
# RECOMMENDATIONS FOR PERIOPERATIVE TEMPERATURE MANAGEMENT

MALAYSIAN SOCIETY OF ANAESTHESIOLOGISTS

COLLEGE OF ANAESTHESIOLOGISTS, AMM

# RECOMMENDATIONS FOR PERIOPERATIVE TEMPERATURE MANAGEMENT


**PUBLISHED BY:**
Academy of Medicine of Malaysia
(College of Anaesthesiologists)
Suite 3.3 Level 3, Medical Academies of Malaysia,
No 5, Jalan Kepimpinan P8H,
Presint 8, 62250 Putrajaya, Malaysia.



**e ISBN:** 978-629-97098-1-7

**Available on the following websites:** https://www.msa.net.my/

**STATEMENT OF INTENT**
*These guidelines are issued in 2025 and will be reviewed periodically. It is designed to guide anaesthesia healthcare professionals in the management of patient in the perioperative period. It is written based on the best available evidence at the time of development. Adherence to these guidelines does not guarantee that perioperative hypo or hyperthermia and its adverse events does not occur. Anaesthesia healthcare professionals are responsible for the perioperative temperature equipment used during their anaesthesia practice.*

## CONTENTS

## ADVISOR

**DATO' DR YONG CHOW YEN**
MD (USM), M.Med Anaes (UM), FRCA (UK), FAMM
*President, Malaysian Society of Anaesthesiologists.*

## EDITORS

**DR SHAHRIDAN BIN MOHD FATHIL**
MBBS (UM), FRCA (UK), FAMM, FEWM
*Consultant Anaesthesiologist*
*Gleneagles Hospital Johor.*

**ASSOC PROF DR RHENDRA HARDY MOHAMAD ZAINI**
MD (USM), M.MED (ANAES) USM
*Consultant Anaesthesiologist*
*Faculty of Medicine*
*Universiti Sains Malaysia.*

## COMMITTEE MEMBERS

## CHAIRPERSON

**ASSOCIATE PROFESSOR DR AZARINAH IZAHAM**
MD(UKM), M.Med Anaes (UKM), FAMM
*Consultant Anaesthesiologist*
*Faculty of Medicine & Hospital Canselor Tuanku Muhriz*
*Universiti Kebangsaan Malaysia.*

## MEMBERS

**DR AZARINA BINTI ZAKARIA**
MD (USM), M.Med. Anaes (USM)
*Obstetric Anaesthesiologist*
*Head of Anaesthesiology & Intensive Care*
*Hospital Sultan Ismail*
*Johor Bahru, Johor.*

**DR HASMIZY MUHAMMAD**
MD (USM), M.Med. Anaes (USM), GDipClinUS (UniMelb), MBA (UNIRAZAK), PGCert LIM:SEA (HMS), FAMM
*Senior Consultant Cardiothoracic Anaesthesiologist*
*Department of Anaesthesiology and Critical Care*
*Sarawak Heart Centre.*

**PROFESSOR DR INA ISMIARTI SHARIFFUDDIN**
*MBChB (Dundee), MAnes(Malaya), MMed Edu (Malaya),*
Fellowship in Paediatric Anaesthesia (Singapore).
FAMM, FAMS.
*Professor & Sr. Consultant Anaesthesiologist,*
*Dept of Anaesthesiology*
*Faculty of Medicine*
*Universiti Malaya*
*President, College of Anaesthesiologists, AMM.*

**DR RAVEENTHIRAN RASIAH**
MBBS (Mysore), M.Med Anaes (UM), FAMM, FAMS
*Consultant Anaesthesiologist*
*Avisena Women's &*
*Children's Specialist Hospital Shah Alam, Selangor.*

**ASSOCIATE PROFESSOR DR RUFINAH TEO**
MB BCh BAO (Ire), M Med Aneas (Mal)
Fellowship in Paediatric Anaesthesia (Aus)
*Consultant Anaesthesiologist*
*Hospital Canselor Tuanku Muhriz &*
*UKM Specialist Children's Hospital*
*Faculty of Medicine*
*Universiti Kebangsaan Malaysia.*

## PREFACE

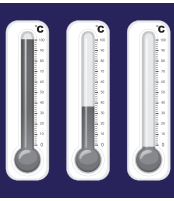
On behalf of the Writing Committee, I would like to express our sincere appreciation to the College of Anaesthesiologists, Academy of Medicine of Malaysia and the Malaysian Society of Anaesthesiologists for entrusting us with the responsibility to develop these recommendation on perioperative temperature management.

Perioperative hypothermia remains a significant yet preventable challenge in modern surgical care, affecting up to 70% of patients and leading to serious complications including surgical site infections, increased blood loss, and prolonged recovery times. These adverse outcomes impose substantial costs on healthcare systems while compromising patient wellbeing.

This guidelines address this critical gap by providing structured, evidence-based protocols for warming strategies to intraoperative monitoring and postoperative care, these recommendations offer practical solutions that can be implemented across diverse healthcare settings in Malaysia.

Lastly, I would like to thank the members of the Writing Committee for their effort and commitment in producing these recommendations.

**ASSOCIATE PROFESSOR DR AZARINAH IZAHAM**
**Writing Committee Chairperson, 2025**
*Perioperative Temperature Management Guidelines*



# SECTION 1 : INTRODUCTION

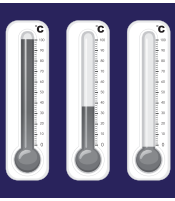
## 1. INTRODUCTION

Inadvertent perioperative hypothermia, defined as a core body temperature below 36.0°C, affects up to 70% of surgical patients and is associated with significant adverse outcomes. These include higher rates of surgical site infections, longer hospital stays as well as increased intraoperative blood loss, greater transfusion requirements, and elevated healthcare costs.[1]

Even mild hypothermia, involving a temperature drop of just 1 to 2°C below normothermia, can impair immune function, alter drug pharmacokinetics, and compromise wound healing by reducing tissue perfusion and slowing cellular metabolism.[2]

This evidence-based guideline therefore recommends actively maintaining a target core body temperature of 36.0°C, with an acceptable variation of plus or minus 0.5°C, throughout the perioperative period.[3]

The key benefits of maintaining normothermia include reduced rates of surgical site infections, 4 shorter hospital stays — such as an average reduction of 2.6 days in colorectal surgery,[4] improved patient comfort and outcomes,[5] lower healthcare costs,[6] and decreased intraoperative blood loss and transfusion needs.[7]



# SECTION 2 : PREOPERATIVE PHASE

## 2. PREOPERATIVE PHASE

### 2.1 Temperature Monitoring

- Measure and document the patient's temperature within 1 hour preoperatively.
- Any non-core / indirect core temperature measurement is acceptable upon arrival to operation theatre.

### 2.2 Prewarming Protocol

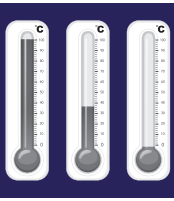
- Initiate prewarming with active or passive forced-air warming or insulation blanket for a minimum of 10 minutes on the highest setting prior to anaesthesia induction.[8]
- Rationale: Prewarming helps maintain normothermia and mitigates the effects of heat redistribution caused by anesthesia.[8,9]

### 2.3 Special Considerations

- If hypothermia is identified before surgery, initiate interventions to normalize core body temperature before transfer to the operating room.
- High-risk patients* should receive prewarming regardless of procedure duration.[2]

**A patient should be considered HIGH-RISK if they have at least TWO of the following:*

- ASA II to V.
- Preoperative temperature < 36.0°C.
- Undergoing combine general anaesthesia and regional anaesthesia.
- Major or intermediate surgery.
- At risk of cardiovascular complications.



# SECTION 3 : INTRAOPERATIVE PHASE

## 3. INTRAOPERATIVE PHASE

### 3.1 TEMPERATURE MONITORING

- Monitor core body temperature continuously throughout the surgical procedure.[2]
- Document temperature every 30 minutes until end of surgery.[2]
- For procedures < 30 minutes, monitor temperature in high-risk patients due to their risk of inadvertent hypothermia.
- Target: Maintain core body temperature near 36.0°C (±0.5°C).[2]
- Temperature monitoring is not typically necessary during mild or moderate sedation, or if a peripheral nerve block is used without general anaesthesia because thermoregulatory control is well maintained in these circumstances.[10]

### 3.2 ACTIVE WARMING STRATEGIES

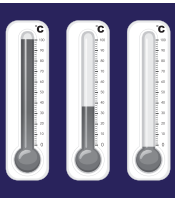
- Continue forced-air warming throughout the procedure.[11]
- Humidification of respiratory gases.
- Irrigation fluid warmed to 38 - 40°C.[2]
- Use fluid warming device if >1L of IV fluid will be administered.[12]
- Implement active warming for all procedures > 30 minutes.[2]
- Minimize the gap between prewarming and intraoperative warming to < 10 – 20 minutes.[13]

## 3.3 ADDITIONAL MEASURES

- Consider environmental factors (room temperature, patient's exposure).
- Use appropriate insulation for exposed body areas.

## 3.4 INTRAOPERATIVE HYPERTHERMIA CONSIDERATIONS

- Hyperthermia is or inadvertent hyperthermia defined as core temperature > 37.5°C due to failed thermoregulation.
- Monitor continuously for temperature elevation during procedure.
- Infants and children are at highest risk of overheating.
- Rule out causes:
    - Excessive heating
    - Inadequate heat loss (eg high ambient temperature, high humidity)
    - Fever - acute transfusion reaction, infection, medications, malignant hyperthermia
- Immediate Actions:
    - Reduce or discontinue active warming devices
    - Assess for underlying causes:
        - sepsis / infection
        - drug reactions
        - blood transfusion reactions
        - thyroid storm.
        - malignant hyperthermia
- Implement cooling measures as appropriate:
    - Remove warming blankets.
    - Use cool IV fluids.
    - Increase room ventilation.
    - Consider cooling blankets.



# SECTION 4 : POSTOPERATIVE PHASE

## 4. POSTOPERATIVE PHASE

### 4.1 IMMEDIATE POSTOPERATIVE CARE (IN PACU)

- Assessment:
  - Measure core temperature (preferably via tympanic or nasopharyngeal thermometer) on arrival and before discharge.[3]
  - Classify temperature status:
    - <36.0°C = Hypothermia (intervene)
    - ≥36.0°C = Normothermia (monitor)
- Interventions[14,15]

| *Temperature* | *Recommended Action* |
|---|---|
| ≥36.0°C | *Use passive warming (blankets, socks). No active warming required.* |
| 35.0°C – 35.9°C (Mild) | *Start active warming (e.g., forced-air warming) + recheck temperature every 15 mins.* |
| < 35.0°C (Moderate - Severe) | *Initiate aggressive active warming, notify anaesthesiologist, monitor closely.* |

- Monitoring
  - Recheck temperature every 15–30 minutes until normothermia is restored.
  - Do not discharge from PACU unless temperature ≥36.0°C, unless clinically justified.

## 4.2 ONGOING WARD-BASED POSTOPERATIVE CARE[14]

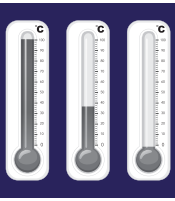
- Measure Temperature
  - Upon arrival to ward.
  - Then every 4–6 hours for the first 24 hours postoperatively or per institutional policy.
- Preventive Strategies[16,17]
  - Maintain adequate room temperature (not < 22°C if possible).
  - Use cotton or reflective blankets routinely.
  - For high-risk patients (elderly, frail, underweight), consider pre-warmed bedding or garments.
- Management of Hypothermia on Ward[3,15]

| *Temperature* | *Recommended Action* |
|---|---|
| 35.5–36.0°C | *Apply passive warming, recheck temperature in 1 hour* |
| <35.5°C | *Initiate active warming, monitor temperature every 30 minutes* |

- Documentation and Communication
  - Record temperature values, interventions applied, and clinical outcomes in nursing/medical notes
  - Escalate to attending team if:
    - Hypothermia persists >2 hours despite warming.
    - Associated signs of cardiovascular compromise, shivering, or altered consciousness

**Note:**

*The use of the air warming device should be according to manufacturer recommendations.*



# APPENDIX 1 : SUMMARY OF RECOMMENDATIONS

| | RECOMMENDATIONS |
|---|---|
| Preoperative Phase | *Measure and document patient's temperature*<br>*Initiate pre-warming especially in high risk patients* |
| Intraoperative Phase | *Target core temperature 36.0°C (± 0.5°C)*<br>*Use active warming strategies*<br>*Document temperature every 30 minutes*<br>*Avoidance of overheating* |
| Postoperative Phase | *Asses and monitor temperature* |
| ≥36.0°C | *Passive warming* |
| 35.0°C–35.9°C | *Active warming, monitor temperature every 15 minutes* |
| <35.0°C | *Aggressive warming, notify doctor* |

**REFERENCES:**


1. *Anderson DJ, Podgorny K, Berrios-Torres SI, Bratzler DW, et al. Strategies to prevent surgical site infections in acute care hospitals: 2014 update. Infect Control Hosp Epidemiol. 2014; 35(Suppl.2): S66-88.*

2. *Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. N Engl J Med. 1996; 334 (19): 1209-16.*

3. *National Institute for Health and Care Excellence (NICE). Hypothermia: prevention and management in adults having surgery. Clinical guideline [CG65]. 2016.*

4. *Global guidelines for the prevention of surgical site infection, second edition. WHO 2018.*

5. *Gustafsson UO, Tim A, Wexner S, How KY et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. 2025; 109397. In Press.*

6. *Hart SR, Bordes B, Hart J, Daniel D, Harmon D. Unintended perioperative hypothermia. Ochsner J. 2011; 11: 259-270.*

7. *Rajagopalan S, Mascha E. Na J, Sessler DI. The effects of mild perioperative hypothermia on blood loss and transfusion requirement. Anesthesiology. 2008; 108: 71-7.*

8. *Horn EP, Bein B, Böhm R, Steinfath M, Sahili N, Höcker J. The effect of short time periods of pre-operative warming in the prevention of peri-operative hypothermia. Anaesthesia. 2012; 67 (6): 612-617.*

9. *Abreu MM. New concepts in perioperative normothermia: from monitoring to management. Anesthesiology News. 2011: 39-48.*

10. *Riley C, Andrzejowski J. Inadvertent perioperative hypothermia. BJA Educ. 2018; 18 (8): 227-233.*

11. *Lau A, Lowlaavar N, Cooke EM, et al. Effect of preoperative warming on intraoperative hypothermia: a randomized-controlled trial. Can J Anaesth. 2018; 65 (9):1029-1040.*

12. *Horowitz PE, Delagarza MA, Pulaski JJ, Smith RA. Flow rates and warming efficacy with Hotline and Ranger blood/fluid warmers. Anesth Analg. 2004; 99 (3): 788-792.*

13. *Grote R, Wetz A, Bräuer A, Menzel M. Short interruptions between pre-warming and intraoperative warming are associated with low intraoperative hypothermia rates. Acta Anaesthesiol Scan. 2019; 64 (4): 489-493.*

14. *Hooper, V. D., Chard, R., Clifford, T., Fetzer, S., Fossum, S., Godden, B., ... & Wilson, L. (2010). ASPAN's evidence-based clinical practice guideline for the promotion of perioperative normothermia. Journal of PeriAnesthesia nursing, 25(6), 346-365.*

15. *Rauch S, et al. Perioperative Hypothermia-A Narrative Review. Int J Environ Res Public Health. 2021;18(16):8749. DOI: 10.3390/ijerph18168749.*

16. *Sessler D I. Perioerative thermoregulation and heat balance. Lancet. 2016; 387(10038): 2655-64.*

17. *Torossian A, Bräuer A, Höcker J, et al. Preventing inadvertent perioperative hypothermia. Dtsch Arztebl Int. 2015; 112(10): 166-72.*