

1 **COMPLICATIONS: PREVENTION AND PREPARATION ARE THE KEYS!**

FLORIDA SOCIETY OF ORAL AND MAXILLOFACIAL SURGEONS
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2 **DISCLOSURES**

- I have no financial relationships to disclose
- Hotline Consultant for the Malignant Hyperthermia Association of the United States
- President-Elect of the Pennsylvania Society of Anesthesiologists
- Delegate to the House of Delegates of ASA
- ASA Liaison to ADA, AAOMS, ADSA
- Proud graduate of Tufts University of School of Dental Medicine

3 **MORTALITY FROM THE OMSNIC PERSPECTIVE**

2015

4

5

6

7 **REASONS FOR MORTALITY IN OBA FOR OMS**

- Outcomes from OMSNIC assessment
- All de-identified

8 **TOP 10 REASONS**

- 1 • 1- Loss of adeq. O2
- 2- Delay in event recog.
- 3- Delay in initiating proper resuscitation
- 4- Failure to appropriately resuscitate
- 5- Failure to respond or emerge
- 2 • 6- Inadequate pre-op eval.
- 7- Judgment on location for procedure
- 8- Judgment on drug selection
- 9- Judgment on depth of anesthesia
- 10- Inadequate assistance

9 **10 REASONS IN DEPTH**

10 **LOSS OF ADEQUATE OXYGENATION**

- First symptom
 - Decreasing SpO2
 - “Difficulty breathing”
 - SOB- MI, PE
 - Agitation
 - Emesis- Laryngospasm, Aspiration
 - Apnea on induction of sedation/anesthesia
 - Change in color of blood

11 **LOSS OF ADEQUATE OXYGENATION**

- First symptom
 - Wheezing- Asthma, acute allergic reaction
 - Laryngospasm
 - Bronchospasm
 - Pulmonary emboli
 - Aspiration- Throat pack, Tooth particles, Instruments

12 **LOSS OF ADEQUATE OXYGENATION**

- Anatomic challenge
 - Obese- Thick neck
 - History of OSA
 - Trismus- Infection, TMJ, Rheumatoid arthritis, Trauma
 - Retrognathia
 - Laryngeal and tongue carcinoma

13 **DELAY IN RECOGNITION OF EVENT**

- Inadequate monitoring
 - SpO₂, ET CO₂, Auscultation, EKG, Pulse
 - Blame equipment connections
 - Turn off alarms

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15 **FAILURE TO APPROPRIATELY RESUSCITATE**

- Unable to re-establish an airway
 - Unable to intubate
 - Absence of an LMA in situ
 - Failed surgical airway
 - After intubation failure to confirm
 - By auscultation
 - With ET CO₂ device

16 **FAILURE TO RESPOND/EMERGE FROM ANESTHESIA(SEDATION)**

- CVA
- Delayed response
 - Overdose
 - ? etiology

17 **INADEQUATE PRE-PROCEDURAL EVALUATION**

- Patient fails to give correct history
- Surgeon fails to explore history response
- Patient taking undisclosed recreational medications

18 **JUDGEMENT ON LOCATION FOR PROCEDURE**

- No documentation

- Updated history
- ASA status
- Airway assessment score- Mallampati as an example
- Medical risk

19 **JUDGEMENT ON MEDICATION SELECTION**

20 **JUDGEMENT OF DEPTH OF ANESTHESIA**

- Sedation vs. general anesthesia
- Mild sedation ⇨ Moderate sedation ⇨ Deep sedation ⇨ General anesthesia

21 **INADEQUATE ASSISTANCE**

- Not enough trained personnel to facilitate the resuscitation
 - No recording of events
 - Inability to restart and infiltrated IV
 - Chaos
 - Unable to locate emergency equipment

22 **INADEQUATE ASSISTANCE**

- EMT personnel assumes care (takes over)
 - Change IV then unable to restart
 - Change monitors and lose all data
 - Wastes time trying to intubate when one is able to ventilate
 - Delay in transport
 - Recline an unconscious breathing patient and lose airway

23 **PREPARATION**

- Patient
- Drugs
- Equipment/Monitors
- Staff
- Self

24 **PREPARATION OF THE PATIENT**

- Is the patient in the best possible condition considering their baseline diseases?
- Examples of poor candidates: Unstable coronary artery disease, recent exacerbation of COPD, recent stroke, poorly controlled diabetes

25 **PREPARATION OF DRUGS**

- Am I using current medications that have the best patient profile?
- Am I using the same doses of the same drugs on all patients?
- Am I using Black Boxed Drugs?
 - Droperidol
 - Phenergan
 - Meperidine
- Multi-dose vials are multi-dose for a single patient only!!!!

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26 **PREPARATION OF EQUIPMENT/MONITORS**

- Have I checked to make sure that all of the instruments are in working order and are sterile?
- Have I checked the functionality of my monitors including capnography and pulse oximeters?
- Is my office truly latex free?
-

27 **PREPARATION OF STAFF**

- Have I empowered my staff to truly assist with emergencies?
 - Do we practice emergency care in the office on a routine basis?
- Have I empowered my staff to remind me to perform a “time out” prior to proceeding with patient care?
-

28 **PREPARATION OF MYSELF**

- Do I practice the most current approaches and techniques?
- Do I use patient safety first?
 - Is it my right to practice or is it my responsibility to patient care?
 - What would I want if it were my family or myself?

29 **PRACTICE CRISIS RESOURCE MANAGEMENT**

- 1 • CALL FOR HELP EARLY
 - Designate leadership
 - Establish role clarity
 - Distribute the workload
- COMMUNICATE EFFECTIVELY
 - Use cognitive aids
 -
- 2 • Anticipate and Plan
 - Know the Environment
 - Use all available information
 - Allocate attention wisely
 - Mobilize resources

30 **SUSPEND DISBELIEF...IT IS HAPPENING!**

- Crisis management has no place for egos!
- Good emergent care requires effective crisis management

31 **TO REITERATE...**

- CALL FOR HELP EARLY
- BE SPECIFIC ABOUT THE EMERGENCY
- MAKE SURE THAT YOUR STAFF UNDERSTANDS HOW TO BE SPECIFIC ABOUT THE EMERGENCY

32 **IN GENERAL FOR ALL EMERGENCIES**

- Oxygen
- Airway

- *Assure functioning IV*
- Normal saline or lactated ringers for IV
- No dextrose *ever* unless *PROVEN* hypoglycemia
-

33 **IMPORTANT THOUGHT**

- Poorer neurologic outcomes when unwarranted dextrose is part of the IV solution

34 **NEW LOOK AT OLD PROBLEMS**

- Protection of the airway...aspiration risk
- What's little Versed and Morphine (substitute any opioid) for that matter!
- Hårdemark Cedborg AI, Sundman E, Bodén K, et al. Effects of Morphine and Midazolam on Pharyngeal Function, Airway Protection, and Coordination of Breathing and Swallowing in Healthy Adults. *Anesthesiology* 2015; 122: 1253-1267.

35 **WHAT ARE THE CONCLUSIONS OF THIS NEW PAPER?**

- "Morphine and midazolam in dosages that produce sedation are associated with increased incidence of pharyngeal dysfunction and discoordinated breathing and swallowing, a combination impairing airway protection and potentially increasing the risk of pulmonary aspirations.

36 **MALIGNANT HYPERTHERMIA**

37 **MH IQ QUESTIONS: TRUE OR FALSE**

- 1- Since MH is better understood due to anesthesia education, research and clinical experience, it is no longer lethal
- 2- Fever is a late finding in MH crisis. If we take measure to keep patients warm, temperature monitorings is uninmportant
- 3- MH is very rare-there is one causative genetic mutation associated with MH

38 **MH IQ QUESTIONS: TRUE OR FALSE**

- 4- MH crisis is only seen when susceptible individuals are exposed to one of the potent volatile anesthetic agents.
- 5- MH crisis is an anesthesia-related syndrome and only occurs in the perioperative period.
- 6- MH crisis isn't possible if someone has had a number of event-free anesthetics
- 7- It is more difficult to remove "triggering" volatile anesthetics from the newer anesthetic machines with high fresh gas flow. Therefore, anesthesia departments should always have a "clean" anesthesia gas machine.
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39 **LAST MH IQ QUESTION**

- 8- Dantrolene comes in large vials and is difficult to draw up.
-
- Answers: All but the last two are FALSE. The last two are true and false!

40 **MALIGNANT HYPERTHERMIA IN THE OFFICE**

- Infrequent events
- Devastating when they occur
- Notable office event: Plastic surgery office in Florida

- Death of 18 year old female

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41 **SIGNS OF MH**

- Hypercarbia
- Hyperthermia
- Tachycardia
- Unexplained dysrhythmias
 - Likely hyperkalemia
- Masseter muscle rigidity
- Abdominal and peripheral muscle rigidity

42 **MH IN THE OPERATOR-ANESTHESIA MODEL**

- Stop surgery ASAP
- Call 911 Call MHAUS
- Start Dantrolene ASAP
- Intubate patient
- Start 2nd IV
- Cool patient by every means possible
 - IV fluids 15 ml/kg/hr X 3 as STARTER
- Prepare to transfer patient

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43 **MHAUS**

- Malignant Hyperthermia Association of the United States
- They have posters and guidelines for management of the patient in the office-based setting
- Transfer to a hospital that has critical care support within the ED or a special Critical care unit

44 **ACTIVATED CHARCOAL FILTER FOR THE ANESTHESIA MACHINE**

- A company called Dynasthetics makes this device
- It effectively removes volatile agents PROVIDED no more agents are introduced or continuing to administer volatile agents
- Depending upon gas flow and depth of agent, effective removal in less than 2 minutes
- May require replacement if case is long
- Effective substitute for preop flushing (10-104 minutes)
-
- Birgenheier et al: Activated charcoal effectively removes inhaled anesthetics from modern anesthesia machines. Anesth Analg 2011; 112: 1363-1370.

45

46 **TREATMENT OF DYSRHYTHMIAS**

- Amiodarone
- Lidocaine

- USE ACLS Protocol from 2010

47 **CONTROL HYPERKALEMIA**

- Bicarbonate
- Glucose 50 GRAMS/Regular insulin 15 units
- Calcium gluconate or chloride
-
- ALL help control hyperkalemia
-

48 **PROHIBITED MEDICATIONS**

- CALCIUM CHANNEL BLOCKERS ONLY
- They interfere with dantrolene function!

49 **ADMINISTRATION OF DANTROLENE**

- Mix: 1 vial of dantrolene (20 mg) in Sterile water 60 ml in sufficient quantities to administer 2.5 mg per kg for initial dose
- Then 1 mg per kg every 10-15 minutes thereafter until acute episode subsides
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- EXAMPLE: 100 KG PATIENT requires 250 mg of dantrolene initially. Requires 13 vials= 260 mg

50 **A NEW PREPARATION OF DANTROLENE**

- RYANODEX® from Eagle Pharmaceuticals
- Just approved by the FDA last July
- Powder reconstituted in a 5 ml syringe with 250 mg! (VS. 12 vials of standard dantrolene)
- Price is higher but only 1 syringe
- Shelf life- similar to previously available dantrolene preparations
- Many institutions have already changed to this preparation

51 **HOW TO PREPARE**

- Have dantrolene- How much is enough?
- Mock MH Drill is invaluable
- Kits available from MHAUS
 - Will tailor to your practice setup
-

52 **CONTROVERSIAL ISSUES**

- No triggers-no dantrolene!
- Have only succinylcholine for laryngospasm?
- Jurisdictions have variable requirements

53 **LITERATURE TO ANALYZE THE ISSUE**

- Dexter, Epstein, Wachtel, Rosenberg: Estimate of the Relative Risk of Succinylcholine for Triggering Malignant Hyperthermia. Anesth Analg 2012. In press
- Paucity of data!

- Complex statistical data

54 **THEIR CONCLUSIONS**

- "In conclusion, at least half the cases of MH in North America have included succinylcholine even though succinylcholine was present for a much smaller percentage of anesthetics (e.g., 5-10% of cases.) Until more epidemiologic data are collected and analyzed, the consensus guidelines to have dantrolene available where succinylcholine is present are reasonable and this practice should be maintained."

55 **COST OF A HUMAN LIFE?**

- Approximately \$3,000,000
- Cost of a malpractice suit with insufficient dantrolene
- > \$3-5 million
- Refer to malpractice case in Florida

56 **TRANSFER OF CARE**

- Start process as soon as MH is suspected
 - Call 911
 - Call MHAUS if possible
- Do all possible to send a stable (clinical signs stable or improving) patient
- DO NOT DELAY TRANSFER to stabilize patient if EMS arrives
- Should go to facility prepared to handle a critically ill patient!

57

58

59 **STROKE**

60 **PERIOPERATIVE STROKE**

- Important hints:
- "This is the worse headache of my life"
 - Nuchal, occipital, unilateral
- CN III ("down and out") and CN VI nerve palsy
- Facial droop
- Anisocoria (unequal pupils)
- Acute limb function asymmetry
- Unarousable
- Delirium
-

61 **TREATMENT OF STROKE**

- IV access
- Supplemental oxygen
- Protect airway if needed
- Intubation should be rapid sequence using meds to blunt intubation response
- Treat escalating BP if needed GENTLY with labetalol

62 **TRANSFER OF STROKE PATIENT**

- Call 911 and STATE THAT THERE IS A STROKE IN EVOLUTION!
- Pt should go to a stroke center when possible vs. a hospital that does not routinely handle stroke patients
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63 **WHEN CAN I ELECTIVELY OPERATE AFTER A STROKE?**

- Jørgensen et al. Time elapsed after ischemic stroke and risk of adverse cardiovascular events and mortality following elective noncardiac surgery. JAMA 2014; 312(3): 269-277.

64 **MAJOR ADVERSE CARDIOVASCULAR EVENTS (MACE)**

- Those were the indicators after stroke for this Danish population cohort
- Ischemic stroke, Acute MI, Cardiovascular mortality, and all cause 30 day mortality

65 **16 SURGICAL CATEGORIES INCLUDED**

- 1 • ENT
- MAJOR OR MINOR ORTHOPEDIC
- ABDOMINAL W/WO BOWEL
- BREAST
- PLASTIC
- ENDOCRINE
- EYE
- UROLOGICAL SURGERIES
- 2 • FEMALE REPRODUCTIVE
- MALE REPRODUCTIVE
- NEUROSURG
- ARTERIAL VESSELS
- NONARTERIAL VESSELS
- THORACIC/PULMONARY

66 **EXCLUDED SURGERIES**

- GASTROSTOMIES
- TRACHEOSTOMIES
- INTRACRANIAL/LESIONS OF SPINAL CORD
- ORTHOPEDIC PROCEDURES THAT WERE PRECEDED BY TRAUMATIC INJURIES
- AORTIC ARCH (USUALLY WITHIN 30 DAYS OF STROKE)
-

67 **POSTOPERATIVE ANALYSIS**

- Surgery within 3 months had a 149.6 fold increase in postop 30 stroke vs. those without previous stroke
- "...incidence rates of 30 day all-cause mortality were 12.6 fold higher in patients with stroke less than 3 months prior compared to patients without stroke."

68 **ISCHEMIC STROKE**

- "A history of stroke was associated with adverse outcomes following surgery, in particular if time between stroke and surgery was less than 9 months. After 9 months, the associated risk appeared stable yet still increased compared with patient with no stroke. The time dependency of risk may warrant attention in

future guidelines.”

69 **IMPACT OF COGNITIVE DECLINE AFTER STROKE**

- Levine DA, Galecki AT, Langa KM et al. Trajectory of Cognitive Decline After Incident Stroke. JAMA 2015; 314: 41-51 (July 2015)
- “Cognitive decline is a major cause of disability in stroke survivors. The magnitude of survivors’ cognitive changes after stroke is uncertain.”
- “Incident stroke was associated with an acute decline in cognitive function and also accelerated and persistent cognitive decline over 6 years.”

70 **DELIRIUM**

71 **DELIRIUM**

- Many causes
- Prolonged sedation or drug (yours or someone else’s) affect
 - Aggressively treat as necessary with naloxone or flumazenil
 - Flumazenil is an inverse agonist-takes longer to work
-
- Rule out: Temperature issues, BP, Electrolyte, Stroke, Postictal, Cardiac rhythm issues

72 **DELIRIUM: TREATMENT/DIAGNOSTIC**

- Supportive care
- Oxygen
- Airway
- Functioning IV access
- Reversal when warranted
- Rapid etiology assessment

73 **DELIRIUM**

- If patient does not arouse after reversal
- Call for transfer and arrange for neurological consultation
- Electrolyte, glucose etc.
- CT vs. MRI

74 **SEIZURES**

75 **NEW ONSET VS CHRONIC SEIZURE HISTORY?**

- >50% of adult patients presenting to ED in status epilepticus are NEW ONSET
- Chronic seizure history- assure that meds are taken on time
 - Treatment depends upon etiology and frequency
- Seizure may occur/resolve irrespective of timing of anesthetic
- Care givers/patients should have thorough grasp of treatment effectiveness
-

76 **SEIZURES**

- Treatment of causes such as hypoxemia, local anesthesia overdose (relative or absolute)
- Drug withdrawal? Benzos, Baclofen, Alcohol, Tricyclics
-

- KEY TO TREATMENT: Oxygen, airway, functioning IV...if short-lived
- Administer benzos as needed
- Treat etiology such as acute hypertension GENTLY and thoroughly while awaiting EMS

-
-

77 **CALL FOR HELP**

- Call 911
- Call 911
- Call 911

78 **CHEST PAIN**

79 **CHEST PAIN: DIFFERENTIAL DIAGNOSIS: THORACIC**

- 1 • Acute coronary syndrome
 - Pericarditis
 - Myocarditis
 - Thoracic aortic dissection
- 2 • Esophagitis
 - Esophageal spasm
 - GERD
 - Esophageal rupture and mediastinitis

80 **CHEST PAIN**

- 1 EPIGASTRIC ORIGIN
 - 2 • Aortic dissection
 - PUD
 - Pancreatitis
 - Cholecystitis
 - Splenic injury
 - Hepatic injury
 - Subdiaphragmatic abscess
 - Referred diaphragmatic injury
 - 3 PLEURITIC ORIGIN
 - 4 • PE
 - Pneumothorax
 - Pneumonia
 - Costochondritis

81 **INITIAL TREATMENT FOR ALL**

- Morphine
- Oxygen
- Nitroglycerin
- Aspirin
- EKG, Supplemental oxygen, Careful monitoring, IV access suitable for transfer

-
- CALL 911: DESCRIBE CHEST PAIN SYMPTOMS IF POSSIBLE...PATIENT MAY NEED AN URGENT PROCEDURE

82 **I USE NSAIDS FOR POSTOP ANALGESIA! IT MAY NOT BE A GOOD IDEA**

- Olsen AMS, et al. Association of NSAID use with risk of bleeding and cardiovascular events in patients receiving antithrombotic therapy after myocardial infarction. JAMA 2015; 313: 805-814.

83 **WHAT WERE THE FINDINGS?**

- "CONCLUSIONS AND RELEVANCE
- Among patients receiving antithrombotic therapy after MI, the use of NSAIDs was associated with increased risk of bleeding and excess thrombotic events, *event after short-term treatment*. More research is needed to confirm these findings; however, physicians should exercise appropriate caution when prescribing NSAIDS for patients who have recently experienced MI."

84 **WHEN WAS THE BLEEDING RISK?**

- As early as three days after initiation of NSAID therapy

85

- JAMA 2015; July 1, 2015 Published online. Accessed 07/15/2015
- Collection of robust data from the field
- Improved public response including bystander CPR and AED use
- Enhance EMS capabilities nationwide
- Update national accreditation standards
- CQI, Increase funding, Rapid adoption of effective cardiac arrest therapies
- Establish a new National Cardiac Arrest Collaborative

86 **DO YOUR PATIENTS WITH LOW EF HAVE IMPLANTABLE DEFIBRILLATORS?**

- Pokorney SD, Miller AL, Chen AY, et al. Implantable Cardioverter-Defibrillator Use Among Medicare Patients with Low Ejection Fraction After Acute Myocardial Infarction. JAMA 2015; 313: 2433-2440. (June 30, 2015)
- Examined ICD implantation rates, associated mortality in older MI patients with low EF
- 441 US hospitals between 2007-2010

87 **WHAT IS THE ISSUE HERE?**

- Fewer than 1 in 10 eligible patients with low EF received an ICD within 1 year after an MI.
- ICD implantation was associated with lower risk-adjusted mortality at 10 years.
- Who needs it?
- EF < 35% after MI

88 **FURTHERMORE**

- These are elderly (Medicare recipients as database)
- Eligible patients: Prior CABG, Higher Peak troponin levels, in-hospital cardiogenic shock
- Should you treat these patient WITHOUT ICDs?

89 **SYNCOPE**90 **SYNCOPE**

- Pediatric syncope- Warning of serious underlying condition
- Adolescent syncope- Less so
 - Adolescent males starting IV
- Adult syncope- Numerous etiologies

91 **SYNCOPE IN ADULTS**

- 1 • Neural-vasovagal
 - Orthostatic
 - Hemorrhagic
 - Cardiac dysrhythmias
- 2 • Structural heart disease
 - PE
 - Pregnancy

92 **6 Ps OF SYNCOPE**

- 1 • Preprodromal
 - Prodrome: visual symptoms, nausea
 - Predisposing factors:
 - Age, Chronic disease, Family history of sudden death
- 2 • Precipitating factors: Stress, postural symptoms
 - Passerby/witness: what was noticed
 - Postictal

93 **TREATMENT IS SIMPLE**

- Oxygen
- Airway
- Appropriate position
- Treat seizure if necessary
- If unusual presentation, call 911

94 **ENDOCRINOPATHIES**95 **ENDOCRINOPATHIES**

- Frequently discussed
- Rarely seen
- May be associated with other endocrinopathies such multiple endocrine neoplasia(MEN) type 1 or 2

96 **ENDOCRINE CRISES**

- IN GENERAL....THESE ARE QUITE RARE
- Personal experience in my 39 year career...
 - I have seen: 1 difficult to manage pheo
 - 2 thyroid storms (Many years ago)
 - 1 *possible* adrenal crisis

- Great for discussion; more likely to see MH!
- Will discuss pheos

97 **PHEOCHROMOCYTOMA: SIGNS AND SYMPTOMS**

- Key: Paroxysmal HTN, tachycardia, diaphoresis
- Headache
- Palpitations
- Anxiety/apprehension
-
- Physical exam: Frequent orthostatic hypertension, tachycardia, weight loss, low-grade temp, pallor, cold/clammy hands

98 **PHEOCHROMOCYTOMA**

- Differential is important: baclofen withdrawal may have similar appearance
 - Tachycardia, HTN, diaphoresis
- In the office: Labetalol IV until heart rate under control
- Oxygen, airway, functioning IV, call 911

99 **THYROID DISEASE**

- Should not treat uncontrolled thyroid disease patients!!!!!!!!!!!!!!!
- Mild hypothyroidism, mild hyperthyroidism are rarely problematic
-

100 **ALLERGY/ANAPHYLAXIS**

101 **DEMOGRAPHICS**

- 10,000 ED/month
- 500-1000 deaths in US/year
- History is important
- Remove the offending agents if known
- Many offending agents in the office

102 **CAUSES OF ANAPHYLAXIS**

¹ PEDIATRIC

² • FOODSTUFFS: MEWS

- Milk
- Eggs
- Wheat
- Soy
-

• PEANUTS

³ ADULT

⁴ • *IG E mediated*

- Antibiotics
- Venom
- Latex
- Vaccines
- Foodstuffs

- *Non IGE mediated*
- Iodine contrast
- Opiates
- Vancomycin
- Neuromuscular blockers

103 **LATEX-INDUCED ANAPHYLAXIS**

- Many products in the office
- Less than before
- Check with vendor prior to purchasing
- DO NOT STORE OPEN BOXES OF LATEX AND NON-LATEX GLOVE TOGETHER!

104 **LATEX-FRUIT SYNDROME**

- From Hepner et al: Anesth Analg 2003
- Varying statistics
- 21% latex allergic also food allergic
- 86% fruit allergic also had latex allergy vs 4% controls
- Other food studies:
 - 11% fruit to latex
 - 35% latex to fruits

105

106 **LATEX PRODUCTS IN THE OFFICE**

- 1 • Ambu bags (old black)
 - Reusable anesthesia circuits
 - Certain Band-Aid type bandages
 - Older model IV sets
 - Medication vial stoppers
 - Stethoscope tubing
- 2 • Some syringes
 - Cloth tape
 - Tourniquets
 - Older style EKG pads
 - Bouffant OR caps
 - PENROSE DRAINS
 - *Poinsettia Plants at Christmas time!*

107 **ALLERGY/ANAPHYLAXIS**

- Seconds to minutes after exposure
- >90% of pts.: skin or mucous membranes, erythema, urticaria, pruritus, angioedema
- Irrespective of etiology: Hypotension or airway compromise are not always part of the initial presentation
-

108 **STANDARD TREATMENT FROM 2010 ACLS PROTOCOL**

- Use standard BLS, ACLS protocols

- Planning for EARLY airway intervention including surgical airway has level 1 evidence
- Multiple fluid boluses of 1000 ml NS warranted
- Epinephrine: IM or IV Careful dosing due to myocardial damage with high dose epinephrine in non-arrest situations
- 50-100 micrograms per dose in anaphylactic shock
- Vasopressin when epinephrine fails

109 **ADJUNCTIVE AGENTS**

- H1
- H2
- Inhaled β adrenergic agents
- Corticosteroids
-
- Helpful but no level 1 evidence Class IIb only

110 **REMEMBER: IN MOST SITUATIONS**

- Call for help/911

111 **COAGULATION ISSUES: IMPLICATIONS OF THE NEW AGENTS**

- Excellent review of the topic
- Baron et al: Management of Antithrombotic Therapy in Patients Undergoing Invasive Procedures. NEJM 2013; 368: 2113-2124.
- MUST discuss with patient's responsible physician prior to proceeding

112 **THE ISSUES**

- "...balancing the risk of postprocedural bleeding with continued treatment again the thrombotic risk with suspension of treatment and the use of bridging anticoagulation therapy."

113 **THE BALANCING ACT**

- Procedure with low risk of bleeding
 - Safely continue antithrombotic therapy
 - Especially important if patient is at high risk for thrombotic event
- High risk procedure (for bleeding)
 - Safely discontinue antithrombotic therapy if the patient is a low risk patient
- Provoked (pre-existing pathology) vs. unprovoked

114 **ATRIAL FIBRILLATION**

- CHADS2 or CHA2-DS2-VASC score
 - Congestive heart Failure 1 point
 - Hypertension 1 point
 - Age > 75 (2 points) 64-75 1 point
 - Diabetes 1 point
 - Prior TIA or stroke (2 points)
 - CAD
 - Female sex
 -

115 **SCORES**

- Low risk- 0-2 points
- Medium risk- 3-4 points
- High risk- 5-6 or TIA with last 3 months or valvular heart disease

116 **MECHANICAL HEART VALVES AND VENOUS THROMBOEMOLISM**

- Mechanical heart valve
 - Low annual risk- Bileaflet aortic-valve prosthesis MINUS a fib, prior stroke or thromboembolic event or known intracardiac thrombus
 - Moderate annual risk- Bileaflet aortic-valve prosthesis PLUS a fib
 - High annual risk- *Any* mitral valve prosthesis, any caged-ball or tilting disk aortic-valve prosthesis, multiple mechanical valves or stroke, TIA, or cardioembolic event

117 **VENOUS THROMBOEMBOISM**

- Low annual risk- Venous thromboembolism > 12 months previously and no other risk factors (either provoked or transient)
- Moderate annual risk- Venous thromboembolism with previous 3-12 months, non-severe thrombophilia, or recurrent thromboembolism.
- High annual risk- Venous thromboembolism with past 3 months, severe thrombophilia, unprovoked venous thromboembolism or active cancer

118 **STENTS**

- Bare metal- greatest risk within 6 weeks after placement
- Drug-eluding stents- greatest risk 3-6 months
-
- After acute coronary events- dual antiplatelet therapy for both stents; up to 12 months for bare metal and at least 12 months for drug eluding stents
- *But this is old data...Now* for the latest ACC/AHA 2014 data

119 **LATEST/2014 ACC/AHA GUIDELINES ON PERIOPERATIVE CARDIOVASCULAR EVALUATION AND MANAGEMENT OF PATIENTS UNDERGOING NONCARDIAC SURGERY**

- Journal of the American College of Cardiology Volume 64 No 22, 2014 e77-e137
- Used only data that has not been retracted!

120 **GENERAL POINTS OF UNDERSTANDING- URGENCY**

- Emergency- life or limb threatened and permanent damage will occur within less than 6 hours if the patient isn't in the OR
- Urgent- time for limited evaluations, life or limb threatened if the patient isn't in the OR within 6=24 hours
- Time-sensitive- delay of 1-6 weeks for important evaluation (oncologic surgery)
- Elective- procedure can be delayed up to a year

121 **GENERAL POINTS CONTINUED-RISK**

- Low risk- Risk of major adverse cardiac events (MACE) is less than 1%
- Elevated risk- Risk of MACE is greater than 1%
- No longer using intermediate risk since the recommendations are the same
-

122 **RISK ISSUES**

- Coronary Artery Disease
- Major Adverse Cardiac Events (MACE)
 - After non-cardiac surgery are more common after prior CAD events.
- Current data- Noncardiac surgery should not occur before 60 days after MI
-

123 **DEFINITION OF RECENT MI**

- Within 6 months
- Independent risk factor for perioperative stroke
- Associated with 8 fold increase in perioperative mortality rate

124 **OTHER RISK FACTORS FOR MACE**

- Age > 62 associated with perioperative risk
- Cerebrovascular disease
- Diabetes
- Heart Failure
- Unknown data for cardiomyopathy

125 **VALVULAR HEART DISEASE**

- Moderate to severe valvular heart disease should undergo correction
- If emergent surgery is necessary, increase level of anesthetic monitoring

126 **CIED (PACEMAKERS AND DEFIBRILLATORS)**

- Individualize plan
- Communicate to the ENTIRE care team

127 **FINDINGS FROM STRESS TESTING**

- Moderate to large areas of myocardial ischemia associated with increased risk of perioperative MI and/or death
- Normal study for perioperative MI/cardiac death very high negative predictive value
- "The presence of an old MI identified on rest imaging is of little predictive value for perioperative MI or cardiac death
- There is clinical utility of pharmacological stress testing
-

128 **SUMMARY OF PAPER**

- CABG is NOT recommended prior to elective surgery just to reduce risk
- Delay elective surgery after stents
- Elective noncardiac surgery should optimally delayed until 1 year after placing DES
- Implied that 6 months after DES, probably OK to proceed...but only probably
- Elective surgery delay until after 14 days when aspirin must be ceased

129 **MORE OF SUMMARY**

- Continue on beta blockers if chronic
- Initiate if intermediate to high risk factors
- If > 3 risk factors

- Should begin more than 1 day prior to elective surgery to allow for adjustments
- Continue statins, start if having vascular surgery
- ACE inhibitors/ARB should be continued...if stopped restart ASAP post op

130 **FINALLY**

- ANTIPLATELET AGENTS
- "Continue DAPT in patients undergoing urgent noncardiac surgery during the 1st 4-6 wks after BMS or DES implantation, unless the risk of bleeding outweighs the benefit of stent thrombosis prevention"
- In patients with stents undergoing surgery the requires P2Y12 inhibitors, continue aspirin and restart the P2Y12 platelet receptor-inhibitor as soon as possible after surgery

131 **MORE RECOMMENDATIONS FOR ANTIPLATELET AGENTS**

- Management of perioperative antiplatelet therapy should be a consensus of all treating clinicians and the patient
- "In patients undergoing nonemergency/nonurgent noncardiac surgery without prior coronary stenting, it may be reasonable to continue aspirin when the risk of increased cardiac events outweighs the risk of increased bleeding."

132 **ANTIPLATELET AGENTS**

- P2Y12 agents
 - Clopidogrel (PLAVIX™)
 - Prasigrel (EFIENT™)
 - Ticagrelor (BRILLINTA™)
- They don't change the risk of death in Non-STEMI but do reduce thrombosis with increased risk of bleeding

133 **PROCEDURAL BLEEDING**

- For OMFS, depends upon the nature and extent of procedure
- If the patient is taking warfarin, then the need for stopping the medication and bridging therapy (heparin)

134 **BRIDGING THERAPY-YES**

- Mechanical heart valve- MVR or 2 or more mechanical valves, non-bileaflet Aortic, or AVR with additional risk factors
- Nonvalvular A fib- Prior stroke or embolic event, or CHADS2 score of 4 or greater
- Venous thromboembolism- Venous thromboembolism with 3 months or severe thrombophilia

135 **BRIDGING THERAPY- NO**

- Mechanical heart valve- AVR, bileaflet prosthesis, and no additional risk factors
- Nonvalvular a fib- No prior stroke or embolic event, absence of cardiac thrombus, or CHADS2 score <4
- Venous thromboembolism- Venous thromboembolism >3 months or no additional risk factors (active cancer or nonsevere thrombophilia)

136 **COMMENTARY ON BRIDGING THERAPY**

- If there is emergent/urgent surgery and anticoagulation is contraindicated, IVC filter is highly recommended.

- If creatinine clearance is less than 30 ml/minute, unfractionated heparin suggested
- For patients with venous thromboembolism, enoxaprin 1.5 mg/kg is recommended or dalteprin 200 u/kg once daily.
- 24 hours prior to procedure, above doses reduced 1 mg/kg and 100 u/kg respectively

137 **UNFRACTIONATED HEPARIN INFUSION**

- Stop 4 – 6 hours prior to high risk procedures
- Reversal with protamine usually not necessary

138 **GENERAL COMMENTS ABOUT ANTICOAGULANTS**

- Warfarin (Coumadin)- Route-PO: Inhibits Vit K Dependent factors (II, VII, IX, and X)
 - Between last dose and procedure: 1-8 days
 - INR decreases in > 90% of patients to less than 1.5 in 5 days
 - For DVT Treatment Vit K +/- FFP or
- Unfractionated heparin- Subq or IV, Inhibits factors IIa, IXa, , Xa, XIa, XIIa
 - Between last dose and procedure: IV 2-6 hours, Subcu 12-24 hours
 - For arterial embolism, DVT, treatment of embolic complications of a fib, MI with associated embolic events
 - Reversal with protamine

139 **ANTICOAGULANTS**

- Low-molecular weight heparins- Enoxaprin (lovenox), Dalteprin (Fragmin)
 - Route Subcut. Mech of action: Antithrombin activation (inhibition of Xa and lesser effect IIa)
 - Between last dose and procedure: 24 hours
 - No monitoring Reversal with protamine
- Fondaparinux (Arixtra)- route subcut: Antithrombin Xa inhibitor
 - Between last dose and procedure: 36-48 hours
 - No monitoring No reversal

140 **MORE ANTICOAGULANTS**

- Dabigatran (Pradaxa)- PO Direct thrombin inhibitor Monitor with PTT or thrombin time for significant activity For non-valvular afib
 - Between last dose and procedure depends upon creatinine clearance. <50 ml/min 3-5 days. > 50 ml/min 1-2 days.
- Rivaxoban (Xarelto)- PO Direct factor Xa inhibitor Between last dose and procedure depends upon creatinine clearance 1 day if normal, 2 days 60-90, 3 days 30-59, 4 days < 30 For non-valvular afib or joint replacements
- PT or anti Xa for r/o significant residual affect
-

141 **APIXABAN (Eliquis)**

- Oral agent that directly inhibit Factor Xa
- Last dose to safe procedure: depends upon creatinine clearance
 - 1-2 days if > 60 ml/min, 3 days 50-59 ml/min, 5 days if < than 50 ml/min
 - For nonvalvular afib

142 **SAVAYSA: THE FOURTH NEW ORAL ANTICOAGULANT**

- Direct Factor Xa inhibitor
- About \$50 less expensive for 30 days than Pradaxa, Eliquis, Xarelto
- Hasn't got a Call 1-800-BAD DRUG label from the malpractice attorneys....YET!
- JAMA 2015; 314: 76-77. (July 2015)
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143 **CONCLUSIONS**

- Similar in efficacy as warfarin in treating acute venous thromboembolism
- Stroke prevent in non-valvular a fib: as effective as warfarin with less bleeding
- In patients with creatinine clearance greater than 95 ml/min....incident of ischemic stroke is higher
- Comparison to Pradaxa, Eliquis, and Xarelto overall?????????????

144 **BOTTOM LINE, HAVE THE PATIENT EVALUATED IMMEDIATELY (WITHIN SEVERAL WEEKS) PRIOR TO YOUR PLANNED SURGERY AND DISCUSS A MUTUALLY AGREEABLE PLAN THAT IS ALSO ACCEPTABLE TO THE PATIENT**