

Why worry about hypothermia?

- Perioperative hypothermia (<36°C) is associated with complications including intraoperative blood loss and transfusion requirement¹, cardiac events², surgical site infections and increased length of hospital stay³ resulting in a significant patient and economic burden.
- Our previous audit of 870 NSQIP-selected patients undergoing major non-cardiac surgery found that 37% were hypothermic intraoperatively, and 21% of patients remained hypothermic on arrival to PACU.
- What causes hypothermia?
 - **Factors we CANNOT change:** skin and surgical site exposure, and blunting of thermoregulation by anesthetics
 - **Factors we CAN change:** Patient pre-warming and intra-operative warming and OR temperature

Perioperative warming study and OR questionnaire

•Over 600 patients undergoing major non-cardiac surgery were perioperatively warmed with forced air warming gowns (Bair Paws, 3M) to investigate if warming before and during surgery reduces hypothermia and associated complications. The gowns are worn in pre-op and are converted to warming blankets intra-op, and then back to full body gowns in PACU as shown below.

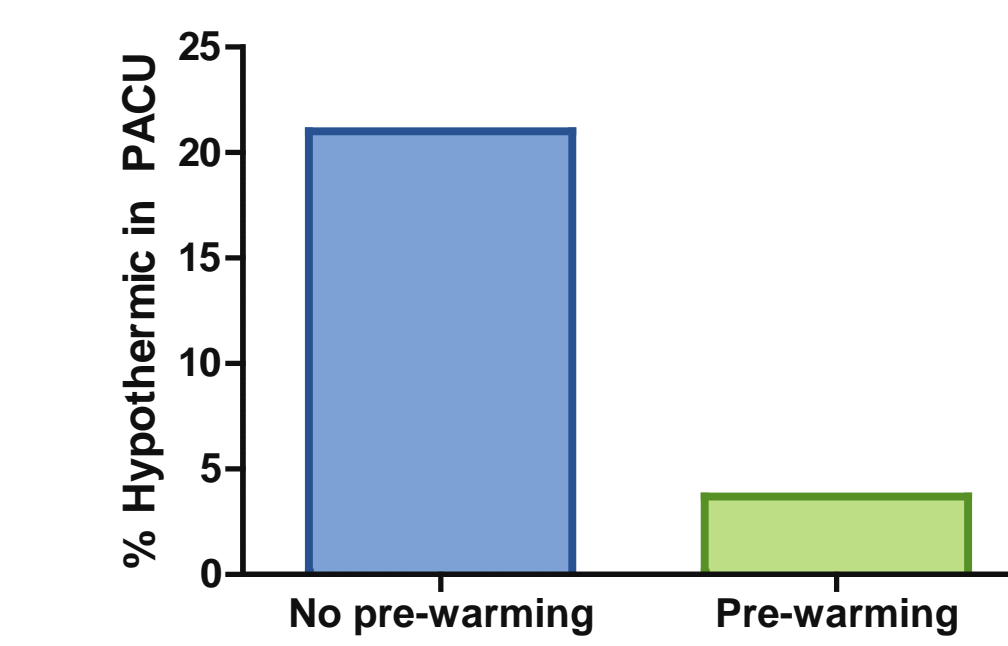


- To further investigate how we can reduce hypothermia we conducted 63 interviews with nurses and 67 interviews with anesthesiologists in operating rooms over a 7 week period.
- The interviews had 2 objectives.
 1. Determine what is currently being done to reduce the incidence of hypothermia intraoperatively, and what we can improve on
 2. Gauge OR staff opinion on the forced-air warming gowns and assess if and how they may be used going forward.

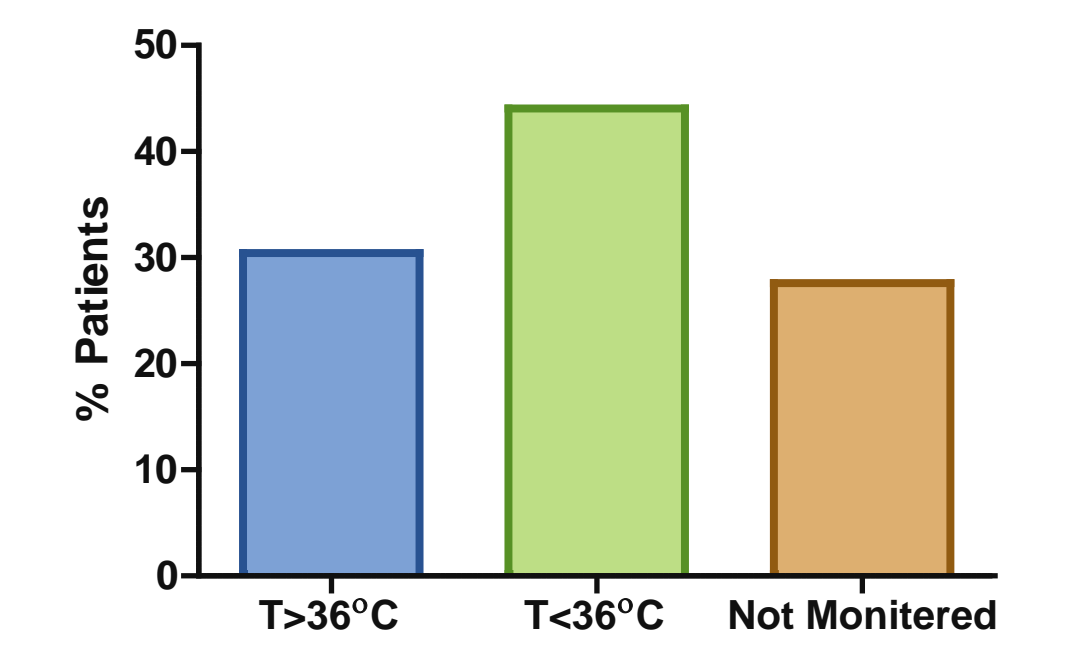
Does pre-warming reduce hypothermia?

The incidence of hypothermia of 600 patients assigned to perioperative forced air warming was compared to 870 patients that did not receive the pre-warming intervention. Perioperative warming occurred pre-op and intraoperatively.

Pre-warming's effect on hypothermia in PACU



Incidence of hypothermia (<36°C) during surgery with pre-warming

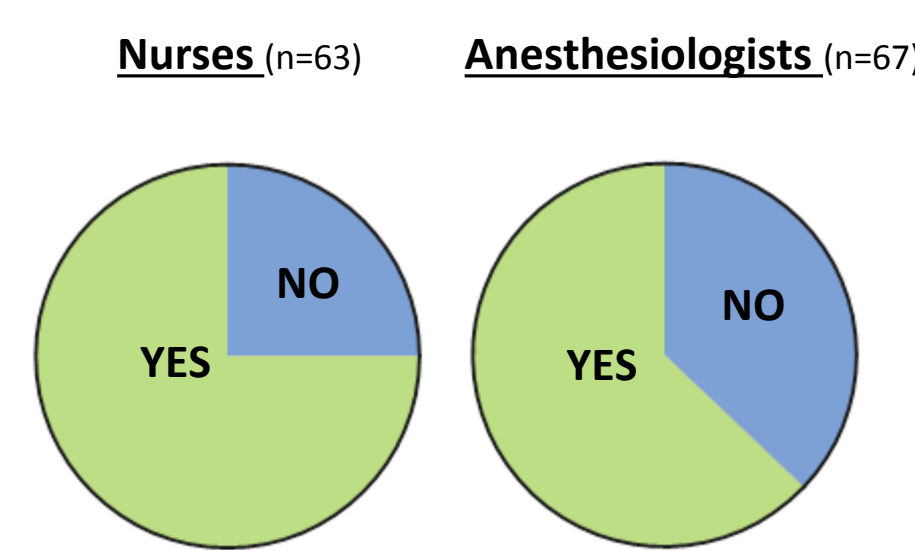
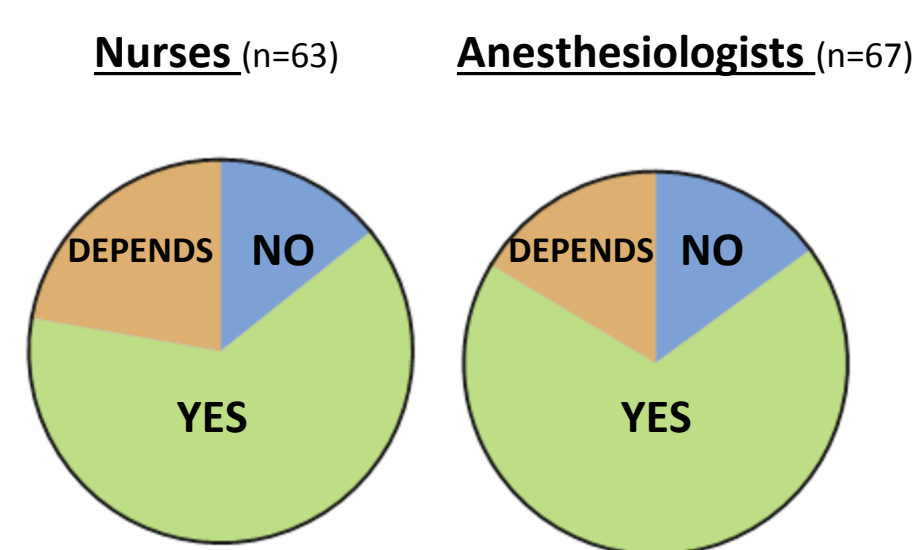


There was a dramatic reduction in incidence of hypothermia on arrival to PACU in the population receiving perioperative forced air warming (left graph). However, pre-warmed patients still frequently became hypothermic during surgery (right graph).

Staff opinion of forced air warming (Bair Paw) gowns?

Are the gowns useful?

Do you feel comfortable converting the gown to a blanket?



Reasons for not being viewed as useful were related to product design (ex gets stuck together, difficult to use)

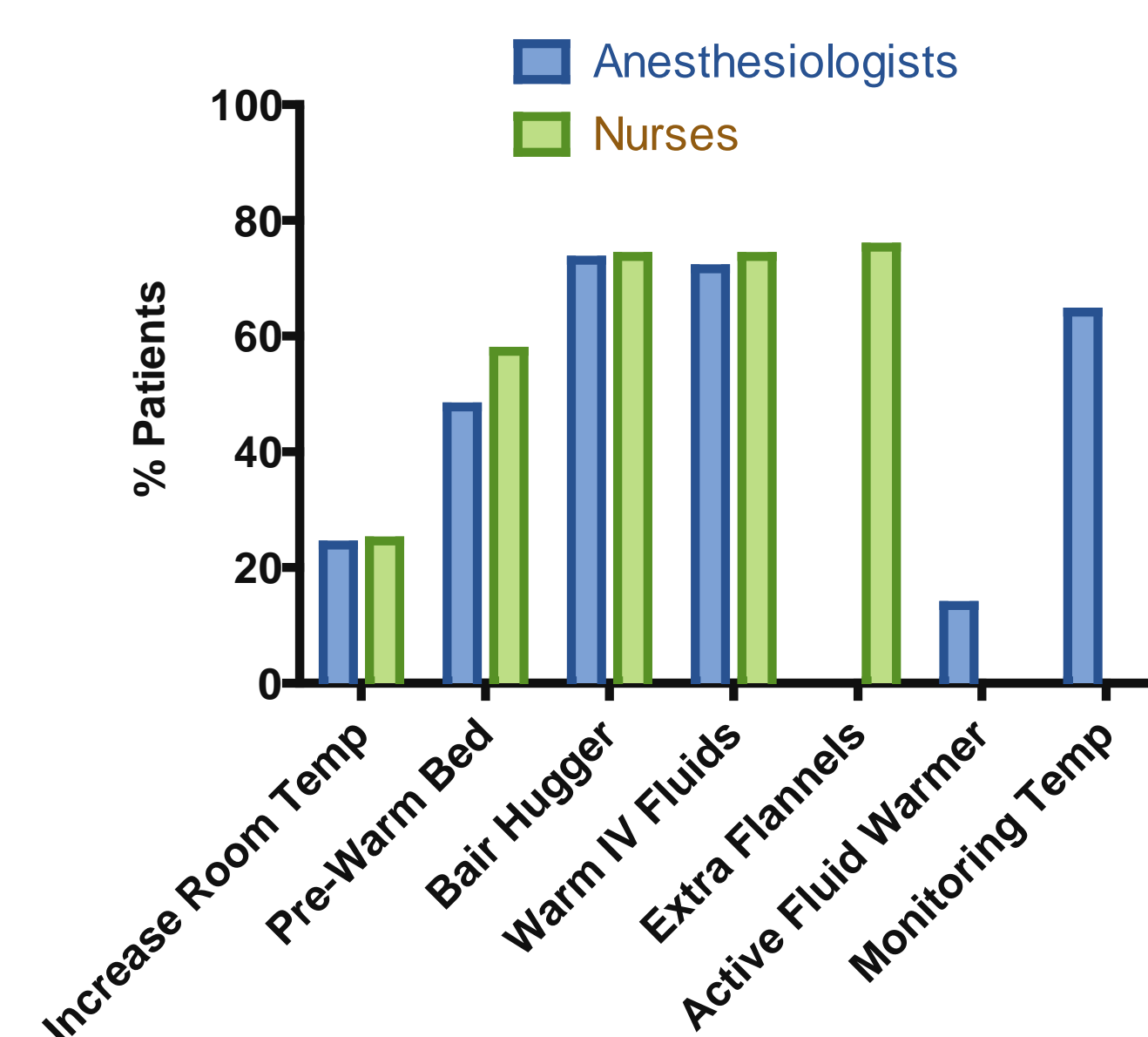
Staff selected "depends" if they thought the gowns are only useful for particular cases. OR position of patient was often a factor.

To prepare the patient for surgery, the warming gown first had to be converted to a blanket to expose the surgical site but maintain warming elsewhere.

The most common reason for not feeling comfortable converting the gowns was lack of practice.

How do staff keep the patient warm in the OR?

Nurses and Anesthesiologists were asked in the OR what strategies they had used to keep the patient warm. Staff answered "yes" or "no" to each warming strategy, shown on the x-axis.



How can we improve?

- Turn up OR temperature at the beginning of each case (mean OR temp mid-case was 19.95 +/- 0.12°C, recommended = >21°C)
- Monitor temperature more frequently (Anesthesiologists)
- Consider use of active fluid warmer for administering fluids > 500 mLs

We also asked staff if they thought their patient was at risk for hypothermia, and then looked to see what staff do differently for high risk patients (data not shown). Most warming strategies were utilized more for high risk patients, except nurses were LESS likely turn up OR temperature for high risk patients. Reasons for this are not clear, but it may be that staff are less likely to tolerate higher temperatures for longer procedures that often accompany higher risk patients.

Summary

- Perioperative hypothermia occurs frequently with surgery and is associated with post-operative complications
- Perioperative warming caused a dramatic decrease in the incidence of hypothermia on admission to PACU. Over a 4 month period of pre-warming over 600 patients undergoing major non-cardiac surgery lasting >60 minutes our incidence decreased from 21% to 4%
- However, the forced air warming (Bair Paw) gowns used for perioperative warming were met with mixed reviews among OR staff. Most complaints were related to ease of use, particularly depending on patient position.
- Mid-case OR temperature was below recommended levels (>21°C) and was rarely increased at the beginning of cases
- Anesthesiologists did not monitor temperature for 1/3rd of cases and infrequently used an active fluid warmer

References

1. Rajagopalan S, Masha E, Na J, Sessler DI. The effects of Mild Perioperative Hypothermia on Blood Loss and Transfusion Requirement. *Anesth* 2008;108:71-7
2. Frank SM, Fleisher LA, Breslow MJ & et al. Perioperative maintenance of normothermia reduces the incidence of morbid cardiac events: A randomized clinical trial. *JAMA* 277, 1127-1134 (1997).
3. Kurz, A., Sessler, D. I. & Lenhardt, R. Perioperative Normothermia to Reduce the Incidence of Surgical-Wound Infection and Shorten Hospitalization. *N. Engl. J. Med.* 334, 1209-1216 (1996).