

ANES 441 SYLLABUS
By
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TOPICS (Preliminary)

NOTE01: ANES 441 comprises lectures and demonstrations by Dr. Cechner and lectures, tours and demonstrations by out-of-department experts. These experts, usually heads of departments or divisions, will be scheduled AFTER preparatory material is presented by Dr. Cechner. In some cases no preparatory material is required.

NOTE02: The topic sequence given below **IS NOT, and cannot be, in chronological order** because, at this moment, we do not know the schedules of the experts. Updates will follow as soon as we know their schedules.

NOTE03: While not scheduled explicitly below, review and analysis of the “Monthly QA Event Report” can be done at any time to focus on important safety and other untoward events seen during surgery/anesthesia here at UHHS.

1. ANES 441 topic makeup

Acid/Base balance (loose ends if any)
Anaphylactic/Anaphylactoid reactions in anesthesia

2. “OOPS in the OR” complications (untoward events) and rescues in the operating room

Lecture and PPT presentation (Dr. Cechner)

3. Special or advanced topics with application in anesthesia

Anesthetic and other forms of myocardial “preconditioning” as applied in anesthesia, post operative cognitive dysfunction (POCD), xenon in anesthesia.
Lecture with references and graphics (Dr. Cechner)

4. Pain: Basic pathways, anatomy, physiology and basic pharmacology (if not already covered elsewhere)

5. Statistics in clinical medicine I (Dr. Cechner)

Reading: Lecture with graphics (Dr. Cechner)

6. Statistics in clinical medicine II (continuation of statistics I) (Dr. Cechner)

Reading: Lecture with graphics

7. Ultrasound and Doppler imaging in anesthesia (Cechner)

Reading: [MMM4 Ch. 4, pp. 73-74 (Doppler flow meters); Ch. 6, pp.139 (simple 2D flow); Ch. 20, pp. 460 (TEE); Ch. 21, pp. 499-507 (advanced TEE – just skim

for concepts); and Barash, Cullen and Stoelting (BCS) 4th Ch. 25 (review entire chapter)

- Ultrasound history:
- Penetration and reflection:
- Timing:
- Single and multiple beams:
- Applications of simple ultrasound:
- The Doppler effect:
- Doppler applications:
 - Blood flow
 - Heart imaging
 - OB imaging
 - Needle guidance (lab demo)**
- Diagram of an ultrasound system

8. Temperature control and humidification in anesthesia (review if needed)

(Cechner)

Reading: [MMM4 Ch. 4, pp. 74-76 and p. 22

9. Lasers and radiation in surgery and anesthesia

(Cechner) Reading: MMM4 Ch. 39, pp. 837–841 + Miller 5th Ch. 64 + Handout. Note

Items of importance to anesthesia provider are **BOLDED**

DEFINITIONS and BASIC CONCEPTS

Frequencies/Wavelengths

VISIBLE range

Far IR - 6000

Near Infrared 1500

RED = 700-1000 nm

Yellow – 600

Green – 514

Blue = 450

Violet – 200

UV –100

Xray

Cosmic

Characteristics:

Coherent

Monochromatic

Collimated

Lasing medium

Cavity

Mirrors

Pump energy input

APPLICATIONS

Tissue effects

Narrow beam – limit extent

LF laser (CO₂) superficial – **vaporize water**

HF laser Nd:YAG = deeper penetration – column on heat – **absorbed by pigment (not water)**

Spectrum - wavelength

AM radio

TV-FM radio

Microwave

CO₂ 10600 nm

>Very far infrared – invisible – need “shoot beam” or **helium-neon laser pilot beam (he-ne laser)**

>Completely abs by water, cell h₂O heats to 100 deg C – **vaporizes → explosion → plume** (might contain pathogens)

>90% energy abs before 0.05 mm depth (graph)

>Cant be directed by optical fibre – needs mirror system

>Advantages

Precise – little collateral damage – rapid heal – pain endings destroyed – low blood loss dt/ coagulation of small vessels

Uses

ENT = microsurgery on vocal cord polyps, papillomas (**pluming possible threat to team**)

GYN – **laparoscopic destruction of condyloma (possible plume problem)**, endometriosis

NEURO – spinal cord brain tumors

GEN – tumor stripping

Nd:YAG (neodymium doped yttrium – aluminum-garnet) 1060 nm

Near infra red

Needs **He-ne**

Penetrates clear structures

Can be directed with optical fibre

Uses

Bladder tumors via cystoscope

Esophageal, tracheal, bronchial via fibre scopes

GI – ulcers via gastroscope

>Excellent – coagulation, **vaporization of neoplasms** – POOR cutting – wide dispersion and scatter large area of damage

Argon (combined with other vapors) 488-514 nm VISIBLE

Visible green blue

Abs by complement color (red)

Absorbed by Hb and Melanin

Remove tattoos

Eye surgery

Vacuolar coagulation

Good coagulation

Poor cut

NO he-ne

Safety

>CO2 – damage cornea/sclera

>Argon-YAG damage retina

>Eye protection

CO2 – clear glass OK

Argon – amber/orange glass

YAG – green glasses

>Reflection – unlimited distance no loss

>Cover windows and portals – goggles given to any user

>Use burnished instruments

>Use moistened sponges, cottonoids drapes

FIRE

No Etoh, Meh

Cloth, sponges, cotton – wet

No organic lubes

ETT fires

>NO PVC unless covered with reflective=diffusive tape

>USE laser-flex tube

>Cuff balloon filled with water

>Keep o2 <40%

If fire

Remove ETT

Reintubate smaller

Use bronchoscope to assess damage and remove junk

May need tracheostomy

→Laser plume evacuation

Can transmit infection w/ bacteria and virus

Contains mutagens and carcinogens

Need high vacuum evacuator

Special mask filters down to 0.3 microns

10. IABP, cardiac assist devices and pressure profile interpretation (Cechner – Preparation for CPBP lecture/demonstration of perfusionist)

Reading: [Handout + MMM4 Ch. 21, pp. 492-496, Barash, Cullen, Stoelting 4th Ed Ch. 32, pp. 915, MI 5 Ch. 30, pp. 1141-1142]

Goal: To become familiar with the IABP and its impact on pressure measurements in vivo. To introduce the CPBP for advanced study later.

1. The IABP.:
 - A. A large balloon device normally threaded into the Femoral artery and positioned just distal to the subclavian ostium
 - B. The device is rapidly inflated with helium or argon at a specific time synchronized to the ECG (during early diastole. It is then actively deflated just BEFORE systole
 - C. The effects on the patient are reduced after load and less myocardial work, less myocardial O₂ consumption, increased CO, increased coronary perfusion,
 - D. The effects on pressure measurement are, bizarre systolic and diastolic waves compared to the normal aortic root or radial artery pressure profiles.

2. CPBP (CardioPulmonary Bypass Pump):
 - A. A device for perfusing the body while heart, or other, surgery is done
 - B. Key elements are venous return cannulae, various “suckers” and “vents”, the arterial supply, the roller pumps, cardioplegia circuit, blood filters, blood heaters, oxygenator, infusion ports for drugs.
 - C. The pressure profile is basically flat with small undulations caused by the roller pumps. Non pulsatile flow may be poorly tolerated by some organs (brain and kidney)
 - D. Major problems are, clots and microemboli, weaning.
 - E. More details in a specialty lecture

11. Cardiopulmonary Bypass – Lecture and Tour (Jeff Foster – Chief Perfusionist)

Basic science preparation (Cechner)

Reading: [MMM4 Ch. 21 to p. 524]

History

Pump setup

Venous reservoir, filter with prime

Suckers

Vents

Oxygenators

Pumps

Cardioplegia

Suction

Heat exchanger

Filters and bubble traps

Injection ports

Thermistors

Pressure transducers

Preop considerations

Serious - lethal consequences if

- EF<25%
- Coronary stenosis >80% and symptomatic
- Poor exercise tolerance
- WMA's
- Hemostasis – intraop and post op
 - Aprotonin
 - Tranexamic acid
 - Heparin
 - Dosing
 - Use of FFP
 - Reversing Heparin
 - Protamine
 - Use of Ca⁺⁺
- Sternal splitting response
- Placing catheters
 - SVT
- Going on pump
 - Cardioplegia
 - Antegrade, retrograde
 - Parameters (table)
 - Priming the pump
 - Hypothermia
 - Mild
 - Moderate
 - Deep
 - Profound
 - Rewarming
 - Brain damage
 - Drug dosing
 - What happens to narcotics and benzos at pump on ?
- Off pump considerations
 - Have Nipride and phenylephrine and dobutamine and dopamine
 - Core temp
 - NSR
 - HR 80-100
 - POX on 100% OK
 - Double check all monitors
- Consideration of CABG redo ??

12. Cell Salvage – Preparation for Cell saver Lecture and Demonstration (Mel Henley).

Basic science preparation (Cechner)

Reading: [Handout for Cobe BRAT-2]

Operations suggesting use of Cell Saver

Basic operating principles

Suckers

- Diluting
- Cell separation
- Reinfusion blood specifications
- Machine setup
 - Bag mounting
 - Harness mounting and hookup
 - Sterile side hookup
 - DOs and DON'Ts
- Machine operation
 - Standard mode
 - Emergency collect-only mode
 - Multiple setups

13. Respiratory Therapy: (Lecture and demonstration by Steve Slaughter – Chief RT department)

- Review of the physiology and pathophysiology
- New machines in use today
- Modes of operation
 - Why use certain modes
 - How to set parameters in various modes
- Demonstration of a modern ventilator

14. Dialysis techniques used today: (Lecture by Susan Blankschaen – Chief of UHHS dialysis)

- Why dialyze
- Physiology of dialysis
- Impact on the practice of anesthesia
- Various forms of dialysis
 - Benefits of each
 - Problems with each
- Pearls

15. Microbiology and Infection in Surgery (Lecture by Dr. Michael Jacobs, Chief Microbiology UHHS)

- Sources of infection
 - In the OR
 - In public
 - How safe are we in the OR?
 - Do hats and booties protect anybody?
- Prevention
- Kinds of infective agents
- Antimicrobials
 - When to use
 - When not to use
 - What is used

16. Blood banking and Transfusion Therapy applied in Anesthesia (Lecture and tour
– Dr. Harry Taylor – Chief of Blood bank and Transfusion services UHHS)

- The modes of operation of a transfusion service
- What products are available
- How they are obtained
- When to use them
- Potential disasters
- Blood Bank Tour

17. Imaging in Medicine and Surgery: (Lecture by Dr. Jeff Duerk)

- Common applications in surgery
- MRI technology and applications in the OR
- CT technology and applications in the OR
- PET technology and applications
- Other

PREPARATION FOR INVITED OUT-OF-DEPARTMENT EXPERTS NOT MENTIONED ABOVE

Respiratory Therapy – Preparation for Lecture and Demonstration (Steve Slaughter – chief RT UHHS)

Reading: [MMM4 Ch. 49, pp. 1023-1044]

Hemodialysis (and other forms of Dialysis) – Impact on the anesthetic plan (Susan Blankschaen – chief dialysis unit UHHS)

Reading: [MMM4 pp. 681-684 + p. 1063 + pp. 747-748]

Blood Bank - Lecture and Tour (Chief of Blood and Transfusion Services UHHS, Dr. Harry Taylor)

Reading: [MMM4 Ch. 29, pp. 695–707]

Selected Antibiotics, Microbiology and Application in the OR (Dr. Michael Jacobs –chief microbiology UHHS)

Reading: Handout

Imaging in surgery and anesthesia: Dr. Jeff Duerk

Reading: Handout

SUMMARY

OUT-OF-DEPARTMENT EXPERT PRESENTATIONS (scheduled as available)

Cell Salvage - Cell saver Lecture and Demonstration (Melvin Henley, Chief Anesthesia Technician UHHS)

Respiratory Therapy – Lecture and Demonstration (Steve Slaughter – chief RT UHHS)

Hemodialysis (and other forms of Dialysis) – Impact on the anesthetic plan (Susan Blankschaen – chief dialysis unit UHHS)

Blood Bank - Lecture and Tour (Chief of Blood and Transfusion Services UHHS, Dr. Harry Taylor)

Selected Antibiotics, Microbiology and Application in the OR
(Dr. Michael Jacobs –chief microbiology UHHS)

Cardiopulmonary bypass systems and associated physiology and pharmacology
(Jeff Foster Chief Perfusionist UHHS)

Advanced Imaging modalities in medical care (MRI, CT, PET, Fluroscopy etc.
Jeffrey L. Duerk, Ph.D. Chairman, Department of Biomedical Engineering and
Director, Case Center for Imaging Research Allen H. and Constance T. Ford
Professor in Biomedical Engineering Professor- Radiology and Oncology- Case
School of Medicine)