PERIOPERATIVE BEST PRACTICE: OPTIMIZING OUTCOMES

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ASPN Nurse Liaison for Special Projects
Perioperative Nurse Manager/Mercy

OBJECTIVES

- Benefits associated with preop warming
- Core principles of preop optimization

ASPN’s Evidence-Based Clinical Practice Guideline for the Promotion of Perioperative Normothermia: Second Edition

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**DEFINITIONS**

**Hypothermia**
- Core temperature less than 36°C

**Normothermia**
- Core temperature range of 36°C to 38°C

**Hyperthermia**
- Core temperature greater than 38°C

**Core**: the state of internal body temperature at which the internal organs and bodily systems function at an optimal level

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**WHY IS PERIOP HYPOTHERMIA A PROBLEM?**

- A significant drop in the patient's core temp occurs after anesthesia given
- This is related to effects of heat redistribution

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**PERIOPERATIVE TEMPERATURE CHANGES**

- GA widens the **interthreshold range** (range of core temp when NO autonomic thermoregulatory responses occur)
  - Normal: 36.8-37.2
  - Under GA: 34.5 to 38.5

- In addition, **regional anesthesia** affects the input and the response
  - Spinals
3 PHASES OF TEMPERATURE IMPACT UNDER GENERAL ANESTHESIA

Phase I
- Vasodilation occurs = cools skin = rapid drop in core as warmer core tries to heat up the skin (0-1 hrs of GA)

Phase II
- Ongoing, slow, heat loss>heat production (occurs over 1-4 hrs)

Phase III
- Equilibrium - vasoconstriction occurs to try to resolve the widened threshold range so that loss = production

COMPLICATIONS OF HYPOTHERMIA

Vasoconstriction causes decreased kidney perfusion - can lead to AKI
Cardiac complications
- Altered electrical conduction can lead to arrhythmias: tachy, brady, a-fib, PVCs, v-fib
- Decreased CO
- Myocardial ischemia and 3x cardiac morbidity
- Increased catecholamines – increases HR, BP

COMPLICATIONS OF HYPOTHERMIA

Medication metabolism altered
- Delayed drug clearance
- Delayed recovery
- Potential hypoventilation
- Increased PACU LOS
Platelet and clotting abilities are impaired
- Platelets fail to function correctly
- Increased blood losses
- Increased risk for DVT

COMPLICATIONS OF HYPOTHERMIA
- Increased need for postop fluids
- Subjective discomfort of feeling cold
  - Major worry of patients — shivering before or after surgery isn’t exactly part of a good surgical experience!!
- Shivering
  - Increased oxygen needs
  - Increased HR
  - Increased O₂ demand and stress

COMPLICATIONS OF HYPOTHERMIA
- Wound impact
  - Reduced white cell mobility
  - Decreased production of antibodies
  - Lower perfusion of O₂ to tissue
  - Decreased synthesis of collagen
  - RESULT: Increased infections
    - Incidence of culture-positive SSI in pts with mild hypothermia 3x higher than normothermic pts
A drop in temp of 2°C increases blood loss by approx. 500mls. Increased transfusion rates with 1°C decrease.

<table>
<thead>
<tr>
<th>Normothermic</th>
<th>Hypothermic</th>
</tr>
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<tbody>
<tr>
<td>36.6</td>
<td>35</td>
</tr>
<tr>
<td>1700 EBL</td>
<td>2200 EBL</td>
</tr>
<tr>
<td>1/30 needed PRB</td>
<td>8/30 needed PRB</td>
</tr>
</tbody>
</table>


RISK FACTORS FOR HYPOTHERMIA
- Extremes of age
- Systolic blood pressure
- Female gender
- Level of spinal block
- Anesthesia > 30 mins
- BMI normal or below
- Procedural duration
- Body surface/wound area uncovered
- History of diabetes with autonomic dysfunction
- Preop hypothermia

WHAT SHOULD WE DO?
- In terms of redistribution:
  - Treating initial drop in temp in the OR is difficult with warmer (takes about an hour)
  - SOLUTION: Prevention by PREWARMING!

Miller RD. Miller's Anesthesia. 2010; vol 1 chap 48:1533-1556
**PREADMISSION/PREOP**

**Interventions**
- Provide passive thermal measures
- Maintain ambient room temp at or above 24°C or 75°F
- Institute active warming if hypothermic
- Evidence shows that prewarming for a minimum of 30 minutes reduces risk of subsequent hypothermia

**POSTOP**

**Assessment**
- Measure pt temp on admission to the PACU
  - If normothermic, continue to measure temp at least hourly, at discharge, and as indicated by pt condition
  - If hypothermic, measure temp at a minimum of every 15 minutes until normothermia is achieved
- Determine patient's thermal comfort level
- Assess for S&S of hypothermia (e.g., shivering, piloerection, &/or cold extremities)

**Interventions**
- If the patient is normothermic provide warming comfort measures:
  - Offer passive thermal care measures
  - Maintain ambient room temp at or 75°F
  - Assess patient thermal comfort level
  - Observe for S&S of hypothermia (shivers, goosebumps and/or cold extremities)
  - Reassess temp if thermal comfort level changes and/or S&S hypothermia occur
  - Measure patient temp prior to discharge
POSTOP

**Interventions**
- If the patient is hypothermic: reinstate active warming measures:
  - Apply forced air warming system
  - Consider adjuvant measures
    - Warmed intravenous fluids
    - Humidified warm oxygen
  - Assess temperature and thermal comfort level every 15 minutes until normothermia is achieved

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**Preoperative Surgical Optimization: Comorbidities and Risks**

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**GOAL?**

Medical ‘clearance’ versus Medical ‘optimization’
**RISK STRATIFICATION**

- **Low Risk Medical Conditions** – Healthy with no medical problems (ASA I) or well controlled chronic conditions (ASA II)

- **High Risk Medical Conditions** – Multiple medical comorbidities not well controlled (ASA III) or extremely compromised function secondary to comorbidities (ASA IV)

- **Low Risk Surgical Procedure** – Poses minimal physiological stress (ex. – outpatient surgery)

- **Intermediate Risk Surgical Procedure** – Medium risk procedure with moderate physiological stress and minimal blood loss, fluid shifts, or postoperative changes

- **High Risk Surgical Procedure** – High risk procedure with significant fluid shifts, possible blood loss, as well as perioperative stress anticipated. Anticipated ICU stays postoperatively

**CORONARY ARTERY DISEASE**

- Cardiomyopathy
- Congestive heart failure
- Arterial hypertension
- Pulmonary hypertension
- Cerebrovascular disease

- Significantly higher morbidity and mortality (#1: MI)

- American College of Cardiology and American Heart Association – clinical practice guidelines

**REVISED CARDIAC RISK INDEX**

**Revised Cardiac Risk Index (RCRI) Criteria**

- Compensated CHF
- Known coronary artery disease
- Angina or CP + with NIT
- remote MI > 3 -6 months
- EKG: pathological Q waves
- abnormal stress test
- abnormal cardiac cath
- prior CABG or PCI
- Ha TIA or CVA
- Intra-abdominal or high risk surgery
- DM requiring insulin
- Renal insufficiency, Cr >2

0 RCRI = <1% mortality
1-2 RCRI = 2.7% mortality
3-4 RCRI = 9.18% mortality
>5 RCRI = >32% mortality
DNP & CHF improve RCRI accuracy
**RECOMMENDATIONS**

- Preop 12 lead ECG
- Echo
- Stress test/dobutamine stress echo
- Preop meds: beta blockers, statins, antihypertensives
- Appropriate intraop management of pacers and ICDs

**ANEMIA**

**INCIDENCE**
- Reported in up to 1 out of 4 pts preop
- % of anemic patients increases postop
- Mild anemia was shown to increase relative risk of adverse events by 30%–40%
- Transfusions are independently associated with:
  - Surgical complications, infections, poorer function and recovery, and overall increased mortality, hospital stay, and costs
- **Recommendation:** multimodal approach to reducing blood loss

**ANEMIA: PBM PROGRAMS**

- **Target**
  - Iron deficiency anemia
  - Preop Hgb <12
  - Scheduled for elective but high blood loss surgery (>500ml)

- **Risks**
  - Increased periop mortality
  - Increased rates of transfusions
  - Transfusion related adverse events

- **Plan**
  - Preop screening
  - Initiation of therapy preoperatively
  - TXA/Cell saver

- **Outcome**
  - Fewer transfusions, fewer transfusion complications
  - Lowered cost of care
  - Shorter length of stay

**ANEMIA**

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Diabetes is defined as a HbA1c of 6.5% or higher OR when a FBS is >126 on two separate tests. **What is the ideal HbA1c?**

- TKA Study: HbA1c >8% is a risk factor for wound complications
- Major non-cardiac surgery study: HbA1c >7% significantly associated with increased infections
- Primary elective CABG study: preop HbA1c >7% have higher 5-yr mortality compared to HbA1c<7%


### Diabetic vs Non-Diabetic Comparison

<table>
<thead>
<tr>
<th></th>
<th>Diabetic</th>
<th>Non-Diabetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 month mortality</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>Major complication</td>
<td>21%</td>
<td>14%</td>
</tr>
<tr>
<td>ICU Postop</td>
<td>27%</td>
<td>18%</td>
</tr>
<tr>
<td>Ventilators</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>LOS</td>
<td>7 days</td>
<td>6 days</td>
</tr>
<tr>
<td>6 month readmission</td>
<td>17%</td>
<td>16%</td>
</tr>
</tbody>
</table>
20.8 million people age 12 and over have substance use disorders
30-40% of patients take chronic pain meds
7.4% of US has alcohol use disorders (WHO)
*Marijuana???

**Risks:**
- Uncontrolled pain (hyperalgesia)
- Postop morbidity & mortality
- Infections
- Wound complications
- Pulm complications
- Prolonged LOS
- Admissions to ICU
- Withdrawal

**Recommendations:**
- Abstinence for 4 weeks prior to surgery decreases complications from 71% to 31%
- Seek multimodal, multidisciplinary support for pain management
- Coordinate care across the continuum
- Support recommendation for substance use treatment

**Complications**
- Hypoxia
- Delayed wound healing
- Increased inflammation
- Higher rate of pneumonia

**Stats**
- Stopping 6-8 weeks preop reduces complications from 52 to 28%
- Stopping LESS than 2 months pts have 4X higher rates
- Only 31% surgeons talk about smoking
- Only 23% advise stopping
Incidence: 20% of adults have OSA and about 85% of those are UNDIAGNOSED!
Screening tools available
Sleep medicine referrals
Consistent use of CPAP throughout the continuum
Multimodal pain techniques

OSA PRACTICE RECOMMENDATION

PREOP
- Assessment - ? STOPBang
PACU Phase I
- Multimodal analgesia
- Leave undisturbed to assess for signs of desaturation
Phase II
- Wait for room air sat to return to baseline
- No evidence of hypoxia if undisturbed 20 minutes
- Observe an average of 3 hours longer than non-OSA
- For each hypoxic event, observe additional SEVEN hours

OSA

STOP-BANG

TABLE 2: STOP-BANG questionaire

<table>
<thead>
<tr>
<th>STOP</th>
<th>Bang</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tired</td>
<td>BMI &gt; 35 kg/m²</td>
</tr>
<tr>
<td>Sleepy</td>
<td>Age &lt; 50 years</td>
</tr>
<tr>
<td>Snore</td>
<td>Neck circumference &lt; 40 cm</td>
</tr>
</tbody>
</table>

OSA PRACTICE RECOMMENDATION

Obstructive Sleep Apnea (OSA) is associated with heightened risk to the patient undergoing surgical procedures during sleep. In the United States, 20% of adults have OSA and over 80% have severe sleep-disordered breathing (SDB) and are at higher risk for cardiovascular disease. The National Sleep Foundation recommends screening for OSA before surgery, and the American Society of Anesthesiologists (ASA) recommends identifying potential OSA to ensure safe surgical outcomes. OSA is an independent risk factor for adverse perioperative outcomes, including perioperative hypoxia, cardiovascular events, and increased risk of mortality. The preoperative assessment should include a review of medical history, a physical examination, and a risk stratification tool such as the STOP-BANG questionnaire. The STOP-BANG questionnaire is a simple and quick tool to screen for OSA, consisting of six questions: (1) Do you feel very tired during the day? (2) Do you feel sleepy when you drive? (3) Do you sleep with an open mouth or mouth breathing? (4) Do you experience noisy breathing or snoring during sleep? (5) Do you experience daytime symptoms such as headaches or morning headaches? (6) Do you have a body mass index (BMI) > 35 kg/m²? If the answer to any of these questions is yes, further investigation is warranted.

Practice Recommendation 10
Obstructive Sleep Apnea in the Adult Patient

Introduction
Obstructive Sleep Apnea (OSA) is a common, yet often undiagnosed, condition that affects approximately 20% of adults in the United States. OSA is characterized by repeated episodes of upper airway collapse during sleep, leading to intermittent hypoxia and hypercapnia. The diagnosis of OSA is typically made using polysomnography, which records various parameters such as respiratory effort, oxygen saturation, and heart rate. Screening tools such as the STOP-BANG questionnaire are recommended to identify patients at risk for OSA. Early recognition and treatment of OSA can significantly reduce the risk of complications during anesthesia and surgery, including cardiovascular events, respiratory distress, and hypoxemia. The American Society of Anesthesiologists (ASA) recommends screening for OSA in all adult patients undergoing anesthesia.
Incidence of VTE (venous thromboembolism) without prophylaxis is 15-30%
Fatal PE occur 0.2-0.9% of surgeries

ISSUES:
- NO prophylaxis
- Wrong prophylaxis
- Prophylaxis without indication

VTE in Surgical Patients: Caprini Predictive Model

BMI/MALNOURISHMENT

Between 2016 and 2017, the adult obesity rate was at or above 35% in 8 states and at least 30% in 29 states. West Virginia has the highest adult obesity rate at 38.1% and Colorado has the lowest at 26%.
NUTRITIONAL RISKS

- Malnourished
  - Weight loss greater than 10 – 15% within 6 months
  - BMI less than 18.5 kg/m²
  - Albumin less than 3 g/dL
- BMI over 35
  - Prolongs surgical time
  - Tough IVs
  - OSA/hypoventilation
  - CAD/HTN
  - DM
  - Special equipment needs

OPTIMIZING NUTRITION

- Nutritional supplements for the undernourished
  - Ensure
  - Vitamins
- ERAS protocols?
  - Theory: fasting leads to insulin resistance, hyperglycemia
  - Carbohydrate loading preoperatively
  - Preop hydration
  - Weight loss programs

“PREHABILITATION”

- "Prehabilitation is the process of enhancing functional capacity before undergoing a physical stressor and is a growing area of preoperative optimization." [Shah, 2018]

  Gains:
  - Preop strengthening
  - Mitigation of postop functional decline
  - Increased postop functional capacity

SURGERY SCHEDULED???

TRY PREHABILITATION!!!