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Bair Gown Evaluation of Implementation: Patient comfort, Surgical Site Infection, and Cost Analysis

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Abstract

It is a Perioperative (Periop) Standard of Care to maintain normothermia or a temperature above 36.0°C (96.9°F) for all patients receiving general anesthesia. The Parkview Randallia periop area has implemented a Bair Gown Active Warming System; this paper evaluates patient comfort, staff perception, surgical site infection (SSI) rate, and cost of said system. Previously, all patients would receive passive warming via warm blankets in preop and postop and active warming in the Operating Room (OR) via a Bair Hugger Blanket. The average preop temperatures were the same before and after implementation at 97.9°. The average intraop temperatures showed the most improvement: 96.8° pre-implementation to 97.2° post-implementation. Post Anesthesia Care Unit (PACU) average temperatures were lower post-implementation: 97.7° pre-implementation and 97.4° post-implementation. We had three reportable SSIs in 2022 year to date (YTD) before implementing the Bair System. After the implementation YTD, there is only one reportable SSI for the unit. Staff did perceive that patients had less postop shivering and overall felt warmer while utilizing the Bair System. Staff also perceived that the patients enjoyed the warming and cooling features of the gowns. The Bair System has saved an average of \$2,456 monthly in linen costs at Randallia. The temperature data was pulled from seventy-six charts. The pre-implementation collection period was from July 2022 and post implementation data from July 2023. YTD following implementation, Randallia has lowered reportable infection rates compared to pre-implementation: thereby improving our reputation in the eyes of our community. We significantly decreased unit linen costs. We have higher intraoperative temperatures with less variance throughout all phases of care. The staff have an increased perception of patient warmth and noticed less postop shivering.

Introduction

"Patients whose core body temperatures slip below 36°C are at increased risk of surgical site infections (SSIs), cardiac arrhythmias, blood loss, altered medication metabolism and increased pain" (Brooks and Matulewicz, 2022). It is a Perioperative (Periop) Standard of Care to maintain normothermia or a temperature above 36.0°C (96.9°F) for all patients receiving general anesthesia. Parkview Health Periop area has implemented a Bair Gown Active Warming System; this paper evaluates patient comfort, staff perception, SSI rate, and cost of said system at Parkview Randallia Procedural Center. A Bair Gown is a plastic gown that can be connected to a forced air warming machine called a Bair Paw or Bair Hugger. Bair Paws are smaller, can blow warm or cool air, and have a patient controller. Bair Huggers are larger, move a larger quantity of air, and are specifically for warming only.

Surgical Site Infection

"Hypothermia itself may delay healing and predispose patients to wound infections. Maintaining normothermia intraoperatively is likely to decrease the incidence of infectious complications" (Kurz et al., 1996). We had three reportable SSIs the year to date (YTD) before implementing the Bair System. Two of the three SSIs suffered from mild hypothermia during their procedure. "SI is the most costly HAI [hospital acquired infection] type with an estimated annual cost of \$3.3 billion, and extends hospital length of stay by 9.7 days, with cost of hospitalization increased by more than \$20,000 per admission" (Center for Disease Control). After implementation YTD we have had only one reportable SSI. Decreasing our SSI rate saves patient discomfort and dissatisfaction and reduces our lost revenue. Low SSI rates improve our standing in the community. SSI rates are available to the public, and having such a low rate makes the public more confident in choosing our facility for their procedural needs. The SSI data was provided by the Periop Clinical Director of Nursing and the SSI Committee.

Cost Evaluation

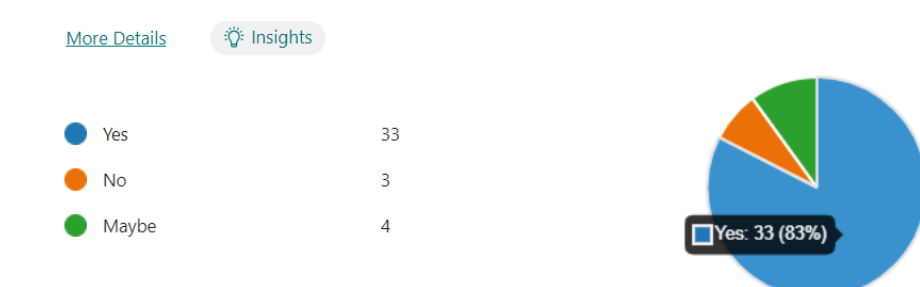
Previously, all patients received passive warming via two to six warm blankets in preop. They then would transfer to the operating room (OR) and placed on an active warming system via a Bair Hugger blanket; the warm blankets from preop were removed and placed in soiled laundry. Once the procedure was complete, the Bair Hugger blankets would be thrown away, and the patient was covered in two to six new blankets. Once transferred to the recovery room, additional warm blankets would be added if temperature standards were not met. Our blankets cost \$0.85 per blanket and patients go through a minimum of four blankets per stay resulting in a cost of \$3.20 per patient, however, most require eight to twelve blankets. The OR charges \$4.54 for a Bair Hugger blanket during procedure. The department was spending on average \$12.25 per patient to maintain normothermia while generating large amounts of laundry. We failed to maintain normothermia throughout all phases of care using this method. Our goal was for all patients to receive active warming before, during, and after surgery to mitigate the potential complications and costs associated with the loss of normothermia during surgery.

On October 24th, 2022, we implemented a Bair Gown system for all general anesthesia patients at Parkview Randallia. Patients are prewarmed in preop with the Bair Gown (\$12.59) and single flat sheet (\$0.20/sheet); both stay with them through all phases of care unless soiled or patient expresses dissatisfaction. With the Bair System, it appears at first glance that the cost analysis is comparable with a \$12.25 average cost to maintain normothermia before implementation and a \$12.79 average cost after. However, upon further inspection, the cost saving becomes apparent. As previously mentioned, warm blankets were utilized to maintain normothermia, and patients go through several in each phase of care. While the price presented is the average, some patients require far more blankets than discussed above, thereby driving up the cost. If a patient reports feeling cold or fails to meet the greater than 96.9° target temperature, the staff simply turns up temperature of the Bair System instead of piling on more blankets. The Bair System has saved an average of \$2,456 per month at Randallia in linen laundering costs. The year before the Bair Gown implementation, the OR charged for 1,446 one-time use Bair Hugger blankets. This year, we have charged for 649 Hugger Blankets. The cost of education and implementation were negatable. The Bair units were provided for free as long as the unit continued to order the gowns and blankets. The Bair reps provided free in-service education for the staff. The cost analysis was derived from the hospital's stocking team (SCORE) and monthly linen reports.

Staff Perception and Patient Satisfaction

Staff perception results were collected via a Microsoft Team's Form survey. Staff did perceive that patients had less postoperative shivering and generally felt warmer while utilizing the Bair System. Staff also perceived that the patients enjoyed the warming and cooling features of the gowns. Out of ninety-five staff members, forty responded to the survey - a 42% response rate. Patients express higher levels of comfort and lowered anxiety while utilizing the Bair Gown. The breakdown of the staff perception survey is presented below

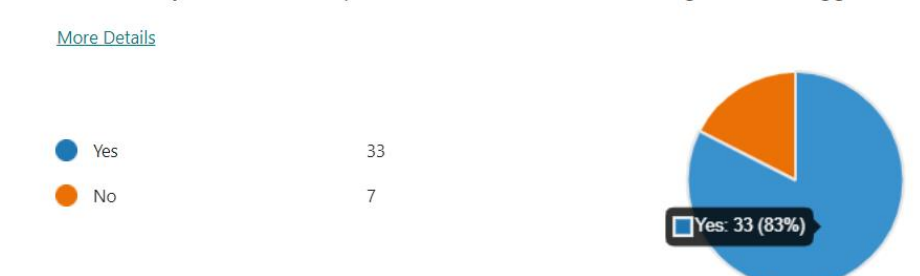
1. Do you feel patients enjoy the Bair hugger gowns and the warming and/or cooling feature?



2. Do you feel that the patients come out of surgery with less post op shivering?



3. Overall do you feel like the patients are warmer while utilizing the Bair Hugger/ Paws System?

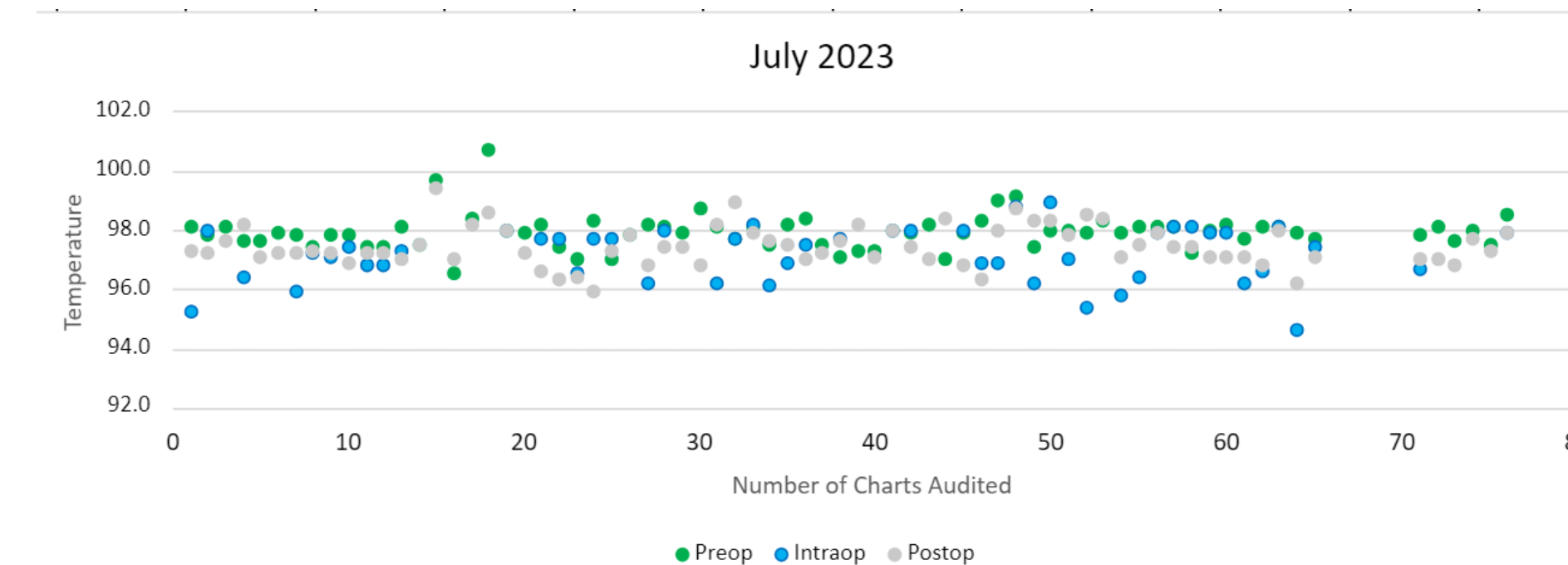
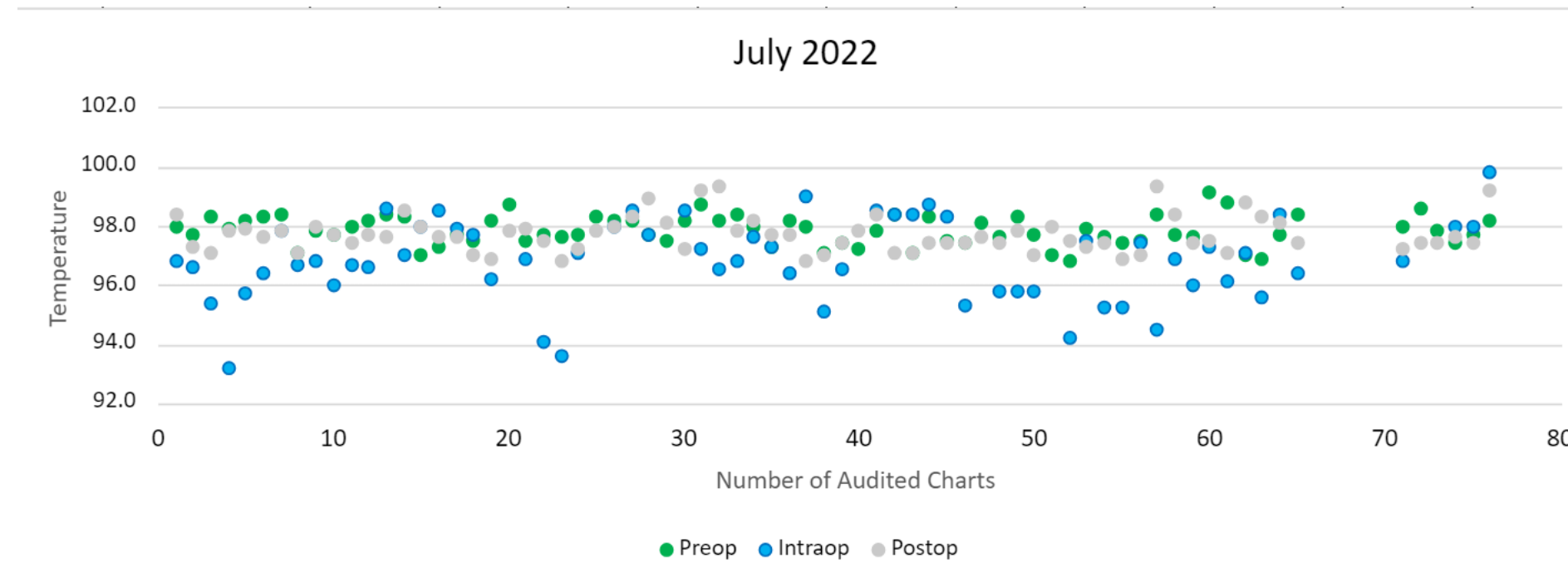


Temperature Data

Temperature data was pulled from the pre-implementation period of July 2022 and post-implementation data from July of 2023. Seventy-six charts from each month were audited in a preoperative, intraoperative, and a post-anesthesia care unit (PACU) for the lowest recorded temperature during each phase of care. The same fifteen surgical providers were audited for consistency. Procedures lasting more than one hour were also part of the criteria for data collection. The average preop temperatures were the same before and after implementation at 97.9°. The average intraop temperatures showed the most improvement: 96.8° pre-implementation to 97.2° post-implementation. The average PACU temperatures were lower post-implementation: 97.7° pre-implementation and 97.4° post-implementation

	Preop	Intraop	Postop
Average Before Bair Prewarming Protocol	97.9	96.8	97.7
Average After Bair Prewarming Protocol	97.9	97.2	97.4

We theorize that the decrease in the PACU temperatures post-implementation is from a more consistent intraoperative temperature. Previously, patients experienced a large drop in temperature in the OR, during induction, before staff had the opportunity to apply the Bair Hugger. Once the patient was fully sedated, the monitors would register a low core temperature and the staff would overcompensate by turning the Bair Hugger on high. It stayed on high for the duration of the procedure even after the patient returned to their preop temperature. The patient would then arrive in PACU with a significantly higher temperature than the patient had preoperatively. The charts below depict the audited temperatures. The temperatures in July 2023 have a much lower variance rate throughout the phases of care compared to 2022. The data reflects that the Bair System has improved our temperature consistency rate and has raised patients' temperatures well above the target temperature thereby, reducing the likelihood of adverse outcomes related to poor temperature management.



Barriers and Limitations

We faced several barriers during the implementation process. Staff perception and resistance was the most challenging barrier to overcome. According to Drejeris & Drejeriene, (2020)"...employee resistance to innovation is one of the main barriers of change failure in a health care organization..." Many staff expressed that the change to the Bair System was unnecessary in the beginning. While perioperative warming is evidence-base practice (EBP), implementing the Bair System was presented as more of a cost savings goal rather than a clinical outcome goal. At the time of implementation, there was no Parkview Hospital System data to support the Bair Gown System utilization. Minimal data was presented to the staff at introduction to justify the change in practice to support clinical outcomes. Team buy-in initially was low; however, after the Bair representatives visited and presented an in-service providing further data, less resistance was observed. The Bair representatives did a full class on how to utilize the Bair Gown to its full potential. The staff faced a steep learning curve. It took staff several weeks to learn to use the gown appropriately and utilize the expandable sleeves, multi-port plug-ins, adhesive features, and face covering. It was challenging for staff to break the habit of piling several blankets on top of patients. We did not see cost savings in linens until several months after implementation as staff tried to break old habits. The OR nurses initially express anxiety about attempting to keep the gowns clean and out of the way during the procedure. It took some change of routine but after a few months they figured out how best to utilize the Bair Gowns built-in adhesive strips to their advantage. Most of the initial barriers were overcome in the months shortly after implementation with tenacious leadership support, identifying key players for implementing change, and hard work. We still face a patient perception barrier. In some cases, patients report disliking the feel or texture of the gown and some patients stated that it felt "cheap" or too "plastic-y". It should be noted that most patient complaints were voiced before the forced air was attached to the gown.

This study is limited by the data collection size of seventy-six and the inability to gauge how well the staff utilized the Bair System. It reflects that stable temperatures may contribute to lowering SSI. Several different factors contribute to SSI, and we cannot determine if the decrease in the unit SSI rates is directly correlated with the stabilization of perioperative temperatures.

Conclusion

Year to date following implementation, Randallia has lowered the reportable infection rate compared to before the implementation of the Bair System. Thereby improving our outcomes and perception in the community. The unit had higher intraoperative temperatures with less variance throughout all phases of care. The staff has an increased perception of patient warmth and noticed less postoperative shivering and unit linen costs were significantly reduced. We successfully overcame most barriers during the initial implementation and now successfully utilize the Bair System as effectively and efficiently as possible.

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