The Zander Perianesthesia Exam Preparation Course

Zander Perioperative Education

www.periop-ed.com
803.271.0744

Certification Courses available for CNOR, Perianesthesia , and CST

CAPA-CPAN Review

Zander Perioperative Education

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Disclaimer:

- This presentation is made with no known conflicts of interest and makes no recommendations for off-label uses of medication. This presentation is made with no commercial or in-kind support.

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Test Taking Strategies

Objectives:
1. Apply Test Taking Strategies for PeriAnesthesia Exams
2. Create a Personal Study Plan

- Difference and Similarity CPAN v CAPA
- Registering for the exam
- Exam Format
- Time Management
- Test Taking Strategies
- Resources

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CPAN vs CAPA

CPAN

- **C**ertified **P**ost **A**nesthesia **N**urse
- RN who primarily works in Post Anesthesia (PACU) Phase 1

CAPA

- Certified Ambulatory Perianesthesia Nurse
- RN in Pre Anesthesia phase, Day of Surgery/Procedure, Post anesthesia Phase II, and/or Extended Care

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About the Exam

3 hour exam
185 multiple choice questions
Target at the most 1 minute/question
45 unscored pretest questions

	C PA N	CAPA
Physiological	57	50
Behavioral/Cognitive	18	21
Safety	25	29

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About the Exam

- Tutorial
  - As much as 15 minutes
  - Calculator
- Multiple Choice only
- Scaled Score
  - Pass/fail notice immediately after test
  - A score of 450 is passing

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Exam Eligibility Requirements

- Currently working full- or part-time at the bedside**
- Current RN license in good standing
- 1200 hours of recent clinical practice
- ASPAN membership is not required
  - Discounted registration
  - Access to JOPAN
- Test Assured Program
  - For initial certification
  - $50 in additional registration fee per exam
  - Re-take the exam in one of the two subsequent exam windows

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DATES AND DEADLINES

Spring Exam Administration

Registration Window Opens:	January 1
Regular Registration Deadline:	March 15
Exam Administration Window:	March 15 - May 15

Fall Exam Administration

Registration Window Opens:	July 1
Regular Registration Deadline:	September 15
Exam Administration Window:	September 15 – November 15

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PeriAnesthesia Certifications Fees

Exam	CPAN	CAPA
Exam Fee ASPAN Member	$314	$314
Exam Fee Non-member	$424	$424
Test Assured Member	$364	$364
Test Assured Non Member	$474	$474

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Recertification

- 900 clinical practice hours during the three years of certification
  - earned in the roles of staff nurse, manager, educator or researcher in perianesthesia
- Successful examination completion
  or
- 90 contact hours of continual learning as defined in the Recertification Handbook

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Perianesthesia Certifications Fees

Exam	CPAN	CAPA
Recertification by Contact hour Member	$194	$194
Recertification by Contact hour Non Member	$315	$315
Recertification by Exam - Member	$314	$314
Recertification by Exam – Non Member	$424	$424

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Professional Organizations

- ABPANC
  - American Board of PeriAnesthesia Nursing Certification Inc
  - Gives the exams
  - cpancapa.org
- ASPAN
  - American Society of PeriAnesthesia Nurses
  - Professional organization, standards of practice
  - ASPAN.org

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After Application Approval

- Authorization to test email
  - Email From ABPANC with your candidate ID number
- Scheduling the exam
  - www.psiexams.com
  - Schedule online or over the phone using your candidate ID number.
  - Don't call local test center – they can't schedule
  - 24-48 hours after application before you can schedule
  - Special accommodations if you have a disability

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After Application Approval

- Delaying the test
  - Don't leave a message. Talk to a human
  - Can delay to new date in same test window up to 48 hours prior to exam with no penalty
  - Cancellation is only partial refund
    - $175 member, $249 nonmember
  - Roll into next test window $100

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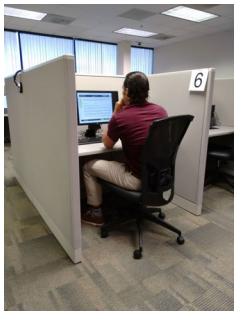
The Day of the Exam

- Arrive on time
- What to bring with you
  - Valid ID
  - As little as possible
- Lockers
- The testing environment
  - headphones



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The Nursing Process

- Accreditation Board for Specialty Nursing Certification (ABSNC).
  - The exam is presented in the nursing process
- Feel comfortable with it
  - Assessment
  - Nursing Diagnosis
  - Identification of Outcomes
  - Planning
  - Implementation
  - Evaluation

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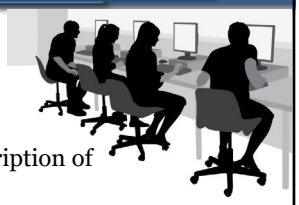
Anatomy of a Question



- The Case scenario is a description of the clinical situation
- The Stem
  - Central focus of question
  - 'Most appropriate', 'primary', 'first' = most right answer
- Distracters are usually the wrong answer

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Types of Questions

- Level I-knowledge & comprehension
- Level II-application and analysis
- Level III-synthesis and evaluation

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What if you don't know?

- Umbrella answer
- Same answers are ruled out
- Opposite answers
- Odd man wins
- Repeated words
- Absolutes

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Test taking tips

- Read and follow directions carefully
- Think **ASPAN** Standards and Practice Recommendations
- Nursing practice only
- Never call the supervisor first
- Patient safety is top priority

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Study Tips

- Assess your level of competency
- Study according to your competency level in each area
- Organize a study group if you study best that way
- Practice questions
  - Practice test taking skills
    - Very valuable especially if out of school a long time
  - Not studying
    - Can turn questions into study with work
    - Studying looks like notes, textbooks and looking stuff up to understand them better

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Sources for Exam Questions

- ASPAN Standards-current edition
- PeriAnesthesia Nursing Core Curriculum, 3e
- Certification Review for PeriAnesthesia Nursing, 4e (650 multiple choice questions, rationale, & resources)
- ACLS and PALS manuals
- Odom-Forren, Drain's PeriAnesthesia Nursing: A Critical Care Approach, 7e
- ASPAN Competency Based Orientation
- JOPAN Articles
- Practice Exams

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Standards and Practice Recommendations

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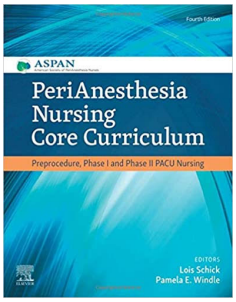
Core Curriculum



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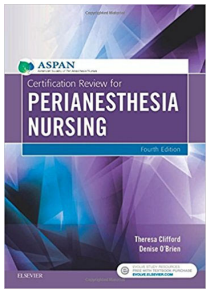
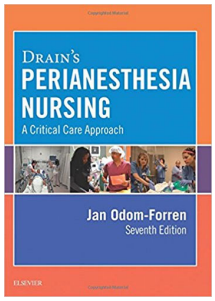
More Study Resources





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Don't Freak out

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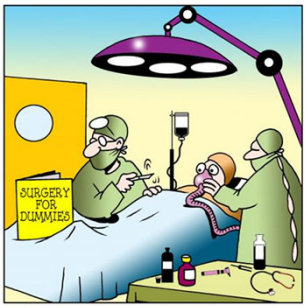
Test Taking Strategies

16 Questions
16 Minutes



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TEST TAKING STRATEGIES

15 Minutes

1. You are the preoperative nurse for a Spanish speaking female schedules for an outpatient knee arthroscopy. She is accompanied by her 14-year-old daughter. As you begin to prepare her for surgery, you realize she only speaks a few words of English. Based on the above information, the nurse should:

   a) Cancel the surgery.

   b) Give preoperative instructions to the daughter so she can convey them to the mother in Spanish.

   c) Contact a translator to convey the preoperative instructions.

   d) Say nothing and continue preparing the patient for surgery.

2. According to the Joint Commission, how many patient identifiers must be used before giving medication, administering treatment, or performing diagnostics on a patient?

   a) One

   b) Two

   c) Three

   d) Four

3. Your patient has had a total knee arthroplasty and is ready for transport to the floor. He is on 3L of Oxygen via nasal cannula, Morphine PCA, and has a pulse oximeter ordered postoperatively. Because of his cardiac history and an episode of angina in PACU, he is going to a telemetry floor for cardiac monitoring. Who can transport this patient?

   a) A nursing technician

   b) A nursing technician and the nursing supervisor

   c) Two nursing technicians

   d) A perianesthesia registered nurse and a nursing technician

4. An appropriate nurse to patient assignment in Phase II care would be:

    a) One Nurse with three patients: One straight from OR because Phase I PACU could not receive the patient, one awake patient waiting for a ride, and one 5-year-old with her mother present.
    b) One nurse to four patients: 2 awake and alert adults, one 6-year-old with parent present, one 7-year-old with no parent present.
    c) One nurse with two patients: 1 patient fast tracked from OR 5 minutes ago and one patient just received from PACU.
    d) One nurse with three patients: One awake and alert 30-year-old, one 11-year-old with mother at bedside, one 8-year-old with both parents at bedside.

5. You receive a patient in PACU after a Craniotomy. You notice his respiratory pattern has rapid, short breathing with pauses of several seconds. This pattern is called:

    a) Cheyne-Stokes
    b) Normal Respirations
    c) Biot's
    d) Meyer

6. The type of respirations described in the previous question can indicate:

    a) The patient needs oxygen
    b) ICP is increasing
    c) ICP is low
    d) The patient is improving

7. The following patient is at highest risk for PONV

    a) 50-year-old male smoker.
    b) Female non-smoker
    c) 40-year-old who has never had surgery
    d) 25-year-old who has had several surgeries.

8. You have received a 10-year-old patient in Phase II PACU after a tonsillectomy. The first thing you will need to assess is:

    a) Adequacy of airway.
    b) Amount of Bleeding.
    c) Where his parents are.
    d) Level of nausea.

9. Discharge preparation and education should begin:

    a) When the patient arrives for surgery.
    b) With the first contact you have with the patient.
    c) When the patient arrives to Phase II PACU
    d) When the patient is awake enough to understand discharge questions.

10. While preparing your patient for surgery, you learn your patient has a Living Will indicating she is a No Code. Your next action should be:

    a) Explain to the patient that No Code orders are rescinded during surgery.
    b) Continue with preoperative preparations.
    c) Follow your hospital's procedure for cancelling the surgery.
    d) Follow your hospital's policy for careful review of the patient's wishes, an explanation of normal surgical events and thorough documentation of the discussion.

11. You are doing the preoperative assessment on a 16-year-old male having an outpatient knee arthroscopy. He denied having any drug allergies when interviewed by anesthesia. When you ask him about allergies, he reports a severe egg allergy. The nurse should:

    a) Document the food allergy.
    b) Make arrangements for preoperative allergy testing.
    c) Notify anesthesia.
    d) Cancel the surgery.

12. Which of the following is a major stressor to toddlers having surgery?

    a) Trust issues.
    b) Threat to body image.
    c) Threat to identity.
    d) Separation anxiety.

13. The perianesthesia nurse understands that preoperative teaching for a patient scheduled for a thoracotomy should include

    a) use of swan ganz- catheter
    b) potential need for a blood transfusion
    c) need for trendelenburg position during the procedure
    d) presence of postoperative chest tubes

14. Your patient is scheduled for a total thyroidectomy as an AM admission. As part of the preoperative labs, you would expect the following to be ordered:

    a) Sodium.
    b) Potassium.
    c) Calcium.
    d) Chloride.

15. The ER notifies you that it has an 18-yr-old patient who was in a sledding accident and who is accompanied by his parents. The patient is alert, oriented, in pain, has a blood pressure of 80/60, pulse of 120, and RR of 24. The abdomen is distended and tender. After being transferred to the holding area the patient is very apprehensive and complains of being cold. The nurse should confirm the patient's name, allergies, and operative procedure by:

    a) Speaking with the patient and reading the patient's chart
    b) A telephone conversation with the ER nurse
    c) Reviewing the ER record
    d) A conversation with the patient’s parents

16. The perianesthesia nurse may notice fasciculation as a response to which of the following depolarizing muscle relaxants?

    a) Tubocurarine chloride (curare)

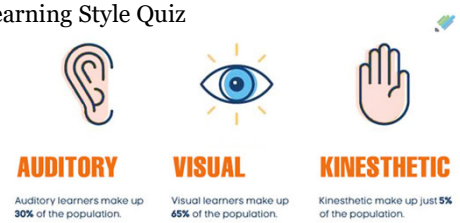
    b) Succinylcholine chloride (Anectine)

    c) Atracurium besylate (Tracrium)

    d) Pancuronium bromide (Pavulon)

What is your learning style?

- How do you figure things out in an unstructured learning situation?
- Learning Style Quiz



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WHAT IS YOUR LEARNING STYLE?

Here are some questions you can ask yourself to help determine the learning style you prefer. The questions are organized by which modality (kinesthetic, visual and auditory) a person prefers for different learning tasks: taking in and organizing new information, decision making, and remembering and creating.

Questions to determine the taking in and organizing preference:

1. I learn new information best by:
   - k ( ) participating in an activity myself after a short explanation
   - v ( ) reading or looking at a diagram or demonstration
   - a ( ) listening to a lecture or spoken instructions

2. When I am inactive but need to stay alert, I :
   - k ( ) find ways to move
   - v ( ) stare, watch something, or doodle
   - a ( ) listen to sounds around me, hum, or talk to myself

3. I have these qualities:
   - k ( ) Interact best by moving, doing, physical contact and like hands-on activity
   - v ( ) Connect with others through eye contact and need visual order
   - a ( ) Interact easily by talking and like lectures and discussions

4. The kind of language I most commonly use is:
   - k ( ) how do you feel about this, I can't grasp that, that is comfortable for me
   - v ( ) look at it this way, I just can't see the point, that is crystal clear to me
   - a ( ) can I tell you how I think about that, do you hear me, that sounds right to me

5. My emotions are apparent to others by:
   - k ( ) muscular state and movement
   - v ( ) facial expression
   - a ( ) voice tone

Questions to determine the decision making or sorting preference:

1. As part of my sorting process, I:
   - k ( ) use my hands to find words
   - v ( ) use writing, drawing, or visual images to find words and feelings
   - a ( ) recall information through words such as a quote or the line of a song that fits that fits the situation

2. If I am trying to make a decision, it helps me to:
   - k ( ) do something physical like go for a walk
   - v ( ) write, draw, or look at nature
   - a ( ) speak to someone or listen to something

3. I can do these things at the same time:
    k ( ) move or touch something and also feel emotions deeply
    v ( ) see things externally and also have inner visual images
    a ( ) listen to external sounds and to own thoughts, listen to radio and read

4. For me intimacy involves:
    k ( ) talking about feelings and fantasies or having total silence and eye contact
    v ( ) seeing and being seen, especially deeply receiving someone with own eyes
    a ( ) hearing and being heard, speaking slower to become more personal

Questions to determine the remembering and creating preference:

1. It takes longer for me to access:
    k ( ) physical sensations
    v ( ) visual images
    a ( ) words and sounds

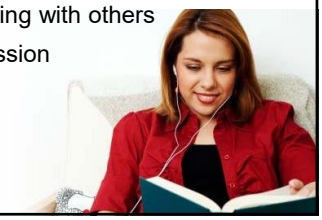
2. A characteristic I have is:
    k ( ) disliking most physical competition and being able to sit still a long time
    v ( ) becoming overwhelmed by visual detail and disliking eye contact
    a ( ) "spacing out" from lots of spoken words and navigating through questions

3. Another quality I have is that I:
    k ( ) am relatively unaware of bodily sensations
    v ( ) get lost in visual material
    a ( ) get lost in conversation or listening to a lecture

4. If I am listening to someone on the phone, I would be most distracted by:
    k ( ) someone putting their hand on my arm or massaging my shoulders
    v ( ) someone giving me something they want me to read
    a ( ) someone asking me a question or playing loud music

AVK – Must talk to learn

- Get in a Study Group
- Hand held recorder
  - Notes
  - Text book
- Share what you are learning with others
- Participate in class discussion
- Read out loud



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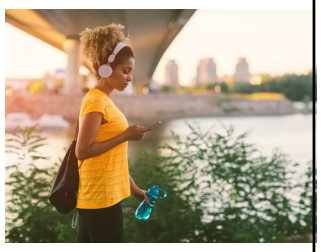
AKV – Listen while moving

- Another AKV as a study partner. Not a study group
- Hand Held Recorder
  - Notes
  - Text books
  - Listen during movement
- Must get up to move about
- Memorize lists by putting to music or rhyme



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KVA – Physical activity a must

- Study partner that will study and move with you is perfect
  - Not a study group
- Flash cards – visual notes on the move
- Retype notes into a word document
- Fidgeting = learning

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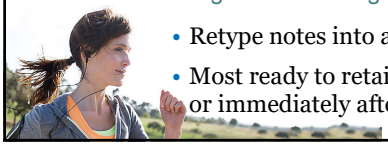
KAV – Physical activity a must

- Hates to read directions – figures it out
- Study partner that will move with you - not a study group
- Hand held recorder
  - Notes
  - Text books
  - Must be moving while listening



- Retype notes into a word document
- Most ready to retain information during or immediately after physical activity

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VAK – Must teach to learn

- Study best with minimal visual clutter
- Organize and rewrite your notes as if you are preparing to teach
- Create charts or tables for information
- Great note taker
  - Review notes often
- Video yourself doing this class

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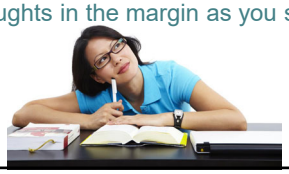
VKA – Traditional Learning Style

- Study groups work well for you
- Flash cards – make your own
- Make up stories about the topics you are learning
- Take notes and review them often
  - Highlight
  - Write thoughts in the margin as you study



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How to study

- Tips from learning style
- Gather notes and study materials
- Assess your strengths and weaknesses
- Create study tools
- Schedule Study time

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General Nursing Principles and PeriAnesthesia Basics

Objective:
1. Identify general nursing principles related to the practice of perianesthesia nursing
2. Identify appropriate care based on ASPAN standards.

Nursing Process
Evidence Based Practice
Ethics
Workplace Violence
Legal Principles

ASA and ASPAN Patient Classification
Staffing ratios
Isolation patients
Regulatory agencies

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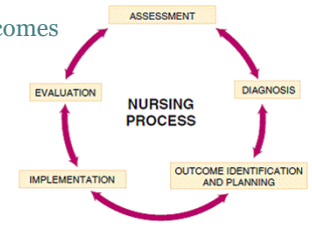
Nursing Process

- Nursing Process
  - Assessment
  - Nursing Diagnosis
  - Identification of Outcomes
  - Planning
  - Implementation
  - Evaluation



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Nursing Process

Assessment
- Purpose is to formulate nursing diagnosis
- Collection of data

Nursing Diagnosis
- Purpose is to identify and classify data collected in the assessment
- Human response
- Actual or Potential
- Nursing treatment is capable of correcting the issue
- NANDA

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Preoperative Patient Assessment

- Baseline Vital Signs
- Medical History
- Medications
- Mobility
- Communication Barriers
- Diagnostic Results
- Allergies
- NPO status
- Detrimental Behavior
- Educational needs
- Diversity / Cultural considerations

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Nursing Process

Identification of Outcomes	Planning
• Purpose is to describe the desired condition achievable through nursing care • Criteria by which nursing interventions are measured • Goals = How will we evaluate?	• Purpose is to select interventions to meet desired outcome • Individualized plan of care ▫ Write client goals ▫ Select interventions ▫ Communicate plan to ▪ Patient and family ▪ Interdisciplinary team ▪ Change of shift

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Nursing Process

Implementation	Evaluation
• Purpose is to carry out the plan of care • Nursing actions: ▫ Promote wellness ▫ Prevent disease ▫ Restore health ▫ Cope with altered functions	• Purpose is to identify if goal was met • Steps ▫ Was the goal met or not met? ▫ What factors were met or not met? ▫ Modify plan of care accordingly

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Evidence-Based Practice

- Professional responsibility to practice with most current evidence
- Maintain current practice by reading, discussing, and participating in nursing research
- Use of current best available evidence paired with clinical expertise and patient values/preference to guide care (Drain's Perianesthesia Nursing, 7e)

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Ethical Nursing Care

- Nurse practices with compassion & respect for every person
- Primary commitment to patient
- Protect rights of patient
- Accountable & responsible for delegation of nursing activities.

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Ethical Principles in Nursing

- Autonomy
- Beneficence
- Nonmaleficence
- Justice
- Veracity
- Fidelity

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Advance Directives

- Patient rights respected
  - Bill of Rights
  - Ethical Dilemma
  - Advance Directives

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DNR / AND

- End of life wishes
- Not automatically suspended
- Conversation between MD and Patient to make a plan for surgery
- Cannot be altered by a nurse

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Legal Principles

- **Statutory law** – made by legislative branch
- **Common law** – derived from principles rather than rules & regulations
- **Civil law** – based on rules & regulations, compensation
- **Tort law** - civil wrong, allows compensation
- **Criminal law –** harmful to society

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Informed Consent

- Elements of a Valid Consent
  - Knowledge of the procedure
  - Understand possible complications
  - Understand the alternatives to surgery
  - Competent to give consent
  - Patient wants the procedure
- Consent may be withdrawn at any time

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Informed Consent

- Perioperative nurse's responsibility
  - Ensure there is a consent on the chart
  - Is the patient
    1. knowledgeable
    2. willing
    3. competent
  - Consent is properly signed and witnessed
- Two witnesses sign if
  - patient is unable to sign
  - telephone consent

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Informed Consent

- Competent to sign
  - Legal Adult
  - Minors require parent or guardian
  - Emancipated minor
    - Married
    - In Armed Forces
- Exceptions to consent (implied consent)
  - Pt is unable to give consent and there is a threat to life, limb, function or organ
  - Must have documentation of emergency in staff notes

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Negligence

- Doing or not doing something a reasonable person would or would not do in similar situation
- Deviation from standard of care

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Malpractice

- Professional negligence
- Misconduct or lack of skill in carrying out job

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Elements of Malpractice

1. Duty owed patient
2. Breach of duty owed patient
3. Causation – most difficult to prove
4. Injury/Damages

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Intentional Torts

- Violating patient's rights
- No actual harm necessary
- Most common:
  - Assault
    - Place person in fear of being touched
  - Battery
    - Touch without permission
  - False imprisonment
    - Unjustified detention

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Quasi Intentional Torts

- No intent to injure or cause distress to another person
  - Intentional action that causes injury or distress
- Patient abandonment
- Defamation of character
- Invasion of privacy
- Breach of Confidentiality

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Ethical Nursing Care

- Owe same duty to self as others
  - Improve health care environment and conditions of employment
  - Improve ethical environment of work setting
- Advance the Nursing profession
  - Collaborate with other HCP and public in promoting health
  - Profession of nursing - responsible for articulating nursing values, shaping policy

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Workplace Violence

- Intimidation
- Threat
- Physical Attack
- Property damage
- Sexual harassment
- Bullying
- Harassment

The Joint Commission calls for a "zero tolerance" approach to violence.

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Workplace Violence

- Risk factors
  - Decreased security
  - Isolated in department
  - Hostile staff or family
  - Drug or alcohol abuse
  - Design of unit
  - Lack of staff training

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Patient Classification and Recommendations

- **Preadmission**
  - Staffing dependent on:
    - Volume
    - Patient health status
    - Educational/literacy needs
    - Discharge planning needs
    - Support for preanesthesia/pre-procedure interventions

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Patient Classification and Recommendations

- **Day of Surgery/Procedure**
- Based on:
  - Patient safety
  - Number and acuity of patients
  - Complexity of preparation interventions
  - Blended levels of care

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Patient Classification and Recommendations

Phase I

- When patient in unit
  - 2 RNs, 1 competent in phase 1 care in same room/unit
- Two nurses to one patient
  - One critically ill, unstable patient
- Maintain during "on call" situations

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Patient Classification and Recommendations

Phase I

- One nurse to one patient
  - At time of admission until critical elements met
  - Unstable airway and/or unstable hemodynamically
  - Unconscious patient 8 or younger
- One nurse to two patients
  - One stable unconscious patient over 8YO and one conscious stable patient
  - Two conscious, stable patients
  - Two conscious patients ≤8YO with parent or support staff present

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Patient Classification and Recommendations

Phase I

Critical Elements

- Transfer of care - SBAR report received, questions answered
- Stable/secure airway
- Initial assessment complete
- Hemodynamically stable
- Free from agitation, restlessness, combative behaviors

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Patient Classification and Recommendations

Phase II

- Two competent personnel,
  - 1 RN competent in Phase II care
- An RN must be in same room/unit when patient present
- New admissions assigned as appropriate
- Adjust based on acuity

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Patient Classification and Recommendations

Phase II

- 1:3 nurse to patient ratio
  - >8YO or <8YO with family present
- 1:2
  - New admission
  - <8YO without family or support staff
- 1:1
  - Unstable patient requiring transfer to higher level of care

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Patient Classification and Recommendations

Extended Care

- Two competent personnel
  - 1 RN competent to patient level of care
  - 1:3 to 5 Staffing Ratio
    - Awaiting transportation
    - No caregiver/home/support system
    - Requiring extended observation or interventions
    - Held for inpatient bed
- Blended levels of care
  - Based on patient acuity
  - Nursing observations and interventions

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Environment of Care

- Privacy/Confidentiality
- Security/Safety
- Dress code policy
- Phase I close to where anesthesia administered
- Preanesthesia patients separated from
  - Procedures
  - Recovering from anesthesia
- Pediatrics separate from adults
- Emergency equipment available

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Environment of Care

- Competency with IT systems
- Safe environment
  - Power Outage
  - Active Shooter
  - Bioterrorism
  - Fire
- Appropriate infection control and sharp safety practices
- RN determines mode of transport and accompanying personnel
- RN verifies safe transport from facility

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Competency for Perianesthesia RN

- Professional development
  - Continuing Education
  - Mentoring and leadership
  - Professional organizations
- Annual competency
- Phase I-ACLS/PALS
- Phase II-ACLS/PALS recommended
- Preanesthesia-ACLS/PALS recommended

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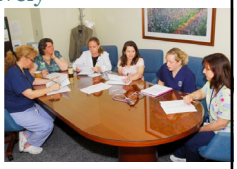
ASPAN Standards

- Quality Improvement
  - Monitor and evaluate care
  - Problems resolved collaboratively
  - Multidisciplinary
  - Patient/family input
  - Staff competency evaluated - written plan



- Research
  - Staff participates in research
  - Identify areas for improvement and incorporate evidence-based practice.

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Regulatory Agencies

- Exist to protect the public, patients, health care providers, & health care facilities
  - Accreditation Association for Ambulatory Health Care
  - American Association for the Accreditation of Ambulatory Surgery Facilities
  - Centers for Disease Control and Prevention
  - Centers for Medicare and Medicaid Services
  - The Joint Commission
  - National Institute for Occupational Safety and Health
  - Individual state health departments

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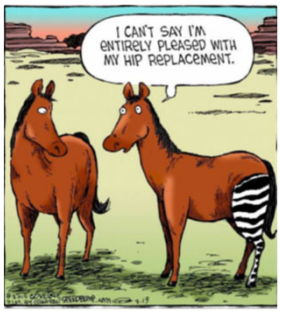
General Nursing Principles and Perianesthesia Basics Quiz

- 20 Questions
- 20 Minutes



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General Nursing Principles and Perianesthesia Basics

20 Minutes

1. A patient is scheduled for a hysterectomy. She informs you that she wants to receive no blood products because of religious preferences. What ethical principal is the patient demonstrating?

   a) Justice
   b) Autonomy
   c) Fidelity
   d) Beneficence

2. All of the following increase the possibility of workplace violence except:

   a) Isolated unit
   b) Security short staffed
   c) Busy home life
   d) Home use of marijuana and alcohol

3. To proceed with a claim of medical malpractice, it is necessary to have which of the following four key elements?

   a) Policy, breach of duty, complaint, and filing
   b) Breach of duty, damages, causation, and duty
   c) Competency, failure of competency, damages, and incident report
   d) Damages, incident report, duty, and loss of work

4. An 86-year-old man was admitted to an outpatient facility for a minor urology procedure. After signing his hospital consent form, he proceeded to the preoperative holding area. After his initial recovery he was moved to PACU Phase II. While moving from the stretcher to the chair, he fell and suffered a fractured right hip. The patient's family is considering a malpractice claim. The patient established a relationship(duty) with the outpatient facility by:

   a) Agreeing to the procedure with his doctor
   b) Choosing a specific outpatient facility
   c) Arriving and signing his hospital consent form
   d) Arriving on time for his scheduled procedure

5. A 19-year-old patient is scheduled for a laminectomy. The doctor explained the procedure to the patient, explained alternatives to the proposed surgery, and then walked out. The patient had the surgery and suffered paralysis, a devastating complication. Identify an important aspect that is missing when referring to "informed consent."

   a) Length of time of proposed surgery
   b) Rehabilitation time after surgery
   c) Risks and benefits of proposed surgery
   d) Choice of anesthesia for proposed surgery

6. You are the charge nurse coming in at 3 PM. The following patients need to be assigned: 2 stable ICU holdovers, an unstable intubated trauma requiring drips and blood products, 2 MRSA patients on contact precautions, one stable orthopedic patient that has been in PACU 1 hour, and a 10-year-old who has a parent at bedside. You have 6 nurses scheduled. The most appropriate assignment would be:

   a) 1 nurse to each ICU patient, 1 for each isolation patient, 2 nurses for the trauma. The other 2 patients must go to Phase II PACU as there is no one left to care for them.
   b) 1 nurse with each ICU patient, 1 taking care of both isolation patients, 1 nurse taking care of the unstable trauma, 1 with the adult, and 1 with the child
   c) 1 nurse with both stable ICU patients, 2 nurses with the unstable patient, 1 with each isolation patient, 1 with the adult and child
   d) 1 nurse with both ICU patients, 1 caring for the unstable trauma, 1 with each isolation patient, 1 with the adult and child.

7. Two nurses are working the night shift. One has an adult male who had an appendectomy. This patient is conscious and stable. The other nurse has an 8-year-old male with mom at bedside who is also awake and stable. The OR calls and wants to bring out a 4-year-old male who had cauterization of a tonsillar bleed who had laryngospasm in the OR. Which nurse should receive this patient?

   a) Nurse 1 as hers is an adult.
   b) Nurse 2 as her patient's mom is at the bedside
   c) The patient will have to remain in OR until 1 of the patients goes to the floor.
   d) 1 nurse should take over care of both patients already in PACU so the other can receive the child from OR

8. Informed consent consists of:

    a) The written document, signed by the patient explaining the proposed procedure
    b) Explanation by preadmission nurse about procedure and what to expect
    c) Explanation by physician about diagnosis, significant complications, benefits, and alternatives of surgery
    d) A written document detailing the surgical procedure and the proposed anesthetic plan

9. Mr. Brown, a 98-year-old male has a foley catheter, but repeatedly insists he needs to go to the bathroom. You have attempted several times to explain about the irritation of the balloon to no avail. You are getting another patient in your other bed, so you restrain Mr. Brown to keep him from getting out of bed. Your action could be determined to be:

    a) Assault
    b) Battery
    c) Kidnapping
    d) Malpractice

10. According to ASPAN Standards, Phase II must have two competent personnel present, one competent in phase II care. Which of the following meets this requirement?

    a) The charge nurse from PACU I can come to Phase II if called.
    b) The nursing supervisor can arrive in 5 minutes
    c) A float nurse from PACU I floats to Phase II and is in Phase II PACU
    d) A tech comes to assist in PACU II from the OR.

11. A patient is brought directly from the OR to PACU II by anesthesia. The patient is sleepy, a room air saturation of 92%, and requiring frequent encouragement to take deep breaths. The most appropriate action for the Phase II nurse to take would be:

    a) Have another PACU II nurse take care of your other patients so you can stay with this patient
    b) Inform anesthesia the patient needs to go to PACU I
    c) Call the attending anesthesiologist
    d) Start oxygen on the patient, call PACU I to inform them a patient will be coming, and have anesthesia take the patient to PACU I

12. A new patient is coming to PACU. The most appropriate nurse to assign the patient to would be:

    a) The nurse who has a 6-year-old child with an oral airway in place.
    b) The nurse who has one awake, stable patient
    c) A student nurse on rotation in PACU
    d) The nurse with 2 ICU patients

13. The nurse to patient ratio for the following patients would be 1 nurse to 2 patients for all of the following except:

    a) A 9-year-old awake patient who has no parent at bedside
    b) A 6-year-old unconscious patient
    c) A conscious 8-year-old with a parent at the bedside
    d) A 10-year-old who is sleepy, but maintaining his own airway

14. Obligation to prevent harm to patients is the ethical principle of:

    a) Autonomy
    b) Nonmaleficence
    c) Beneficence
    d) Justice

15. Concerning the transport of a patient with a compound fracture of the humerus to the operating room, the best description of the outcome goal is that the patient will be free of:

    a) pain
    b) anxiety
    c) injury to joints adjacent to the injury
    d) further injury at the fracture site

16. Informed consent occurs when the patient has an understanding of the:

    a) intended procedure and proposed anesthesia
    b) potential risks and consequences of the intended procedure
    c) preoperative, intraoperative, and postoperative phases of the intended procedure
    d) intended procedure, alternatives available, and risks involved

17. A young male automobile accident victim with no identification was brought to the emergency room. He had a flat electroencephalogram upon arrival and died soon afterward. This patient does not meet the criteria for organ donation, because:

    a) the exact age of the patient is unknown.
    b) A history cannot be obtained.
    c) a valid donor card had not been found.
    d) no one may give consent for an unknown.

18. The planning phase of the nursing process is characterized by such activities as:

    a) putting identified interventions into practice
    b) using new data to reassess nursing actions and patient goals
    c) reviewing the patient record for data collection and data analysis
    d) establishing goals, priorities, and evaluation criteria

19. The authoritative organization responsible for delineating the accepted list of nursing diagnoses is:

    a) NANDA
    b) TJC
    c) ANA
    d) AORN

20. The perioperative nurse explains how the surgical site will be prepared for surgery after induction. This is an example of what part of the nursing process?

    a) Assessment
    b) Planning
    c) Implementation
    d) Outcome Identification

Preop and Post op Overview

Objective:
1. Explain basic preoperative care of the surgical patient
2. Explain basic postoperative care of the surgical patient

Herbals and Supplements
Preadmission Testing
Preoperative Preparation
Day of Surgery

Phase I
Phase II
Extended Care
Transfer of Care
Fast Tracking
Visitation

109

Preadmission

- Far enough in advance to alter medical treatment and get diagnostic testing if needed
  - Anticoagulants, HTN, Glucose control
  - Make family arrangements
  - Obtain post op equipment and supplies
- Not so far that diagnostics outdated, and patient forgets preop instructions
  - Nothing by mouth (NPO)
  - Medications to take or hold
  - Need for responsible adult and transportation for outpatients
  - Postoperative home care

110

Preadmission

- Patient teaching
  - Physician and anesthesia providers are the chief source of information
  - Preoperative nurse is the primary educator and teacher of the provided information
  - Written Instructions-5th Grade Level
- Medications history
  - Prescription, herbals and OTC
    - May have to ask specifically for OTC and herbals
  - Medication reconciliation starts preoperatively

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Medication History

- Anticoagulant therapy and nonsteroidal anti-inflammatory drugs, aspirin
  - Aspirin can affect platelet adhesiveness for up to 7 days
  - Coumadin often discontinued 48 hours before surgery
    - Clotting studies done immediately before surgery
    - Closely monitor patients receiving long-term therapy for signs of bleeding
    - May be candidate for low-molecular-weight heparin bridging
  - Dipyridamole (Persantine) usually stopped 2 days before surgery

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Medication History

- Can interfere with platelet function
  - Indomethacin, tricyclic antidepressants, phenothiazines, furosemide, and steroids
- Procedure or physician specific
  - Validate necessary testing and/or therapy change prior to procedure

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Medication History

- May be held the day of surgery
  - Diuretics, insulin, oral hypoglycemic medications
  - Monoamine oxidase inhibitor (MAOI) antidepressants
- May be taken the day of surgery
  - Cardiac, antihypertensive (may be held if contain diuretics)
  - Beta-blockers
  - Calcium channel blockers
  - Anticonvulsants
  - Chronic pain medication

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Anesthesia/Herbal Interactions

- Antidiabetic Agents:
  - Decreases glucose
    - Garlic
  - Increases glucose
    - Ephedra
- Antihypertensives:
  - Decreases BP
    - Black cohosh
  - Increase BP
    - Ephedra, guarana, licorice
- Steroids
  - echinacea, licorice may decrease effect

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Herbals\Supplements

- Increase anticoagulant effect
  - Feverfew, garlic, ginger, ginkgo, saw palmetto, vitamin E, fish oil
- Decrease anticoagulant effect
  - Ginseng, Green tea, St John's wort
- Barbiturates and Benzodiazepines
  - Increase effect
    - Kava, hawthorn, St. John's wort, valerian
  - Decreases effect
    - Sarsaparilla

116

Indications for Diagnostics

- Complete Blood Count (CBC)
  - Infections
  - Autoimmune Disease
  - Alcohol Abuse
  - Blood disorders
    - Anemia
    - Coagulopathies
    - Chronic disease states
  - Expected large EBL or recent significant blood loss

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Indications for Diagnostics

- Basic Metabolic Panel (BMP)
  - Chronic renal failure
  - HTN
  - Heart disease
  - Any disease with potential for fluid/electrolyte disturbance
  - COPD or OSA
- Comprehensive Metabolic Panel (CMP)
  - Chronic renal or liver disease
  - Malnutrition

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Diagnostics Tests

- ECG/EKG
  - Known CAD, angina, CHF
  - Dyspnea on exertion
  - Dysrhythmia
  - HTN
  - Smoker-long term
  - Peripheral vascular disease
  - Hx CVA or TIA
  - Diabetes mellitus
- Pregnancy Test
  - Discussed with patient before done and document
- Fasting Blood glucose
  - On all diabetic patients unless electrolytes ordered

119

Diagnostics Tests

- Blood bank
  - Patient pre-donated
  - Large EBL
- CXR
  - If there are signs/symptoms of cardiac or pulmonary disease
- PFT (Pulmonary Function Test)
  - Pulmonary surgery, CABG

120

Obstructive Sleep Apnea (OSA)

- Preop – standardized screening tool
  - ASA OSA Checklist
  - STOP –Bang
- ASA OSA Checklist
  - BMI>30
  - Abdominal fat
  - Cardiovascular disease
  - Age-middle age or older
  - Male gender
  - Endocrine disease – Type II Diabetes, metabolic syndrome

121

STOP-BANG Questionnaire

- **S**noring
- **T**ired - upon awakening
- **O**bserved - stop breathing / choking /gasping during sleep
- **P**ressure – Hypertension
- **B**ody Mass Index more than 35 kg/m²
- **A**ge older than 50
- **N**eck size
  - Male : 17 inches / 43cm or larger
  - Female: 16 inches / 41cm or larger
- **G**ender = Male

122

Day of Surgery - Relevant preop status

- Substance abuse/use
- NPO status
- Physical/mental impairments
- Mobility limitations
- External/implanted medical devices
- Sensory limitations (hearing/vision)
- Pregnancy related assessment

123

Postanesthesia care unit (PACU) Environment of Care

- PACU phase I
  - Located in close proximity to where anesthesia is administered
  - Allows visibility of all patients through direct observation and monitoring
  - Allows space for visiting family members and approved visitors
  - One and a half beds for each operating room (OR)
  - Two beds for each OR for short procedures and pediatric cases
  - Chairs for visitor

124

Postanesthesia care unit (PACU) Environment of Care

- PACU phase II
  - Provides a friendly, family-oriented atmosphere with sufficient space for each patient and several visitors
  - Beds, stretchers, carts, or recliners
  - Chairs for visitors
  - Wheelchairs for patient transport
  - Oxygen tank holder
  - Intravenous (IV) poles as indicated

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Postanesthesia care unit (PACU) Environment of Care

- Both PACU phase I and phase II
  - Emergency preparedness
  - Emergency alarm system to obtain help when needed
  - Emergency equipment and medications

126

Phase I Focus of Care

- Immediate postanesthesia period
- Basic life-sustaining needs
- Provide constant nursing observation
- Sharing information with family members
- Transitioning the patient for continued care
  - PACU phase II
  - Inpatient nursing unit
  - Critical care or special care unit

127

Phase I Admission

- PACU receives advance notice of transfer of patient
- Equipment ready
- OR team responsibilities include the following:
  - Ensure proper patient's identification
  - Help settle the patient safely in PACU phase I
  - Report to the PACU phase I nurse
  - Remain with the patient until the PACU phase I nurse accepts responsibility
- Defer verbal report if the patient's condition becomes unstable, requiring emergent interventions

128

Phase I Admission - Report

- Type of anesthetic
- Type and time of reversal agents
- Unplanned responses
- Allergies
- VS
- I&O
- Medications
  - Analgesics
  - Antiemetics
  - Antibiotics
- Relevant history
- Comorbidities
- Answer Questions*

129

Phase I Admission

- Apply monitoring equipment
- Head to toe assessment
  - Rapid and thorough
  - Physical assessment
  - Tubes, drains, catheters patent
- Report current vital signs to the anesthesia provider

130

Phase I - Visitation

- ASPAN supports family visitation in PACU phase I
- Establish a well-organized family visitation program
  - Nurses, physicians and administrative collaboration
- Appropriate education for patients and families
  - maintain a safe and beneficial experience
- PACU nurse determines visit timing
  - Confidentiality and privacy maintained

131

Phase I Discharge

- Internal policy may require a physician's attendance for discharge

OR

- Predetermined criteria may allow the PACU phase I nurse to discharge patients when criteria are met

132

Rapid postanesthesia progression (RPP)

- Progression based on patient's condition versus time
  - PACU phase I nurse provides quality aggressive care
  - Assesses the patient more frequently
    - Respiratory and cardiac status
    - Comfort: Pain and PONV to patient's satisfaction
  - Nursing care based on patient needs
- Transfer to Phase II when patient meets PACU phase I discharge criteria

133

Safe transfer of patient care

- Notify receiving unit
  - staff assignment
- Give a complete report to a licensed nurse
  - Received by nurse responsible for patient's care
  - Before or at the time of transfer
  - Answer all questions

134

Safe transfer of patient care

- Arrange safe transportation to the receiving area
  - Mode
  - Number and competency level of accompanying personnel
- Accompany patient as appropriate
  - Requires continuous cardiac monitoring
  - Requires evaluation and treatment during transport (e.g., vasopressor infusions or pulse oximeter)
  - Remain with the patient until the receiving unit personnel are with the patient to assume responsibility for care

135

PACU phase I bypass or fast-tracking

- Bypass phase 1, go directly to phase 2
- Appropriate patient selection
  - Avoid extremes of age
- Patient is a candidate for same-day surgery
- Physical health status is ASA I or II
- Agents with rapid onset, short half-life, and relatively few side effects
- Meet phase 1 discharge criteria in OR
  - PACU phase I discharge assessment at conclusion of surgery

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PACU phase I bypass or fast-tracking

- Discharge Criteria for Phase I used to Fast Track
  - Aldrete Score
  - Modified Aldrete Score
  - White Fast Track Score
  - Hospital Specific Discharge Criteria for Phase I

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Phase II Focus of Care

- Facilitate adequate recovery from anesthesia or sedation rather than from surgery or procedure
- Prepare and provide discharge teaching
  - Medication or prescription to the patient and family or caregiver
  - Discharge instructions written on 5th grade level

138

Phase II Admission

- PACU receives advance notice of transfer of patient
  - From Phase I
    - RPP
  - Directly from OR
  - PACU phase I bypass or fast-tracking
- Transporting team is responsible
  - Help the patient settle safely, placing the call signal within easy reach (if used)
  - Remain with the patient until the PACU phase II nurse assumes responsibility for the patient's car

139

Phase II Admission - Report

- Report to nurse who will care for patient
- Patient's name and procedure
- Level of consciousness
- PONV
  - Oral intake, and tolerance
- Allergies
- Medications administered before admission
  - Pain level
- Location and condition of dressings
- Location and output of drains, tubing, and catheter or voiding
- I&O
- Neuromuscular strength as appropriate
- Comorbidities
- Physician's orders completed
- Sensory deficits and special needs
- Numeric score if used by facility
- Answer questions*

140

Phase II Admission

- Head to toe assessment
  - Physical assessment
  - Tubes, drains, catheters patent
- Tend to any immediate needs or changes in patient's condition as appropriate
- Reunite the patient with the family or caregiver as soon as stable and possible

141

PACU phase II discharge assessment

- Patient meets discharge criteria or discharge is approved by anesthesia provider
- Determine whether patient meets established discharge criteria of facility
- Sleepiness is not necessarily a deterrent to discharge as long as
  - Patient's condition is stable
  - Patient will be in a safe location and monitored by a responsible adult

142

Phase II Discharge

- Discharge instructions based on postoperative or postprocedure orders and patient needs
  - Verbal and written instructions
  - To patient / caregiver
- Encourage and answer all questions
- Include contact and emergency information
- Confirm receipt with signature
  - Unsedated patient or caregiver

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Discharge to home

- Caregiver or staff may assist patient to dress as appropriate
- Verify receipt of
  - Personal valuables
  - Discharge instructions, medications, and prescriptions
  - Supplies and equipment provided at facility
- Verify means of safe transport
- If the patient is going home
  - Arrange transport to exit by appropriate method
  - Accompany to exit and assist into vehicle
  - Coordinate postoperative follow-up phone call after 24 hours

144

Discharge to another department or extended care facility

- Verify destination and anticipated transfer time
  - Notify family if present
- Call report to
  - Next department for treatment
  - Extended observation or extended care facility
- Send chart, discharge instructions, medications and prescriptions, supplies and equipment, and personal valuables with patient
- Confirm safe transport as appropriate

145

Preop and Postop Overview Quiz

- 12 Questions
- 12 Minutes

"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?' icon."

146

PREOP AND POSTOP OVERVIEW

12 Minutes

1. _____ is an herbal supplement that has been linked to an increased risk of bleeding

   a) Ephedra
   b) Black Cohosh
   c) Gingko
   d) St. John's Wort

2. When gas cylinders are used during a patient transport, recommendations include

   a) securing them to the transport cart or bed in holders designed for this purpose
   b) placing the gas cylinder horizontally to one side of the patient in the stretcher
   c) the transporter carrying the gas cylinder
   d) placing the cylinder between the patient's legs on the stretcher

3. The process of medication reconciliation begins at what point in the perianesthesia process?

   a) Before the patient is discharged to home
   b) On the morning of surgery preoperatively
   c) During the preadmission assessment
   d) In Phase I PACU

4. After an esophageal dilation under anesthesia when is it is most appropriate for the toddler to resume fluid intake?

   a) Immediately after surgery
   b) As soon as the patient is completely awake
   c) 1-2 hours post op
   d) When the gag reflex returns

5. Which of the following medications can affect platelet adhesiveness so is held a week prior to surgery?

    a) Warfarin
    b) Aspirin
    c) Heparin
    d) St. John's Wort

6. To protect the patient's privacy during an admission to Phase I it is most appropriate to

    a) Pull the drapes between the admission and the adjacent patient and ask any visitors to leave the PACU
    b) Pull the drapes around the admission and receive written report instead of verbal when visitors are in the area
    c) The adjacent patients will likely not remember so soon after surgery. If there are not visitors no additional measures are needed
    d) Hold the admission until adjacent patients can be transferred out of phase I

7. During the preadmission interview with the patient, the nurse is sure to include information about all the following except

    a) When to eat and drink
    b) What to bring to the hospital
    c) What clothing to wear
    d) What kind of anesthesia will be used

8. During the preoperative assessment, the patient states that he has been working as a nurse in home health for 25 years. The perianesthesia nurse understands

    a) The patient knows the preoperative instructions without a detailed explanation
    b) The patient likely has back trouble and will recommend positioning to alleviate low back pain
    c) The patient may have increased risk for colonized MRSA
    d) The patient has a latex allergy risk

9. The best indicator that the tubal ligation patient post epidural anesthesia is ready to be discharged to home is when

    a) The patient's family have received DC instructions and prescriptions and have a safe way for the patient to go home
    b) When the patient meets criteria for discharge approved by the anesthesia group and the facility
    c) When the patient can urinate, reports no nausea and is taking fluids by mouth
    d) When the nurse needs to take a new admission

10. The following is true regarding Rapid postanesthesia progression (RPP)

    a) This is when patients rapidly meet Phase I discharge criteria in the surgical suite and are admitted to Phase II directly
    b) The patient progresses rapidly through phase I, phase II and is discharged to home very rapidly after surgery
    c) This is aggressive recovery through Phase I based on patient condition rather than time
    d) Are only for post moderate sedation patients after minor procedures

11. The following is an indication for a preoperative Comprehensive Metabolic Panel

    a) A patient history of insomnia
    b) The patient had a Comprehensive Metabolic Panel prior to her last surgery
    c) Suspected malnutrition secondary to addiction
    d) Patient reports prolonged menstrual cycle

12. The perianesthesia nurse transfers the patient to the pediatric floor. The receiving nurse is tied up with another patient. The perianesthesia nurse

    a) Waits for the receiving nurse to arrive and receive report
    b) Leaves a written report and phone number to ask questions for the receiving nurse
    c) Give report to the charge nurse so she can cover for the receiving nurse until she finishes with her other patient.
    d) Take the pediatric patient back to the recovery area until the receiving nurse can call for the patient.

Common Perianesthesia Concerns and Complications

Objective:
1. Discuss the treatment of the most common perianesthesia concerns
2. Discuss common perianesthesia complications.

PONV
Normothermia
Pain
Malignant Hyperthermia
Prolonged neuromuscular blockade
Upper Airway Obstruction
Anesthesia awareness
Central anticholinergic syndrome

159

PONV – Risk Factors

- Risk Factors - Patient
  - Female
  - Nonsmoker
  - Hx: PONV, motion sickness
  - Delayed gastric emptying
  - Increased gastric volume
  - Hypotension, bradycardia
  - Pain
  - Dehydration

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PONV – Risk Factors

- Risk factors-Surgery related
  - Laparoscopic
  - Strabismus
  - Middle ear procedures
- Risk factors-anesthesia related
  - Volatile anesthetics
  - Nitrous
  - Ketamine, etomidate
  - Postop opioids

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PONV - Prevention

- Adequate hydration
- Analgesia
- Slow, controlled movement
- Avoid gastric distension

- Preemptive meds-multiple receptors
  - Scopolamine patch preop
  - Ondansetron
  - Steroids
  - Antihistamine
  - Metoclopramide
  - Compazine

162

PONV - Prevention

- Complementary therapies
  - Acupressure
  - Suggestion
  - Aromatherapy
  - Music
- D/C instructions
  - Advance PO slowly
  - Rest
  - Contact MD for persistent, unrelenting N&V

163

Normothermia

- Body Heat Production
  - Liver = 50%, Muscle 25%

- Body Heat Loss
  - Radiation– 40% - 60%
    - Electromagnetic energy loss
  - Convection – 25% – 35%
    - Cold room
  - Conduction – 10%
    - Cold solid surface
  - Evaporation – 25%
    - Breath or moist skin or open abdomen

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Normothermia

- Newborns
  - Immature vasomotor control
  - Decreased muscle mass compared to body surface area
- Children age 6 months to 2 years
  - Larger body surface area compared with muscle mass
- Elderly patients
  - Shrinking muscle mass
  - Decreasing subcutaneous fat layer
  - Debilitated vasomotor control

165

Normothermia

- Hypothermia is temp below 96.8° F (36° C)
- Prevention
  - Core temps preferred (98.6°F/37.0°C)
  - Patients lose 3-5 degrees under anesthesia
  - Active Warming
    - Forced air warming, Fluid warmers
  - Passive Warming
    - Warm blankets, Heated oxygen, Warming lights
  - Warm the room
  - Supplemental oxygen if shivering

166

Normothermia

- Post op shivering increases O2 consumption by 400%
- Myocardial ischemia
- Cardiac arrhythmias below 90° F (32° C)
- Increased Surgical Site Infections
  - Decreased blood flow and oxygenation to wound
- Acidosis
  - Liver metabolizes lactic acid
    - Hypothermic liver doesn't do it efficiently

167

Normothermia

- Increased Bleeding
  - Interrupts clotting cascade
  - Also, cold laparoscopic gas may vasoconstrict initially, resulting in delayed bleeding after warming
- Delayed emergence
  - Medications stay active longer – slowed metabolism

168

Pain

- Visceral
  - Poorly localized and distant quality
  - Nociceptors activated in visceral tissues
- Somatic
  - Well localized with familiar quality
  - Nociceptors activated in somatic tissue
- Neuropathic
  - Damage or irritation to nerves
  - Experienced as burning and squeezing, or sensory loss and numbness

169

Phase I pain intervention

- Patient's self-report of pain is the most reliable assessment tool
  - Pain is subjective
- Direct relationship exists between preoperative education and decreased analgesic needs
  - Less fear
  - Decreased feeling of powerlessness
  - Earlier ambulation

170

Assess Pain – verbal child / adult

- Intensity using pain scale appropriate for age and cognitive level
  - Numerical (0 to 10)
  - Wong-Baker FACES (smiling to crying)
  - Colors (blue to red)
  - Visual analogue scale (VAS): no pain to pain as bad as it could possibly be

171

Assess Pain - Infants

- FLACC (Face, Legs, Activity, Cry, Consolation)
  - Each area rated 0 to 2 for total score of 0 to 10
    - best, 10 = worst
- CRIES score
  - Crying, Requires O2 for Spo2 > 95%, Increased vital signs from preoperative values, Expression, Sleepless
  - Each consideration rated 0 to 2
    - 0 = best and 2 = worst
- Intervention recommended when a baby's score = 4

172

Phase I pain intervention

- Mild to moderate pain
  - Use nonopioid acetaminophen, NSAIDS
- Moderate to severe pain
  - Use nonopioid and opioid combined (Demerol only for shivers)
- Severe acute pain
  - Local anesthetic, ketamine
- Comfort measures positioning, heat and cold

173

Complementary Therapies

- Aromatherapy
- Music therapy
- Massage
- Therapeutic touch
- Relaxation therapy
- Guided imagery

http://www.sptimes.com/2002/07/29/TampaBay/Healing_with_touch.shtml

174

Malignant Hyperthermia

- Who is at risk?
  - Malignant Hyperthermia (MH) is an inherited syndrome
  - MH has no racial boundaries although, at least in America, those most often affected are Caucasian
  - MH happens more frequently in older children and young adults
  - Consistently more frequent in men
  - Pre-Op assessment for risk factors

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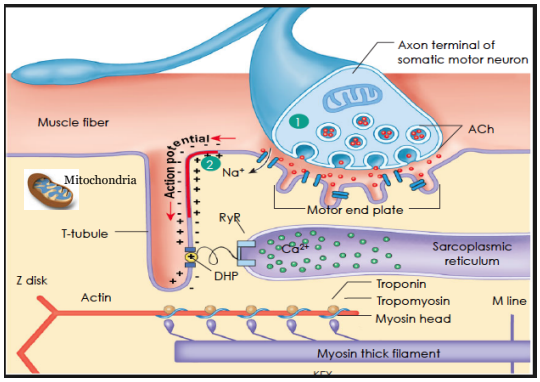

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Malignant Hyperthermia

- Triggering an episode
  - A genetically susceptible patient
  - Succinylcholine is one of the most common triggers, especially when used in conjunction with an inhaled anesthetic such as Desflurane, Isoflurane and Halothane
  - An MH susceptible patient should never receive Succinylcholine or one of these anesthetics

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Malignant Hyperthermia

- Early signs include:
  - Trismus
  - Rapid increase in body metabolism
    - This is indicated by a rise in exhaled CO_2 and metabolic acidosis
    - This is the earliest consistent indicator
  - Intense muscle rigidity
  - Increased heart rate
  - Increased blood pressure

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Malignant Hyperthermia

- Late Signs include:
  - Rapidly rising body temperature (Pyrexia)
  - Change in color of soda lime
  - Hyperkalemia
  - Hypoxia
  - Myoglobinuria
  - Cardiac arrest

179

Malignant Hyperthermia

- Immediately discontinue all triggering agents
- Hyperventilate the patient with 100%
- Call MHAUS-1-800-MH-HYPER
- Dantrolene 2-3 mg/kg
- Sodium bicarbonate IV for metabolic acidosis
- Hyperkalemia
  - Calcium, insulin, glucose
- Myoglobinuria
  - Furosemide 1mg/kg/dose, bicarb, fluids

180

Malignant Hyperthermia

- No Calcium channel blockers
- Ice packs / hypothermia blanket
- Give iced NSS - Avoid Ringers
- Send labs - Correct electrolyte imbalances
- Monitor ECG - Correct arrhythmia
- Transfer patient to ICU when stable and monitor for 36 hours for recurrence and complications

181

Prolonged Neuromuscular Blockade

- Temperature
  - Hypothermia potentiates the effects of non-depolarizing agents and depolarizing agents
- Potassium
  - Hypokalemia potentiates the effects of non-depolarizing agents
  - Hyperkalemia potentiates the effects of depolarizing agents
- pH
  - Acidosis potentiates the effects of non-depolarizing agents

182

Prolonged Neuromuscular Blockade

- Calcium channel blockers
  - Potentiate the effects of depolarizing and non-depolarizing neuromuscular blockers
- 'Mycin' Antibiotics,
  - Decrease the release of acetylcholine at nerve terminals
    - Potentiate the effects of non-depolarizing neuromuscular blockers

183

Prolonged Neuromuscular Blockade

- Pseudocholinesterase deficiency
  - Enzyme that metabolizes Succinylcholine
  - Ventilation, sedation and time
- Liver Disease
  - Rapacuronium
  - Vecuronium
- Renal disease
  - d- Tubocurarine
  - Metocurium

184

Awareness Under Anesthesia (AUA)

- Incidence
  - Light anesthesia
    - Emergent cases start before stage 3 achieved
  - Increased anesthetic requirement
    - Younger age, tobacco smoking, long-term drug use
  - Machine malfunction or misuse
    - Empty vaporizer or N^2O cylinder
    - Malfunctioning intravenous pump or disconnection

185

Awareness Under Anesthesia (AUA)

- Prevention = good history
  - Opioid abuse
  - Previous history of AUA
- Avoiding AUA in High risk patients
  - Amnesic Drugs
  - Deeper anesthesia with intubation
  - Avoid paralytics
    - Sparing if at all
  - Supplemental opioids
  - Volatile gases with Minimum alveolar concentration (MAC)

186

Awareness Under Anesthesia (AUA)

- Treatment
  - Believe
  - An apology should be given
    - No blaming
  - The patient should be reassured about nonrepetition
    - This episode will guide future anesthetic treatment
  - The patient should be offered psychologic or psychiatric support

187

Concerns and Complications Quiz

- 11 Questions
- 11 Minutes

188

CONCERNS AND COMPLICATIONS

11 Minutes

1. To alter the course of malignant hyperthermia, Dantrolene sodium primarily:

   a) Contracts vascular smooth muscle
   b) Reverses cellular acidosis
   c) Relaxes skeletal muscle
   d) Augments hypothalamic temperature regulation

2. The 25-year-old patient arrives to the Phase 1 PACU ventilated and paralyzed. The CRNA reports that the patient's succinylcholine should have worn off but has not. She has given versed before leaving the OR. The perianesthesia nurse's care for the suspected pseudocholinesterase deficiency patient will include:

   a) Ventilation and sedation with periodic weaning trials
   b) Neostigmine, Atropine and active warming
   c) Non depolarizing paralytics and sedation
   d) Transfer to a ventilated unit for long term care

3. All of the following are possible causes of prolonged neuromuscular blockade except:

   a) Hypothermia
   b) Electrolyte abnormality
   c) Pseudocholinesterase deficiency
   d) Hyperthermia

4. Which of the following patients would have the highest risk for developing postoperative nausea and vomiting?

   a) Male, smoker, having an orthopedic procedure under spinal anesthesia
   b) Female, nonsmoker, with a history of carsickness having a laparoscopic tubal
   c) Male, nonsmoker, sleep apnea, having a strabismus repair
   d) Female, smoker, history of reflux having a carpal tunnel repair under axillary block

5. Hypothermia can do all the following except:

    a) Coagulopathies
    b) Delay healing
    c) Cause the patient to experience intraoperative awareness
    d) Delay emergence

6. Loss of body heat from infusion of cold blood products would be what kind of loss?

    a) Radiation
    b) Convection
    c) Conduction
    d) Evaporation

7. A patient comes out of the OR making crowing, high pitched sounds. Anesthesia reports a traumatic intubation. Subglottic edema is suspected. Treatment will probably include:

    a) Humidified oxygen, racemic epinephrine, heliox, IV steroids
    b) Dry oxygen, albuterol, beta blockers, diazepam
    c) Immediate reintubation, antibiotics, and lidocaine
    d) Nothing, it will resolve without intervention

8. According to ASPAN guidelines, a patient is hypothermic if his core temperature is:

    a) Less than 96.0 F
    b) Less than 96.8 F
    c) Less than 95 F
    d) Less than 98 F

9. Mr. S. is exhibiting unexplained tachycardia, rapid respirations, and muscle rigidity. The anesthesia team determines Mr. S. is showing early signs of Malignant Hyperthermia. In response, the perianesthesia nurse retrieves the MH cart and begins to reconstitute the Dantrolene Sodium with:

    a) Normal Saline
    b) Preservative free sterile water
    c) Hydrocortisone acetate
    d) A hypertonic saline solution

10. The following patient has the highest risk for awareness under anesthesia.

    a) 22-year-old male smoker from the trauma ICU with a history of pelvic fracture repair one month ago and is returning for necrotizing fasciitis. He has had a fentanyl drip and requires additional pain medication.
    b) A 51-year-old female nonsmoker for a vaginal hysterectomy with a history of asthma
    c) An 8-year-old patient newly diagnosed with acute lymphocytic leukemia admitted for placement of a hick's catheter.
    d) A 48-year-old man with a history of opioid abuse but has been clean for four years. He's very concerned about receiving narcotics. He and his anesthesia provider plan on an epidural and sedatives for his inguinal hernia repair.

11. In the recovery room the post laparoscopic cholecystectomy patient complains of pain in the shoulder. What should the perioperative nurse do?

    a) Place the patient in Trendelenburg position
    b) This is a symptom of internal bleeding. Notify the anesthesiologist immediately.
    c) Apply ice pack to the shoulder
    d) Apply hot pack to the shoulder

Special Patient Populations

Objective:
1. Identify unique care needs of special patient populations
2. Plan preoperative care based on patient's individual needs

Identify Unique Care Needs of Special Patient Populations
- Pediatric
- Pregnant
- Geriatric
- Culture

200

Pediatric Patients

- PeriAnesthesia nurse learn about and become skilled in pediatric nursing care
- PALS certification Recommended

201

Peds Preop

- Family-centered care - include parents and family, involve in child's care
- Family knows and understands specific needs of child, how to help child cope with surgery

202

Pediatric Considerations

- Infant (up to 12 months)
  - Sooth with pacifier,
  - hold and rock
- Newborns obligate nasal breathers
  - Until about 4 months
  - Prone to obstruction
- Diaphragmatic Breathers
- Anatomic differences
  - Neonate epiglottis C1
    - C3 by 6 months
  - Neonate vocal cords C4
    - C6 in adult
  - Neutral neck alignment

203

Prematurity - <37 weeks gestation

- Prone to airway obstruction and apnea
  - Prematurity up to 6 months
- IV caffeine can decrease risk of apnea
- Infant Respiratory Distress Syndrome
  - Insufficient surfactant
- Bronchopulmonary dysplasia
- Immunocompromised
- Retinopathy
  - Want PaO2 60-80 (pulse ox 90-95%)

204

Thermal Regulation

- Sensitive to heat loss:
  - Poor vasomotor control
  - No shiver response
- Heat loss from vascular scalp
- Born with mature pain receptors
- Generate heat by crying, and burning brown fat

205

CV Considerations

- Normal HR decreases with age
- BP increases with age
  - Major blood loss before hypotension
- Hypotension one of the latest signs of shock in an infant.
  - This is one of the earliest signs in an adult patient.
  - They are in trouble perfusing tissue long before their BP starts to fall

206

CV Considerations

- Fetal hemoglobin levels high at birth, with high affinity to oxygen
  - Does not readily release O2 to tissues
- Hgb levels decrease for approximately 3 months
- Fetal hemoglobin is nearly completely replaced by adult hemoglobin by approximately 6 months.
- Physiologic anemia of childhood
  - Inefficient tissue oxygenation due to decreased unloading of oxygen

207

Fluid and Electrolytes

- Neonates poor ability to conserve fluid or clear overload
- Dehydration can also affect renal function
  - This can affect clearance of drugs cleared by kidneys
- Glomerular filtration and tubular function nearly complete at 20 weeks
- Reach renal maturity 2-3 years of age

208

Pediatric Considerations

- Toddler (13 to 36 months)
  - Separation anxiety
  - Communicate with simple sentences
  - Sooth with distraction and familiar objects

209

Age Appropriate Interventions

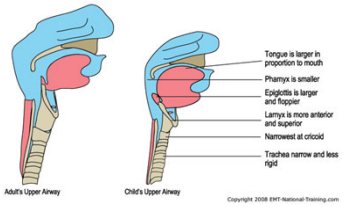
- Toddler (13 to 36 months)
  - Learn any special words child uses
  - Preparation just before procedure
  - Simple and careful choice of words
  - Expect and prepare parents for regression
  - Comfort objects and measures
    - Play with mask and doll
  - Parental presence and involvement
  - Parent in OR for induction

210

Respiratory Considerations

Anatomic Considerations:

- Diameter of pediatric airway is small
- Epiglottis U shaped, hard-flatter in adult
- Larynx inverted cone
  - Adult cylinder



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Pediatric Considerations

- Preschooler (3y– 5y)
  - May believe they are in the hospital because they are in trouble
  - Fear pain and mutilation
  - Fear of abandonment
  - Provide independence when possible
  - Communicate using compound sentences

212

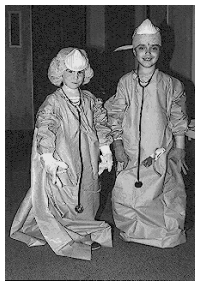
Age Appropriate Interventions

- Preschool (3-5 years old)
  - Encourage verbalization fear and anxieties
  - Playing with equipment
  - Simple explanations
  - Parental presence
  - Consider parent present for induction

213

Pediatric Considerations

- Developmental
  - School age (6y – 12y)
    - Give honest gentle information
    - Able to be more cooperative
    - Give positive reinforcement for cooperative behavior
    - Watch for loose teeth!



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Age Appropriate Interventions

- School age (6-12 years old)
  - Advance preparation
  - Explanation for questions
  - Emphasize things child can do after surgery
  - Comfort objects or measures
  - Encourage sense of control
  - Parental presence
  - Play with equipment/explanation

215

Pediatric Considerations

- Developmental
  - Adolescent (13y – 18y)
    - Fear loss of privacy
    - Body Image is important
  - Adolescents are hypersensitive to the opposite sex as caregivers
  - Give honest information

216

Age Appropriate Interventions

- Adolescent (13-18 years old)
  - Explain pain control
  - Give choices when appropriate – transitioning between dependence and independence
  - Encourage sense of control
  - Answer questions – tend to be uncertain in unfamiliar environments
  - Preop teaching
  - Parental presence

217

Peds Teaching Guidelines

- Learn through play
- PRECEDE
- Consider developmental stage
  - <2 yr - educate parents
  - 2-4 yr - play therapy
  - 4-7 yr - experiences, literal
  - 7-12 yr - hands on, want to know the whys
  - >13 yr – include in discharge teaching

218

Estimated blood volume (EBV)

Premature = 95ml/kg

Newborn = 80-90 ml/kg

3-month-old – 3-year-old = 75 – 80 ml/kg

Child (> 6 years) approximates volume of adults 65 ml/kg female, 70 ml/kg male

Maximum allowable blood loss should not exceed 20% of EBV, depending on pre-op hematocrit

219

Pregnant Patients - Cardiovascular

- Blood volume increases
  - CO, SV, HR all increases
  - Ejection fraction increases
  - Cardiac walls thicken

- Scott's Syndrome-aortocaval compression
  - 2nd and 3rd Trimester
  - Compression of inferior vena cava and pelvic veins

220

Pregnant Patients

- Respiratory
  - Alveolar ventilation increases
  - Tidal volume increases until 3rd trimester
  - Diaphragm elevates
- Gastrointestinal
  - Slowed gastric emptying
  - Decreased gastric motility
  - Gastroesophageal reflux

221

Pregnant Patients

- Renal
  - Kidneys and ureters dilate
  - GFR increases
  - Urine output increase
    - increased waste products
- Hepatic
  - Liver function slightly delayed
    - physical manipulation

222

Pregnancy Complications

- Most common non-obstetric surgeries
  - Appendectomy
  - Cholecystectomy
- Incompetent cervix - cerclage
- Ovarian cystectomy or oophorectomy (tumor)
- Ectopic pregnancy
- Preterm labor
- Preeclampsia/eclampsia

223

Pregnancy - Pharmacology

- Oxytocin – induction of labor/uterine contractions
- Magnesium Sulfate – tocolytic/delay preterm labor/preeclampsia
- Terbutaline – bronchodilator/ delay preterm labor
- RhoGAM – Rh negative mom
- Bromocriptine – prevents lactation

224

Preeclampsia Signs and Symptoms

- Hypervolemia
  - Increased BP
- Developing HELLP
  - **H**emolysis, **E**levated **L**iver enzymes, **L**ow **P**latelets
- Neurological symptoms
  - Severe headache
  - Dizziness
  - Excessive Vomiting
  - Blurry vision
- Decreased or even no urine output
  - Proteinuria

225

Preeclampsia Treatment

- Delivery is best treatment
  - Corticosteroid Injections
- Magnesium Sulfate
  - Load 4-6 Gm IV over 20 min
  - 2-4 Gm/hour infusion
- Assess for Mg Toxicity
  - Poor or Absence of deep tendon reflexes
  - Rapid Onset Pulmonary Edema
  - Hypotension
- Antidote for Mg Sulfate:
  - Calcium gluconate

226

Pregnancy Complications

- Trauma
  - Leading cause death of maternal death during pregnancy
  - Abdominal trauma
    - 1st trimester - fetus well protected
    - 2nd - less protection
    - 3rd - if engaged, fetal skull fracture, placental abruption
  - Complications due to trauma
    - Uterine rupture, placenta abruption, bladder trauma
    - Amniotic fluid embolism

227

Pregnant Patients - PreOperative

- Support and Reassurance
- Consult with OB
- Fetal heart tones (FHT) 120-160
- Anesthesia will treat as full stomach
  - Antacids and H2 Blockers
- Position off right side
- Type and Rh factor

228

Alterations With Age

- Cardiovascular
  - Decreased vessel elasticity
  - Decreased tissue elasticity
  - Vessel tone
- Respiratory
  - Decreased compliance
  - Chest wall rigidity = increases work of breathing

229

Alterations With Age

- CNS
  - Cognitive assessment
  - Delirium
    - Return assistive devices ASAP
  - Functional level
    - No assumptions
  - Alcohol and drug use
  - Depression
  - Falls history

230

Alterations With Age

- Integumentary
  - Hypothermia risk
    - Loss of subcutaneous fat
    - Debilitated vascular tone
  - Risk assessment for mistreatment
  - Decreased skin elasticity
    - Skin tears
    - Shearing injuries

231

Alterations With Age

- Musculoskeletal
  - Decreased bone mass
  - Joint degeneration
- Gastrointestinal
  - Decreased peristalsis
  - Decreased blood flow
  - Decreased metabolism

232

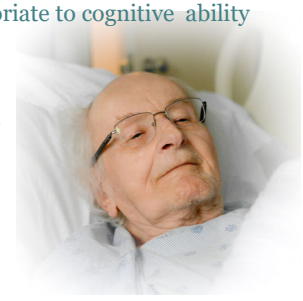
Alterations With Age

- Renal/Genitourinary
  - Decreased bladder capacity, tone
  - Decreased renal circulation
- Endocrine
  - Decreased catecholamine response
  - Decreased function and absorption
- Hematologic/Immune
  - Decreased function

233

Pain and our Elders

- Pain undertreated
  - Assessment tools appropriate to cognitive ability
  - Communication aides
- Titrate narcotics
  - Taking other medications
- Alternative therapies
  - Enhance narcotic action



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Cultural Competence

- As an employer
  - A culturally diverse staff that reflects the communities served
  - Inclusive policies and procedures
  - Fairness in retention and promotion
  - Inclusive decision-making,
  - Leadership commitment.
- Physical environment
  - Signage and instructional literature in the clients' language and consistent with their cultural norms

235

Cultural Competence

- Resources for employees
  - Training for providers about the culture and language of the people they serve
  - Employee resource group
  - Providers or translators who speak the clients' language
- Personal Competence
  - An ability to recover from inevitable cultural collisions,
  - Considerable knowledge about cross-cultural differences
  - Cross-cultural communications skills
  - Inclusive beliefs and values
  - Awareness of personal biases and stereotypes

236

Special Populations Quiz

- 11 Questions
- 11 Minutes

237

SPECIAL PATIENT POPULATIONS

11 Minutes

1. A patient who is 8 months pregnant is to undergo an emergency laparotomy. In planning nursing care for this patient, the perioperative nurse should have available a wedge cushion or pillow to place under the patient's:

   a) knees
   b) left side
   c) right side
   d) shoulders

2. An 8-year-old boy is being prepared for a bilateral inguinal herniorrhaphy. As the anesthesia provider is about to start the IV, the boy begins to cry. The most appropriate action at this point would be to:

   a) give the patient psychological support through tactile contact and verbal reassurance
   b) impress upon the patient how important it is to be brave and not to cry
   c) distract the patient's attention from the venipuncture by asking him if he has a pet or a hobby
   d) turn the patient's head to the side so that he cannot see the venipuncture

3. Which of the following is the major stressor on an adolescent in the OR?

   a) Issues of trust
   b) Threats to body image
   c) Threats to justice
   d) Separation anxiety

4. During the preoperative assessment for a patient scheduled for an emergency Caesarean section, the perioperative nurse notes that the patient’s magnesium level is 6mg/dL. This places the patient at risk for:

   a) Seizures
   b) Hypertensive episode
   c) Tachycardia
   d) Hypotensive episode

5. A 25-year-old Navajo man has been brought to the preoperative holding area from the emergency room for repair of a fractured femur. His consent has been signed and he is ready to go to surgery. As you go to check on him, he tells you he does not want to go to surgery until he sees his medicine man. He says his family has contacted him and he should be at the hospital shortly. The best action for the nurse would be:

   a) Tell him his surgery time has been posted for him and cannot be changed.
   b) Inform the OR there may be a slight delay due to important patient visitor
   c) Call pastoral services to see the patient before proceeding to OR
   d) Let the family know the patient is going back to the OR and let them talk to the medicine man.

6. A 8-month-old infant is admitted to the PACU after a Nissen fundoplication. His HR is 175 bpm, BP 50/38 mmHg, and an axillary temp is 36.6 degrees Celsius (97.9 degrees Fahrenheit) Admission assessment also reveals periorbital edema, grunting, and adventitious lung sounds. The perianesthesia nurse is most concerned about?

   a) hyperthermia
   b) pain
   c) respiratory distress
   d) hypervolemia

7. You are caring for a 30-year-old woman, 8 months pregnant, who had an appendectomy with spinal anesthesia in Phase I PACU. She begins to complain of intermittent lower abdominal pressure and cramping. You suspect:

   a) A resolving spinal
   b) Preterm labor
   c) Discomfort caused by intraoperative positioning
   d) Surgical site pain

8. You receive a patient post C Section in PACU I. You notice a magnesium sulfate infusion going. This infusion is usually used for what in pregnant women:

   a) Hypertension
   b) Preeclampsia
   c) Muscle spasms
   d) Uterine tone

9. Signs/symptoms that could indicate magnesium sulfate toxicity include:

    a) Hyperventilation
    b) Muscle spasms
    c) Loss of deep tendon reflexes
    d) Decreased urine output

10. What age group is most likely to believe pain is a punishment for being “bad”?

    a) Toddler
    b) School age
    c) Preschool
    d) Teenager

11. Concerning the intention to combat fluid volume deficit intraoperatively in a patient who professes to be a Jehovah's witness, which of the following interventions would be permitted by this patient's religion?

    a) Intraoperative administration of autologous blood
    b) Directed donor transfusion
    c) Blood from the blood bank
    d) Autotransfusion

Hematology, Fluid and Electrolytes

Objectives:

1. Understand the influence of hematologic disturbances in the perianesthesia care of a patient
2. Discuss the influence of fluid and electrolyte balance on the perianesthesia patient

Complete Blood Count
Clotting factors
Coagulation Disorders
Blood Products
Transfusion Reactions

Fluid loss
Fluid Replacement
Electrolytes

249

Complete Blood Count

- RBC's
  - Normal range
    - Men: 4.3 to 5.9
    - Women: 3.5 to 5.5
  - Contains Hemoglobin
- Hemoglobin
  - Normal range
    - Men: 13.2 to 17.5
    - Women: 11.5 to 16
  - Carries Oxygen
  - Can be low even with a normal RBC

250

Complete Blood Count

- Anemia – Low Hematocrit
  - Normal range:
    - Men 42-52
    - Women 37-47
- Ideally treat low H&H with iron preoperatively

251

Complete Blood Count

- Thrombocytopenia – Low platelet count
  - Normal range 150,000-450,000 µL
  - Not a problem for most surgeries if above 50,000 µL
- Decreased
  - ETOH, chemo, DIC, HIV, viral infections, sepsis
- Increased
  - Acute blood loss, cancer, pre-eclampsia

252

White Blood Cell

Normal Value: 5000 – 10,000 cells/mm3

Decrease	Increase

• Prolonged infection
• Bone Marrow suppression
  ▫ Chemotherapy
  ▫ Radiation
	• Infection
	• Inflammation
	• Autoimmune Disease
	• Leukemia

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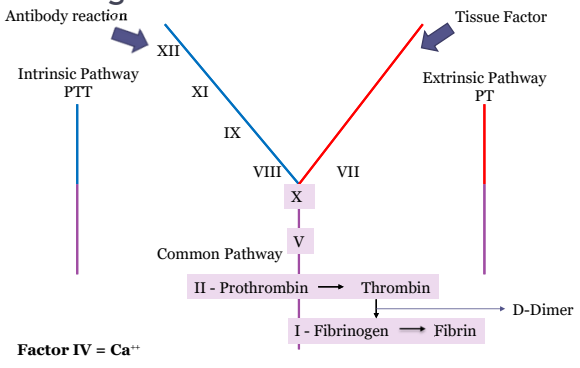
Clotting Cascade



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Prothrombin Time (PT)

Normal Value: 11-12.5 sec

What it measures	What it means
• A PT test evaluates the coagulation factors VII, X, V, II, and I (fibrinogen)	• Bleeding or Clotting disorder • Liver Disease* • Warfarin Therapy* • May cancel case if unsuspected

255

Partial Thromboplastin Time (PTT)

Normal Value: 30-40 seconds

What it Measures	What it means
• Evaluates coagulation factors XII, XI, IX, VIII, X, V, II (prothrombin), and I (fibrinogen)	• Bleeding or Clotting disorder • Heparin Therapy* • Hemophilia* • Shortened in early stage DIC • May cancel case if unsuspected

256

Disseminated Intravascular Coagulation (DIC)

- Inappropriate clotting followed by hemorrhaging
- Systemic response: Tissue Factor
  - Trauma
  - Sepsis
  - Obstetrics – amniotic fluid
  - Cancer

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Disseminated Intravascular Coagulation (DIC)

- Tissue Factor
  ↓
- Prothrombin → Thrombin
  ↓
- Fibrinogen (soluble) → Fibrin (non-soluble)
  ↓
- Fibrinogen Degradation Products (FDP)
  - D-Dimer

258

Disseminated Intravascular Coagulation (DIC)

- Elevated:
  - Fibrin Degradation Products (FDP)
    - D-Dimer
  - PT elevated
  - PTT shortened initially then elevated
- Decreased:
  - Fibrinogen
  - Platelets

259

Disseminated Intravascular Coagulation (DIC)

- Signs and symptoms:
  - Petechiae (abdomen),
  - Ecchymosis, purpura (purple blotches), abnormal bleeding,
  - Stroke
  - Dyspnea, Chest pain,
  - Decreased Urine Output

260

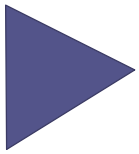
Disseminated Intravascular Coagulation (DIC)

- Treatment:
  - Correct the cause
  - Treat with FFP and Cryoprecipitates
  - Vitamin K and folic acid
  - Heparin sometimes used in the beginning
  - Volume / blood replacement

261

Virchow's Triad ⟶ DVT formation

- Venous Stasis
  - Immobility during surgery
    - Sequential Compression Device
- Hypercoagulability
  - Clotting cascade triggered



- Endothelial injury
  - Surgery interrupts vascular endothelium

262

Heparin Induced Thrombocytopenia

- Immune response
  - Starts when Heparin binds to a protein on inactivated platelets
    - Creates Heparin-PF4 Complex
      - Heparin-PF4 is immunogenic in some people
- It takes about a week for sensitive patients to produce the antibodies for Heparin PF4
  - HIT normally seen after 1-2 weeks of therapy
  - History of previous Heparin therapy

263

Heparin Induced Thrombocytopenia

- Antibodies bind to Heparin PF4 complex
  - This action Activates platelets
    - Release TXA2
      - Stimulates other platelets to activate
    - Releases more PF4s
- Consumes Platelets rapidly forming clots
  - Patients on Heparin need platelet count twice a week
  - Risk for DVT, PE, MI

264

Heparin Induced Thrombocytopenia

- Treatment
  - Stop all Heparin
  - Argatroban
    - Non-Heparin anticoagulant
    - Thrombin inhibitor
    - 3-6 months if coagulation event
    - Until platelets normalize if no event

265

Sickle Cell Anemia

- Abnormal shaped RBCs
  - Decrease O2 carrying capabilities
  - Abnormal shape causes clumping of cells
    - Occlusion of flow
    - Decreased circulation
      - Pain
- Triggers
  - Hypotension
  - Hypothermia
  - Hypoxia
  - Hypoglycemia
  - Hypovolemia

266

Sickle Cell Anemia

- Treatment:
  - Ensure adequate oxygenation
  - Promote circulation/reduce vasoconstriction
    - Temperature regulation
    - Pharmacology
  - Reduce stress by managing pain and controlling environment

267

Blood Products

- PRBC
  - Deliver O2 to tissue
  - Improve platelet function and hemostasis
  - Administer over 1.5-2 hours, slow 1st 15 minutes unless emergency
- Plasma
  - Clotting factors
  - Increased INR
  - Improve coagulation
  - Administer over 20-30 min

268

Blood Products

- Platelets
  - To treat thrombocytopenia, platelet dysfunction
  - Provide coagulation and hemostasis
  - Usually given over 60 min
- Cryoprecipitate
  - Improves fibrinogen and Factor XIII, VIII, von
  - Willebrand
  - Transfuse as rapidly as possible

269

Acute Hemolytic Reaction

- Incompatibility or antibody reaction
  - Severe and noticeable immediately
- Symptoms
  - Lumbar pain, chest pain, SOB, fever, chills, hemoglobinuria, hypotension
- Treatment
  - STOP transfusion
  - NS IV
  - Antipyretics and antihistamines

270

Febrile Reaction – Non-Hemolytic Reaction

- Symptoms
  - Fever, chills, headache, back pain, Flushed skin, Hypotension
  - Onset 1 to several hours into transfusion
- Treatment
  - STOP transfusion
  - NS IV
  - Antipyretics and antihistamines

271

Allergic Reaction

- Histamine Release
- Varied degrees of severity
  - Itching to anaphylaxis
  - Rash to airway edema
- Treatment
  - STOP transfusion
  - NS IV
  - Antipyretics and antihistamines

272

Transfusion Associated Circulatory Overload (TACO)

- Infusion volume too much or too fast
  - Acute pulmonary edema secondary to CHF
    - Respiratory distress, tachypnea, cyanosis, hypertension
    - Pink frothy sputum
- Treatment
  - Stop transfusion
  - Diuretics
  - CXR. CBC

273

Transfusion Related Acute Lung Injury (TRALI)

- Two different etiology pathways
  - Immune and Nonimmune
- Immune Response
  - Donor Antibodies attack Patient's antigen
    - Donors with Human Leukocyte Antigen (HLA) antibodies
      - 5-15% mortality when TRALI only
    - Cell destruction triggers common pathway
      - Pulmonary Capillary leakage and respiratory failure

274

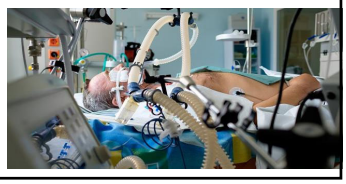
Transfusion Related Acute Lung Injury (TRALI)

- Nonimmune (Two Hit Response)
  - #1. Sick patient
    - Sepsis, Multiple transfusions, Aspiration
      - 41-67% mortality in ICU pts with TRALI
  - #2 Transfusion of activated clotting factors
    - Cell destruction triggers common pathway
      - Pulmonary Capillary leakage and respiratory failure

275

Transfusion Related Acute Lung Injury (TRALI)

- Symptoms
  - Within 6 hours
    - Typically 2
  - Hypoxia
  - Pulmonary Edema
    - Pink frothy sputum
    - Cough
  - CXR diffuse infiltrates
  - Fever
  - HR ↑ & BP ↓
- Treatment
  - Stop transfusion
  - IV NS
  - Hemodynamic support
  - Respiratory support



276

ASA 2010 Guidelines for PO intake prior to surgery

- 2 hours clear liquids
- 4 hours breast milk
- 6 hours nonhuman milk
- 8 hours solid food
- Calorie intake stimulates gastric emptying and decreases acidity
- Surgery begins with **minimal deficit**

277

Estimating Volume Loss in Surgery

- Blood
  - 4x4 hold ~ 10 mL blood
  - Ray-techs ~ 10-20 mL blood
  - Lap sponges ~ 100 mL blood
  - Pediatric - weigh sponges for volume
- Other losses based on amount of tissue trauma
  - Evaporation from open wound
  - Third-spacing from fluid redistribution

278

Fluid Replacement During Surgery

- Make up for Deficit (Should be minimal)
  - Maintenance for hours the patient has been NPO
    - Hours x Rate = Volume to be replaced
      - Calculating Maintenance Rate = 4 2 1 formula
        - 4 ml/kg/hr for 0-10 kg weight
        - 2 ml/kg/hr for the next 10 kg weight
        - 1 ml/kg/hr for each kg > 20
- Make up for Losses
  - Replace 1 mL blood with:
    - 3ml Crystalloid (3:1 ratio)
    - 1 mL Colloid or PRBC (1:1 ratio)

279

Fluid Replacement During Surgery

- Rate of Replacement
  - First hour:
    - 1/2 Deficit + Hourly Maintenance + Loss
  - Second hour:
    - 1/4 Deficit + Hourly Maintenance + Loss
  - Third hour:
    - 1/4 Deficit + Hourly Maintenance + Loss

280

Electrolytes – Sodium

Normal value 135 - 145

- Hyponatremia:
  - Results from fluid overload
  - Bladder Irrigation fluid absorbed into venous sinuses
  - Hysteroscopies, TUR procedures
    - Careful I&O during surgery
      - Glycine and Sorbitol leave behind free water after metabolism
  - Causes fluid to shift into tissues

281

Electrolytes – Sodium

Normal value 135 - 145

Hyponatremia

- Hypervolemia
- Cerebral Edema
  - N/V
  - Irritability
  - Slowed breathing
  - Headache
  - Blurred vision
- Edema
- Muscle twitching, cramping

Treatment:

- Restrict fluids
- Diuretic
- Hypertonic Saline solution

282

Electrolytes – Sodium

Normal value 135 - 145

Hypernatremia:

- Hypovolemia
  - Thirst
  - Concentrated urine
  - Muscle weakness
  - Seizures
  - ↓ LOC
- Fluid shifts out of tissues and into the vascular system

Treatment:

- Fluid Replacement

283

Magnesium - Hypomagnesemia

Normal value is 1.5 to 2.5

- Poor nutrition
  - Addiction
  - Elderly
- Pancreatitis
- Diuretics
- Symptoms
  - Muscle spasms and twitching
  - Ventricular arrhythmias
- Treatment
  - Magnesium Replacement

284

Magnesium - Hypermagnesemia

Normal value is 1.5 to 2.5

- Sedative effect on the CNS
- Used for premature labor, Preeclampsia,
  - Monitor mom / baby
    - Rapid onset pulmonary edema
    - Poor deep tendon reflexes
    - Hypotension
- Treatment
  - Calcium gluconate and fluid to promote diuresis

285

Calcium - Hypocalcemia

Normal value is 8.5 - 10.5
Normal Ionized Value is 4.5 - 5.6

- Hypoparathyroidism
  - ↓CA and ↑ Phosphate
- Multiple banked blood transfusions – Citrate
- Diuretics
- Vitamin D deficiencies

- Symptoms
  - Twitching
  - Laryngospasm
  - Cramping
  - Diarrhea
  - Prolonged ST, QT intervals
  - ↑ PT/INR, PTT
  - Positive Chvostek's sign and Trousseau's sign
- Treat with replacement

286

Calcium - Hypercalcemia

Normal value is 8.5 - 10.5
Normal Ionized Value is 4.5 - 5.6

- Hyperparathyroidism
  - ↓Phosphate and ↑ Ca
- Hypophosphatemia
- Vomiting
- Diarrhea
- Diuresis
- Burns

- Symptoms
  - Bradycardia
  - Hypotension
  - Weakness
  - ↓ Deep Tendon Reflexes
  - ↓ Bowel sounds
  - Decreased LOC
- Treatment
  - Phosphate replacement
  - Ca channel blockers
  - Lasix

287

Phosphorus - Hypophosphatemia

Normal value is 1-2mEq/L

- Hyperparathyroidism
  - ↓Phosphate and ↑ Ca
- Hypercalcemia
- Vomiting
- Diarrhea
- Diuresis
- Burn patients

- Symptoms
  - Bradycardia
  - Hypotension
  - Weakness
  - ↓ Deep Tendon Reflexes
  - ↓ Bowel sounds
  - Decreased LOC
- Treatment:
  - Phosphate replacement
    - Watch Calcium!
  - Ca channel blockers
  - Lasix

288

Phosphorus - Hyperphosphatemia

Normal value is 1-2mEq/L

- Hypoparathyroidism
  - ↓CA and ↑ Phosphate
- Hypocalcemia

- Symptoms
  - Twitching
  - Laryngospasm
  - Cramping
  - Diarrhea
  - Prolonged ST, QT intervals
  - Positive Chvostek's sign and Trousseau's sign
- Treatment
  - Calcium Replacement
  - Phosphorus binding antacids
  - Dialysis

289

Potassium - Hypokalemia

Normal value is 3.5 – 5.0

- Lost by diuretics
- Bowel prep
- Vomiting / diarrhea
- Laxative abuse, Bulimia

- Symptoms
  - Abdominal distention
  - Loss of bowel sounds
  - Weakness
  - Hypotension
  - PVCs
- Treat with potassium replacement

290

Potassium - Hyperkalemia

Normal value is 3.5 - 5.0

- Usually caused medically
- Massive crushing trauma

- Symptoms
  - Intestinal cramping
  - Prolonged PR, QT interval
    - Widened QRS
  - Peaked T waves
  - Hypertension
  - Spastic paralysis
  - Cardiac standstill

- Potassium, Hydrogen Ion and glucose are Pals
  - Diabetic Ketoacidosis
  - burns
  - Addison disease

- Treatment:
  - Kayexalate
    - takes several hours.
  - D50 followed by insulin
  - Correction of acidosis

291

Hematology, Fluid and Electrolytes Quiz

- 12 Questions
- 12 Minutes

292

HEMATOLOGY, FLUID AND ELECTROLYTES

12 Minutes

1. You are caring for Mr. Brown, a multi-trauma after a motor vehicle crash. You are administering packed red blood cells. 15 minutes after starting the blood, his temperature has increased from 99 to 103, his urine is dark, and he is tachypneic. You suspect:

    a) Malignant hyperthermia
    b) Hyperkalemia
    c) Hemolytic reaction to the blood
    d) Pyrogenic reaction to blood

2. Your first action to take after noticing the symptoms in the previous question would be:

    a) Discontinue the blood
    b) Give a Tylenol suppository
    c) Call the surgeon
    d) Give the patient a LR bolus

3. Hyponatremia can be caused by:

    a) Dehydration
    b) Bladder Irrigation fluid
    c) Large blood loss
    d) Hypothermia

4. Chvostek's sign can indicate:

    a) Low potassium
    b) High glucose
    c) Respiratory alkalosis
    d) Low calcium

5. Patients with one or more of Virchow's triad are at increased risk for

    a) Deep vein thrombosis
    b) Hemorrhage
    c) Surgical site infection
    d) Respiratory distress

6. Mr. B is post transurethral resection of the prostate. The CRNA reports that Glycine was used as an expansion medium. Why is this significant?

    a) This can cause hypervolemia and hyponatremia
    b) This can cause hypovolemia and hypernatremia
    c) Large volumes used during this procedure may perforate the bladder from over expansion
    d) This causes Hyperkalemia and hypertension

7. Mr. K has come to the OR for a bowel resection. His preoperative lab work shows a potassium of 2.9. What manifestations would you expect to find?

    a) Crushing injuries
    b) Muscle cramping
    c) Hypotension
    d) Vomiting and diarrhea

8. Ms. F is a 19-year-old patient who has been hospitalized for 2 days after a snow mobile accident. She comes to you post wound debridement. You notice some petechia on her abdomen during your initial assessment. Her CBC shows that the fibrinogen and platelets are both decreased. What complication do you expect Ms. F might be experiencing?

    a) Heparin Induced Thrombocytopenia
    b) Acute hemolytic reaction
    c) Metabolic syndrome
    d) Disseminated Intervascular Coagulation

9. Written policies and procedures for blood transfusion services must conform to the standards of the:

    a) American Red Cross
    b) American Association of Blood Banks
    c) American Medical Association
    d) American Heart Association

10. The patient arrives to the pre-operative area reporting that they have had uncontrolled vomiting and diarrhea for two days. The GI upset stopped early hours this morning but the patient reports feeling weak. They patient's initial VS show hypotension and the EKG shows an inverted T wave in lead II. The Perianesthesia nurse calls the physician because

    a) She suspects the patient has a low potassium level and needs labs drawn and fluids with potassium started
    b) The patient has the flu and needs to be isolated
    c) The patient's case will need to be moved up so he can be seen quickly
    d) He will want to know the patient has arrived

11. Which of the following laboratory measures would be seen in a patient with DIC?

    a) Prolonged PT, Prolonged PTT, Elevated Fibrinogen
    b) Prolonged PT, Normal PTT and elevated Fibrinogen
    c) Normal PT, Normal PTT, Low Platelet Count
    d) Prolonged PT, Prolonged PTT, decreased Fibrinogen

12. A 17-year-old young man has arrived in the preoperative area. He has a history of Sickle Cell Anemia and is going for an appendectomy. The Perianesthesia nurse decreases the patient's likelihood of a sickle cell crisis by

    a) Providing antiemetics as ordered
    b) Placing a forced air warmer on the patient
    c) Obtaining a detailed history of past surgeries
    d) Giving pain medications as ordered

Pharmacology and Anesthesia

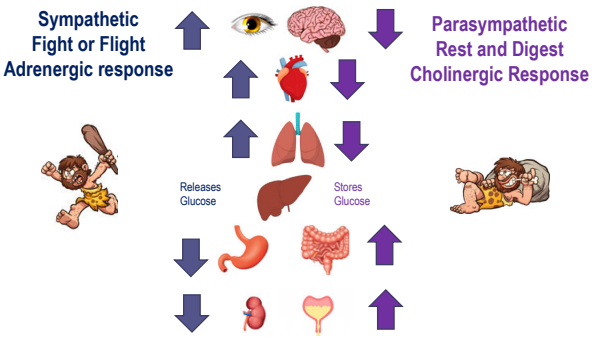
Objectives:

1. Discuss the most commonly used pharmacologic agents used in the perianesthesia patient
2. Plan care based on regional anesthesia technique used

Adrenergic	GABA Receptor Agents
Adrenergic Blockers	Narcotics
Renin-Angiotensin-Aldosterone	Paralytics
Diuretics	Regional Blocks
Calcium Channel Blockers	LAST
Vasodilators	Neuraxial Anesthesia
Physiology of Pain	General Anesthesia

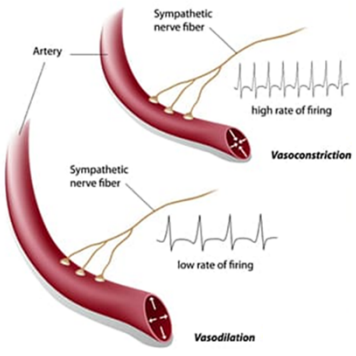
305

Autonomic Nervous System



306

Sympathetic Nervous System



Arteries are only connected to the **Sympathetic Nervous System** (Only Adrenergic Receptors)

307

Adrenergic V. Cholinergic

- Adrenergic Drugs
  - Affect the Sympathetic Nervous System
  - Mimic, inhibit or enhance the neurotransmitter adrenaline and noradrenaline
    - Two types of Adrenergic Receptors:
      - Alpha and Beta
- Cholinergic Drugs
  - Affect the Parasympathetic Nervous System
  - Mimic, inhibit or enhance the neurotransmitter acetylcholine
    - Two types of Cholinergic Receptors:
      - Nicotinic and Muscarinic

308

Alpha Adrenergic Receptors

- Alpha-1
  - On the vascular smooth muscle
    - Simulation constricts
    - Blocking dilates
  - Also on the muscles around the urinary tract
    - Stimulation constricts
    - Blocking dilates

- Alpha-2
  - On the bronchiole muscle
    - Stimulation dilates
    - Blocking constricts

309

Beta Adrenergic Receptors

- Beta-1
  - On the myocardium
    - Simulation squeezes the heart harder and faster
    - Blocking relaxes and slows
  - On the Kidneys
    - Stimulation increases blood flow and releases Renin
- Beta-2
  - On the bronchiole muscle
    - Stimulation bronchodilates
    - Blocking bronchoconstricts
- Beta-3 (**FAT**)
  - On the liver
  - Stimulation causes lipolysis -> Glucose releases

310

Adrenergic Receptor Drugs

- Dopamine – Dose matters
  - Low dose: 2- 5 mcg/kg/min
    - Beta-1 on kidneys
      - Increases renal perfusion
  - Intermediate dose: 5-10mcg/kg/min
    - Stimulates Beta-1 in heart
      - Ionotropic and Chronotropic
  - High dose: >10mcg/kg/min
    - Stimulates Alpha 1
      - Vasoconstrictor

311

Adrenergic Receptor Drugs

- Dobutamine
  - Stimulates Beta-1
    - Ionotropic and Chronotropic
  - Simulates Beta-2
    - Bronchodilator
- Epinephrine
  - Acts on all adrenergic receptors
    - Ionotropic and Chronotropic
    - Vasoconstriction
    - Lipolysis

312

Adrenergic Receptor Drugs

- Levophed (Norepinephrine)
  - Acts on all adrenergic receptors
    - Vasoconstriction
    - Ionotropic and Chronotropic
    - Lipolysis
- Neo-Synephrine (Phenylephrine)
  - Acts on Alpha-1 receptor
    - Vasoconstriction

313

Not really an Adrenergic Drug

- Pitressin (Vasopressin)
  - This is a peptide hormone naturally produced by your hypothalamus
    - When naturally occurring known as arginine vasopressin or antidiuretic hormone (ADH)
      - Suppresses diuresis – Treats Diabetes Insipidus
- People sometimes think of it as an adrenergic because
  - Large doses act on Alpha-1 receptor
    - Vasoconstriction
      - Off label usage for GI bleed and V-tach and V-Fib

314

Alpha Adrenergic Blockers

- Hytrin (Terazosin)
  - Alpha-1 Blocker
    - Vasodilator
      - Decreases BP
    - Relaxes muscles around prostate and urinary sphincter
      - Treats age related urinary retention
- Minipress (Prazosin)
  - Alpha-1 Blocker
    - Vasodilator
      - Decreases BP
    - Reduces hyperawareness associated with PTSD

315

Alpha Adrenergic Blockers

- Cardura (Doxazosin)
  - Alpha-1 Blocker
    - Relaxes muscles around prostate and urinary sphincter
      - Treats age related urinary retention
      - This is the primary function for Doxazosin
    - Vasodilator
      - Decreases BP

316

Alpha and Beta Adrenergic Blockers

- Coreg (Carvedilol)
  - Non-selective Alpha and Beta blocker
    - Vasodilation
      - Decreased peripheral resistance after a heart attack
- Trandate (Labetalol)
  - Alpha and Beta Blocker
    - Reduces heart rate during exercise while maintaining cardiac output by an increase in stroke volume and decreased vascular resistance

317

Beta Blockers

- Beta-1 Antagonists
  - Negative ionotropic and chronotropic effect
    - Decrease heart rate and blood pressure
  - Reduce production of melatonin
    - Sleep disturbances
      - Beta-1 side effect that can affect compliance
- Beta-2 Antagonists – not on purpose
  - Beta blockers try to target Beta-1
  - No clinical use

318

Renin-Angiotensin-Aldosterone System

Naturally activated by low BP

- Beta-1 activated by Sympathetic Nervous System
  - On the Kidneys
    - Stimulation increases blood flow and releases Renin
    - **Goal is to produce Angiotensin II**
  - Renin causes the liver to produce Angiotensinogen
    - When activated, this becomes Angiotensin I in the blood
  - Angiotensin I circulates through the lungs and kidneys
    - Angiotensin Converting Enzyme (ACE) lives in the endothelium of the lung and kidney
  - Angiotensin Converting Enzyme (ACE)
    - Converts Angiotensin I into Angiotensin II

319

Renin-Angiotensin-Aldosterone System

- Why is Angiotensin II so great?
- Vasoconstriction
  - Does this by breaking down Bradykinin
    - Bradykinin is an inflammatory substance that vasodilates
- Acts on the kidneys
  - Angiotensin II cause kidneys to hold onto sodium (and water) independently
    - Decreases Urine output
  - Stimulates adrenal cortex to make Aldosterone
    - Decreases urine output
    - Causes kidneys to hold onto sodium (and water)
    - Potassium sparing
  - Stimulates pituitary to produce ADH
    - Decreases urine output

320

Renin-Angiotensin-Aldosterone System Agents

- ACE inhibitors 
  - Inhibits conversion of angiotensin I into angiotensin II
- ARBs (Angiotensin Receptor Blockers)
  - Blocks access of angiotensin II to the receptors
    - Mostly on smooth vascular muscle and adrenal gland 
- Aldosterone antagonists
  - Blocks aldosterone 

321

RAAS Agents - ACE inhibitors

- Lowers Blood Pressure
  - Relaxes blood vessels
  - Decreased fluid retention
- Generics end in 'pril'
  - Benazepril
  - Captopril
  - Enalapril
  - Lisinopril
  - Ramipril
  - Fosinopril
- Nursing considerations
  - No Angiotensin II constricting the vessels
    - Hypotension
  - No angiotensin II on Adrenals
    - Releases Sodium (and water)
    - Holds onto Potassium
      - Hyperkalemia
  - Bradykinin (irritant) not broken down by RAAS
    - Cough
    - Switch to ARBs

322

RAAS Agents - ARBs

- Lowers Blood Pressure
  - Relaxes blood vessels
  - Decreased fluid retention
- Generics end in 'sartan'
  - Losartan
  - Candesartan
  - Valsartan
  - Olmesartan
- Nursing considerations
  - Blocking Angiotensin II receptors on the vessels
    - Hypotension
  - Blocking angiotensin II receptors on the adrenals
    - Releases Sodium (and water)
    - Holds onto Potassium
      - Hyperkalemia

323

RAAS Agents - Aldosterone antagonists

- Diuretic
  - Releases Sodium
    - and water
  - Holds onto Potassium
- Nursing considerations
  - Holds onto Potassium
    - Hyperkalemia
- Generics end in 'one'
  - Aldactone
  - Eplerenone
  - Spironolactone

324

Thiazide Diuretics

Acts directly on the tubule of the kidney

- Increase urine output
  - Decreased extracellular fluid (ECF) and plasma volume
    - Good for mobilization of edematous fluid
  - Potassium wasting
- Nursing considerations
  - Potassium wasting
    - Hypokalemia
- Thiazide Diuretics:
  - Chlorothiazide (Diuril)
  - Chlorthalidone.
  - Hydrochlorothiazide (Microzide)
  - Indapamide.
  - Metolazone

325

Loop Diuretics

Act at the ascending limb of the **loop** of Henle

- Increase urine output
  - Decreased extracellular fluid (ECF) and plasma volume
    - Good for mobilization of edematous fluid
  - Potassium wasting
- Nursing considerations
  - Hypokalemia
  - Ototoxicity – tinnitus
    - Not permanent
- Loop Diuretics:
  - Bumetanide (Bumex)
  - Ethacrynic acid (Edecrin)
  - Furosemide (Lasix)

326

Osmotic Diuretics

Pulls water into the tubules of the kidney

- Increase urine output
  - Not good for mobilizing extracellular fluid
  - Prevents renal failure
    - Cisplatin
    - Myoglobinuria with MH
  - Reduces ICP
  - Reduces Intraocular pressure
- Nursing considerations
  - Edema (not given in CHF)
  - Loss of free water
    - Hypernatremia
- Osmotic Diuretics
  - Glycerin (Glycerol)
  - Isosorbide.
  - Mannitol IV

327

Calcium Channel Blockers

- Specific to the L-Calcium Channels
  - Inhibit Ca from entering cell
    - Vascular smooth muscle
    - Cardiac myocytes
    - Cardiac nodal tissue
- Two types of Calcium Channel Blockers
  - Dihydropyridines
    - Specific to vascular smooth muscle
  - Non Dihydropyridines
    - Specific to cardiac monocytes and nodal tissue

328

Calcium Channel Blockers Dihydropyridines

- Work on vascular smooth muscle
  - Wider coronary and peripheral arteries
    - Decreased afterload (↓SVR)
    - Increase oxygenation of the myocardium
- Primarily for Hypertension and Angina
  - Miscellaneous uses
    - Migraines
    - Raynaud's syndrome
  - End in 'pine'
    - Amlodipine, Nifedipine, Felodipine
- Side Effects
  - Orthostatic hypotension

329

Calcium Channel Blockers Non Dihydropyridines

- Work on Cardiac myocytes and Nodal Tissue
  - Negative inotropic effect
    - Decreases Oxygen demand of myocardium
    - Helpful in angina not related to heart failure
  - Negative chronotropic (SA node)
  - Negative dromotropic effect (AV node)
    - Helpful in treating AV nodal dysrhythmias (SVT, A-fib)
    Non Dihydropyridines – specific to myocardial tissue
- Primarily for Hypertension, Angina, Dysrhythmias
  - Verapamil, Diltiazem

330

Calcium Channel Blockers Non Dihydropyridine

- Side Effects and Nursing Considerations
  - Bradycardia, hypotension,
  - Reflex tachycardia – in response to hypotension
  - Contraindicated in 2° or 3° block
  - Can cause 1° block
  - Monitor for S/S of heart failure
    - Edema, dyspnea
  - Don't give with Grapefruit juice – Increases effectiveness

331

Vasodilators

- Nipride / Nitropress (Nitroprusside Sodium)
  - Nipride binds to oxyhemoglobin
    - Releases cyanide, methemoglobin and nitric oxide
  - Nitric Oxide lowers blood pressure
    - but it also releases…um…cyanide
    - Symptoms of cyanide poisoning:
      - skin rash, flushing, veins show dark through skin, abdominal pain, nausea
  - Drops pressure fast
    - Any adjustment can cause very labile BP
    - IV drip with Arterial line management

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Vasodilators

- Nitroglycerin
  - Converted into nitric oxide
    - Lowers BP by causing vasodilation
  - Given sublingual, transdermal or IV
  - Treatment of choice for chest pain
  - Adverse reaction includes hypotension and headaches

333

Vasodilators

- Apresoline (Hydralazine)
  - Direct relaxation of vascular smooth muscle
    - Mechanism not really understood
  - Nursing considerations & Side effects
  - Can stimulate Beta-1
    - Increase HR, BP and Renin (fluid retention)
    - Usually given with a Beta Blocker to help with that
    - Headache and tachycardia significantly higher

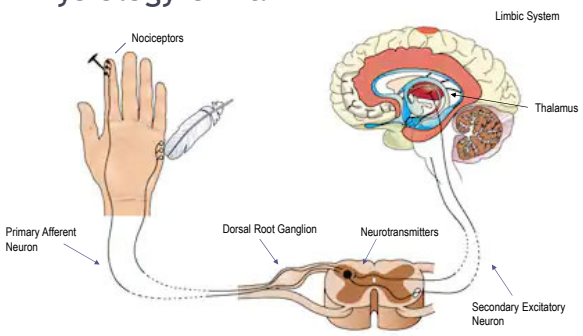
334

Physiology of Pain

- Noxious stimuli
  - Interpreted as something that could cause damage to our tissues
- Nociceptors are activated and send signals to our brain
  - Specialize receptors for pain
  - Let your brain know all about the dumb thing you just did

335

Physiology of Pain



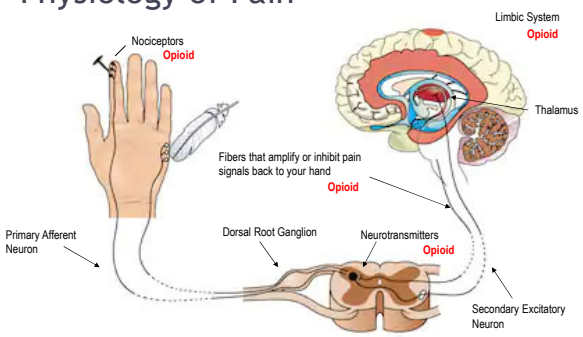
336

Physiology of Pain

- Limbic System
  - Modifies our behaviors and emotions about pain
- Opioids are great for pain because they inhibit multiple steps in this pathway
  - Periphery
  - Spinal Cord
  - Brain
    - Sedation
    - Decrease Emotional Response to pain

337

Physiology of Pain



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Opioid Receptors

- We control our own pain with natural Endorphins
  - We have receptors for our endorphins so we can build muscle, move stuff and run from tigers
    - Sometimes the natural ability to ignore pain is a big advantage
  - The word **Endorphin** derived from the words **Endo**genous Mo**rphin**e <- See what they did there?
- Synthetic opioids can cause a histamine release in some people

339

Opioid Receptors

- Activated Opioid receptors
  - Pharmacological stronger than natural endorphins
  - Cause analgesia AND suite of side effects
    - Kappa Receptors
      - Anxiety and Restlessness
      - Nausea
      - Dizziness
    - Delta and Mu Receptors
      - Sedation
      - Urinary retention and constipation
      - Respiratory Depression
        - Suppress midbrain ability to detect CO_2

340

Narcotics

- Fentanyl is 100x more potent than Morphine
  - Push slowly
    - Rapid IV injection may trigger bronchial constriction and chest wall rigidity
  - Dose 50-100 mcg
  - Onset < 30 Seconds
  - Duration 30-60 minutes
- Sufentanil is 5-10x stronger than Fentanyl
  - Adjunct to general anesthesia
  - Onset 1-3 min
  - Duration 20-45 min

341

Narcotics

- Hydromorphone is 7x more potent than Morphine
  - Push slowly
  - Dose: 0.5-2 mg
  - Onset-< 1 minute
  - Duration: 2-4 hours
- Morphine dances all over that Kappa receptor
  - Nausea and vomiting
  - Dose: 2-15 mg
  - Onset 1-5 minutes
  - Duration 4 hours
- Demerol is a weak opioid used for shivering only
  - Dose: 12.5-25 mg

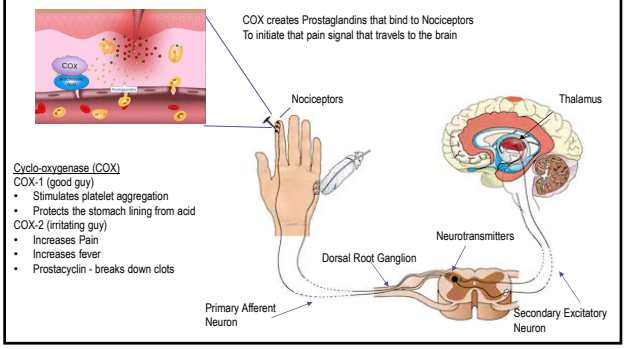
342

Narcotic Reversal Agent

- Naloxone (Narcan)
  - Competes for the opiate receptors
  - Dose: 0.1 to 0.2 mg at two- to three-minute intervals
  - Onset 1-2 min
  - Duration 30-45 minutes
  - Monitor for return of respiratory depression

343

NSAIDs inhibit Cyclo-oxygenase (COX)



344

Classical NSAIDs

Non-Selective COX inhibitors

- Block COX-1 and COX-2
  - Anti inflammatory
  - Antipyretic
  - Analgesic
- Side Effects
  - Stomach Ulcers
    - COX 1 protects the lining of the stomach from acid
  - Anticoagulant
    - Inhibits platelet aggregation
  - Bronchospasm
    - Some prostaglandins have a role in bronchodilation

345

New Generation NSAIDs

Selective COX-2 inhibitors

- Block only COX-2
  - Anti inflammatory
  - Antipyretic
  - Analgesic
- Side Effects
  - COX-1 is busy causing platelets to clot
  - COX-2 is inhibited and not producing prostacyclin to break them down
  - Increased risk of clotting
    - Stroke
    - MI

346

NSAID Selectivity	Drugs	Notes
COX-2 Selective	Celecoxib	• Increased risk for CV events • Decreased risk for GI side effects
Semiselective	Diclofenac Etodolac Indomethacin Meloxicam Nabumetone Piroxicam Sulindac	• Increased affinity for COX-2 but still retain activity for COX-1 • Use with caution in patients at increased CV risk • Diclofenac has demonstrated the highest CV risk of any of the nonselective NSAIDs
Nonselective	Ibuprofen Naproxen	• Decreased risk for CV events • Increased risk for GI side effects • Naproxen has demonstrated the least CV risk compared to others
Irreversible Nonselective	Aspirin	• Cardioprotective at low doses • Increased risk for GI side effects

347

Nonpharmacologic Therapy

- Cold therapy, decreases bleeding, pain, edema. Take care to prevent tissue damage by covering ice pack
- Heat useful for muscle aches, back pain, take care to prevent burns
- Massage
- Therapeutic touch to promote relaxation
- Slow deep breathing
- Imagery
- Music
- Distraction

348

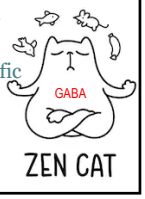
Physiology of Anxiety

- During times of stress the **Amygdala** sends out signals to other parts of the brain to create feelings of fear and anxiety.
  - Amygdala is the CNS's Fraidy Cat
- GABA suppresses those signals to control anxiety
  - We learn to control our anxiety with experience
    - We're yanking on our GABA receptors when we do that

349

Central Nervous System - GABA Receptors

- Three classes of drug work on the GABA receptor
  - Benzodiazepines
    - GABA channel opens more frequently
  - Barbiturates
    - GABA channel opens for much longer
      - Toxic dose is not much higher than therapeutic
  - Non-barbiturate Hypnotics
    - Binds directly to the GABA binding site specific to sleepiness, not anxiety



350

Benzodiazepines Suppress the CNS

- Antianxiety
  - Suppresses the Amygdala
    - Amnesia
- Muscle relaxant
  - Inhibits the polysynaptic pathway in the spinal cord
    - Good for muscle spasms
- Suppresses Seizures
  - Affects the voltage gated sodium channels
- Side effects
  - Drowsiness
  - Confusion
  - Respiratory Depression
    - Suppresses midbrain ability to detect CO_2

351

Benzodiazepines

- Diazepam takes days to fully metabolize
  - Onset 1-5 minutes
  - Peak duration 1-2 hours
  - Full duration 40-50 hours
- Lorazepam has good cardiac and respiratory stability
  - Onset 5-20 minutes
  - Duration 10-20 hours
- Midazolam is short acting
  - Onset 15 minutes
  - Peak duration 1-2
  - Duration 2-6 hours

352

Benzodiazepines - Reversal

- Flumazenil (Romazicon)
  - Competitively inhibits the activity at the benzodiazepine recognition site on the GABA receptor
  - Onset: 1 to 2 minutes
  - Duration: 19 to 50 minutes
    - Peak effect is 6 to 10 minutes after administration
    - 80% response is seen within the first 3 minutes

353

Barbiturates

- Powerful CNS antagonist
- Not given long term
  - Tolerance is unacceptable
    - Toxic dose is not much higher than Therapeutic
- No Reversal Agent
  - Clinical half life very short
  - Elimination lengthy

354

Barbiturates

- Thiopental (sodium pentothal) is fast acting
  - Used for induction
  - Onset Immediate
  - Peak duration 5-10 minutes
  - Can take up to 10 hours to fully metabolize
- Brevital (Methohexital)
  - Lowers seizure threshold
    - Agent of choice for electroconvulsive therapy (ECT)
  - Onset: Immediate
  - Duration 10-20 Minutes
  - Burns on injection – push slowly

355

Nonbarbiturate Hypnotics

- Binds directly to the GABA receptor specific to sedation
- Does not reduce anxiety
- Used for Induction
- No Reversal Agent
  - Clinical half life very short
  - Elimination lengthy

356

Nonbarbiturate Hypnotics

- Propofol
  - Contraindicated in egg & soybean allergies
  - Onset immediate
  - Peak duration 5-10 minutes
- Etomidate
  - Frequently causes nausea
  - Onset 15-45 secs
  - Duration 3-12 minutes
  - Adrenal suppression up to 24 hours

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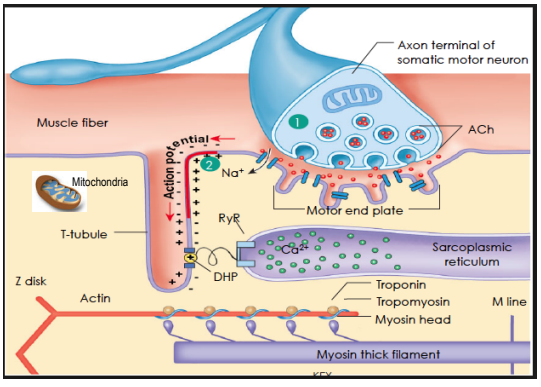

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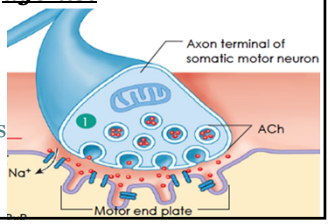
Depolarizing Muscle Relaxants

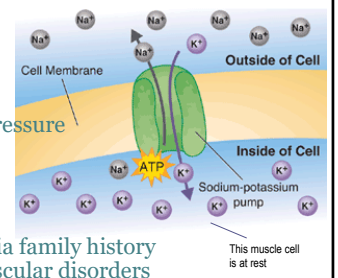
- Succinylcholine (Anectine)
  - Used primarily for induction to facilitate tracheal intubation
  - Acetylcholine receptor ***agonist***
    - Rapid onset 1 min
    - Duration 5-10 min
- Metabolized by Pseudocholinesterase
  - Not the normal process of acetylcholinesterase
    - Takes longer



359

Succinylcholine

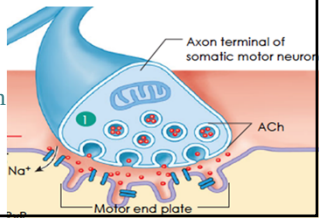
- Adverse reactions
  - Bradycardia
  - Increases intraocular pressure
  - Hyperkalemia
  - Oxygen depletion
- Contraindications
  - Malignant Hyperthermia family history
  - Degenerative neuromuscular disorders
- No Reversal agent
  - Effects reversed quickly by metabolism only
    - Pseudocholinesterase Deficiency



360

Non-Depolarizing Muscle Relaxants

- Acetylcholine competitive ***antagonists***
  - Aptly called blocking agents
  - Blocks acetylcholine
  - Does not interact with receptor
- All work slower than Succinylcholine
  - Larger doses Rocuronium come close



361

Non-Depolarizing Muscle Relaxants

Intermediate Acting (less than an hour)

- Rocuronium fastest NDMR especially in large doses
  - Onset 60-90 seconds
  - Duration 15-20 min
- Vecuronium likes the heart receptors a little too
  - Onset 3-5 min
  - Duration 20-35 min

362

Non-Depolarizing Muscle Relaxants

Intermediate Acting (less than an hour)

- Atracurium has a histamine release
  - Can cause hypotension/bradycardia
  - Onset 3-5 min
  - Duration 20-35 min
- Cisatracurium is quick, strong and long
  - 3 times more potent than Atracurium
  - Onset 1.5-2 minutes
  - Duration 50-60 minutes

363

Non-Depolarizing Muscle Relaxants

Long Acting (more than an hour)

- Pancuronium has a histamine release at high doses
  - Can increase HR and BP
  - Onset 3-5 minutes
  - Duration 60-120 minutes
- Pipecuronium has a histamine release
  - Onset 3-5 minutes
  - Duration 60-90 minutes
- Doxacurium has a strong histamine release
  - Flushing, itching, Bronchospasm, Hypotension
  - Onset 3-5 minutes
  - Duration 60-120 minutes

364

Anticholinesterases
NDMR reversal agents

- Work indirectly by increasing the acetylcholine concentration in the neuromuscular junction
  - Displaces the muscle relaxant from the acetylcholine receptor
  - Only works when there is not extra muscle relaxant ready to jump on the receptor
    - Given when function already partially recovered
      - No more unbound muscle relaxant waiting
    - If not, re-paralysis occurs

365

Anticholinesterases
NDMR reversal agents

- Act at both skeletal neuromuscular junction and parasympathetic system
  - Numerous unwanted side effects
    - Bradycardia
    - Bronchospasm
    - Enhanced GI peristalsis
    - Enhanced oral secretions
- Therefore, typically combined with a muscarinic antagonist (anticholinergic)
  - Glycopyrrolate or Atropine

366

Anticholinesterases
NDMR reversal agents

- Neostigmine
  - Always mixed with glycopyrrolate
    - Atropine effects occur before neostigmine
  - Onset in 3.5 - 7 min
  - Duration 60 min
- Edrophonium - Enlon Plus is premixed with atropine
  - Onset 30 - 90 sec
  - Duration 60 min
- Pyridostigmine is less commonly used
  - Mixed with glycopyrrolate
  - Onset 4 - 12 minutes <- why less commonly used
  - Duration 90 minutes

367

Sugammadex

- Selectively binds rocuronium or vecuronium
  - Able to reverse any depth of neuromuscular block
  - Sucks muscle relaxant out of muscles
  - Injected IV (central compartment)
  - ⬇
  - Binds with free Roc or Vec
  - ⬇
  - Concentration gradient shifts Roc/Vec from peripheral compartment (muscle) to central compartment (vasculature)
  - ⬇
  - Binds to more Roc/Vec

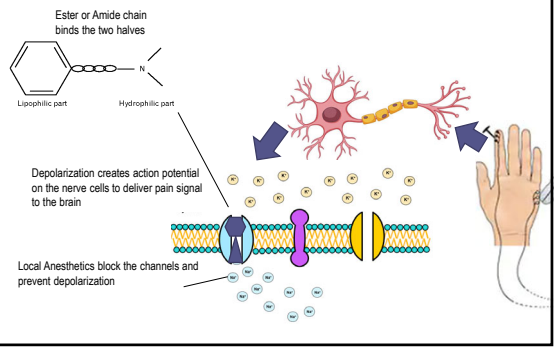
368

Anticholinergic

- Cholinergic Response
  Rest and Digest
  - Anticholinergics suppress this parasympathetic response
    - Inhibits acetylcholine
  - 'Digest antagonist':
    - Decreases acidity of gastric secretions
    - Decreases oral secretions
  - 'Rest antagonist':
    - Used for bradycardias
- Nursing Considerations
  - Anticholinergic syndrome
    - agitated (hyperactive) delirium
    - confusion, restlessness and picking at imaginary objects
- Anticholinergic Drugs
  - Glycopyrrolate (Robinol)
  - Atropine (Atropen)
  - Scopolamine

369

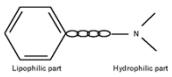
Local Anesthesia



370

Local Anesthesia

- **Esters**-cocaine, procaine, tetracaine
  - Metabolized by pseudocholinesterase
    - Process releases para-aminobenzoic acid (PABA)
      - Some people are allergic to that
- **Amides**-bupivicaine, lidocaine, mepivacaine,
  - Metabolized in liver



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Esters

- Cocaine
  - Topical only
  - ENT cases-vasoconstriction
  - CNS Stimulant
  - Toxicity:
    - Increases BP, HR, temperature
    - CVA, coronary artery vasoconstriction
    - Decreased fetal blood flow
- Procaine
  - Local, block, spinal
- Chloroprocaine
  - Stronger but shorter duration than Procaine
  - Local, block, epidural
  - Duration 30-60 minutes
- Tetracaine
  - Local, block
  - Slow onset, long duration
  - Eyes, tracheal topical

372

Amides

- Lidocaine
  - Topical, block, spinal, epidural, Bier block
  - Rapid onset
  - Depresses reflexes trachea and larynx
  - Duration 1.5-2 hours
- Prilocaine
  - Local, block, IV, epidural
  - Metabolism releases ortho-toluidine
    - Converts hemoglobin to Methemoglobin
  - Methemoglobinemia S/S
    - Darkened urine and blood
    - Tachypnea
    - Metabolic acidosis
    - Hypoxia
  - Treatment
    - Methylene blue
      - 1-2 mg/kg
    - Can repeat

373

Amides

- Mepivacaine
  - Local, block, epidural. NOT spinals
  - Longer acting than Lidocaine
  - Does not cause vasodilation
- Ropivacaine
  - Epidural
  - Safe for OB use
  - 12 hours duration
- Bupivacaine
  - Local, block, spinal, epidural
  - Long duration
  - Analgesia after anesthetic effect resolved 4 to 8 hr
- Etidocaine
  - Local, block, epidural
  - 5-10 hours duration
  - Local

374

Regional Blocks

- Traditional technique
  - Palpate for an artery
    - Nerves just distal to arteries
  - Push the needle toward the artery until patient reports a shock runs down extremity
  - Inject

375

Regional Blocks

- Nerve stimulator technique
  - Advance nerve stimulator toward the nerve
  - Slowly turn down the amps as advances
  - Still twitching when you get to 1 amp?
  - Inject
- Ultrasound guided technique
  - See the anatomy and where the block should be
  - Inject
  - Bleeding and nerve damage rare

376

Regional Blocks

- Cervical Plexus Block
  - Superficial surgery on the neck and shoulders and thyroid surgery
  - Most commonly carotid endarterectomy
    - Neuro status during cross clamp of carotid artery
- Deep or Superficial block same areas
  - Deep cervical plexus block
    - C2-4 spinal nerves
    - Complications far more common
  - Superficial cervical plexus block
    - Subcutaneous blockade of superficial branches of C2-4 spinal nerves

377

Regional Blocks

- Cervical Plexus Block Complications
  - Intrathecal or intravascular injection
    - Local Anesthetic Systemic Toxicity
  - Phrenic nerve paralysis
  - Hoarse voice
- Contraindications
  - Patient refusal,
  - Local infection
  - Previous surgery or radiation therapy to the neck

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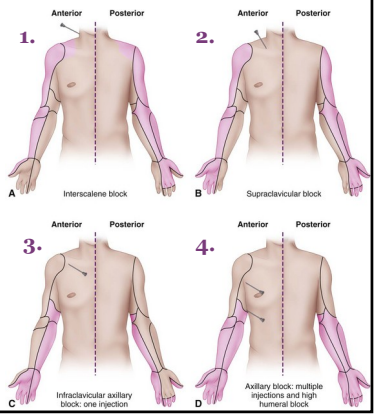
Brachial Plexus Block

1. Interscalene
2. Supraclavicular
3. Infraclavicular
4. Axillary



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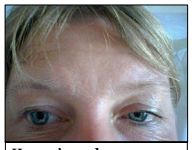
Brachial Plexus Block Complications

- Interscalene
  - Horner's syndrome
  - Phrenic nerve paresis common
- Supraclavicular
  - Pneumothorax
  - Phrenic nerve paresis less common
- Infraclavicular
  - Short duration
  - Good pain control
- Axillary
  - Hematoma
  - Accidental vascular injection
  - Reliability improving with ultrasound technique

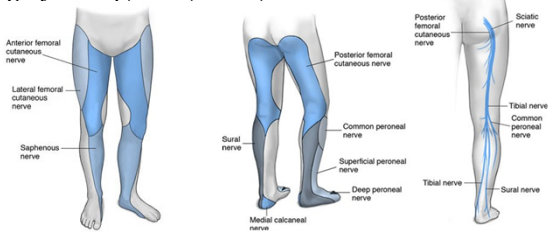


Horner's syndrome
Signs on same side as the block
- Miosis
  - Constricted pupil
- Ptosis
  - Droopy eyelid
- Anhydrosis
  - Decreased sweating

380

Lower Extremity Blocks

- Patient not a candidate for general or neuraxial anesthesia
- Surgery on hip, knee, ankle, or foot



381

Local Anesthetic Systemic Toxicity (LAST)

- High Serum levels of the local Anesthetic
  - Use the lowest dose to achieve desired result
- Central Nervous System and/or Cardiovascular System complications
- Early signs usually appear around a minute after injection but can be delayed for up to 30 min
- Frequent verbal communication with patient to assess for S/S

382

Local Anesthetic Systemic Toxicity (LAST)

- All local anesthetic agents are sodium channel blockers
  - Blocks action potential in nerve cells
    - The SA and AV nodes are nerve cells…Hello
- Injection of local anesthetic into the systemic circulation
  - Either errantly as part of a regional block i.e. Bier block
- Rapid absorption of local anesthetic injected into a Doses in excess of the maximum
  - Typically with multiple subcutaneous injections

383

Signs and Symptoms of LAST

1. Initial Phase:
   - Metallic Taste
   - Numb tongue and lips
   - Ringing in ears
   - Light headedness
   - Agitation
2. Excitation Phase:
   - Shivering
   - Slurred speech
   - Confusion
   - Seizures
   - Tachycardia/hypertension
3. Depression Phase:
   - Coma
   - Bradycardia/hypotension (progression)
   - Ventricular arrhythmias
   - Respiratory/Cardiac arrest

384

Patients at highest risk for LAST

- Advanced age
- Heart failure, ischemic heart disease, conduction abnormalities
- Liver disease
- Low Albumin Levels
- Metabolic or respiratory acidosis

385

Local Anesthetic Systemic Toxicity (LAST)

- Prevention!
  - Know + calculate maximum doses of local anesthetic agent
  - Always aspirate prior to injection
  - Ask patient about symptoms after injection
  - Serial repairs of large or multiple wounds
- Oxygen, Monitors, IV fluid
  - Hyperventilate with 100% O2
  - Establish IV access if not already there
- ACLS
- 20% lipid emulsion ★
  - 1-1.5 ml/kg bolus over a minute
    - Can repeat bolus up to 3x
    - Then infusion at 0.25 ml/kg/min

386

Peridural or Epidural/Caudal	Subdural or Spinal / Saddle
• Medication injected into epidural space • Can be used for postoperative pain • Longer Duration achievable • Thoracic and Lumbar region • Preferred for Obstetrics • Onset in 15 – 30 minutes	• Medication injected into the spinal fluid • Lasts about two hours • Injected below L2 • Not for postoperative pain • Onset in 5 minutes

387

Neuraxial Anesthesia Long procedures

- Bupivacaine:
  - Duration 90-120 mins
  - Slightly more intense sensory anesthesia and less motor blockade than Tetracaine
  - Fentanyl or Morphine as adjunct common
- Tetracaine:
  - Duration 90-120 mins
  - Slightly more intense motor anesthesia and less sensory blockade than Bupivacaine

388

Neuraxial Anesthesia Short procedures

- Lidocaine
  - Duration 60-90 minutes
  - Good sensory and motor block
  - Has been linked to Transient neurologic symptoms (TNS)
    - Up to 1/3 of patients receiving lidocaine
- Chloroprocaine
  - Duration 60-90 minutes
  - Vasoconstriction contraindicated
  - Enhanced effects with Fentanyl and Clonidine
  - Will likely replace lidocaine as the drug of choice for short procedures
  - Initially linked to neurologic injuries in the 1980s
    - Later determined linked to accidental injection - LAST

389

Neuraxial Anesthesia Considerations

- History of spinal malformation
- Previous spinal surgery
- Psychological status
- High skill level required in children

390

Neuraxial Anesthesia Contraindications

- Patient is anticoagulated
  - Bleeding disorders
  - Pharmacological
- Increased ICP
- Septicemia
  - Weigh risks and benefits
- Skin infection at the insertion site
- Pre-existing neurologic disorders
  - Considerate controversy
  - Multiple sclerosis
  - Avoid if possible
- Cancer of Brain/spinal cord
- Patient refusal

391

Spinal Sequence

- Order of loss
  - Autonomic/Sympathetic
  - Sense of temperature
  - Pain
  - Touch
  - Movement
  - Proprioception
- Order of Return
  - Proprioception
  - Movement
  - Touch
  - Pain
  - Sense of temperature
  - Autonomic/Sympathetic

392

Neuraxial Anesthesia Complications

- Hypotension
  - Occurs in 1/3 of patients
  - Decreased Systemic vascular resistance (SVR)
    - Alpha-1 blockade
  - Decreased venous return and cardiac output
    - GREATLY enhanced by hypovolemia
- Treatment
  - IVF
  - Vasopressors
  - Slight head down position (5-10°)

393

Neuraxial Anesthesia Complications

- Post Dural Puncture Headache (PDPH)
  - Spinal anesthesia
    - Pencil point needles preferred over beveled
  - Accidental Dural puncture in Epidural anesthesia
- Noninvasive treatments
  - HOB flat, fluids, analgesics, caffeine, and Sumatriptan
- Invasive Treatment
  - Epidural Blood patch

394

Neuraxial Anesthesia Complications

- High Spinal
  - Nausea first
    - Alerts the physician to the possibility of a high spinal
    - Critical warning sign
  - Next is hypotension severe enough to cause a stroke
    - You want to catch it at nausea
  - Total spinal anesthesia" is accompanied by LOC
- Treatment
  - Airway control and ventilation
  - IVF
  - Adrenergic drugs

395

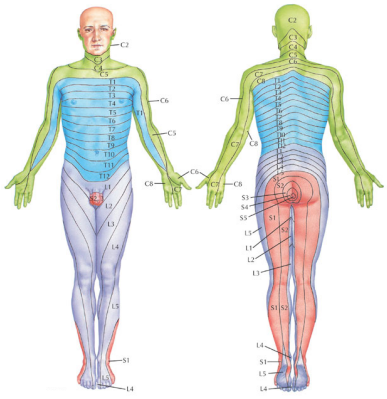
Neuraxial Anesthesia Complications

- Dyspnea
  - Patients can't feel themselves breathing and don't like that
  - Spinal anesthesia has little effect on ventilation
    - high spinals can affect abdominal/intercostal muscles and the ability to cough
  - Hypoventilation
    - Thoracic or cervical spread in Spinals
- Other Complications:
  - Urinary retention and backache

396

Dermatomes

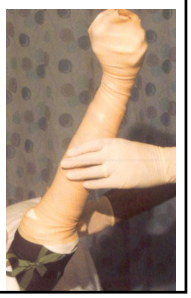
- Neck C3
- Nipples T4
- Xiphoid T6
- Navel T10
- Knees L4



397

IV Regional Anesthesia – Bier Block

- Primarily in hand procedures
- 20 to 60 minute cases are ideal
- Motor function always returns first, then sensation
- Risk of toxicity when tourniquet released



398

General Anesthesia

- A state of being unaware and unresponsive to painful stimuli
- Several aspects are involved:
  - Lack of conscious awareness
    - Unconsciousness
  - Lack of perception of pain
    - Analgesia
  - Lack of movement
    - Muscle relaxation
  - Modification of autonomic responses
    - HR BP to painful stimuli

399

General Anesthesia

- Goal: Level of sedation adequate to prevent patient being awake
  - Amount of required sedation depends on intensity of stimulation
- A combination of various drugs satisfies all the desired categories and often has a synergistic effect
  - A sedative + narcotic is more potent than bigger dose of either alone

400

No perfect drug for GA

- Volatile agent has large amount of sedation, some muscle relaxation, but no analgesia
  - Nitrous oxide does have analgesia
- Propofol has sedation, some relaxation, some amnesia and no analgesia
- Fentanyl has mild sedation, no relaxation, no amnesia and large amount of analgesia
- Muscle relaxants have no sedation, amnesia or analgesia

401

General Anesthesia Induction

- Quick onset, short acting medications
  - Non-Barbitruate Hypnotics
- Laryngeal reflexes lost
- Induction agents Do NOT provide analgesia
- Inhalation induction
  - Lack of patient cooperation or comprehension
- Nursing Considerations
  - Support ventilation, maintain open airway
  - At risk for aspiration
  - Suction ready

402

Stages of Anesthesia

- Stage I - analgesia
  - Analgesia and amnesia; drowsy
  - Conscious, can follow simple commands
- Stage II – delirium/excitation
  - Dream, excitement
  - Unconscious
  - Risk of laryngospasm
  - Risk of cardiac arrest
  - Pupils dilated

403

Stages of Anesthesia

- Stage III - Surgical stage / Unable to protect airway
  - 1st plane-regular respirations
  - 2nd plane-regular respirations, no longer moving
  - 3rd plane-diaphragmatic respirations
    - Optimal for surgeon
  - 4th-irregular respirations
- Stage 4 – OVERDOSE!!
  - Respiratory paralysis
  - Deeper than necessary

404

ASA scoring system

- ASA 1 - normal healthy patient
- ASA 2 - patient with mild systemic disease
- ASA 3 - patient with severe systemic disease
- ASA 4 - patient with severe systemic disease that is a constant threat to life
- ASA 5 - near-death patient who is not expected to survive
- ASA 6 - declared brain-dead patient
  - In an emergency the number is followed by an E

405

Inhalational Anesthetics

- Respiratory effects
  - Depresses spontaneous ventilation
  - Dull laryngo-protective reflexes
  - Cause bronchodilation
- Renal effects
  - Decrease GFR so hydrate patient
- GI effects
  - Relaxes smooth muscles
- Uterine effects
  - Relaxes uterine smooth muscles
  - May increase uterine bleeding during C-section

406

Inhalational Anesthetics

- Nursing considerations post op
  - Impairment of respiration and airway protective reflexes
  - Ectopy from dysrhythmia effects vital signs
  - Pain
  - Volatiles have no residual analgesic effect
  - Urine output
  - Temperature

407

Minimum Alveolar Concentration (MAC)

- Compares relative potency of various inhalation anesthetic gases
  - How much is needed before movement stops in response to painful stimuli
- Inverse relationship
  - Low MAC indicates a very potent anesthetic
    - Low concentration required to achieve anesthesia
  - High MAC indicates a less potent anesthetic
    - High concentration required to achieve anesthesia

408

Factors that Alter Anesthesia Requirements

- **Require more:**
- Hyperthermia
- Drug and alcohol abuse
- Acute use of amphetamines
- Hyperthyroidism

- **Require less:**
- Increased Age
- Hypothermia
- Opioids
- Alcohol intoxication
- Pregnancy
- Hypothyroidism

409

Inhalational Anesthetics

- Drugs that potentiate the effects of volatiles
  - Acute Alcohol and THC intoxication
  - Ketamine
  - Nitrous Oxide
  - Narcotics: morphine, fentanyl
  - Sedatives: benzodiazepines, barbiturates
- Drugs that antagonize volatiles
  - Amphetamines
  - Cocaine
  - Chronic Alcohol and THC intoxication
  - Naloxone

410

Inhalation Agent Classification

- **Gas:**
- Nitrous Oxide
- Does not Trigger MH

- **Volatile Liquids:**
- All triggers for MH
- Halothane
- Isoflurane (Forane)
- Sevoflurane (Ultane)
- Desflurane (Suprane)

411

Nitrous Oxide

- Good Analgesic
- Weak Anesthetic
- Excreted via lungs
- Odorless, colorless, tasteless
- Very high MAC - No anesthesia at lower doses
- Diffusion Hypoxia
  - Usually during emergence
  - N_2O displaces alveolar oxygen
  - Must have supplemental O_2 during emergence and immediate post op period

412

Halothane

- Not in common use
  - Ventricular Dysrhythmias with Epinephrine
  - 20% metabolized in liver. Some liver toxicity
- Agent most commonly associated with MH
- One of the first agents (circa 1950)
- Strongest inhalation agent Very Low MAC
- Weak Analgesic
- Bronchodilator
- Colorless, Pleasant odor
- Post Op shivering common

413

Isoflurane (Forane)

- Pungent and irritating odor
  - Skunk and rotten meat
  - Not suitable for inhalational induction
    - People hold their breath
- Metabolized mostly exhalation
- Cardiovascular Stability
- Rapid recovery
- Peripheral vasodilation
  - Postop shivering caused by heat loss from intraoperative vasodilation

414

Sevoflurane (Ultane)

- Sweet, pleasant odor, nonirritating
  - Agent of choice for inhalation induction
- Less potent CV depression, no increase in HR and BP
- Fast on, fast off
- Muscle relaxant properties which may be sufficient without a neuromuscular blocker
- No analgesic properties
  - Unhappy patients on emergence without additional analgesia
- Eliminated through exhaled breath

415

Desflurane (Suprane)

- Pungent and irritating
  - coughing, breath holding and laryngospasm
- Fast on fast off, no residual analgesia
  - Popular for ambulatory surgery
  - Low solubility = rapid emergence, less time in PACU
- Cardiovascular effects
  - Increase in HR and BP on induction

416

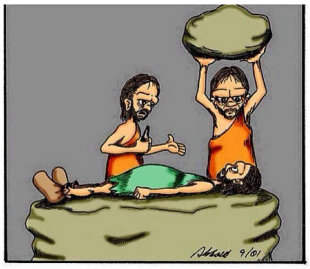
Ketamine - Dissociative Anesthesia

- N-Methyl-D-aspartate (NMDA) receptor antagonists
  - Side effects resemble psychosis
    - Paranoid delusions, Hallucinations, Confusion
    - Minimal stimulation important
    - Avoided in a person with a psychosis
- Sensory loss, analgesia, amnesia
  - Not accompanied by loss of consciousness
  - No respiratory depression
  - Does not block visceral pain
- Cannot be reversed
  - Sedation to calm adverse reaction

417

Pharmacology and Anesthesia Quiz

- 22 Questions
- 22 Minutes



"...and this is Ralph, your anesthesiologist."

418

PHARMACOLOGY AND ANESTHESIA

22 Minutes

1. Your patient is about to undergo a carpal tunnel release. The anesthesia professional asks you to assist him in applying a double tourniquet. He is going to perform a:

   a) Brachial plexus nerve block
   b) Bier Block
   c) Interscalene block
   d) Intravenous catheter insertion

2. The inhalation agent that is most likely to induce airway spasm is:

   a) Desflurane
   b) Enflurane
   c) Halothane
   d) Isoflurane

3. Which of the following nondepolarizing muscle relaxants has the most rapid onset:

   a) Atracurium
   b) Rocuronium
   c) Succinylcholine
   d) Vecuronium

4. The following is a depolarizing muscle relaxant:

   a) Norcuron
   b) Succinylcholine
   c) Rocuronium
   d) Brevital

5. A patient needs reversal of benzodiazepines. Which of the following would be used?

    a) Naloxone
    b) Flumazenil
    c) Atropine
    d) Glycopyrrolate

6. Horner's Syndrome is a possible complication of

    a) Spinal
    b) Epidural
    c) Local
    d) Brachial plexus block

7. The correct dose for Dantrolene is

    a) 25 mg/kg
    b) 2.5 mg/kg
    c) 25 mg/kg
    d) 1.25 mg/kg

8. The following are considered safe anesthetic agents to use in patients that are at risk for malignant hyperthermia except:

    a) nitrous oxide
    b) propofol
    c) succinylcholine
    d) ketamine

9. Side effects of naloxone include all of the following except:

    a) Hypertension
    b) Tachycardia
    c) Pulmonary edema
    d) Hypotension

10. A patient able to bend his knees after a spinal has a level of:

    a) T10
    b) C4
    c) L4
    d) T8

11. The floor calls looking for anesthesia about a patient who had an ORIF of the ankle done under spinal 36 hours ago. The patient is complaining of a severe headache. The perianesthesia nurse suspects a

    a) Epidural hematoma
    b) Dural leak
    c) Lack of caffeine
    d) Rebound pain from the analgesic given postop

12. The perianesthesia nurse is assisting with an epidural block in the block room when the patient begins to seize and then rapidly deteriorates with a very low HR and BP. The most important drug to give in this situation is

    a) Lidocaine
    b) Sodium Bicarb
    c) Magnesium Sulfate
    d) 20% Lipid emulsion

13. All of the following are absolute contraindications to spinal anesthesia except:

    a) Patient refusal
    b) Infected insertion site
    c) Increased intracranial pressure
    d) Previous spine surgery

14. You are the nurse working in the preoperative holding area. You are assisting the anesthesiologist, who is placing an epidural catheter to be used intraoperatively. After inserting the catheter, when the provider aspirates the syringe, the following should be seen in the syringe

    a) Blood
    b) Clear straw-colored liquid
    c) Nothing
    d) Cloudy, thick liquid

15. The anesthesiologist injects a test dose of lidocaine and epinephrine into the catheter. The nurse will observe the patient closely for:

    a) Bradycardia and hypotension
    b) Tachycardia and hypertension
    c) Cool extremities
    d) Nausea and vomiting

16. The patient's heart rate increases 30 beats/minute and systolic blood pressure increased twenty points 2 minutes after the epidural test dose. This is most likely due to

    a) Apprehension
    b) Vascular injection of test dose
    c) A normal finding
    d) Hypovolemia

17. Mrs. M is a 50-year-old female with a history of hypertension scheduled for a left total knee arthroplasty under epidural anesthesia. Because this is an epidural, you would expect the anesthesiologist to administer _____ than would be given if the case were done as a spinal.

    a) More local anesthetic
    b) Less local anesthetic
    c) Lidocaine
    d) The same amount of local anesthetic

18. You are receiving Mrs. M after a carpel tunnel release with a Bier Block Anesthetic with additional subcutaneous lidocaine for post op pain. She begins complaining of a metallic taste in her mouth, ringing in her ears and dizziness. Based on the symptoms described, you suspect:

    a) A normal Bier block
    b) Local anesthetic system toxicity
    c) The patient needs more local anesthetic
    d) The patient is hypoglycemic

19. Your patient is ordered a loop diuretic. Which finding below would require you to hold the dose and notify the physician for further orders?

    a) Calcium level 9 mg/L
    b) Potassium level 2.5 mEq/L
    c) Blood pressure 102/78
    d) Sodium level 144

20. What are some side effects of adrenergic antagonist?

    a) Tachycardia and bronchoconstriction
    b) Bradycardia and bronchoconstriction
    c) Tachycardia and Bronchodilation
    d) Bradycardia and Bronchodilation

21. Mr. K is a 78-year-old patient with a history of heart disease arrives in the holding area. He has received versed and local lidocaine injection for an axial block with bupivacaine. Upon injection of the bupivacaine, the patient begins to seize and rapidly decompensates. The perianesthesia nurse

    a) Understands the patient is likely experiencing Local Anesthetic Systemic toxicity
    b) Suspects the patient is likely experiencing Central Anticholinergic Syndrome
    c) Suspects an adverse reaction to midazolam
    d) Starts cardiopulmonary resuscitation

22. To treat Mr. K's condition in the previous question the perianesthesia nurse prepares:

a) Physostigmine injection
b) Romazicon
c) 20% lipid emulsion for rapid infusion
d) Vasopressin

Systems

Objectives:

1. Describe care of the patient having pulmonary surgery
2. Describe care of the patient with cardiovascular alterations
3. Plan care for a patient having vascular surgery
4. Discuss the care of a patient having neurological surgery
5. Describe the perianesthesia care of the EENT surgery patient

441

Systems

Objectives:

6. Describe the perianesthesia care of the patient having orthopedic surgery
7. Discuss the perianesthesia care of the OB/GYN patient
8. Describe the perianesthesia care of the genitourinary patient
9. Plan the perioperative care of the patient having GI surgery

442

Ventilation Perfusion Ratio (V/Q)

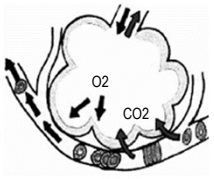
- **Ventilation (nice average)**
- Alveolar Ventilation Rate (AVR)
  - (Tidal Vol (500 ml/breath) – Dead space (150 ml/breath)) X RR(12/min)
    - 350 X 12 = **4200 ml/min**
- **Perfusion (nice average)**
  - Cardiac Output (**5000 ml/min**)
  - HR X Stroke Volume (SV)

$$\frac{\text{Ventilation}}{\text{Perfusion}} = \frac{4200\ \text{ml/min}}{5000\ \text{ml/min}} = 0.8\ \frac{V}{Q}$$

443

Oxygenation

- Lung has a large surface area because there are a LOT of Alveoli
  - The surface area is only one cell thick
- Oxygen diffuses from high concentration (alveoli) to low concentration (venous blood)
- But wait, there's more
  - The O2 from the lungs acts on the vasculature
  - The CO2 from the blood acts on the bronchioles



444

Ventilation Perfusion Ratio (V/Q)

- Hyperventilation
  - Increased ventilation = increase oxygenation in the pulmonary capillary bed = stimulates vasodilation
- Hypoventilation
  - Decreased ventilation = decreased oxygenation in the Capillary bed = vasoconstriction
- Exactly opposite from systemic autoregulation

$$\frac{\text{Ventilation}}{\text{Perfusion}} = \frac{4200\ \text{ml/min}}{5000\ \text{ml/min}} = 0.8\ \frac{V}{Q}$$

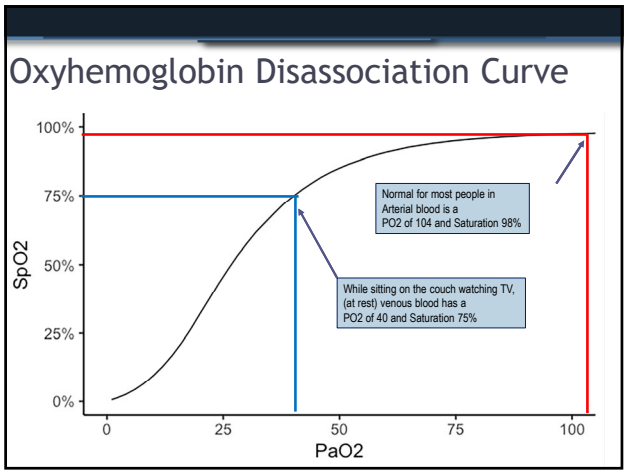
445

Ventilation Perfusion Ratio (V/Q)

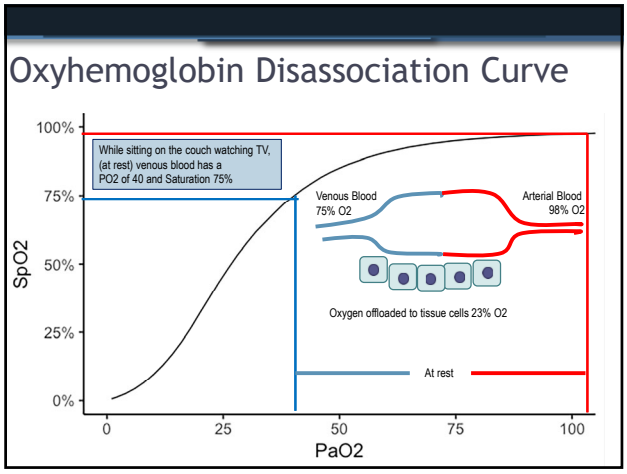
- Increased Perfusion
  - Blood flow in Pulmonary capillary bed increased = ↑CO2 being delivered to Alveoli = Bronchodilation = Decreased resistance and increased flow of O2
- Decreased Perfusion
  - Decreased blood flow across alveoli = ↓CO2 being delivered to alveoli = bronchoconstriction = increased resistance and decreased flow to that alveoli

$$\frac{\text{Ventilation}}{\text{Perfusion}} = \frac{4200\ \text{ml/min}}{5000\ \text{ml/min}} = 0.8\ \frac{V}{Q}$$

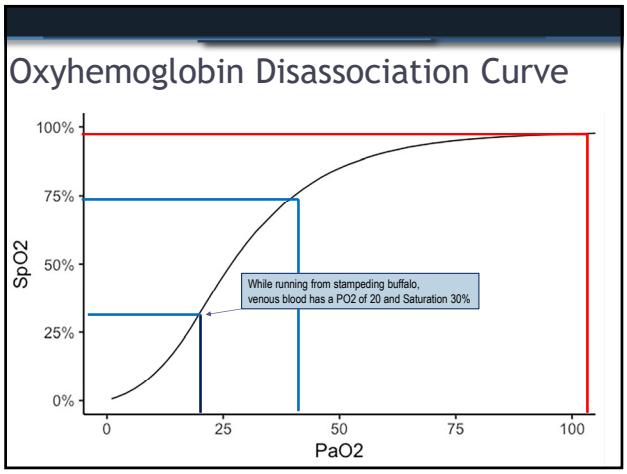
446


Oxyhemoglobin Disassociation Curve
100%
75%
50%
25%
0%
SpO2
0
25
50
75
100
PaO2
Normal for most people in Arterial blood is a PO2 of 104 and Saturation 98%
While sitting on the couch watching TV, (at rest) venous blood has a PO2 of 40 and Saturation 75%

447

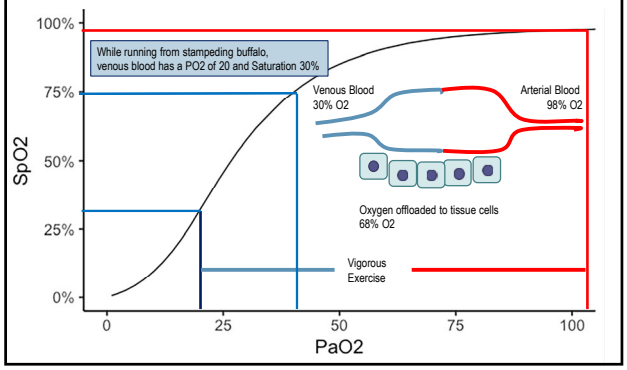

Oxyhemoglobin Disassociation Curve
100%
75%
50%
25%
0%
SpO2
0
25
50
75
100
PaO2
While sitting on the couch watching TV, (at rest) venous blood has a PO2 of 40 and Saturation 75%
Venous Blood 75% O2
Arterial Blood 98% O2
Oxygen offloaded to tissue cells 23% O2
At rest

448


Oxyhemoglobin Disassociation Curve
100%
75%
50%
25%
0%
SpO2
0
25
50
75
100
PaO2
While running from stampeding buffalo, venous blood has a PO2 of 20 and Saturation 30%

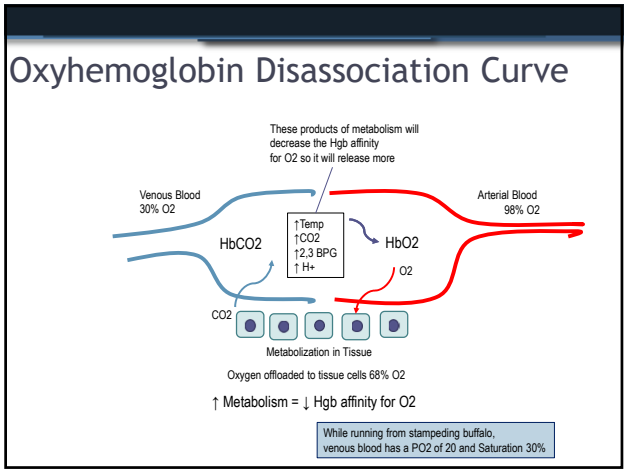
449

Oxyhemoglobin Disassociation Curve



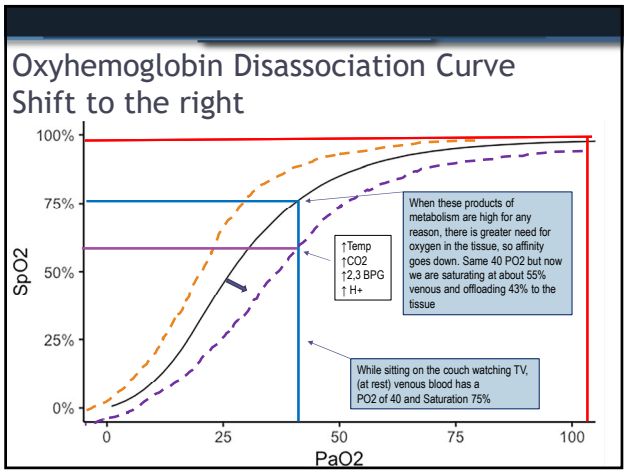
450

Oxyhemoglobin Disassociation Curve



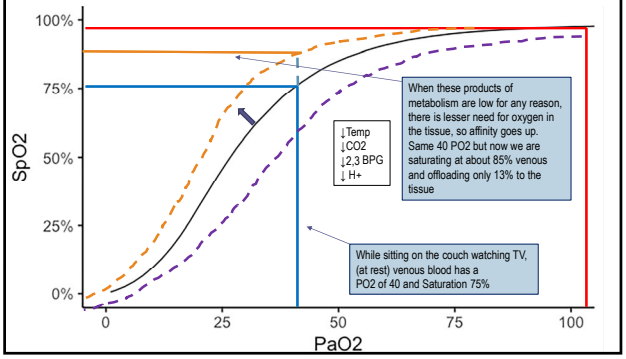
451

Oxyhemoglobin Disassociation Curve Shift to the right



452

Oxyhemoglobin Disassociation Curve Shift to the Left



453

Ventilation Problems

- Bronchospasm
  - Increased resistance = decreased flow
  - Decreased flow = decreased PO2 in the alveoli
- Symptoms:
  - Wheezing, using accessory muscles
- Treatment
  - Beta 2 agonist
    - Aminophylline
    - Albuterol

454

Ventilation Problems

- Laryngospasm
  - Increased resistance = decreased flow
  - Decreased flow = decreased PO2 in the alveoli
  - Secretions/foreign body, trauma/edema
- Symptoms:
  - High pitched crowing, rocking chest movement
- Treatment
  - 100% O2 with positive pressure ventilation
  - Cough/suction to clear
  - Larson's maneuver by physician
  - Paralyze and intubate

455

Pulmonary Edema

- Accumulation of fluid in the extravascular compartments of the lungs

- **Signs and Symptoms**
- Dyspnea/SOB that worsens when lying down
- Pink Frothy Sputum
- Circumoral Cyanosis
- Tachycardia

456

Cardiogenic pulmonary edema

- Fluid is pushed into the lung tissue because:
  - Heart muscle is not able to pump effectively
  - Back-up of blood returning from the lungs to the heart
  - Increase in pressure within the blood vessels of the lung
  - Excess fluid leaking from the blood vessels into lung tissue

- Causes:
  - Congestive Heart Failure
  - Myocardial Infarction
  - Atrial Stenosis
  - Mitral Stenosis

457

Non-Cardiac Pulmonary Edema

- Changes in capillary permeability as a result of injury
  - Damage to the lung tissue and inflammation of tissue
  - Tissue that lines the structures of the lung to swell and leak fluid into the alveoli and the surrounding lung tissue
- Causes:
  - Aspiration
  - Inhalation injury
  - Allergic reaction
  - Adult respiratory distress syndrome

458

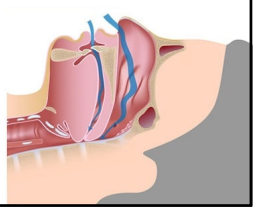
Preexisting Respiratory Disorders

- Asthma
  - Chronic airway inflammation and hyper-responsiveness
    - Manipulation of airway
    - Premedicate with inhaler from home
    - Deeper sedation before intubation
  - Prevent and control inflammation with steroids
  - Beta 2 agonists if symptoms
  - Avoid triggers

459

Obstructive Sleep Apnea

- Risk Factors
  - Sex
    - Male
    - Women after menopause
  - Obesity
    - 10-14 x more likely
  - Age
    - Increases until 50-59
  - Race
    - Caucasian ¼ as likely as other races
  - Nasal obstruction
    - Allergies
    - Surgical swelling
    - Packing
- Nursing Considerations
  - Bring CPAP from home
  - Side lying position



460

ABG Interpretation

- Normal Values

pH	7.35 to 7.45
pO2	80 to 100
O2 Sat	≥ 98
pCO2	35 to 45 (Respiratory Acid)
HCO3	22 to 26 (Metabolic Base)
Base Excess	+2 to -2 (buffer to base ratio)

461

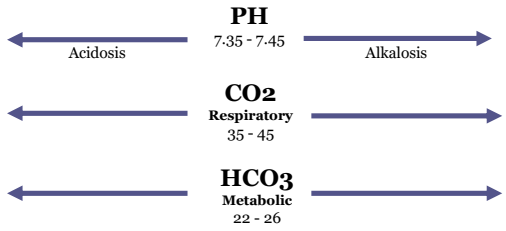
R.O.M.E

- Respiratory Opposite
  - Respiratory gas (CO_2) and pH going in Opposite directions.
  - Indicates a Respiratory problem
- Metabolic Equal
  - Metabolic Gas (HCO_3) and pH going in Equal or same direction
  - Indicates a metabolic problem

462

ABG Interpretation

Is it a Respiratory or Metabolic Problem?



463

ABG Interpretation

- Respiratory Acidosis
  - Caused by decreased ventilation
  - Treat with ventilation
- Respiratory Alkalosis
  - Caused by hyperventilation
  - Treat with sedation or decreased ventilation

464

ABG Interpretation

- Metabolic Acidosis
  - Excess production of metabolic acids
    - Cardiac arrest
    - Sepsis
    - Ketoacidosis
    - Renal failure
  - Treat with Bicarb
- Metabolic Alkalosis
  - Acid loss
  - Upper GI loss
  - Diuretics (Potassium loss = Hydrogen Ion loss)
  - Over administration of Alkali
  - Treat the cause

465

Some Examples

#1
- pH 7.30
- pCO2 70
- HCO3 30

#2
- pH 7.48
- pCO2 20
- HCO3 15

#3
- pH 7.25
- pCO2 40
- HCO3 12

#4
- pH 7.50
- pCO2 45
- HCO3 35

466

Compensation

- Compensated
  - pH = WNL
  - CO2 = Not WNL
  - HCO3 = Not WNL
- Partially Compensated
  - pH = Not WNL
  - CO2 = Not WNL
  - HCO3 = Not WNL
- Uncompensated
  - pH = Not WNL
  - CO2
  - HCO3

One Not WNL & One is WNL

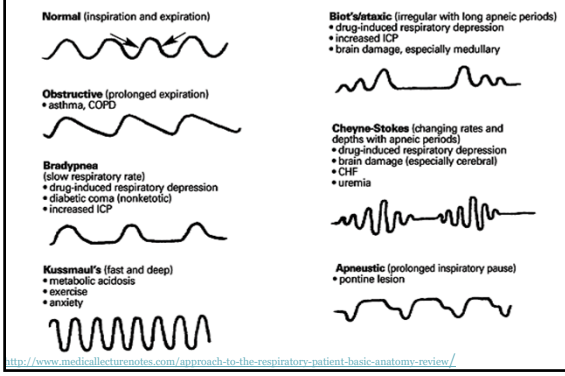
467

Pulse Oximetry

- Factors affecting accuracy:
  - Nail polish-especially blue, green, black
- False low
  - Dyes
  - Anemia
  - Hypotensive
  - Vasoconstricted
  - Raynaud's
  - Cold
- False high
  - Methemiglobinemia
  - CO poisoning
  - Cyanide poisoning
- Sometimes used to monitor extremity perfusion

468

Respiratory Patterns



http://www.medicallecturenotes.com/approach-to-the-respiratory-patient-basic-anatomy-review/

469

Oxygen Therapy

- Nasal cannula
  - 1-6 L/min
  - 24-44% O2
- Simple mask
  - 40-60% O2
  - 5-10 L/min
- Partial rebreather
  - 40-70%
  - Minimum 10 L/min
- Nonrebreather
  - 60-80%
  - >15 L/min
- Face tent
  - >8L/min
  - Up to 70%

470

Oxygen Therapy

- Venturi Mask
  - Air-entrainment mask
  - 100% O2 blended with RA
    - Allows specific FiO2
  - Don't cover the holes!

471

Indications for Intubation

- Work of Breathing:
  - Minute Volume > 10 L/minute
  - RR 30 breaths/min or>
- Lung Expansion:
  - Tidal Volume < 3 ml/kg
  - Vital Capacity < 15 ml/kg
- Respiratory Muscle Strength:
  - Negative inspiratory force Less than – 25 cm H2O
- Oxygenation:
  - PaO2 < 55 mm with increased FiO2

472

Intubation

- Ventilator set up
- Preoxygenation
- Placement
  - Cricoid pressure
- Proof
  - Auscultation
  - Bilateral
  - CXR
- Secure Airway
  - Mark depth

473

Ventilation Modes

- A/C Assist Controlled – Most common resting mode
  - A.K.A. Continuous Mandatory Ventilation (CMV)
  - Patient initiates breaths
  - Ventilator delivers specific volume
    - Usually 500-600ml in an adult
    - 8ml/kg
  - Can set a rate of minimum Breaths Per Minute
    - If the patient is initiating breaths above the set rate the ventilator will not deliver any. This is just a back up rate
  - Compliance of the lung determines the pressure
    - High and low pressure alarms alert to trouble

474

Ventilation Modes

- P/C Pressure Controlled
  - Set pressure
    - Patient initiates breaths
  - Can set a rate of minimum Breaths Per Minute
    - If the patient is initiating breaths above the set rate the ventilator will not deliver any. This is just a back up rate
  - Compliance of the lung determines the tidal volume
    - High and low volume alarms alert to trouble

475

Ventilation Modes

- P/S Pressure Support – most common weaning mode
  - Set pressure
    - Patient initiates breaths
    - Delivers positive pressure to assist inhalation
  - No back up rate
  - Compliance of the lung determines the tidal volume
    - High and low volume alarms alert to trouble

476

Ventilation Modes

- Synchronized Intermittent Mandatory Ventilation (SIMV)
  - Set number of breaths per minute (controlled breaths)
    - Can be AC or PC
  - Spontaneous breaths receive Pressure Support
  - If the patient initiates a breath close to the scheduled breath the ventilator will deliver the full controlled breath
    - This is the Synchronized part
  - We wanted this to be the new great way to wean but it isn't.
    - Patients wean slower and more failures than PS

477

PEEP or CPAP

- On a Ventilator it's called PEEP with a mask it's CPAP
- Continuous positive pressure
  - Breathing in or out same pressure
  - 5-20mmHg
- Positive End Expiratory Pressure (PEEP)
  - Keeps alveoli from collapsing
  - Increases O2 by recruiting more alveoli
  - Most commonly 5mm/hg
- Continuous Positive Airway Pressure (CPAP)
  - Keeps airway from collapsing
  - Sleep apnea
  - Most commonly 10 mm/Hg

478

Unsuccessful Weaning

- Dyspnea
  - Nasal flaring
  - Accessory muscles
  - Panic
- Respiratory Acidosis
  - Increased CO_2 and decreased pH
- Blood pressure ↓ or ↑ 20 mm/Hg
- Heart Rate ↓ or ↑ 20 BPM

479

Extubation Criteria

- Following commands
- Able to sustain head lift >5 seconds
- Meds:
  - Muscle relaxants fully reversed
  - Inhaled anesthetics gone
  - Adequate analgesia
- Patient comfortable
- Vital Signs Stable
- ABG results WNL

480

Extubation

- Elevate head of bed
- Preoxygenate with 100% oxygen
- Suction endotracheal tube, above cuff, orally
- Instruct patient to take deep breath
- Deflate cuff
- Remove tube on peak inspiration
  - Cough it out
- Administer prescribed oxygen

481

Respiratory Procedures

- Decortication
  - Fibrothorax
    - Thick peel forms in the pleural space
  - All fibrous tissue and pus removed
  - Thoracoscopy or thoracotomy
- Pleurodesis
  - For recurrent pleural effusion or persistent pneumothorax
  - Chest tube to coat pleural cavity in talc
  - Adheres visceral pleura and parietal pleura with scar tissue

482

Respiratory Procedures

- Lobectomy-removal of lung lobe
  - Early stage lung cancer
  - Fungal infection
  - Emphysema
  - Tuberculosis
- Wedge resection
  - Wedge shaped portion of lung removed
  - Diagnose cancer
  - Removal of small tumor

483

Respiratory Procedures

- Pneumonectomy-removal of lung
  - Chronic lung infection
    - multiple abscesses, bronchiectasis, fungal infection, tuberculosis
  - Traumatic lung injury
  - Bronchial obstruction with destroyed lung
  - Congenital lung disease
- Volume reduction surgery -removal damaged tissue
  - Usually emphysema
  - Lung movement and compliance improved

484

Preoperative Respiratory Assessment

- Risk Factors
  - Obstructive Sleep Apnea
  - Smoker
  - COPD
  - Asthma

- Preoperative teaching equipment to be used postop
  - Incentive spirometry
    - A sustained, maximal inspiration

  - Acapella
    - Slowly inhale and exhale with pressure through the device and it has a vibratory flutter

485

Postop Care

- Positioning
  - HOB ↑ 30°
  - Affected side down
    - Pneumonectomy, lobectomy
- Respiratory assessment
  - Work of breathing
  - Oxygen Saturation
  - Breath sounds
- Pain management
  - Mindful of respiratory suppression
- Fluids
  - Adequate hydration for thinner secretions
- Bleeding
  - Bronchoscopy
    - pink tinged sputum normal
  - More extensive procedures
    - >100ml/hour excessive

486

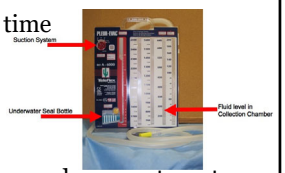
Chest Tubes

- Suction usually set to -20 cm H2O
  - Gravity for transport->leave suction port open
- Water seal filled to 2
  - <can let air into pleural space
  - >increases work of breathing
- Check air leak at seal, usually numbered (1/5)
  - Clamp to see if leak in patient or device
- Keep tubing kink free
- Gently milk if necessary
  - NOT strip

487

Chest Tubes

- Record fluid level-mark with time
- Report drainage:
  - >100 ml/hour
  - Not decreasing over time
  - Fresh bleeding



- Should see fluctuation in water seal compartment with respirations
- CXR for placement

488

Preop Assessment Cardiac History

- Anesthesia assessment days to weeks before surgery
- Cardiac workup
  - Would we work them up if they were not going to surgery?
  - Will it change the decision to go to surgery?
    - Little difference in outcomes for patients undergoing revascularization procedures or not before non-cardiac surgery

489

Preop Assessment Cardiac History

- Myocardial Infarction
  - Important indicator of anesthesia morbidity
  - Elective, nonurgent surgery, postponed for at least 6 months after an MI
- Significant History
  - Angina
  - Aortic stenosis
  - Poorly controlled dysrhythmias
  - Congestive heart failure (CHF)
  - Extremes in blood pressure (high or low)
  - Presence of pacemaker

490

Preop Assessment Cardiac History

- S/S of Cardiac Disease
  - Chest pain or tightness
  - Palpitations
  - Chronic fatigue
  - Loss of appetite
  - Angina
  - Swelling of the ankles
  - Paroxysmal nocturnal dyspnea
  - Exhaustion

491

Preop Assessment Cardiac History
Physical Examination

- Apical pulse
  - Rate
  - Rhythm
  - Quality
- At least one blood pressure reading
- Palpation of peripheral pulses
- Observation for
  - Edema
  - Clubbing of fingers
  - Cyanosis
  - Distention of neck veins
  - General energy level
  - Respiratory ease

492

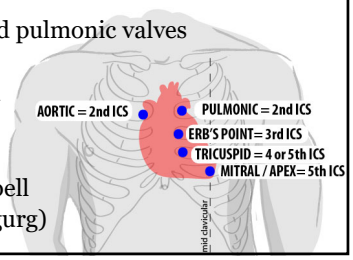
Preop Assessment Cardiac History

- Cardiac Echo
  - Determine Stroke Volume
  - Assess valve function
    - Regurgitation
- EKG
  - For active cardiac s/s and intermediate and high-risk procedures
- Maintain normal routine preoperatively
  - Do not skip doses
    - Beta-blockers
    - Calcium channel blockers
    - Antihypertensives
- Common Labs
  - Electrolyte Panel, Creatinine, CBC, Urinalysis, Coagulation test

493

Assessing Heart Sounds

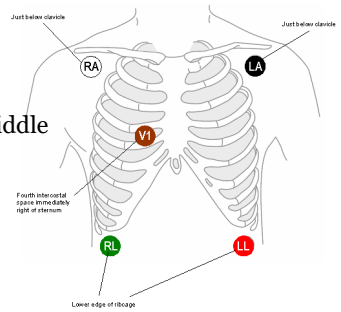
- With the diaphragm of your stethoscope listen to S1, S2 (Lub, Dub)
- S2 is loud at aortic and pulmonic valves
- Same at Erb's Point
- S1 is loud at Tricuspid and mitral
- Mitral is Apical Pulse
- Now flip and use the bell to listen for swish (regurg)



494

Electrocardiogram Lead Placement

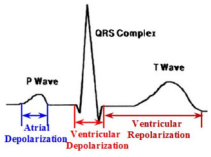
- White - Right
- Clouds over Grass
- Smoke over Fire
- Chocolate in the middle



495

Electrocardiogram

- P wave
  - Origination of impulse in sinus node
  - Abnormality indicates impulse origination in some other area of heart
  - Atrial depolarization
- PR interval
  - Conduction through atria and AV node and into bundle of HIS
- QRS complex
  - Conduction through bundle branches
  - Ventricular depolarization
- T wave—ventricular repolarization



496

Stroke Volume

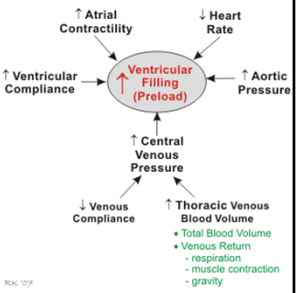
Preload and Afterload

- CO = HR x SV
  - Needed to perfuse tissues with oxygen
- Stroke Volume depends on:
  1. Contractility of the heart muscle
  2. Preload
     - A.K.A. End Diastolic Volume (EDV)
     - Amount the ventricles stretch at the end of diastole
  3. Afterload
     - The pressure the heart muscle pushes against to open the semilunar valves to allow blood to leave the heart

497

Influences on Preload

- Anything that increases return to heart
- Anything that keeps blood in the ventricle longer
- Central Venous Pressure (CVP)
  - Measures Right Ventricular Preload
- Pulmonary Wedge Pressure (PWP)
  - Measures Left Ventricular Preload



498

Influences on Afterload

- Vascular Resistance
  - PVR (pulmonary vascular resistance)
    - Pulmonary hypertension
  - SVR (systemic vascular resistance)
    - Systemic Vasoconstriction
- Valve function
  - Aortic stenosis
  - Pulmonary stenosis

499

Left sided heart failure

- Symptoms:
  - Dyspnea
  - Rales
  - Cough w/ frothy sputum
  - Cyanosis
  - Fatigue/weakness/ lethargy
  - Confusion
  - Murmur or mitral insufficiency
  - Elevated PWP
- Causes:
  - Cardiomyopathy
  - Acute MI
  - Cardiovascular Disease
  - Increased circulating volume
  - Cardiac tamponade
  - Constrictive pericarditis
  - Aortic Stenosis

500

Right sided heart failure

- Symptoms:
  - Tachypnea
  - Dependent, pitting edema
  - Jugular Vein Distention
  - Abdominal pain
  - Hepatomegaly/ splenomegaly
  - Weight gain
  - Anorexia
  - Murmur or tricuspid insufficiency
- Causes:
  - Elevated CVP/RAP
  - Acute right ventricular MI
  - Fluid volume overload
  - ASD/VSD
  - Cardiovascular Disease
  - COPD
  - Pulmonary embolism
  - Pulmonary hypertension
  - Pulmonic stenosis

501

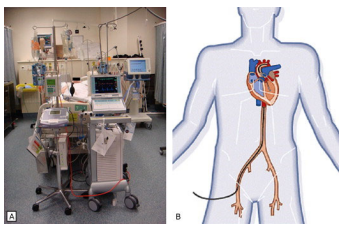
Intra-aortic Balloon Pump Indications

- Supports and recovers the myocardium
- Cardiogenic shock
- Perioperative treatment of complications due to myocardial infarction
- Cardiac failure after a cardiac surgical procedure
- Failed PTCA
- Unstable angina
- Bridge to cardiac transplant – severe left ventricular dysfunction

502

Intra-aortic Balloon Pump

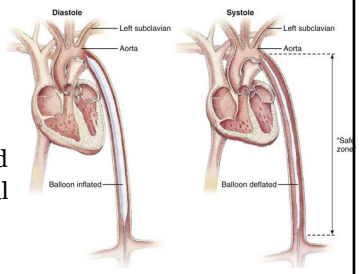
•Heparinized
•Art line
•ECG monitor



503

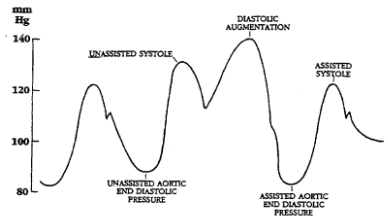
Intra-aortic Balloon Pump

- Increases Cardiac Output
- Increases Coronary blood flow
- Reduces the afterload
- Decreases myocardial oxygen demand and increases supply



504

Intra-aortic Balloon Pump
Timing Frequency and Waveform



505

Troubleshooting

- ECG trigger may not be functioning properly
  - Check slave cable connections
  - Check patient leads
  - Change ECG lead source
- Autofill may fail
  - Check helium and refill, then check balloon
- Balloon may not augment Cardiac Output adequately
  - Check balloon position
  - Reposition balloon if necessary
    - fluoroscopy

506

Intra-aortic Balloon Pump

Contraindications	Complications
• Severe aortic insufficiency • Aortic aneurysm • Significant aortic regurgitation • Thromboembolism	• Limb ischemia • Renal failure and bowel ischemia • Neurologic complications including paraplegia • Bleeding and insertion site • Heparin induced thrombocytopenia • Aortic perforation and/or dissection • Infection

507

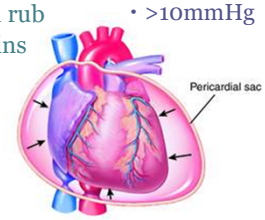
Types of Shock

- Hypovolemic – blood volume insufficient to fill the vascular space
- Cardiogenic – myocardium unable to pump an adequate cardiac output to maintain tissue perfusion
- Obstructive – physical obstruction to flow
  - Aortic Dissection, Pulmonary embolism
- Distributive – abnormal distribution of intravascular volume
  - Neurogenic – loss of vascular tone
  - Septic Shock – 3rd space loss and decreased preload
  - Anaphylactic Shock – Pulmonary vasoconstriction and systemic vasodilation

508

Cardiac tamponade

- Signs & symptoms
  - Narrow pulse pressures
  - Muffled distant heart sounds
  - Pericardial friction rub
  - Distended neck veins
- Treatment
  - Pericardiocentesis
  - Surgery
- Hemodynamics
  - Tachycardia & hypotension
  - Pulsus paradoxus
    - >10mmHg



509

Aneurysm

- Etiologies
  - Atherosclerosis
  - Hypertension
  - Degeneration of medial layer
  - Aortitis
  - Complication of aortic surgery
  - Trauma
  - congenital
- Diagnosis
  - Chest x-ray
  - CT scan
  - Transesophageal echo
- Signs & symptoms
  - Ascending aorta – chest pain
  - Transverse aorta – dypsnea, stridor, hoarseness, cough, chest pain
  - Descending aorta – back or chest pain

510

Thoracic Aortic Aneurysm

- Unruptured
  - Tenderness or pain in the chest
  - Back pain
  - Hoarseness
  - Cough
  - Shortness of breath
- Ruptured:
  - Sharp, sudden pain in the upper back that radiates downward
  - Pain in your chest, jaw, neck or arms
  - Difficulty breathing
  - Shock

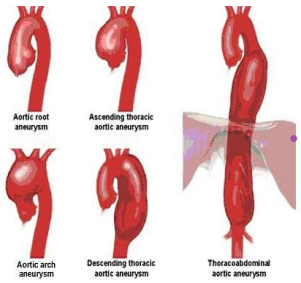
511

Abdominal Aortic Aneurysm

- Unruptured
  - Commonly no symptoms
  - General belly pain
  - Cool toes or foot if clot
- Ruptured:
  - Sudden, severe pain.
  - An extreme drop in blood pressure.
  - Signs of shock

512

Aneurysm



- Treatment
  - Surgical management
    - Immediately
  - Medical management
    - Controlling BP
- Nursing Care after surgery
  - Monitor peripheral circulation; pulses, urinary output
  - Monitor neuro status

513

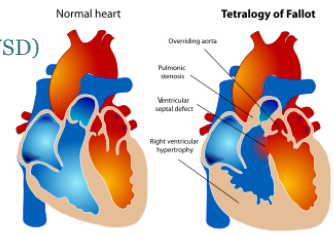
Congenital Heart Defects

- Ventricular Septal Defect – Most common
  - Surgical intervention for failure to thrive (FTT)
  - Patch on the atrial side
    - Usually about 4-6 months old
    - Good prognosis
  - Normal heart after surgery
    - Additional treatment uncommon
- Atrial Septal Defect
  - 80% close spontaneously
  - Close in cath lab for FTT
  - Normal heart after surgery
    - Additional treatment uncommon

514

Congenital Heart Defects

- Tetralogy of Fallot
  - **R**ight Ventricular Hypertrophy
  - **A**orta displaced
  - **P**ulmonary Stenosis
  - **S**eptal Defect (large VSD)



515

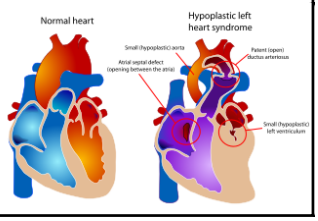
Tetralogy of Fallot

- TET spell – activity intolerance
  - Heart cannot meet O2 demand
    - Crying, feeding, playing
- Knee to chest position
  - Increases systemic vascular resistance
  - Decreases right to left shunt and pushes more O2 into lungs
- Surgery at 6-12 months old
  - Temporary stent in pulmonary artery
    - Sometimes this part must be done in first weeks of life
    - Alprostadil – Keeps Patent Ductus Arteriosus from closing
  - Complete repair – patch VSD
  - Usually need Pulmonary valve replacement (adult size)

516

Single Ventricle Defects

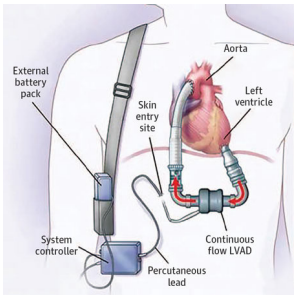
- Left Hypoplastic Heart Syndrome
  - Series of three procedures to route deoxygenated blood to the lungs
  - Expect 80% O2 Saturation. More is bad / less is bad
- Never give 100% O2
  - Pulmonary artery dilates
  - Decreases systemic BP dramatically
- Will need Mechanical Assistance or Transplant eventually



517

Left Ventricular Assist Device

- For left ventricular heart failure
  - 90/year currently placed
- Placed in Apex
- Routes blood directly from Left Ventricle to Aorta
- The patient has no pulse or blood pressure post procedure



518

Pacemaker

- Indications pacer
  - Complete heart block
  - Symptomatic bradycardia
  - Syncope with carotid sinus syndrome
  - MI with 2nd or 3rd degree block
- Preoperative
  - Discontinue anticoagulants
  - CXR
  - Chemistry and Coagulation studies
- Post procedure limitations
  - Limited arm movement several weeks
- Pacemaker precautions
  - Electromagnetic interference
    - Store security systems
    - Welding equipment
    - Electric generators

519

Pacer Malfunctions-Failure to Capture/Pace and Failure to Sense

520

Automatic Implantable Cardioverter Defibrillator (AICD)

- Indications
  - Cardiac arrest
  - Sustained VT or VF
- Preop
  - Discontinue anticoagulants
  - CXR
  - Chemistry and Coagulation studies
- Post Procedural
  - Same as pacer except-driving limitation up to 6 months
  - Discomfort of discharge
- Complications:
  - Pneumo
  - Tamponade
  - Refractory VF

521

PostOp Cardiac Complications

- Second and third postoperative days are most common time for MI in noncardiac surgical patients.
- Intraoperative ischemia designates patient as "high risk" in postoperative period.

522

Arterial Vascular Procedures

- Procedures
  - Endarterectomy
  - Embolectomy
  - Thrombectomy
- Medications
  - Anticoagulants
- Postop
  - VS, cardiac monitoring
  - Monitor for ischemic tissue
    - Pulses
      - Doppler
    - Motor and sensory function

523

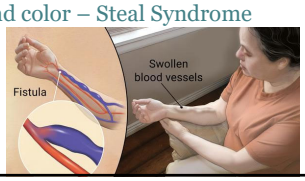
Large Vessels

- Aorta / Iliac vessels
  - Grafts
  - Bypass
  - Endarterectomy
- Medications
  - Beta blockers
  - Anticoagulants
- Postop
  - Hemodynamic monitoring
    - BP control vital
  - Neuro checks
  - Circulation assessment
  - Analgesia
  - Warming

524

Arteriovenous fistula

- Surgically created for dialysis
  - Arterial flow into the vein makes it large and strong
    - Takes 8-12 weeks to dilate
  - Easy reliable access for dialysis
- Post op care
  - Distal extremity temp and color – Steal Syndrome
  - Bruit and thrill
  - Elevate extremity
  - No BP or IV



525

Neurological Assessment

- Level of Consciousness
  - Maximum arousable state
- Call by familiar name
- Gently shake patient
- Noxious stimuli
  - Nail bed pressure
  - Pinching trapezius muscle
  - Sternal pressure
- Movement and strength symmetrical bilaterally
- Loss of orientation begins with loss of time, then place, then person
- Never 'squeeze my hand'
  - Grasping reflex
- Pupil constriction
  - Fast and equal with no bouncing
  - Be mindful of medications
  - CNIII – pupil constriction

526

Neurological Assessment - Vital Signs

- Cushing's Triad
  - Sign of dangerously increased ICP

1. Hypertension
2. Bradycardia
3. Respiratory changes

- Changes in Respiratory Rate and Rhythm
  - Biot's – even clusters with pauses – Increasing ICP
  - Ataxic – all over the place, no pattern, - Herniation
  - Apneustic – in, pause, out, pause - Brain Stem damage

527

Intracranial Pressure Monitoring

- Normal intracranial pressure
  - 0 to 15 mm Hg with invasive monitoring
- Transducer zeroed at level of the tragus

- CPP = MAP – ICP
  - 70 to 100 mm Hg: Normal
  - 60 mm Hg: Provides minimally adequate blood supply
  - <50 mm Hg: Autoregulation begins to fail
  - <40 mm Hg: Cerebral blood flow decreases by 25%

528

Glasgow Coma Scale

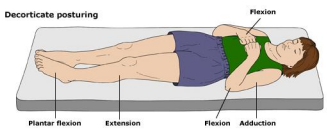
The Glasgow Coma Scale and Score

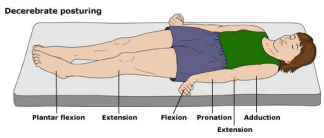
Feature	Scale Responses	Score Notation
Eye Opening	Spontaneous	4
	To Speech	3
	To Pain	2
	None	1
Verbal Response	Orientated	5
	Confused Conversation	4
	Words (inappropriate)	3
	Sounds (incomprehensible)	2
	None	1
Best Motor Response	Obey Commands	6
	Localise Pain	5
	Flexion - Normal	4
	Flexion - Abnormal	3
	Extend	2
	None	1
Total Coma Score		3/15 - 15/15

529

Posturing

- Decorticate
- Decerebrate



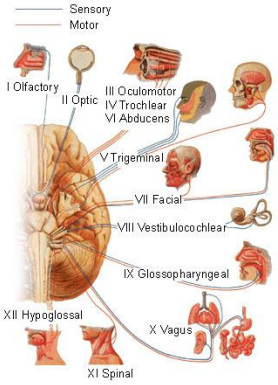


530

Cranial Nerve Assessment

Motor, Sensory or Both?

1. **S**ome
2. **S**ay
3. **M**arry
4. **M**oney
5. **B**ut
6. **M**y
7. **B**rother
8. **S**ays
9. **B**ig
10. **B**rains
11. **M**atter
12. **M**ost



531

Jim's bad day

- You awake. You cannot move. You are lying on a cold hard surface. Everything is perfectly dark and silent. You can **smell** oil, the tang of dirty metal and mildew like an **old factory**. The air is stagnant and close.
- Cranial Nerve I - Olfactory
  - Sensory
  - Smell
- You begin to **see** with your **two eyes** that there are **shapes** in the dark room.
- Cranial Nerve II – Optic
  - Sensory
  - Sight – cones and rods
- You **blink**, **turn**ing your **eyes** to look all around. Your **pupils adjust** to the dim light and you focus on **three** large machines confirming where you are. You become more aware and sense that you are not alone.
- Cranial Nerve III – Oculomotor
  - Motor
  - Movement of the eyelid, eyeball and pupil

532

- You **look down and inward** to see **four** pinpoints of light at the end of your nose. You follow the light to its source to find a **truck leering** at you with **four** dim red lights where headlights should be.
- Cranial Nerve IV – Trochlear
  - Motor
  - Move eyes down and inward
- You **clench** your **jaw** as the truck roars to life with an ear splitting bang that knocks dust from the ceiling. Your **ears ache** and you **feel** the dirt fall across your **face**. You realize that you've bitten your **tongue** as the **pain** of it registers. You think to yourself, "**Try Jim**! Get it together"
- Cranial Nerve V - Trigeminal
  - Both sensory and motor
  - Jaw clenching
  - Tensor Tympani Muscle
  - Sensation in the face and tongue
- You hear foot falls and though you cannot move your head you **pull** your **eyes** hard to the **side** to see your **abductor**.
- Cranial Nerve VI – Abducens
  - Motor
  - Lateral eye movement

533

- You know his **face**. You **grimace** as **saliva** floods your mouth and mixes with the blood from your bleeding tongue. You **taste** the bile and blood and **feel** the sting where a piece of the falling metal has nicked your **ear**.
- You **heard** this man speaking in the **vestibule** of the **CoCo Leer** hotel last night. Your head starts **spinning** and you **feel** un**balance**d even though you are still lying, wrists and ankles bound, on the floor. The **gravity** feels heavy.
- You close your **throat** to keep from being sick and to **gloss** over the fact that you're struggling. You **taste** bile in the **back of** your **mouth**. You don't want this man to know your distress.

- Cranial Nerve VII – Facial
  - Both sensory and motor
  - Facial expression
  - Taste, salivary glands
  - Sensation of outer ear
- Cranial Nerve VIII – Vestibulocochlear
  - Sensory
  - Dynamic and static equilibrium
- Cranial Nerve IX – Glossopharyngeal
  - Both sensory and motor
  - Taste and sensation back of tongue
  - Throat muscles

534

- However, you are distressed. You remember Mr. **Vega** now and your **heart** speeds up and your **chest** tightens. Your **guts** churn as you **swallow** hard.
- He is guilty of murder and you just might be an **accessory**. You **stretch** your **neck** and try to scoot to the left with your **shoulders** and strain to keep him in your sight as he walks to stand near your head.
- You **stick** your **tongue out** between your dry lips and utter a weak greeting. "**Hi Paul, glad Saul** is not with you".

- Cranial Nerve X – Vagal
  - Both sensory and motor
  - Parasympathetic smooth muscle, heart, airway, organs
  - Soft palate and throat movement
  - Sensation of gut and throat
- Cranial Nerve XI – Accessory
  - Motor
  - Movement of neck and shoulders
- Cranial Nerve XII – Hypoglossal
  - Motor
  - Tongue movement and extension

535

Cranial Nerves

- **O**h, **O**h, **O**h, **T**o **T**ouch **A**nd **F**eel **V**ery **G**ood **V**elvet, **A**h **H**eaven

536

Post Operative Nursing Care

- Ongoing Neurological Assessment
  - Seizure activity, altered LOC, VS
- Elevate head of bed 30°
- Maintain head in neutral position
  - Sandbags or Philadelphia collar
- Prevent Valsalva maneuver
  - Patient exhales through any strain
- Prevent isometric muscle contraction
  - Assisting patient in turning
- Avoid clustering of nursing activities
  - Space nursing care to give patient frequent rest periods

537

Post Operative Nursing Care

- Midbrain compression
  - Avoid narcotics
    - Respiratory depression
- Diuretics
  - Mannitol
  - Serum osmolarity kept between 290 and 320 mOsm/kg
- Goals
  - ICP remains below 20 mm Hg
  - CPP remains above 60 mm Hg or as ordered

538

Spinal Cord Injury

- Neurogenic Shock
  - Loss of vascular tone
- Hypotension
  - Vasodilation below site
  - Dopamine
- Bradycardia
  - Vasovagal response
- Thrombosis
  - Venous pooling
  - Immobility
- Autonomic Dysreflexia
  - Sympathetic CNS stimulation below level of injury
    - Above injury level- sweaty, flushed
    - Below injury level- pale, goose bumps
- Skin breakdown

539

Spinal Cord Surgery

- Purpose
  - Decompress spinal cord
  - Stabilization
  - Repair damage to cord
- Approaches
  - Anterior
  - Posterior
- Procedures
  - Decompression
  - Fusion
  - External mobilization of Cervical Spine

540

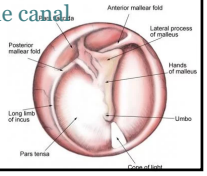
Postoperative Nursing Care

- Airway
  - May keep intubated
- Perfusion
  - Hypotension common
    - Sympathetic NS depression
- Prednisone Infusion SCI
  - Bolus, then 8 hour infusion
- Positioning
  - Usually flat
  - Logroll
- Site(s) assessment
- Comfort
  - Muscle spasms
  - Don't give IM below injury level
- Neurovascular Assessment
- Assess for evidence CSF leak

541

External Ear

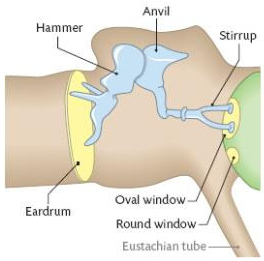
- External Ear
  - Auricle or Pinna made of elastic cartilage
- External acoustic meatus
  - Boney canal with ceruminous glands that produce ear wax (Cerumen)
    - To discourage insects
  - Tympanic Membrane at the end of the canal
    - Pars Tensa (tough connective tissue)
    - Pars flaccida (loose connective tissue)
    - Outline of the Malleus bone
    - Tensor Tympani Muscle



542

Middle Ear

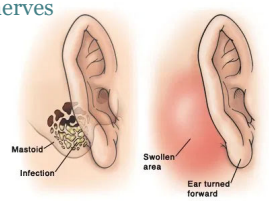
- Ossicles - Tiny bones relay movement of tympanum
  - Malleus (Hammer)
    - Tensor Tympani muscle
      - Cranial Nerve V
      - Tenses Tympanic membrane
  - Incus (Anvil)
  - Stapes (Stirrup) – taps on Oval window
    - Stapedius muscle
      - Tightens or loosens Stapes
      - Cranial Nerve VII
- Oval Window
  - Transfers vibration to Cochlea



543

Middle Ear

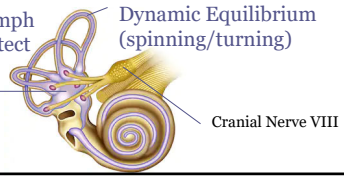
- Eustachian Tube
  - From middle ear to pharynx
    - Equalizes pressure
- Mastoid Sinus
  - Located near many cranial nerves
  - Drains into middle ear and eustachian tube



544

Inner Ear

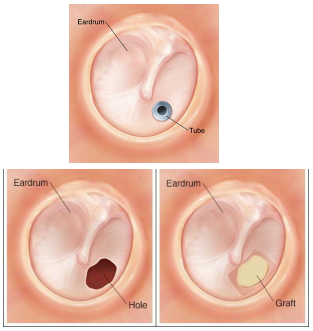
- Cochlea
  - Cochlear duct
    - Endolymph and hair cells to sense sound
- Vestibule
  - Utricle and Saccule
    - Filled with Endolymph and hair cells to detect Static Equilibrium (linear)
- Anterior, Posterior and Lateral Semicircular canals
  - Semicircular ducts
    - Filled with Endolymph and hair cells to sense Dynamic Equilibrium (spinning/turning)



545

Ear

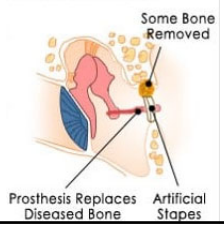
- Myringotomy
  - Most frequent pediatric procedure
- Tympanoplasty
  - Don't want to cough, sneeze, blow nose



546

Ear

- Cochlear Implant
  - Assess facial nerve
  - Turned on later, so no immediate impact on hearing
- Mastoidectomy
  - Firm bulky dressing around head
  - May have donor site
  - Dizziness
- Stapedectomy
  - Usually have packing
  - Don't want to cough, sneeze, blow nose



547

Nasal/Sinus Surgery Post-Op Nursing Care

- Humidified oxygen
- Semi Prone Position
- Bleeding
  - Check back of throat
  - Frequent swallowing
- Packing
  - Laryngospasm
- NPO until local resolved
- Oral care
- Ice packs

548

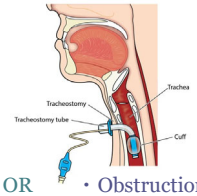
Throat Surgery Post-Op

- Tonsillectomy and Adenoidectomy
- Bleeding
  - Frequent swallowing, clearing throat
  - Check back of throat
  - Semi-prone position
- Swelling
  - Once local resolved, ice lukewarm fluids
  - No straw
- Laryngospasm risk
- Notify MD:
  - Bleeding, Decreased BP, restless, tachycardia, pale

549

Tracheostomy

- Preop
  - Respiratory assessment
  - Patient Teaching
  - Emotional support
- Postop
  - Trach tray brought from OR
  - Humidified air
  - Respiratory assessment
  - Suctioning
    - Sterile and careful
    - Preoxygenate
    - Insert 6-8 inches
  - Problems:

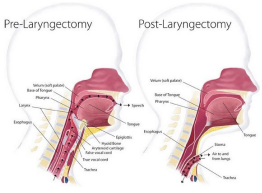


    - Obstruction
    - Bleeding
    - Subcutaneous emphysema
  - Emotional support
    - Means of communication

550

Laryngectomy

- Total
  - Loss of voice
- Supraglottic
  - Normal voice
  - Aspiration risk
- Hemi – laryngectomy
  - Hoarse voice
- Partial laryngectomy
  - Hoarse voice
- Preop
  - Respiratory assessment
  - Emotional support



- Postop
  - Humidified air
  - Respiratory assessment
  - Laryngectomy tube
  - Emotional support
    - Means of communication

551

Radical Neck/Reconstructive Surgery

- High Risk for Complications
  - Radiation
  - COPD
  - Heart disease
- Carotid blowout
  - Most frequent if radiation
- Edema
  - Dysphagia
  - Difficulty clearing secretions
- Usually no trach
- Careful positioning
- Assess Flap
  - Color, temp
- Suction drains
- Minimal bleeding

552

Eye Procedures - Preoperative

- Post op instructions
  - Avoid:
  - Quick movements
  - Bending over from the waist
  - Rubbing eyes
  - Heavy lifting
- Expectations
- Anxiety
- Verify operative eye
- More than one type of drops
  - Wait 5 minutes between medications
- Keep assistive devices as long as possible

553

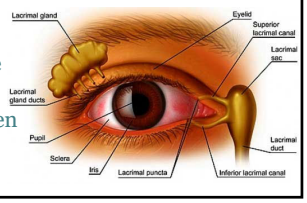
Common Eye Procedures

- Extracapsular cataract extraction
  - Lens removed whole and replaced
- Phacoemulsification
  - Ultrasonic vibration and evacuation of lens
  - Extracapsular cataract extraction and Intraocular lens placement (IOL)
- Radial or Laser keratotomy
  - Myopia
  - Cuts in cornea to flatten
  - Antibiotics and steroid drops
  - Insertion of soft contacts to maintain shape

554

Common Eye Procedures

- Dacryocystorhinostomy (DCR)
  - Passage between the lacrimal sac and the nasal cavity
    - Anesthetized with Cocaine preoperatively
- Conjunctivodacryocystorhinostomy (CDCR)
  - Just like DCR except lacrimal sac recreated
  - Permanent stent placed
- Entropian repair
  - Bottom lashes stuck in eye
- Ectropian repair
  - Bottom eyelid hanging open
- Ptosis
  - Drooping of upper lid



555

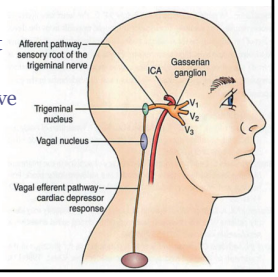
Common Eye Procedures

- Exenteration
  - Removal entire orbit
- Evisceration
  - Removal contents of globe
    - Pop a prothesis in there to maintain shape
  - Sclera and muscle remain
    - Normal eye movement
- Enucleation
  - Removal of eye and part of optic nerve

556

Common Eye Procedures

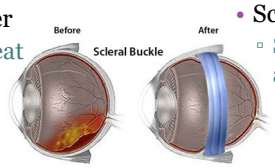
- Strabismus Repair
  - Post Op Nausea and Vomiting
  - Oculocardiac effect
    - a.k.a Trigeminocardiac effect
    - Medial rectus muscle innervated by trigeminal nerve
    - Shares an afferent pathway with the Vegas nerve



557

Retinal Detachment Procedures

- Cryotherapy
  - -200°F - Most popular
- Diathermy
  - Radio frequency makes heat
- Laser
  - Heat
- Pneumoretinopexy
  - Gas bubble holds retina in place
    - Must maintain position
- Scleral buckle
  - Silicone pads and belt around orbit
    - Pushes orbit toward retina



558

Eye Procedures Postoperative

- Airway big challenge
  - No coughing
- Position per procedure
  - Retina Face Down
  - HOB ↑ 30° for others
- Oculocardiac effect
  - Vasovagal
    - Anticholinergics, Adrenergic
- Nausea and vomiting
  - Preemptive antiemetic
  - Intraocular Hemorrhage
- Pain Control
  - Iced Saline compress
  - Retina particularly painful
- Flying, diving restrictions if gas bubble

559

Orthopedic Procedures

Preoperative

- Specialization
  - Maxillofacial
  - Hand
  - Spine
  - Foot
  - Joint
- Evaluate support system
  - Mobility / self care at home
  - Assistive devices

☆**Neurovascular Assessment**

560

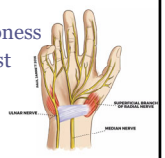
Intermaxillary Fixation

- Preop
  - Teach how to suction
- Postop
  - Airway protection
    - Wire cutters at bedside
      - Drawing of where to cut in emergency should come with patient
    - Teach patient how to suction self
  - Bleeding
  - Aspiration
  - Vomiting
    - Awake-sit up, lean over, help hold cheeks out and let flow
  - Reassurance

561

Orthopedic Procedures - Hand

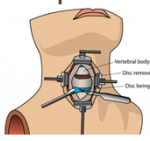
- Carpal tunnel release
  - Medial nerve innervates muscle and sensation in thumb and next 2 ½ fingers
    - Carpel Tunnel Syndrome – Pain and numbness
    - Brace, corticosteroid injection, NSAIDs first
  - Transverse Carpal Ligament is cut
    - Endoscopic or Open
- Dupuytrens release
  - Thickening of fascia removed



562

Orthopedic Procedures - Spinal Fusion

- Cervical Fusion
  - Usually anterior approach
  - Drain
- Posterior Spinal Fusion
  - Bone graft between the bodies and hardware
- Anterior Lumbar Interbody Fusion
  - Often also with posterior placement of pedicle screws
    - Incision in front and sometimes also back
  - Pain control
    - Epidural drip



563

Orthopedic Procedures – Shoulder

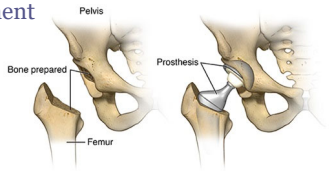
- Rotator Cuff
  - Neurovascular assessment
  - Support as ordered
    - Sling, abduction pillow
  - Ice
  - Dressing
    - Pain
      - Local into joint
      - Interscalene block
    - Home care-Lengthy rehab

- Arthroplasty
  - Neurovascular assessment
  - Drainage
  - Positioning
    - Adduction and internal rotation
    - Edema-ROM
    - CPM
  - Pain

564

Orthopedic Procedures – Hip

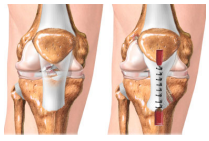
- Arthroplasty
  - Neurovascular status
    - At risk for peroneal nerve palsy
    - Frequent assessment
  - Drainage
    - Drains
  - Positioning
    - Neutral hip
  - Pain
    - If foot drop, will stop epidural for assessment



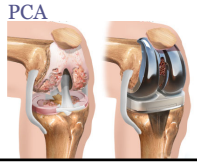
565

Orthopedic Procedures – Knee

- Anterior cruciate ligament (ACL) reconstruction
  - Ice and elevate
  - Same day
  - Two small incisions



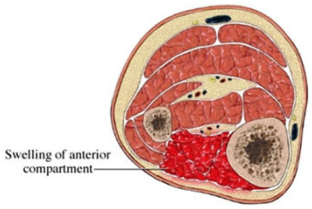
- Knee Arthroplasty
  - Neurovascular status
    - At risk for peroneal nerve palsy
  - Pain
    - Ice and elevate
    - Epidural
    - PCA



566

Compartment Syndrome

- Risks
  - Closed fractures
  - Casts / braces / dressings
- Neurovascular Assessment
  - Pulse
  - Capillary refill
  - Pain
- Prevention
  - Ice and elevate
- Treatment
  - Loosen Cast / device / dressing
  - Fasciotomy



567

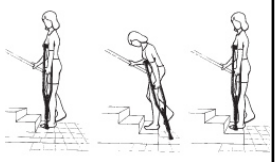
Crutches

- Stand erect, looking forward when walking
- Lead with strong, unaffected leg
- Weight is born on wrist and triceps
- Two or three fingers should be fit between axilla and axillary pad
- Raise or lower handgrips so that elbows are bent 20 – 30 degrees

568

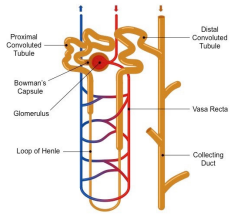
Crutches

- Stair climbing
  - Step up with unaffected leg and follow with crutches and affected leg
  - Step down with affected leg and crutches; brings unaffected leg down to same stair
- Take small controlled steps
- Wear sturdy walking shoes with nonskid soles
- Assess home for throw rugs, electrical cords, obstructions



569

Renal System



- Nephrons
  - Functional unit of kidney
  - Glomerular Filtration Rate
    - Affected by MAP
  - Tubule Reabsorption
    - Most electrolytes, urea, and all glucose and amino acids reabsorbed
    - ATP needed to move medications into filtrate and out of the body

570

Renal Surgery

- Nephrectomy
  - Several surgical approaches
  - Complications:
    - Bleeding
    - Post Op pneumonia
- Adrenalectomy
  - Same surgical approaches as nephrectomy
  - Fluid /Electrolyte issues
  - Cortisone treatment



571

Renal Surgery - Transplant

- Preop
  - Reassurance
  - Assess for potential infection sources
  - Assess for hepatitis
- Postop
  - Frequent VS / CVP
  - UOP measurement and replacement
  - Steroids, antibiotics, antihypertensives, immunosuppressants
  - Turn/position gently

Complications:
- Early rejection
- Decreased Urinary output

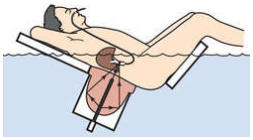
Open Surgery

Robotic Surgery

572

Renal Surgery - Lithotripsy

- Placed on water mattress
- Shock waves crush calculi
- Postop:
  - Fluids
  - Pain
  - Strain urine
- Complications:
  - Bleeding
  - Steinstrasse - obstruction from sludge
  - Bruising at site
    - Cold compress



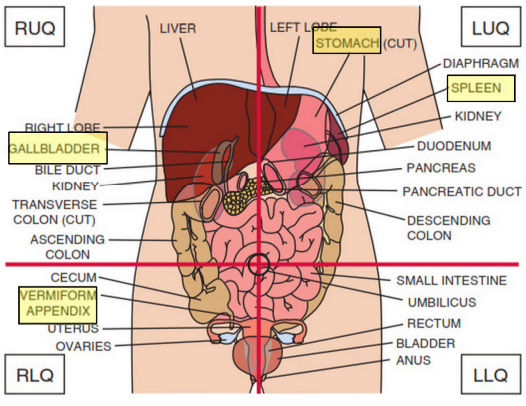
573

Renal Procedures
Transurethral Resection of the Prostate

- Postop:
  - Fluid and electrolyte
  - Urinary catheter
    - Irrigation possible
    - UOP-color, amount
  - Labs-serum osmolality, NA, K
- Complications
  - Fluid volume overload
    - Hyponatremia
  - Bleeding
  - Incontinence
  - Fistula

574

Abdominal Organs



575

Gastrointestinal Surgery

- Preop Assessment
  - Labs
    - CBC, BMP, serum enzyme levels, coag studies
    - Carcinoembryonic antigen (CEA) test
      - Marker for cancer of the colon and rectum
  - Diagnostic Tests
    - EGD (EsophagoGastroDuoendoscopy)
    - ERCP (Endoscopic Retrograde CholangioPancreatography)
      - Visualize common bile duct
      - Diagnostic for gallbladder, biliary system, pancreas, and liver
    - Colonoscopy, Sigmoidoscopy
    - Ultrasounds, and radiological examinations

576

Gastrointestinal Surgery

- Gastrointestinal Complications:
  - Paralytic ileus
  - Anastomotic leak
  - Anastomotic or stomal obstruction
  - Fistulas
  - Stress ulceration
  - Pancreatitis
  - Peritonitis
  - Bladder distension

577

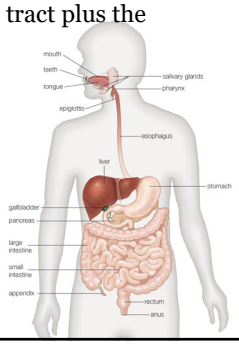
Gastrointestinal Surgery

- Other Complications:
  - Fluid & electrolyte imbalances
  - Hemorrhage or shock
  - DVT/PE
  - Hiccups
  - Aspiration
  - Hypoventilation
  - Atelectasis/pneumonia
  - Wound infection
  - Dehiscence or evisceration
  - Toxic shock syndrome

578

Gastrointestinal Surgery

- Consists of the gastrointestinal tract plus the accessory organs of digestion
  - Oral Cavity
  - Esophagus
  - Stomach
  - Bowel
  - Liver
  - Gallbladder
  - Pancreas



579

Gastrointestinal Surgery

- Oral Cavity
  - Mechanical Digestion – Teeth and tongue
  - Chemical Digestion – Salivary glands
    - Submandibular, Sublingual and Parotid
    - Salivary amylase – begins to break down food
- Oral Pharynx
  - Shared by respiratory and gastrointestinal systems
  - End of the soft pallet to the hyoid bone
- Laryngopharynx
  - Shared by respiratory and gastrointestinal systems
  - Hyoid to cricoid cartilage

580

Gastrointestinal Surgery

- Esophagus
  - Superior Esophageal Sphincter
    - Skeletal muscle tissue – conscious control
- Esophageal Sphincter
  - Smooth muscle – autonomic control
  - Also called Cardiac Sphincter
- Esophageal Tube
  - Very Elastic
  - Superior is skeletal muscle
  - Inferior is smooth muscle

581

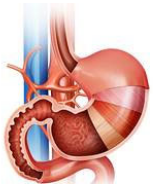
Gastrointestinal Surgery

- Esophagomyotomy (Heller procedure)
  - Loosens muscle that makes esophageal sphincter
  - Difficulty swallowing
- Procedures that treat Reflux
  - Collis-Belsey & Collis-Nissen repairs
  - Hill repair
  - Belsey Mark IV repair
  - Nissan fundoplication
  - Toupet partial fundoplication

582

Gastrointestinal Surgery

- Stomach
  - Mechanical digestion continues
    - Smooth muscle
  - Chemical digesting continues
    - Proteases
    - Acids
  - Mucosal lining
  - Rugae
    - Gastric folds
      - Allows the stomach to expand
  - Pyloric sphincter
    - Allows food to slowly enter the duodenum



583

Gastrointestinal Surgery

- Small intestine – 20 ft long
  - Circular folds and Villi – lots of surface area
- Three parts
  - Duodenum – Receives Chyme from stomach
    - Chemical digestion continues
      - Lipase and Protease from the liver
    - Adjusts pH to something that won't eat the jejunum
      - Bicarb from the pancreas Jejunum
  - Jejunum
    - Absorbs sugars, fatty acids, and amino acids
  - Ileum
    - Continues to absorb nutrients and B12 is absorbed only here
    - Sucks up any unused bile to reuse for digestion

584

Gastrointestinal Surgery

- Large intestine
  - Primary function is the absorption of water
- Sections of the large intestine
  - Cecum
    - Appendix is hanging off the Cecum
  - Colon
    - Ascending, Transverse, Descending, Sigmoid
  - Rectum
    - Folds that allow air to pass without solid matter
  - Anus
    - Internal and external sphincter

585

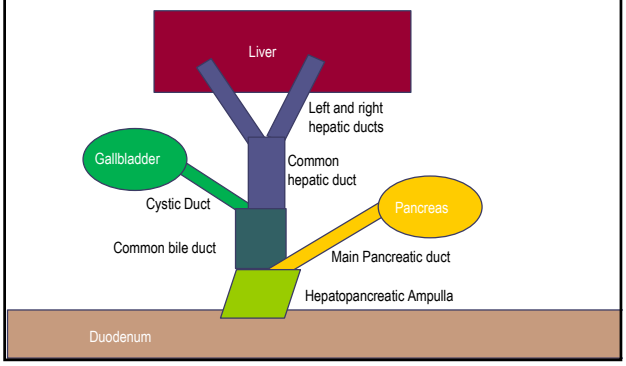
Gastrointestinal Surgery

Accessory organs of digestion

- Liver
  - Produces bile
    - Emulsifies fat and creates surface area so lipases can break down and absorb it
  - Hepatic ducts
    - Dump bile into bile duct or up into gallbladder to be stored
- Gallbladder
  - Stores bile
  - Helps liver by dumping bile into bile duct if needed
- Pancreas
  - Dumps digestive enzymes into hepatopancreatic ampulla to mix with bile

586

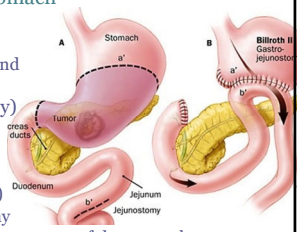
Gastrointestinal Surgery



587

Gastrointestinal Surgery

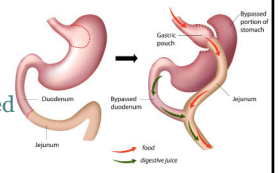
- Gastrectomy
  - Removes all or a portion of stomach
    - Antrectomy
      - 50% removal of distal stomach consisting of the antral mucosa and truncal vagotomy
    - Billroth I (gastroduodenostomy)
      - Pylorus removed
      - Superior duodenum is sewn to remaining stomach
    - Billroth II (gastrojejunostomy)
      - Reconstruction after antrectomy
      - Jejunum is sewn to the greater curvature of the stomach
    - Total gastrectomy
      - Treatment of stomach cancer



588

Gastrointestinal Surgery

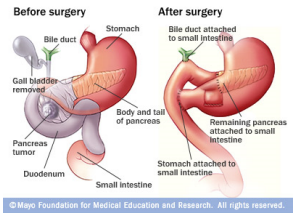
- Roux-en-Y gastrojejunostomy
  - Reconstruction after an antrectomy or gastrectomy
  - Bypass procedure for unresectable pancreatic cancer
- Roux-en-Y gastric bypass
  - 90-95% capacity reduction
  - Upper stomach is anastomosed by an approximately 1cm opening to jejunum to allow intestinal absorption and elimination of food



589

Gastrointestinal Surgery

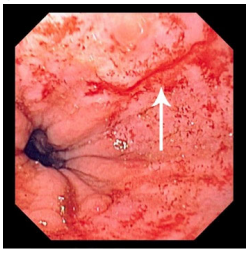
- Whipple Procedure
- Usually for metastatic pancreatic cancers
  - Antrectomy
  - Cholecystectomy
  - Choledochectomy
  - Pancreatojejunostomy
  - Hepaticojejunostomy
  - Gastrojejunostomy



590

Gastrointestinal Surgery

- Mallory-Weiss Tear
  - Longitudinal tear gastroesophogeal juncture
  - Violent coughing or vomiting
    - Aspirin, alcohol ↑ risk
  - Hematemesis 1st sign
  - Endoscopic treatment
    - Thermal coagulation
    - Epinephrine injection
    - Laser, ligation, clip
  - Angiotherapy
  - Rarely requires surgical over sew



591

Gastrointestinal Surgery
Postoperative Care

- Esophageal Surgery
  - Airway a primary concern
  - HOB ↑ unless contraindicated
  - Pain control
  - Drains-CT, NG
    - Mark drainage on arrival
  - Tracheostomy care
- Gastric surgery
  - Pulmonary toilet essential
  - Careful pain management
  - NG tube
  - CV assessment for hypovolemia

592

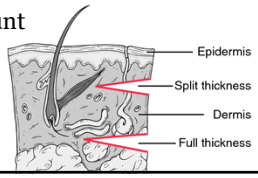
Gastrointestinal Surgery
Postoperative Care

- Small bowel
  - Sodium and Bicarb losses may be great
  - Fluid and electrolyte imbalances
  - Ileostomy-Bowel sounds return quickly
    - Stoma condition
    - Drainage
    - Bag
- Rectum and Anus
  - Check drainage
  - Pain management
  - Urinary retention

593

Skin Grafts and Flaps

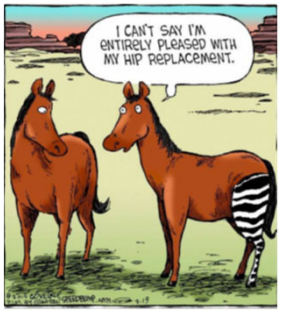
- Postop Care 3Ps
  - Pressure
    - Avoid pressure on or proximal to site
  - Position
    - Elevate and immobilize
  - Pain
- Vascular assessment paramount
  - Doppler, BP adequate
- Avoid shearing forces



594

Systems Quiz

- 31 Questions
- 31 Minutes



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SYSTEMS

31 Minutes

1. To prevent complications after cataract surgery, the patient should be instructed to:

   a) Bend over only for short periods
   b) Sleep on the affected side
   c) Refrain from heavy lifting
   d) Read as much as possible

2. A patient undergoing a transurethral resection of the prostate (TURP) under spinal anesthesia starts to have trouble breathing and has a bounding pulse. The electrolyte panel shows a sodium of 130 mEq/L. The most likely cause is:

   a) Anesthesia overdose
   b) An adverse reaction to the bladder's being filled and emptied rapidly during surgery
   c) Hemorrhage
   d) Absorption of irrigation fluid into the vascular system

3. A patient with severe chronic obstructive pulmonary disease (COPD) requires both humidification of oxygen and a tightly controlled flow rate. Which of the following would be the best choice for oxygen therapy?

   a) Venturi mask
   b) Partial non-rebreather mask
   c) Non-rebreather mask
   d) Simple facemask

4. Auscultation of the pulmonic heart sound is best heard at the

   a) second right intercostal space at the right sternal border
   b) second left intercostal space at the left sternal border
   c) third left intercostal space at the left sternal border
   d) fifth left intercostal space at the left sternal border

5. A classic sign of lower extremity compartment syndrome is severe pain on

   a) Eversion of the foot
   b) Passive stretching of the large toe
   c) Inversion of the hip
   d) Plantar flexion of the foot

6. Which agent would be inappropriate for multimodal pain control post augmentation mammoplasty with placement of prosthesis under pectoral muscle

   a) Narcotic
   b) Ice
   c) Aspirin
   d) Oral muscle relaxant

7. You receive a patient from the OR into Phase I PACU who has had a Caldwell-Luc procedure. You would expect this patient to be received positioned how?

   a) Side lying
   b) HOB ↑ 30°
   c) With the surgical extremity elevated
   d) A and B

8. Which of the following is a clinical picture of cardiogenic shock?

   a) decreased CVP, shallow breathing, decreased level of consciousness
   b) collapsed neck veins, dry mucous membranes, and cyanosis
   a) Tachypnea, dyspnea, and tachycardia
   c) elevated cardiac index, decreased systemic vascular resistance, and hypercarbia

9. Your patient grimaces and flexes his arms and wrists toward his chest and extends his legs, pointing his toes downward and inward upon assessment. The nurse documents the patient's current response as:

   a) Decerebrate rigidity
   b) Asynchronous reflex
   c) Decorticate posturing
   d) Withdrawal reaction

10. In the preoperative setting, a patient states that he always gets antibiotics before dental procedures. Which of the following items in the patient's history would explain his statement?

   a) Pacemaker placed 2 years ago
   b) Coronary artery bypass graft (CABG) 2 years ago
   c) Prosthetic repair of mitral valve.
   d) Atrial septal defect (ASD) repair as a child

11. Patient M is in recovery after open heart surgery, the nurse is concerned about cardiac tapenade from which following assessment?

   a) CVP 6
   b) No output from mediastinal chest tubes
   c) Bradycardia
   d) Distinct S1/S2 sounds

12. All of the following can be used to evaluate a patient's preload *except.:*

   a) Right atrial pressure (RAP)
   b) Systemic vascular resistance (SVR)
   c) Central venous pressure (CVP)
   d) Pulmonary capillary wedge pressure (PCWP)

13. The four-month-old with Tetralogy of Fallot is in the preoperative area when he begins to cry. The child becomes very cyanotic. What is the response of the perianesthesia nurse?

    a) Call the rapid response team
    b) Lie the infant supine on the bed and give 100% oxygen and start an IV
    c) Put the child in a knee to chest, give oxygen and calm
    d) The fit will pass if you ignore the behavior

14. A patient with an implanted cardioverter defibrillator (ICD) goes into ventricular fibrillation upon transfer into the PACU. Which of the following statements is true about an ICD?

    a) Patients with an ICD will never require external defibrillation
    b) Cardiopulmonary resuscitation should be interrupted when the ICD fires
    c) Defibrillation paddles/pads should be placed directly over the ICD to override it
    d) Defibrillation paddles/pads should not be placed directly over the ICD

15. A moderately obese male patient, recently extubated after a thoracotomy, continues to be sedated and has oxygen desaturations despite stimulating the patient to cough and deep breathe. He is wearing a simple facemask with 8L O2. ABG's are drawn. pH =7.32, PaCO2 = 50, HCO3 = 25, PaO2 = 65. These results indicate what acid base imbalance?

    a) Metabolic acidosis
    b) Metabolic alkalosis
    c) Respiratory acidosis
    d) Respiratory alkalosis

16. Scopolamine is classified as a/an:

    a) Class III antiemetic
    b) Anticholinergic
    c) Class II neuroleptic
    d) acetylcholinesterase

17. Your patient is hypothermic and has a low CO2. This would cause the oxyhemoglobin dissociation curve to shift to the left, which would:

    a) Decrease the release of oxygen from hemoglobin to the tissues
    b) Increase the release of oxygen from hemoglobin to the tissues
    c) Cause potassium to be released from the cells
    d) Promote oxygenation of the tissues

18. Your postop intubated patient has an ABG drawn. She is starting to awaken and have spontaneous respirations. The ABG is as follows: pH 7.49 CO2 30 HCO3 24 PaO2 98 Sat 98. Based on the patient and the ABG, you would expect anesthesia to order respiratory therapy to:

    a) Increase the tidal volume
    b) Decrease the respiratory rate
    c) Give 1 amp of sodium bicarbonate
    d) Increase the respiratory rate

19. You have a patient with a pulse oximetry reading of 90%. This would correspond to a PaO2 of:

    a) 90
    b) 70
    c) 60
    d) 50

20. Anesthesia is bringing a patient to your bed via OR cart. As the patient is rolling toward you, you hear the patient making high pitched crowing noises, sitting straight up in bed with a fearful look on his face. You suspect:

    a) Cardiac tamponade
    b) Pulmonary edema
    c) Laryngospasm
    d) Pneumothorax

21. You are the preoperative nurse obtaining a medication history on your patient. Which of the following medications might be causing the frequent cough the patient has?

    a) Loop diuretic
    b) ACE Inhibitor
    c) Beta Blocker
    d) Calcium channel blocker

22. Upon receiving a patient from the OR, you hook the patient to the cardiac monitor. The ST segment appears elevated. You know this could indicate:

    a) Ischemia
    b) Injury
    c) Myocardial cell death
    d) A normal finding

23. The nurse asks a patient to move his tongue in a side to side motion. What cranial nerve function is the nurse evaluating?

    a) the hypoglossal
    b) vagus
    c) glossopharyngeal -controls gag reflex
    d) facial

24. You are doing the preadmission assessment on a patient who is on digitalis. He notes recently seeing yellow halos with both eyes. This would lead you to suspect:

    a) Hyperkalemia
    b) Lidocaine toxicity
    c) Digitalis toxicity
    d) Organic brain syndrome

25. The nurse receives an order to monitor a patient's atrial pressure after CABG surgery to evaluate the patient's preload status. The nurse understands that the preload refers to the

    a) percentage of blood in the ventricle
    b) end-diastolic pressure
    c) pressure against which the ventricles must pump
    d) the amount of blood ejected by the ventricle

26. Interpret the ABG: pH 7.25, PCO2 40, HCO3 12

    a) Metabolic alkalosis
    b) Metabolic Acidosis
    c) Respiratory alkalosis
    d) Respiratory acidosis

27. Interpret the ABG: pH 7.48, PCO2 50, HCO3 34

    a) Metabolic alkalosis
    b) Metabolic Acidosis
    c) Respiratory alkalosis
    d) Respiratory acidosis

28. Interpret the ABG: pH 7.18, PCO2 60, HCO3 26

    a) Metabolic alkalosis
    b) Metabolic Acidosis
    c) Respiratory alkalosis
    d) Respiratory acidosis

29. Interpret the ABG: pH 7.55, PCO2 20, HCO3 18

    a) Metabolic alkalosis
    b) Metabolic Acidosis
    c) Respiratory alkalosis
    d) Respiratory acidosis

A 16 year old male patient under general anesthesia is admitted to the PACU after an anterior cruciate ligament reconstruction. On admission to PACU he is alert and oriented. BP is 100/50, HR is 120, RR is 28. O2 sat is 88% on 4L nc. When speaking his O2 sats drop to 82% and he is noticeably dyspneic. Scattered rales auscultated bilaterally. Consider this scenario when answering the next two questions.

30. Understanding postanesthesia complications, what does the nurse suspect?

    a) Anaphylactic reaction
    b) Noncardiogenic pulmonary edema
    c) Cardiogenic shock
    d) Narcotic overdose

31. What mechanism of would cause this to occur?

    a) Exposure to latex
    b) Inadequate reversal
    c) Airway obstruction
    d) Both B and C

Bibliography

- Odom-Forren, J. (2018). *Drains perianesthesia nursing: a critical care approach*. St Louis, MO: Elsevier.
- Schick, L., & Windle, P. E. (2016). *Perianesthesia nursing core curriculum: preprocedure, phase I and phase II, PACU nursing*. St. Louis, MO: Elsevier.
- *2019-2020 perianesthesia nursing standards, practice recommendations and interpretive statements*. (2021). Cherry Hill, NJ: American Society of PeriAnesthesia Nurses.

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Thank You!

- Please let us know how you do
- Contact us if you need anything!

Zander Perioperative Education

803-271-0744

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AVK

You need to talk to learn. Reading out loud and reading along are very effective ways to retain information.

What you need

1. A study group
2. A hand held recorder
3. The recordings of class
4. A Perianesthesia nursing text book
    a. Perianesthesia Nursing Core Curriculum – Preoperative, Phase I and Phase II PACU Nursing. WB Saunders, St. Louis, MO., 2021.
    b. Odom-Forren, J. Drain'sPeriAnesthesia Nursing: A Critical Care Approach. 7th Ed. Elsevier Saunders, 2018.
5. 2021 – 2022 Perianesthesia Nursing Standards, Practice Recommendations and Interpretive Statements
6. Blank Notebook

What to do

1. Schedule your exam. Everyone works better with a deadline.
2. This learning style does well with a study group. If you have the opportunity to belong to one make an effort to attend.
3. You should have marked your slides to identify your areas of weakness as you took notes. You may want to listen through the recordings again with no other thought than to mark the slides with content that you think you may answer incorrectly.
4. Next look those things up in the Perianesthesia text book that you've chosen to use. Take notes in a separate notebook on the topics you marked.
5. Make sure you check each topic with the Standards to make sure your information from the text is current. This takes a long time. It's work. And it's very effective.
6. Once you have worked through the whole class. You've looked up every topic you mark as an area of weakness and taken notes on the information. Now it's time to record. Read your notes from your notebook into the recorder. This takes a little time but not nearly as laborious as writing it.
7. Once you have the notes and the recordings you will listen to them over and over. Preferably you will be reading the notes at the same time you are listening. This will engage both your auditory and visual learning at the same time. Also, listen to the recordings from class but remember your own notes are more important. If English is not your first language, it's okay for your recording to be in your first language if that makes it easier for you to remember.
8. Study for about an hour a day for 6 weeks before your exam.
9. Use the apps with practice questions. My favorite is Certification Review for PeriAnesthesia Nursing, 4e
10. Email me at Wendy@periop-ed.com or any of the instructors if you have any questions. We are here to help you. Remember I can share a copy of the recorded class with you one final time. I ask that you have scheduled your exam before I send you this final set. I record at least one class every month. The recordings are available for two months from the day they are recorded. So I can send them to you about two months before your exam date.

AKV

For an AKV the worst thing you can do is review written notes and read books... You're not a visual learner so that's the most ineffective way to retain information. You can do it, it's just harder. A study partner that will get up and move with you is okay but not a study group.

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5. You'll have the recordings I'll send to you and now you have your focused recordings too. Now listen to these at least an hour a day while you are doing something physical. Clean the house, walk the dog, or do some laundry. I also like to listen while I am driving. It can be anything as long as you're not lying down or curled up resting. If English is not your first language, it's okay for your recording to be in your first language if that makes it easier for you to remember.
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KVA

A study partner that will get up and move with you is okay but not a study group. You need physical activity but written books and notes work better than an audio version.

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5. Laptop or computer

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5. Once you have worked through the whole class. You've looked up every topic you mark as an area of weakness and taken notes on the information. Now, copy those notes onto flashcards
6. Set your notebook up on a treadmill and program it to a slow walk while you review your notes.
7. Divide the flashcards by topic and pick a topic a day to carry with you. Read through some of them if you get a minute.
8. You may want to retype them into a word document. Copying the information will help you retain it.
9. If you want to review your notes while sitting it's okay but only in short bursts. Sit and study for no more than 15-20 minutes and then get up and be active at least that long. Then sit down and study for another 15-20 minutes.
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6. Study for about an hour a day for 6 weeks before your exam.
7. Use the apps with practice questions. My favorite is Certification Review for PeriAnesthesia Nursing, 4e
8. Email me at Wendy@periop-ed.com or any of the instructors if you have any questions. We are here to help you. Remember I can share a copy of the recorded class with you one final time. I ask that you have scheduled your exam before I send you this final set. I record at least one class every month. The recordings are available for two months from the day they are recorded. So I can send them to you about two months before your exam date.

VAK

Must teach to learn. You are high visual learners so clutter doesn't work well for you. You are the people that go into the OR and have to clean and straighten it before you start the day. Study in a place with minimal visual clutter.

What you need

1. A video camera or smartphone with video recording capability
2. The recordings of class
3. A Perianesthesia nursing text book
    a. Perianesthesia Nursing Core Curriculum – Preoperative, Phase I and Phase II PACU Nursing. WB Saunders, St. Louis, MO., 2021.
    b. Odom-Forren, J. Drain'sPeriAnesthesia Nursing: A Critical Care Approach. 7th Ed. Elsevier Saunders, 2018.
4. 2021 – 2022 Perianesthesia Nursing Standards, Practice Recommendations and Interpretive Statements
5. Blank Notebook and flashcards

What to do

1. Schedule your exam. Everyone works better with a deadline.
2. You should have marked your slides to identify your areas of weakness as you took notes. You may want to listen through the recordings again with no other thought than to mark the slides with content that you think you may answer incorrectly.
3. Next look those things up in the Perianesthesia text book that you've chosen to use. Take notes and create an outline for yourself so you can record a short presentation for each topic.
4. Make sure you check each topic with the Standards to make sure your information from the text is current. This takes a long time. It's work. And it's very effective.
5. Once you have worked through the whole class. You've looked up every topic you mark as an area of weakness and taken notes on the information.
6. Divide your notes by topic and pick a topic. Read through and rehears until you can present this topic to your video camera. Record yourself presenting. Work your way through each topic.
7. By doing this you are dividing up the material into smaller chunks and then absorbing them one at a time.
8. Once you get through recording all of the topics. You study by watching them. You can also watch the recordings I will send to you. *Your own recordings are more useful though.*
9. If English is not your first language, it's okay for your video to be in your first language if that makes it easier for you to remember. Present the information in the language you think in.
10. Study for about an hour a day for 6 weeks before your exam.
11. Use the apps with practice questions. My favorite is Certification Review for PeriAnesthesia Nursing, 4e
12. Email me at Wendy@periop-ed.com or any of the instructors if you have any questions. We are here to help you. Remember I can share a copy of the recorded class with you one final time. I ask that you have scheduled your exam before I send you this final set. I record at least one class every month. The recordings are available for two months from the day they are recorded. So I can send them to you about two months before your exam date.

VKA

You are a traditional learner so reviewing your notes is the best way to study. What is most important for you is to have the RIGHT information. The best thing you can do is to focus your study on your personal areas of opportunity

What you need

1. A study group
2. The recordings of class
3. A Perianesthesia nursing text book
    a. Perianesthesia Nursing Core Curriculum – Preoperative, Phase I and Phase II PACU Nursing. WB Saunders, St. Louis, MO., 2021.
    b. Odom-Forren, J. Drain'sPeriAnesthesia Nursing: A Critical Care Approach. 7th Ed. Elsevier Saunders, 2018.
4. 2021 – 2022 Perianesthesia Nursing Standards, Practice Recommendations and Interpretive Statements
5. Blank Notebook

What to do

1. Schedule your exam. Everyone works better with a deadline.
2. This learning style does well with a study group.
3. You should have marked your slides to identify your areas of weakness as you took notes. You may want to listen through the recordings again with no other thought than to mark the slides with content that you think you may answer incorrectly.
4. Next look those things up in the Perianesthesia text book that you've chosen. Take notes in a separate notebook on the topics you marked.
5. Make sure you check each topic with the Standards to make sure your information from the text is current. This takes a long time. It's work. And It's very effective.
6. Once you have worked through the whole class. You've looked up every topic you mark as an area of weakness and taken notes on the information. Now, copy those notes onto flashcards
7. Divide the flashcards by topic and pick a topic a day to carry with you. Read through some of them if you get a minute.
8. Flash cards work really well for you. Reading while pacing about works for you to and is easy to do with flashcards
9. You may want to retype them into a word document. Copying the information will help you retain it.
10. If you want to review your notes while sitting it's okay but only in short bursts. Sit and study for no more than 20 minutes and then get up and be active at least that long. Then sit down and study for another 20minutes. You can do long study sessions but you are most efficient for the first 20 minutes
11. Once you have the notes and the recordings you will listen to them over and over. Preferably you will be reading the notes at the same time you are listening. This will engage both your auditory and visual learning at the same time. Also, listen to the recordings from class but remember your own notes are more important. If English is not your first language, it's okay for your recording to be in your first language if that makes it easier for you to remember.
12. Study for about an hour a day for 6 weeks before your exam.
13. Use the apps with practice questions. My favorite is Certification Review for PeriAnesthesia Nursing, 4e
14. Email me at Wendy@periop-ed.com or any of the instructors if you have any questions. We are here to help you. Remember I can share a copy of the recorded class with you one final time. I ask that you have scheduled your exam before I send you this final set. I record at least one class every month. The recordings are available for two months from the day they are recorded. So I can send them to you about two months before your exam date.

Zander Perioperative Education