Interactions:** N/A ▪ **Renal or Hepatic Dose Adjustments:** N/A ▪ **Dosage Forms:** U-100 pen, U-100 vial

High-Yield Clinical Knowledge

- **Adverse Events**
  - Causes hypoglycemia, weight gain and/or edema, and injection-site reactions.
    - Patients with renal or hepatic disease may be more susceptible to hypoglycemia.
    - Beta-blockers can mask hypoglycemic effects.
- **Basal Insulin Dosing**
  - Insulin pens should be primed with 2-4 units before use.
  - Basal/Bolus is usually divided in approximately a 50/50% ratio, but can vary from 30-50% of each insulin type.
  - T1DM
    - Dosing is initially weight-based, but should be adjusted in a patient-specific manner.
    - 0.4-1 units/kg/d total daily insulin dose
  - T2DM
    - Dosing should be patient specific.
    - Start 10 units daily or 0.1-0.2 units/kg/d in insulin-naïve, or 1:1 if converting from another basal insulin for most.
- **Administration**
  - May inject SC only into back of the arm, outer thigh, buttocks, or abdomen.

        - Abdomen results in most consistent absorption.
        - Site rotation should be advised to avoid lipodystrophy.
    - Insulin should be clear, except insulin containing NPH, which is cloudy.
        - Need to invert or roll NPH in hands to re-suspend.
- **U-500**
    - U-500 regular insulin is utilized in patients (mostly T2DM) requiring >200 units daily to improve absorption by decreasing the injected volume.
        - U-500 is the only concentrated insulin that accomplishes this effect.
- **Storage and Expiration**
    - Insulin expires according to the package date if refrigerated.
    - Insulin expires at varying times once at room temperature and/or used for the first time.
        - Typically, expiration is 28 days once used/at room temperature.
            - Insulin detemir and insulin glargine U-300 expires after 42 days.
            - Insulin degludec expires after 52 days.

HIGH-YIELD BOARD EXAM ESSENTIALS

- **CLASSIC AGENTS:** NPH, U-500, insulin degludec (U-100, U-200), detemir, glargine (U-100, U-300)
- **DRUG CLASS:** Basal insulin
- **INDICATIONS:** Treatment of T1DM and T2DM in adult and pediatric patients
- **MECHANISM:** Replaces endogenous insulin due to pancreatic beta-cell deficiency or insufficiency.
- **SIDE EFFECTS:** Hypoglycemia, weight gain, edema, injection site pain
- **CLINICAL PEARLS:**
    - Insulin degludec and glargine are typically better basal insulins that can be administered once a day whereas detemir typically requires twice a day dosing and can result in dose increases over time.
    - The basal agents should not be mixed with other insulins (e.g., glargine is acidic).
    - U-500 regular insulin is utilized in patients (mostly T2DM) requiring >200 units daily to improve absorption by decreasing the injected volume.

High-Yield Basic Pharmacology

- **Mechanism of Action**
  - Competitive inhibition of HBV DNA polymerase and reverse transcriptase, causing chain termination.
- **Adefovir Prodrug**
  - Adefovir dipivoxil is a prodrug of adefovir, which is an acyclic phosphonated adenine nucleotide analog.

Primary Net Benefit

- Anti-HBV agents provide viral load suppression, although unable to establish a clinical cure.

Hepatitis B Antivirals - Drug Class Review
High-Yield Med Reviews

Mechanism of Action: *Competitive inhibition of HBV DNA polymerase and reverse transcriptase, causing chain termination.*

Class Effects: HBV viral load suppression, but no cure; Myopathies, peripheral neuropathies, pancreatitis, anemias, and granulocytopenia.

Generic Name	Brand Name	Indication(s) or Uses	Notes
Adefovir dipivoxil	Hepsera	▪ Hepatitis B	▪ **Dosing (Adult):** – Oral 10 mg daily ▪ **Dosing (Peds):** – Oral 0.25 to 0.3 mg/kg/dose daily ▪ Maximum 10 mg/dose ▪ **CYP450 Interactions:** None ▪ **Renal or Hepatic Dose Adjustments:** – GFR 30 to 49 mL/minute - 10 mg q48h – GFR 10 to 29 mL/minute - 10 mg q72h ▪ **Dosage Forms:** Oral (tablet)
Entecavir	Baraclude	▪ Hepatitis B	▪ **Dosing (Adult):** – Oral 0.5 to 1 mg daily ▪ **Dosing (Peds):** – Oral 0.15 to 1 mg daily ▪ **CYP450 Interactions:** text ▪ **Renal or Hepatic Dose Adjustments:** – GFR 30 to 49 mL/minute - 0.25 to 0.5 mg q48h – GFR 10 to 29 mL/minute - 0.15 to 0.3 mg q72h – GFR less than 10 - 0.05 mg to 0.1 mg daily or normal dose every 7 days ▪ **Dosage Forms:** Oral (solution, tablet)

Hepatitis B Antivirals - Drug Class Review High-Yield Med Reviews			
Generic Name	**Brand Name**	**Indication(s) or Uses**	**Notes**
Lamivudine	Epivir, Epivir HBV	▪ HIV ▪ Hepatitis B	▪ **Dosing (Adult):** – HIV ▪ Oral 300 mg daily or 150 mg BID – HBV ▪ Oral 100 mg daily ▪ **Dosing (Peds):** – Oral 30 to 150 mg BID ▪ **CYP450 Interactions:** None ▪ **Renal or Hepatic Dose Adjustments:** HIV indication – GFR 30 to 49 mL/minute - 150 mg daily – GFR 15 to 29 mL/minute - 150 mg x1 then 100 mg daily – GFR less than 15 mL/minute - 150 mg x1 then 50 mg daily – GFR less than 5 - 50 mg, then 25 mg daily ▪ **Dosage Forms:** Oral (solution, tablet)
Tenofovir alafenamide	Vemlidy	▪ Hepatitis B	▪ **Dosing (Adult):** – HIV ▪ Only available in combination with other ART (Biktarvy, Genvoya, Odefsey, Symtuza) – HBV ▪ Oral 25 mg daily ▪ **Dosing (Peds):** – Not routinely used ▪ **CYP450 Interactions:** None ▪ **Renal or Hepatic Dose Adjustments:** – GFR less than 15 mL/minute - Not recommended – Child-Pugh class B or C - Not recommended ▪ **Dosage Forms:** Oral (tablet)
Tenofovir disoproxil	Viread	▪ Hepatitis B ▪ HIV	▪ **Dosing (Adult):** – HIV ▪ Oral 300 mg daily or 150 mg BID – HBV ▪ Oral 100 or 300 mg daily ▪ **Dosing (Peds):** – Oral 8 mg/kg/dose daily ▪ Maximum 300 mg/day ▪ **CYP450 Interactions:** None ▪ **Renal or Hepatic Dose Adjustments:** HIV indication – GFR 30 to 49 mL/minute - 300 mg q48h – GFR 10 to 29 mL/minute - 300 mg q72h – GFR less than 10 mL/minute - Not recommended ▪ **Dosage Forms:** Oral (solution, tablet)

High-Yield Clinical Knowledge

- **Lamivudine and Tenofovir Dosing**
  - Lamivudine and tenofovir disoproxil are used for HIV-1, HIV-2 at a dose of 300 mg daily or 150 mg twice daily and 300 or 150 mg daily, respectively.
  - For hepatitis B, lamivudine can also be used, but at a dose of 100 mg twice daily.
    - To treat coinfection with HIV and HBV, the HIV dosing (300 mg or 150 mg BID dosing).
  - Tenofovir disoproxil for HBV is used at a dose of 300 or 100 mg daily, leading to virologic failure in HIV co-infected patients.
- **Toxicities**
  - Anti-HBV antivirals may adversely affect the DNA polymerase gamma of human mitochondria, resulting in mitochondrial toxicities including myopathies, peripheral neuropathies, pancreatitis, anemias, and granulocytopenia.
  - These agents are rarely associated with lactic acidosis and hepatic steatosis.
- **HIV and HBV Coinfection**
  - Of the anti-HBV agents, tenofovir and lamivudine have clinically relevant HIV antiretroviral activity.
  - In patients with HIV and HBV coinfection, exacerbations of HBV may occur if one of these agents is discontinued.
- **Resistance and Mutations**
  - The terminology for resistance describes the target amino acid, its position, and the amino acid that has been substituted.
    - For example, an M184V mutation where methionine is substituted for valine at position 184.
  - In patients with HIV co-infection, appropriate NRTI selection should reduce the likelihood of M184V variant resistance, as observed with entecavir therapy.
- **Serum Creatinine Changes**
  - Adefovir is associated with a reversible increase in serum creatinine that is not a reflection of changes in renal function.
- **Pregnancy**
  - Adefovir should be avoided in pregnant patients as animal models have suggested this agent is embryotoxic and genotoxic.
  - Lamivudine may be suitable for therapy in pregnant patients as it has been effective in preventing vertical transmission of HBV when given for the last four weeks of gestation.

HIGH-YIELD BOARD EXAM ESSENTIALS

- **CLASSIC AGENTS:** Adefovir dipivoxil, entecavir, lamivudine, tenofovir disoproxil/alafenamide
- **DRUG CLASS:** Hepatitis B antivirals
- **INDICATIONS:** HBV infection
- **MECHANISM:** Competitive inhibition of HBV DNA polymerase and reverse transcriptase, causing chain termination.
- **SIDE EFFECTS:** Myopathies, peripheral neuropathies, pancreatitis, anemias, and granulocytopenia.
- **CLINICAL PEARLS:** Adefovir is associated with a reversible increase in serum creatinine that is not a reflection of changes in renal function.

HIGH-YIELD
MED REVIEWS

PART 3

DISEASE STATE
RAPID REVIEW

Disease State Rapid Reviews:
- Think of this section as "study cards"
- The NAPLEX exam blueprint by the NABP indicates you must also know basic disease state information
- We linked the primary treatment for you to help make it easy and link back to the drug class reviews

ACLS - BRADYCARDIA

- **PATHO:** Altered automaticity and impuls
  conduction disturbance in the atria and v
- **CLASSIC PRESENTATION:** May be asympt
- **CLASSIC FINDINGS:** ECG changes consistent with bradyarrhythmia. Pulse < 60 bpm.
- **TREATMENT:**
  - Identify reversible causes.
  - Acute management includes pacing (transcutaneous, transvenous), atropine, or epinephrine.

ACLS - PULSELESS ELECTRICAL ACTIVITY (PEA)

- **PATHO:** Organized or semi-organized cardiac electrical activity and ineffective LV stroke volume, not producing a detectable pulse.
- **CLASSIC PRESENTATION:** Cardiac arrest (unresponsive, no palpable pulse, no spontaneous breathing)
- **CLASSIC FINDINGS:** Pulseless, apneic or agonal respirations, not responding to verbal/painful stimulation.
- **TREATMENT:**
  - ACLS protocol (chest compressions, intubation/ventilation). Epinephrine IV/IO 1 mg q3-5 minutes.
  - Consider treatment of the H's: Hypovolemia, hypoxia, hydrogen (acidosis), hyper/hypokalemia, hyper/hypothermia, hypoglycemia and T's: Trauma, tamponade, tension pneumothorax, thrombus (coronary), thromboembolism (PE), toxins.
  - No defibrillation, use of atropine, lidocaine, or amiodarone.

ACLS - PULSELESS V-TACH/V-FIB

- **PATHO:** Increased automaticity and triggered activity causing ventricular tachycardia (VT), inadequate diastole, and hemodynamic collapse from insufficient cardiac output.
- **CLASSIC PRESENTATION:** Cardiac arrest (unresponsive, no palpable pulse, no spontaneous breathing)
- **CLASSIC FINDINGS:** Pulseless with either monomorphic VT or polymorphic VT.
- **TREATMENT:**
  - ACLS protocol (chest compressions, intubation/ventilation), defibrillation.
  - Epinephrine IV/IO 1 mg q3-5minutes, amiodarone IV/IO 300 mg OR lidocaine IV 1.5 mg/kg.

ACLS - SUSTAINED V-TACH

- **PATHO:** Consecutive beats with a wide QRS and a rate of at least 100 bpm associated with CAD or structural heart disease.
- **CLASSIC PRESENTATION:** Chest pain, palpitations, diaphoresis, nausea/vomiting, altered mental status, and palpable pulses.
- **CLASSIC FINDINGS:** V-tach sustained for at least 30 sec or causing a hemodynamic collapse in < 30 sec.
- **TREATMENT:**
  - Synchronized cardioversion (NOT defibrillation), amiodarone IV 150 mg over 10 minutes.

ACUTE CORONARY SYNDROME – NSTEMI – UNSTABLE ANGINA

- **PATHO:** Coronary artery atherosclerotic plaque causing partial occlusion of a coronary vessel leading to myocardial ischemia.
- **CLASSIC PRESENTATION:** Pressure-like substernal chest pain persisting for more than 10 minutes which occurs with minimal effort or at rest, and that may radiate to either the arm, neck, or jaw.
- **CLASSIC FINDINGS:** Elevations in troponin and ECG findings that may include ST-segment depression, T-wave flattening/inversion, or ST-segment elevation that otherwise does not meet STEMI criteria.
- **TREATMENT:**
  - Delayed PCI may be selected and clinically appropriate.
  - Aspirin, heparin or enoxaparin, oxygen if saturation below 90%, nitroglycerin (if no recent use of type 5 PDE inhibitors, right-sided MI, or SBP < 90 mmHg).

ACUTE CORONARY SYNDROME – STEMI

- **PATHO:** Complete and persistent occlusion of perfusion in the heart due to rupture of coronary atherosclerotic plaque and subsequent platelet adhesion, activation, and aggregation to form a thrombus.
- **CLASSIC PRESENTATION:** Pressure-like substernal chest pain persisting for more than 10 minutes which occurs with minimal effort or at rest, and that may radiate to either the arm, neck, or jaw.
- **CLASSIC FINDINGS:** New ST-segment elevation of at least 0.1 mV in two contiguous leads.
- **TREATMENT:**
  - Primary PCI (either GP IIb/IIIa plus anticoagulation with heparin, enoxaparin, or bivalirudin strategy), aspirin, P2Y12 inhibitor (clopidogrel, prasugrel, ticagrelor), +/- morphine, +/- supplemental O2 (only if pulse ox < 92%).
  - Thrombolytic strategy (alternative if not cath lab available, symptom onset within 12 hrs, and assuming no contraindications).

ACUTE CORONARY SYNDROME – COCAINE-INDUCED

- **PATHO:** Dose-dependent decreased in oxygen supply due to coronary vessel vasoconstriction, induction of prothrombotic states, and accelerating atherosclerosis.
- **CLASSIC PRESENTATION:** Recent cocaine use, usually within 3 hours but may be up to 4 days with pressure-like substernal chest pain.
- **CLASSIC FINDINGS:** ECG showing UA/NSTEMI or STEMI + patient-reported or lab evidence of cocaine use.
- **TREATMENT:** Benzodiazepines (1st line), +/- aspirin and UA/NSTEMI or STEMI management strategies if patient has underlying CAD. NO BETA-BLOCKERS, including carvedilol or labetalol.

AORTIC DISSECTION – STANDFORD A or DeBakey TYPE I & II

- **PATHO:** LV hydrodynamic forces produce stress tears allowing blood to enter the aortic media or, as a result of hemorrhage into the aortic media from the damaged vasa vasorum.
- **CLASSIC PRESENTATION:** Acute chest pain radiating to the back described as tearing or sharp quality, hypertension, pulse deficit, syncope, aortic regurgitation, new murmur
- **CLASSIC FINDINGS:** Dissection of the ascending aorta.
- **TREATMENT:**
  - Negative inotrope and vasodilators titrated to SBP of 100 to 120 mmHg, and HR of < 60 bpm (esmolol plus sodium nitroprusside IV) as fast as possible.
  - STAT consult to CVT surgery for acute surgical intervention (graft replacement of the ascending aorta, aortic valve resuspension, or replacement).

AORTIC DISSECTION – STANDFORD B or DeBAKEY TYPE III

- **PATHO:** LV hydrodynamic forces produce stress tears allowing blood to enter the aortic media or, as a result of hemorrhage into the aortic media from the damaged vasa vasorum.
- **CLASSIC PRESENTATION:** Acute abdominal pain radiating to the back described as tearing or sharp quality, hypertension.
- **CLASSIC FINDINGS:** Dissection of any other part of the aorta that is not the ascending aorta.
- **TREATMENT:**
  - Not commonly surgical emergencies, but rather elective candidates.
  - Negative inotrope and vasodilators titrated to SBP of 100 to 120 mmHg and HR of less than 60 bpm (esmolol plus sodium nitroprusside IV).

AORTIC STENOSIS

- **PATHO:** LV outflow obstruction leading to LV systolic dysfunction with afterload mismatch, diastolic dysfunction, and irreversible myocardial fibrosis.
- **CLASSIC PRESENTATION:** SAD symptoms (syncope, angina, dyspnea), crescendo-decrescendo systolic ejection murmur, displaced point of maximal pulse, diminished carotid pulse with delayed upstroke, and narrowed pulse pressure.
- **CLASSIC FINDINGS:** Patients with symptoms: elevated aortic jet velocity, mean pressure gradient elevation, and decreased aortic valve area.
- **TREATMENT:** Definitive management of aortic stenosis and includes surgical interventions (aortic valve replacement, percutaneous aortic balloon valvuloplasty) plus careful management of hypertension recognizing that these patients can still be preload and afterload dependent where sudden changes can lead to lightheadedness and syncope.

ATRIAL FIBRILLATION (CHRONIC, RATE-CONTROLLED)

- **PATHO:** Local ectopic focus, a single localized re-entry circuit, or multiple functional reentry circuits.
- **CLASSIC PRESENTATION:** Chest palpitations, chest pain, shortness of breath, lightheadedness, and near syncope. Further categorized as either paroxysmal, persistent, long-standing, or permanent.
- **CLASSIC FINDINGS:** 12-lead ECG findings of irregularly irregular rhythm.
- **TREATMENT:**
  - Rate control with either a non-dihydropyridine calcium channel blocker or beta-1 selective antagonist is preferred for most patients. Rhythm control may be used in selected populations.
  - Avoid non-DHP CCB ins patients with AFIB + Wolff-Parkinson-White (WPW) syndrome.

ATRIAL FIBRILLATION (ACUTE; RAPID VENTRICULAR RESPONSE (RVR))

- **PATHO:** Local ectopic focus, a single localized re-entry circuit, or multiple functional reentry circuits.
- **CLASSIC PRESENTATION:** Chest palpitations, chest pain, shortness of breath, lightheadedness, and near syncope.
- **CLASSIC FINDINGS:** ECG findings of irregularly irregular rhythm and hemodynamic instability
- **TREATMENT:**
  - Rate control (hemodynamically stable) with diltiazem, metoprolol, or amiodarone (low dose).
  - Rhythm control (in patients who are hemodynamically unstable) with DC cardioversion.
  - Avoid non-DHP CCB ins patients with AFIB + Wolff-Parkinson-White (WPW) syndrome (it can result in an increase in pulse due to push of action potentials down accessory pathway).

HYPERLIPIDEMIA

- **PATHO:**
  - The primary differentiating factor between the 2 centers around the presence of elevated TGs and, to some degree, the severity of LDL concentrations.
  - **Type IIa**
    - Significant elevations in LDL levels dues to:
      - Alterations in the regulation of LDL production.
      - More commonly, the autosomal dominant genetic defect disorder resulting from a deficiency in LDL receptors that make it difficult to clear LDL cholesterol from the circulating blood.
  - **Type IIb**
    - More commonly seen in patients with metabolic syndrome.
- **CLASSIC FINDINGS:**
  - **Type IIa**
    - Increase incidence of premature CAD, Achilles tendon xanthoma, yellow plaques on the eyelids, tuberous xanthomas.
  - **Type IIb**
    - Patterns of metabolic syndrome with elevated TG and low HDL
- **TREATMENT:**
  - Nutrition and lifestyle modifications PLUS HMG CoA reductase inhibitors (statins)
    - Mainstay of evidence-based treatment for both primary and secondary prevention.
  - Ezetimibe
    - Especially considered in patients for secondary prevention of ASCVD and where high-intensity statin either has not achieved the LDL goal or cannot be tolerated.
  - PCSK9 Inhibitors (Alirocumab & evolocumab)
    - Should be added to existing maximal statin dosing as well as ezetimibe in patients considered very high risk for ASCVD or who have not achieved their desired LDL goals (typically LDLs < 70 mg/dL)

	High-Intensity Statins	Moderate Intensity	Low Intensity
Primary Prevention	ASCVD Risk of ≥ 20% or "High Risk"	ASCVD Risk of ≥ 7.5% to < 20% or "Intermediate Risk" ASCVD Risk of 5% to < 7.5% or "Borderline Risk" + ASCVD Risk Enhancers	ASCVD Risk of < 5% or "Low Risk"
Secondary Prevention	"Very High Risk" ASCVD	ASCVD + Unable to Tolerate High-Intensity Statins	ASCVD + Unable to Tolerate Moderate-Intensity Statins
Desired LDL-c Lowering	≥ 50%	30% - 49%	< 30%
Statins	▪ Atorvastatin 40 – 80 mg ▪ Rosuvastatin 20 – 40 mg	▪ Atorvastatin 10 – 20 mg ▪ Rosuvastatin 5 – 10 mg ▪ Simvastatin 20 – 40 mg ▪ Pravastatin 40 – 80 mg ▪ Lovastatin 40 – 80 mg ▪ Fluvastatin XL 80 mg ▪ Fluvastatin 40 mg BID ▪ Pitavastatin 1 – 4 mg	▪ Simvastatin 10 mg ▪ Pravastatin 10 – 20 mg ▪ Lovastatin 20 mg ▪ Fluvastatin 20 – 40 mg

NOTE:

The following pages only reflect a few sample pages from this book which has over 1,000 pages.

If you need help or have questions, email us at:
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Thank you for giving us the opportunity to be a part of your final preparation for your exam. We are confident you will find this study guide very helpful to you.

- The High-Yield Team