Foundational Warming: The Hot Pink Pad®

Normothermia Achieved in 98% of Surgical Patients in Observational Clinical Study

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Abstract

Maintaining perioperative normothermia remains one of the primary objectives of modern surgical care. Even mild perioperative hypothermia is associated with increased risks of surgical site infection, impaired coagulation, delayed recovery, and higher healthcare costs.[2.1, 2.12, *, †] This represents a significant opportunity to improve outcomes at a time when **inadvertent perioperative hypothermia (IPH) affects more than half of surgical patients.**[2.13]

Although numerous intraoperative patient warming technologies are available, most are not implemented until after anesthesia induction, patient positioning, surgical preparation, and draping are complete. This reduces valuable warming time during a period when patients are particularly vulnerable to heat loss.[2.9] Additionally, active warming frequently ends well before patients leave the operating room.

The Hot Pink Pad® introduces a different approach by integrating active conductive warming directly into the patient positioning surface. Warming begins immediately upon patient transfer to the OR table and continues uninterrupted until transfer to the Post Anesthesia Care Unit (PACU), establishing a continuous baseline of active warming throughout the intraoperative period. Supplemental warming interventions may be incorporated whenever clinically indicated, allowing perioperative leaders to individualize patient care while maintaining a consistent warming foundation.

In this paper, *foundational warming* refers to the establishment of continuous baseline active warming beginning immediately upon patient transfer to the OR table, and continuing until transfer from the operating room, while preserving complete flexibility to incorporate supplemental warming interventions whenever clinically indicated.

As part of an observational clinical study, core temperatures measured at the time of case close were evaluated in 104 surgical patients. The Hot Pink Pad® served as the foundational warming intervention during every procedure, while supplemental warming strategies remained at the discretion of the clinical team.

Study data showed that 98% (102/104) of patients completed surgery with a core temperature between 36.0°C and 38.0°C; within the clinically accepted range of normothermia.

These findings support foundational warming via the Hot Pink Pad® as a practical strategy that complements contemporary **Enhanced Recovery After Surgery (ERAS) initiatives, as well as AORN Guidelines for patient temperature management.**[Δ]

Study at a Glance

- **Study Type:** observational clinical evaluation
- **Study Population:** 104 surgical patients across 35 sites
- **Primary Endpoint:** core patient temperature measured at the time of case-close
- **Normothermia Definition:** ≥ 36°C and ≤ 38°C
- **Normothermia Achievement Rate:** 98% (102/104)
- **Patient Temperature at Case-Close (Mean):** 36.5°C
- **Clinical Approach:** active, foundational patient warming via the Hot Pink Pad® with supplemental warming as clinically indicated

A New Approach to Surgical Patient Warming

Perioperative warming strategies have traditionally been influenced by surgical workflow. Many active warming interventions are not initiated until after anesthesia induction, patient positioning, surgical preparation, and draping have been completed. Likewise, some warming modalities are discontinued before patients leave the operating room, creating care gaps when patients are most vulnerable.[2.9]

> [2.9] *"Patients' core temperatures decline most dramatically during the first hour of surgery… Core temperature can fall 0.5°–1.5° below normal within just 30 minutes of general anesthesia induction."*

The Hot Pink Pad® was designed to address safety and workflow limitations by integrating active, conductive warming directly into the patient positioning surface. Because warming begins immediately upon transfer to the operating room table and continues until transfer to the PACU, nearly every minute the patient spends in the OR is utilized for active warming.

This foundational warming strategy establishes a continuous baseline upon which additional interventions may be layered according to patient condition, procedure complexity, anesthesia duration, or institutional ERAS protocols. This approach supports individualized clinical decision making while helping maintain consistent perioperative temperature management.

> *"Maintaining normothermia is associated with enhanced recovery after surgery (ERAS) in patients, which is a multimodal, multidisciplinary approach to the care of the surgical patient.*[2.14] *Importantly, ERAS protocols are designed to be adaptable, allowing for individualisation based on patient characteristics and surgical complexity, while maintaining adherence to core evidence-based elements."* [2.15]

The objective of this study was to evaluate whether implementing the Hot Pink Pad® as the baseline component of a comprehensive intraoperative warming strategy would consistently support normothermia in surgical patients.

Observational Clinical Study

As part of the study, data were collected from 131 patients undergoing minimally invasive and robotic surgical procedures in which the Hot Pink Pad® System was implemented. Following predefined quality review criteria, 104 patients comprised the final analysis population.

For every patient included in the analysis:

- The Hot Pink Pad® System served as the foundational warming intervention throughout the procedure.
- Active, conductive underbody warming began immediately upon patient transfer to the OR table.
- Warming continued uninterrupted until transfer to the PACU.
- Clinicians maintained complete discretion to implement supplemental warming interventions based on patient condition, procedure type, institutional ERAS protocols, and standard perioperative practice.

When clinically indicated, supplemental warming interventions included:

- Warmed intravenous fluids
- Passive warming blankets
- Forced-air warming
- Additional active or passive warming interventions consistent with routine clinical care

Study design and population details:

- Study Population: 104 surgical patients across 35 sites
- Primary Endpoint: patient temperature at surgical case-close.
- Normothermia Definition: core temperature ≥ 36°C and ≤ 38°C.
- Surgical Technique: included both laparoscopic and robotic approaches.
- Surgical Specialties: included general, urology, gynecology, colorectal, orthopedic, plastics, pediatrics, and others.
- Gender Distribution: 71 female patients and 33 male patients.
- Patient BMI: ranged from 14.6 to 53.6.
- Patient Weight: ranged from 23lbs to 350lbs.
- Patient Age: ranged from 1 to 93 years of age.

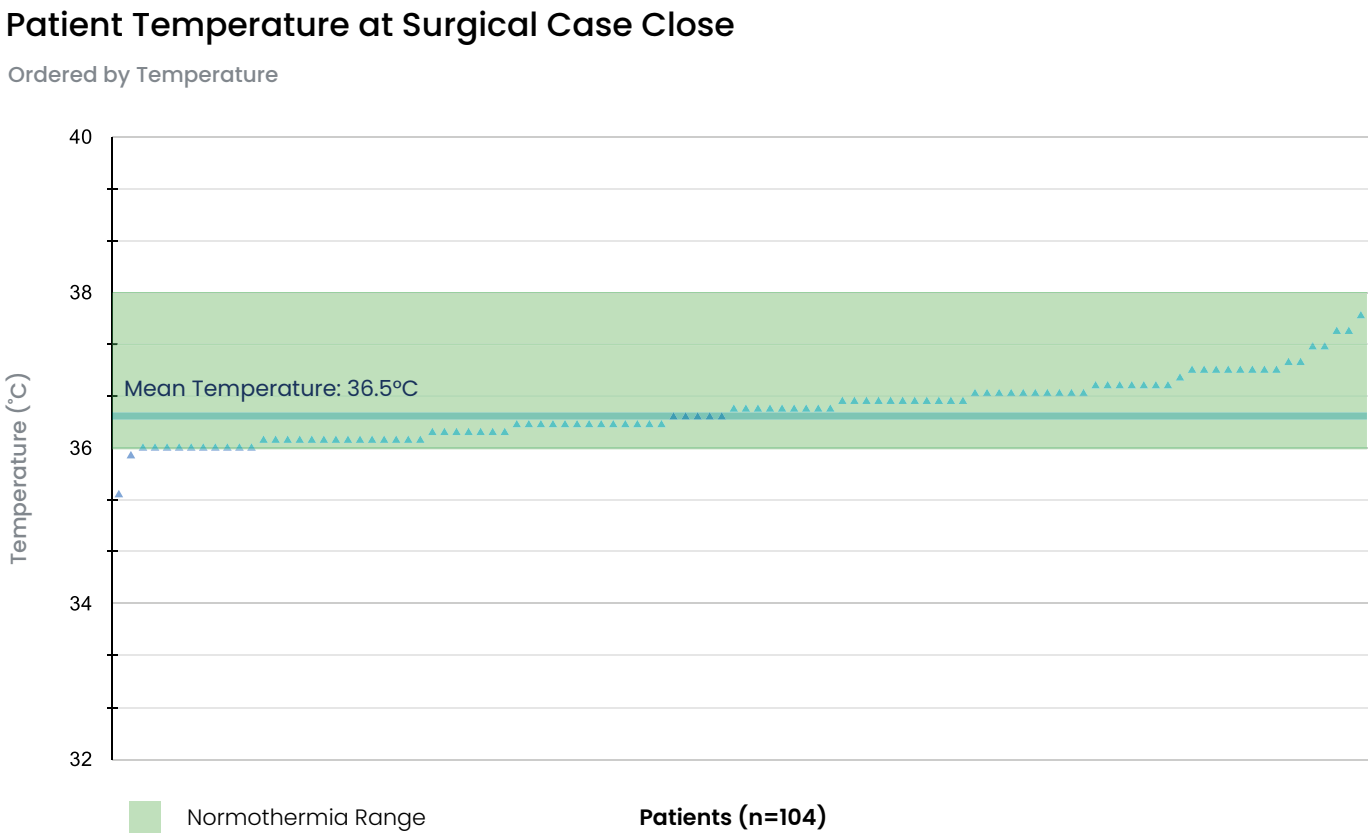
Results

Among the 104 evaluable patients, 98% achieved normothermia at surgical case-close, with a mean case-close temperature of 36.5°C.

The results of this study suggest that integrating continuous, active warming into the patient positioning surface creates an effective foundation for perioperative normothermia management.

Despite variations in patient characteristics, procedure types, operative duration, environmental conditions, and supplemental warming interventions, the overwhelming majority of patients completed surgery within an accepted normothermic range.

Ultimately, these findings demonstrate that the Hot Pink Pad® provides a reliable baseline for perioperative temperature management across a broad range of surgical patients and procedures. By initiating active warming immediately and maintaining it uninterrupted throughout the intraoperative period, the Hot Pink Pad® supported consistent normothermia across the study population.



Data Quality

To ensure the analysis reflected the intended clinical use of the Hot Pink Pad® System, data were reviewed using predefined quality criteria prior to final evaluation.

Of the original cohort of 131 patients, 27 datasets were excluded because they represented incomplete data or clinical circumstances that could substantially influence interpretation of the results.

Reasons for exclusion included:

Reason for Exclusion	Number
Reported ambient temperature regulation issues	1
Patient not fully positioned on the Hot Pink Pad®	3
Reported temperature monitoring concerns	5
OR ambient temperature at or below 64°F	3
Patients who entered the OR in a hypothermic state and did not reach 36°C prior to case-close	9
Incomplete or invalid data	6
Total Excluded	**27**

These predefined exclusions were intended to improve data quality and ensure that the findings reflected representative clinical use of the Hot Pink Pad® System.

Clinical Perspectives

"The Hot Pink Pad® helps patients return to their pre-op temperature more quickly, which greatly supports our ERAS program. It's a welcome addition to our normothermia bundle."

— Kimberly Godawa, RN, MSN, CCRN
ERAS Coordinator

"We need a solution that provides immediate warmth for our patients. The Hot Pink Pad® actively warms the minute the patient lays on the table and keeps warming until they're transferred after the case. That could add up to an hour of warming in critical moments when patients used to be exposed!"

— Lynne Schubert, CRNA, BSN, MS

Implications for Clinical Practice

The findings of this study extend beyond observed case-close temperatures. By integrating active warming directly into the patient positioning surface, the Hot Pink Pad® establishes foundational warming as a continuous baseline intervention throughout the intraoperative period, increasing the time available for active patient warming. This represents a significant opportunity to improve outcomes at a time when **inadvertent perioperative hypothermia (IPH) affects more than half of surgical patients.**[2.13]

△ *"Researchers concluded that active body surface warming was demonstrated to be effective in maintaining normothermia, decreasing the incidence of SSI, decreasing shivering, decreasing blood transfusions, and increasing patient satisfaction…"*
AORN Guidelines: Patient Temperature Management, Section 3.2

The Hot Pink Pad® complements contemporary ERAS initiatives by making normothermia management a continuous component of intraoperative care rather than a delayed intervention. Patients who maintain normothermia with the Hot Pink Pad® alone require no additional interventions, while those undergoing more complex procedures can seamlessly receive supplemental warming without altering the underlying warming strategy.

"The true innovation is that warming becomes part of patient positioning. Every patient begins receiving active, conductive warming immediately, and clinicians remain free to layer additional warming modalities whenever they're needed. That combination of consistency and flexibility is what's needed to maintain normothermia."

— Craig Kaforey, Chief Executive Officer
Xodus Medical

Implications for Clinical Practice (Continued)

The results of this study show that when the Hot Pink Pad® served as the foundational warming intervention, 98% of patients completed surgery in a normothermic state, with a mean case-close temperature of 36.5°C.

> *"By incorporating patient warming directly into the positioning layer, every patient receives active underbody warming as a foundational intervention. This helps us achieve a goal we share with our customers: a safer, more effective standard of care."*
>
> — Bob Johnson, Chief Marketing Officer
> Xodus Medical

Conclusion

The results of this study show that 98% of patients completed surgery in a normothermic state (≥ 36°C and ≤ 38°C), with a mean case-close temperature of 36.5°C, when the Hot Pink Pad® served as the foundational warming intervention.

This novel patient temperature management approach complements contemporary ERAS initiatives, allowing clinicians to individualize warming strategies that are built upon a consistent, active normothermia-management foundation.

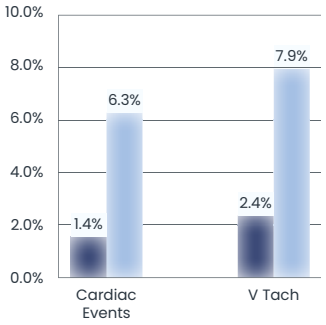
Maintaining normothermia remains a fundamental objective of modern surgical care. Within the limitations of this study, the overwhelming majority of evaluable patients achieved normothermia at surgical case-close. This finding suggests that the Hot Pink Pad® provides clinicians with a reliable, workflow-friendly strategy for supporting consistent patient temperature outcomes across a broad range of surgical procedures.

*Figure 1: Clinical Implications of Inadvertent Perioperative Hypothermia (IPH)

Foundational Clinical Research

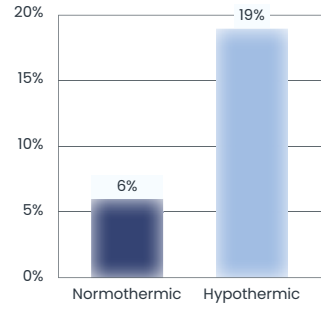
Normothermic | Hypothermic

Percent of Patients with Morbid Cardiac Events



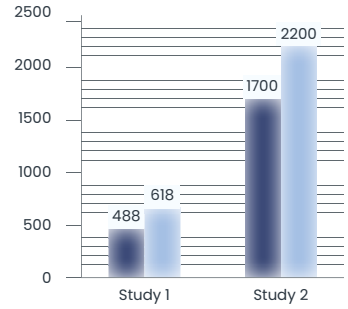
Frank SM, Fleisher LA, Breslow MJ, et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events. A randomized clinical trial. JAMA. 1997;277:1127-1134.

Percent of Patients with Surgical Site Infection Events



Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical- wound infection and shorten hospitalization. Study of Wound Infection and Temperature Group. N Engl J Med. 1996;334:1209-1215.

Average Blood Loss (mL)



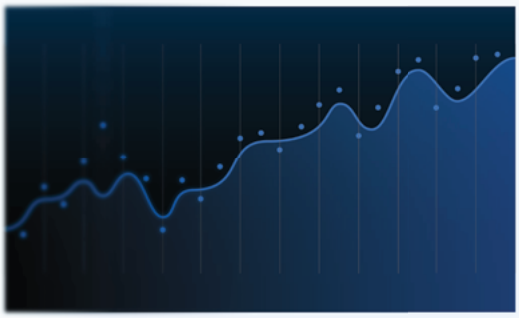
1. Winkler M, Akca O, Birkenberg B, et al. Aggressive warming reduces blood loss during hip arthroplasty. Anesth Analg. 2000;91:978-964.
2. Schmied H, Kurz A, Sessler DI, Kozek S, Reiter A. Mild hypothermia increases blood loss and transfusion requirements during total hip arthroplasty. Lancet. 1996;347:289-292;

†Figure 2: Financial Implications of Inadvertent Perioperative Hypothermia (IPH)

Financial Implications

Managing Unplanned Perioperative Hypothermia Saves Between $2,500 and $7,000 Per Patient[4]

- CMS measure for reimbursement
- Prolonged recovery times
  - » Increasing the average hospital length of stay by 1–2 days[5]
- Extended Post-Anesthesia Care Unit (PACU) times
  - » 90 minutes on average[6]
- Patient satisfaction



[4,5]Visit xodusmedical.com/Education to schedule Continuing Education Seminars

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Δ: *AORN Guidelines: Patient Temperature Management, Section 3.2*

Fig 1:

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Fig 2:

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6: *Centers for Medicare & Medicaid Services*

Notes


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