Keeping patients warm not only keeps them comfortable. It can also help prevent surgical site infections (SSI) and other complications.

Studies have found mild hypothermia can triple the infection rate and prolong hospital stays, even for uninfected patients. Research has also linked hypothermia to adverse cardiac outcomes and increased blood loss.

Keeping patients warm means more than just keeping the blanket warmer stocked.

Organizations need an improvement process that includes deciding when to take patients’ temperatures, what type of thermometers to use, and what methods to use to keep patients warm.

Improving the process for patient warming was part of the national Surgical Infection Prevention (SIP) collaborative sponsored by the Centers for Medicare and Medicaid Services (CMS). Work of the year-long collaborative, which wrapped up in 2003, is being carried forward at the state level by Medicare’s quality improvement organizations. In the national project, some organizations have seen infection rates drop by as much as 70% to 100% for some procedures.

Two hospitals that participated in the national collaborative shared how they improved thermal regulation.

**Moore Regional Hospital**
**Pinehurst, NC**

**Outcomes**

- Increased percentage of patients with normal temperatures (36ºC) on arrival in the postanesthesia care unit (PACU) from 20% to 30% to 85%.
- Reduced the infection rate by 50% for its target population of hip and knee replacement patients. Increased the number of cases between infections from 29 to 167.

The patient-warming project, which began in 2002 with hip and knee replacement patients, since has spread to all surgical patients.

“We take patients’ temperatures preoperatively in the holding area or in the outpatient area and start to warm them accordingly,” says Jayne Lee, RN, MPH, CIC, director of infection control and patient safety for Moore Regional’s parent, FirstHealth. The 385-bed hospital has 10 ORs and a volume of about 9,000 procedures a year.

“A huge piece” was deciding what type of thermometer to use, says Lee.

The ear (tympanic) thermometers the nurses were using are out of favor. A leading researcher, Daniel Sessler, MD, PhD, of the University of Louisville in Kentucky, says most studies have found the ear thermometers are little more than “random number generators” (sidebar page 12).

Lee worked with the PACU manager and nurses to test alternatives. The nurses decided to try an easy-to-use oral thermometer that took the patient’s temperature in 4 seconds. In a 1-month pilot with orthopedic patients, nurses took simultaneous temperatures with the oral and tympanic thermometers and recorded them.

“We did see the oral temperature was higher and felt it was more accurate than the tympanics,” Lee says.

Now all temperatures in the PACU are taken orally if possible.

The nurses also tested bladder temperatures for patients with Foley catheters, prompted by an article in the *AORN Journal*. But they found the oral thermometers were just as successful.
A bonus—more patients were normothermic than the staff had originally thought—75% with the oral thermometers versus 40% with the ear type. Oral thermometer probe covers also are cheaper than those for the ear thermometers.

Another challenge was setting a policy for ambient temperature. The consensus was to keep the holding area and PACU at 70°F to 72°F. ORs are kept at 70°F to 72°F until the patient is draped; the temperature can be turned down when the surgery begins.

The performance improvement team is now focused on warming the remaining 15% of patients who do not have normal temperatures on arrival in the PACU. The hospital has increased use of forced-air warming blankets. A current pilot project is to place the warming blankets on patients in the holding area rather than waiting until the patient is in the OR. Other measures include warm blankets, patient drapes, warmed fluids, and head coverings such as towels.

Mercy Health Center
Oklahoma City

Outcomes

- Within 3 months, improved the rate of patients of interest who were warm (at least 36°C) on arrival in the PACU from 24% to 100%.
- Reduced surgical infection rate by 78% in populations having coronary artery bypass, hip and knee surgery, colon surgery, and hysterectomy.
- Went from 100 surgical procedures between infections at the beginning of the collaborative to more than 400 at the end.

Mercy’s patient-warming project began with an unlikely step—a visit to the facility engineers who run the hospital’s power plant.

“I asked them about heating and cooling of our ORs. What were the implications for humidity, air changes, and so on?” notes the day-to-day project leader, Ronda Pasley-Shaw, RN, CIC, manager of epidemiology and occupational health.

Facility engineers were included in the process and now are on a first-name basis with the surgeons and other OR staff who need their help with temperature control—an example of Mercy’s organizationwide approach to infection control performance improvement. A 400-bed tertiary care center, Mercy performs about 12,000 procedures a year in its main OR and two surgery centers.

Leaders have worked to bring about a cultural change that involves employees at all levels and in many departments.

“We started with the facility services guys because we realized that if we didn’t have a ventilation plan that would support the [room temperature] targets we were after, our warming interventions would not be effective,” she notes. Other departments also became active participants—materials management for thermometer trials, information technology for data capture, among others.

Another tenet: Don’t be dogmatic. Rather than telling people what to do, emphasize what’s best for the patient, based on the scientific evidence. Then make it easier to do the right thing.

Among practical steps the project entailed:

Identify a baseline

Mercy’s team was surprised to learn that only 24% of surgical patients were arriving in the PACU with the target temperature of at least 36°C. Forced-air warmers were already being used for long cases.

Measuring ambient temperatures in the department, they found a wide range. To gather objective data, they bought big, digital thermometers at a discount store and posted them throughout the perioperative area, including several in each OR. Though scientifically room temperature doesn’t have much effect on patient warmth, reading the thermometers helped raise awareness about the project.

“When you have six people working in a room, and two are hot and four are cold, you can look at the thermometer to see what the temperature is,” Pasley-Shaw notes.
It also helped keep the focus on the patient. When someone says, “Cool it off in here,” the staff are cued to say to the anesthesiologist, “How is the patient’s temperature?” Then if the room is cooled, extra steps are taken to keep the patient warm.

“We don’t say no,” she says. “We say, ‘Let’s check the patient and implement what we need to do to maintain the patient’s temperature.’”

The digital thermometers didn’t cost much but “were worth their weight in gold,” she says. “It was a visible reminder to the whole team that we were working on something that we would otherwise just experience subjectively.”

**Set a goal**

Mercy’s goal was that 100% of surgical patients would be normothermic (at least 36°C) on arrival in the PACU.

**Decide on measurements**

Because standard ear thermometers aren’t considered reliable, Mercy conducted small studies to look at other options.

The anesthesiologists championed the project. In a series of tests on patients who were intubated and had a temperature probe, the anesthesiologists compared temperatures with another type of thermometer.

As a result of the tests, the clinicians selected the temporal artery thermometer, an infrared device placed on the forehead over the temporal artery. The device is made by Exergen Corp (www.exergen.com).

After reviewing the data, the team standardized on thermometers, documentation in Celsius, and data capture.

Patients’ temperatures are taken:

- in the preoperative area about 45 minutes after arrival (after patients have changed clothes and are subject to heat loss)
- during surgery
- on arrival in the PACU.

**Educate and communicate**

As part of the CMS collaborative, Mercy was able to attend conferences and participate in conference calls that provided scientific background for the project. Some resources are listed in the sidebar.

The anesthesiologists were subject matter experts because their literature has most of the research on patient warming.

**Develop change strategies**

Having determined that patients were cold in the preop area, the preoperative staff championed an effort to make sure patients were warm when they went to the OR.

“We knew patients are not going to gain warmth in the OR—they are going to lose it,” Pasley-Shaw says. “The preoperative staff’s commitment really turned the process around.”

Warming measures are individualized to the patient—a small 80-year-old woman with a hip fracture may need more active warming than a younger person awaiting elective surgery. The staff uses a variety of methods. Forced air warming is difficult to use in the preop area because the plugs are at the foot of the beds and can cause a trip hazard.

Patients receive warmed fluid if they will receive more than 3 L of fluid during surgery or if they have had significant blood loss, as in trauma surgery.
Traditionally, PACU staff have had the responsibility to warm the patient up after surgery. But efforts to warm patients preoperatively and maintain temperature in the OR have relieved them of that duty.

“The recovery room staff noticed immediately that their warm blanket utilization went down, and their length of stay was positively affected,” Pasley-Shaw notes.

Patients also didn’t shiver as much, a patient satisfier. Some commented they were much more comfortable than after previous surgery.

**Capture data**

Patients’ temperatures are documented in the preop area, in the OR, and in the PACU. Temperatures are recorded even if they are normal. The ambient temperature is also recorded.

“We report to surgical services the percent of cases that arrive in PACU at equal to or greater than 36ºC,” says Pasley-Shaw.

Feedback is provided to clinicians so they can investigate cases where patients went to the OR cold or had temperatures below 36ºC.

**Keep a sense of humor**

After a few weeks of the project, everyone was sick of hearing, “What’s the temperature in here?”

A sense of humor comes in handy, Pasley-Shaw acknowledges. It also helped to acknowledge that everyone’s perception of room temperature is valid—the surgeon in a lead apron and full surgical attire and the anesthesiologist working with bare arms.

“We’re not going to argue with them whether they are cold or hot. What we are going to do is to check on the patient before we adjust the temperature in the room.

“Once the idea took hold that we are going to keep the environment warm and comfortable for the patient, people helped us to identify gaps in the process.” Physicians and staff began to recommend and use case-specific warming measures, such as an insufflation warmer, for surgical populations not included in the pilot.

How do they keep it all going?

“Our best one-liner is, ‘I know this is impossible, but what can we do by Tuesday?’” says Pasley-Shaw.

That is part of the collaborative philosophy—a big practice change can’t be addressed all in one bite. It needs to be broken into parts, small tests run, and changes adopted that make small differences. Eventually, it all adds up to success.

Pasley-Shaw is quick to credit other team members, such as Rose Dupas, RN, CNOR, director of perioperative services. “Kudos go to all of the people who created this success,” she says.

**Previous articles in this series addressed eliminating the preoperative shave (January) and improving the process for prophylactic antibiotics (February). Next time the focus is on glucose control.**

**References**


### Improving the process for patient warming

**Key changes**
- Designate responsibility and accountability for thermal regulation.
- Standardize use of warming devices (warming blankets, hot air blanket, IV fluid heaters) to ensure patient temperature is >36°C on arrival in the PACU.
- Limit heat loss in patients prior to operative procedures.
- Assure engineering controls allow surgical staff to control room temperature.

**Definition**
Normothermia occurs when temperature is > 36°C. Excluded are patients for whom hypothermia is deliberately sought for therapeutic reasons (e.g., hypothermic total circulatory arrest).

**Measure**
Percent of surgical patients with perioperative normothermia (procedure specific).

**Goal**
100% for patients not excluded from normothermic maintenance.

**Data collection**
- Record on arrival in PACU.
- Create a system to capture data prospectively on 100% of patients.

*Source: Centers for Medicare and Medicaid Services. Surgical Infection Prevention Collaborative.*

### Patient-warming resources

**American Society of PeriAnesthesia Nurses**
Clinical guideline for prevention of unplanned perioperative hypothermia. www.aspan.org/hypothermia.htm

**Outcomes Research Institute**
University of Louisville
Proposed guidelines for thermal management and other resources. www.or.org
Look under Reference Files, then Temp Monitoring.
A researcher comments on patient warming

Daniel Sessler, MD, a leading researcher on thermal regulation and the effects of hypothermia on patients, responded to questions about patient warming. He is vice dean for research, professor of anesthesiology, and director of the Outcomes Research Institute at the University of Louisville.

**OR Manager:** What is the most cost-effective and efficacious method for warming surgical patients?

**Dr Sessler:** The answer is simple—forced air. It’s the most effective, inexpensive, and commonly available method of warming patients.

**ORM:** Is that being widely used?

**Dr Sessler:** Almost all institutions use forced air. The problem is they don’t use it with every patient. Probably only one half to one third of patients who should be warmed are getting warmed.

**ORM:** Do all surgical patients need to be warmed?

**Dr Sessler:** Patients become hypothermic initially because of a core-to-peripheral redistribution of body heat. This redistribution occurs even in warm rooms and in patients having small, short operations. Once clinicians recognize the importance of redistribution, it becomes clear that almost all surgical patients should be warmed.

**ORM:** What is the most effective method for measuring patients’ temperatures?

**Dr Sessler:** The easiest way in an intubated patient is to use an esophageal probe. The problem is when you have patients who aren’t intubated or have a laryngeal mask airway.

There are other good sites such as the pulmonary artery or nasopharynx, but they are harder to use. Among those, only the nasopharynx is really a usable option. The nasopharynx is a perfectly good place to measure temperature in patients having general anesthesia.

If the patient isn’t having general anesthesia, other options include forehead skin temperature or axillary, oral, or rectal temperature. Infrared tympanic membrane thermometers should be avoided. Those are unreliable. In fact, most studies suggest they are little better than random number generators.

**ORM:** What type temperature measurement do you recommend in the PACU?

**Dr Sessler:** Oral temperatures are probably the best.