



Perioperative Temperature Monitoring and Management to Maximize Patient Safety: A Quality Improvement Project

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INTRODUCTION

- Temperature monitoring is an ASA and AANA anesthesia standard of care for basic patient monitoring^{1,2}
- Incidence of perioperative hypothermia ranges from 20% to 70% among patients receiving general anesthesia in the United States³
- Current research focuses on the recurring problem of inadvertent perioperative hypothermia (IPH)³
- IPH: hypothermia that is not induced, planned, or intentional⁷
- IPH increases the risk of:
 - Poor patient outcomes^{3,4}
 - Patient dissatisfaction⁴
 - Reimbursement issues⁴
- Anesthesia providers' access to educational resources is critical to maximize the effectiveness of clinical practice⁶

Purpose

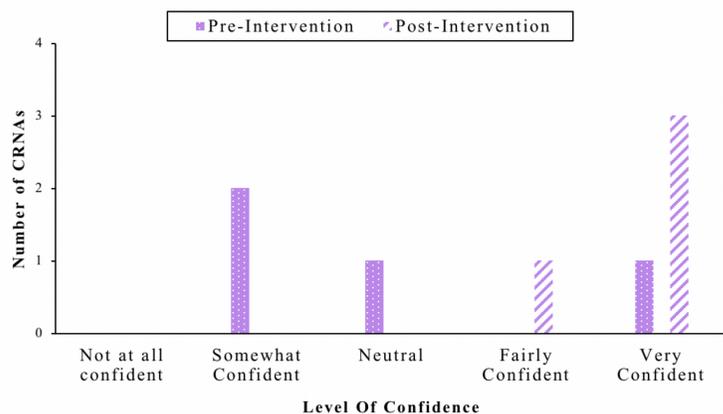
The purpose of this quality improvement project was to assess anesthesia providers' perceptions of the effectiveness of their current practice for intraoperative temperature monitoring and of a newly developed intraoperative temperature monitoring educational resource

METHODS

- Quality Improvement (QI) Design
- Five participants selected for this project (n=4)
- Survey created using Qualtrics survey software and distributed via email to participating CRNAs
- Learning resource created with voice-recorded PowerPoint presentation reviewing each section of tool both shared via email
- Follow-up post implementation Qualtrics survey two-weeks after the initial survey
- Responses analyzed using Microsoft Excel
- Project went as planned with COVID having no apparent impact on implementation

RESULTS: CRNA Confidence Level

Figure 1
Self-Reported Confidence Level of Perioperative Temperature Monitoring Knowledge



Note. N=4. CRNAs = Certified Registered Nurse Anesthetists.

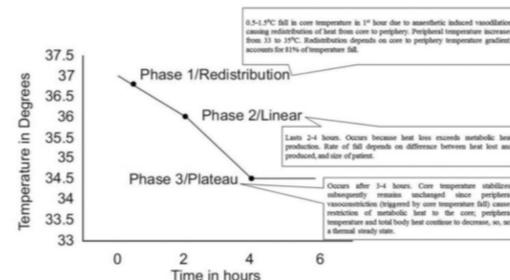
LEARNING TOOL

Causes of Hypothermia Under Anesthesia^{1,6}

- 1) Exposure to a cold environment
- 2) Behavioral regulation is impaired or nonexistent
- 2) Anesthetic-induced impaired thermoregulation
 - Vasodilation promoting heat loss
 - Vasoconstriction, shivering, and non-shivering thermogenesis are less effective and have a reduced threshold for activation
 - Autonomic defense mechanisms
 - 20-30% reduction in metabolic rate
 - Inter-threshold range increases up to ten-fold → poikilothermia

Mechanisms of Heat Loss Under Anesthesia

Conduction, convection, radiation, evaporation, and redistribution



Current Standard of Care

The current minimally accepted temperature is 36 °C.²

AANA Standard IX: Monitoring²

"When clinically significant changes in body temperature are intended, anticipated, or suspected, monitor body temperature. Use active measures to facilitate normothermia."

ASA Standards for Basic Anesthetic Monitoring³

"During all anesthetics, the patient's oxygenation, ventilation, circulation, and temperature shall be continually evaluated. To aid in the maintenance of appropriate body temperature during all anesthetics, every patient receiving anesthesia shall have temperature monitoring when clinically significant changes in body temperature are intended, anticipated, or suspected."

Potential Negative Outcomes⁴

- Alterations in pharmacokinetics of anesthetic drugs
- Enzymatic reduction
- Increased blood loss and transfusion requirements
- Surgical site infection and complications
- Delayed post-operative discharge

Raising the BARR On Temperature Management

High risk Populations & Procedures⁵

- | | |
|-----------------------|--------------------------|
| Advanced Age >65 | Recent burn |
| ASA Grade 2-5 | Large fluid shifts |
| Pre-op temp <36 °C | Combined GA and RA |
| Pediatrics/Neonates | Prolonged duration of GA |
| Female > Male | Open abdomen |
| Low BMI | Orthopedics |
| Autonomic dysfunction | Trauma/Blood loss |

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Prevention of hypothermia^{6,7}

- #1 Pre-operative warming (most effective)
- Passive warming – covering the patient with blankets and a headcover to minimize heat loss
- Active Warming – forced air cover (Bair Hugger), circulating water mattress/pads (Arctic Sun), heated fluids, maintaining ambient room temperature of 23 °C

Accepted core body sites^{7,8}

- Esophageal
- Bladder
- Rectal
- Right Atrium

Other monitoring sites^{7,8}

- Axillary
- Skin
- Nasopharyngeal
- Temporal
- Tympanic

Tools available for temperature monitoring^{7,8}

- Transesophageal probe
- Foley catheter
- Rectal temperature probe
- Pulmonary artery catheter
- Oral probe thermometer
- Temporal scanner
- Nasopharyngeal probe
- Tympanic thermometer



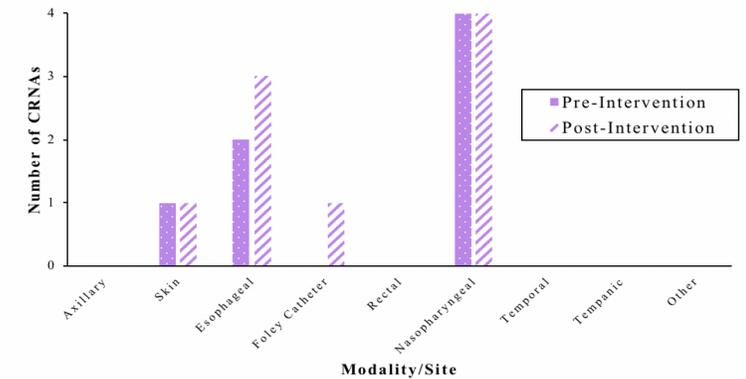
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RESULTS: Modality/Site for Temperature Monitoring

Figure 2

Preferred Modality/Site for Temperature Monitoring



Note. N=4. CRNAs = Certified Registered Nurse Anesthetists. Multiple responses allowed.

DISCUSSION

- Education is paramount for healthcare workers⁵
 - Evidenced in multiple studies
 - Lack of local policies and procedures about preferred practices for temperature monitoring was a barrier identified in surveys
- Factors determined to be out of CRNA control⁶:
 - Staff preference for operating room temperature
 - Often surgeon dictated
 - Patient warming resource may have limited availability for all cases
 - Bair Huggers, fluid warmers, and tubing for warmers
- Provider confidence and awareness of different monitoring sites was higher after the intervention

CONCLUSIONS

- As QI projects can have a significant impact on total healthcare costs⁷, increased staffing education could help prevent inadvertent perioperative hypothermia
- Increased perioperative personnel education (surgeons, anesthesia, nurses and technicians) may help prevent inadvertent perioperative hypothermia
 - Education should include:
 - Normal hemodynamic responses to hypothermia
 - Resources/monitoring measures available
 - Current evidence-based practice on best practice
- Multi-disciplinary teamwork approach:
 - Presenting continued education to staff has been demonstrated to have more impactful change in practice⁶
 - Eager and motivated staff are essential in ensuring success
- In future projects, need to determine:
 - If educational barriers were present
 - What resource access each team member has
- This QI Project should be repeated with a larger sample to increase meaningfulness of the data to the department and system