Determining the Prevalence of Hypothermia and Risk Factors in the Albany Medical Center Pediatric Trauma Population

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PURPOSE

The purpose of this study is to determine the prevalence and risk factors of pediatric hypothermia in the trauma population at Albany Medical Center. Results from this study will be used to evaluate to effectiveness of hypothermia prevention and adherence to heat loss prevention protocols

BACKGROUND

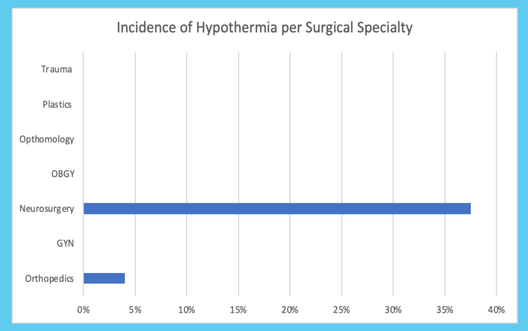
- Pediatric population is vulnerable to perioperative hypothermia (Body temperature below 36.0 degrees Celsius)
- The most significant drop in temperature occurs between entrance into the OR and first incision.
- Hypothermia increases the risk of
  - *Infection*
  - *Longer hospital stays*
  - *Increased medical cost*
  - *Poor wound healing*
  - *Coagulopathies*
- Heat loss prevention protocols may lower these risks
- Heat Loss Prevention Protocols include:
  - *Temperature handoff report*
  - *Warming during transport*
  - *Pre-warming*
  - *Active intraoperative warming*
  - *Heat loss prevention methods*
- Heat Loss Prevention Protocols are often underutilized due to
  - Provider education
  - Limited access to supplies
  - Time constraints

METHODS

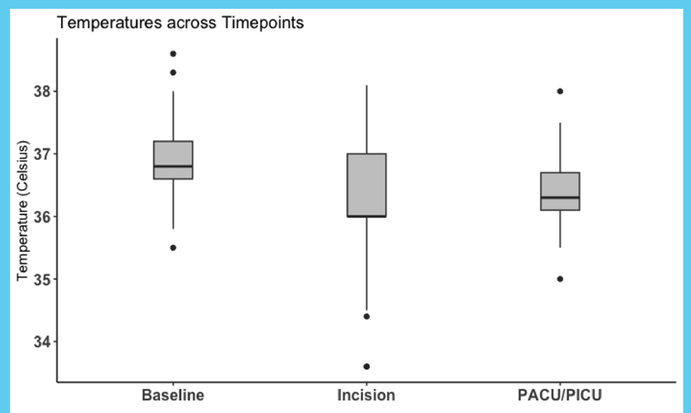
- Retrospective Chart review collection
- Pediatric trauma patients classified as level one or two under 15 years of age.
- The following key metrics were obtained:
  - Age
  - Length of Stay
  - Duration of stay in the emergency department before surgery
  - Temperature readings
    - Arrival to ED
    - Pre-operative temperature
    - Temperature at incision
    - Temperature at the end of the case
    - Temperature in PACU
  - Warming Interventions
  - Surgical specialty
  - Surgical procedure
  - Total Surgical Time
  - Pre-pediatric hypothermia protocol or not
  - Injury Severity Score (ISS)
  - Fluid resuscitation
  - Pre-hospital fluids
  - Transfusion status

RESULTS

- The average age of the pediatric patient was 8 years old
- Average surgical time was 395.4 minutes
- Average temperatures upon arrival, incision, and PACU were normothermic
- Warming methods were used in 88.97% of the cases
- Bair Hugger was the most used warming method
- There is a significant drop in temperature between the baseline temperature recorded and the temperature upon arrival to PACU=Mean temperature 36.82(*P* value < 0.001)
- The overall percentage of hypothermia was 4.5% for this study.
  - Orthopedics had a rate of 4%
  - Neurosurgery had a 37.5% incidence



		N
		154
Length of Stay	Mean (SD)	18.64 (54.87)
	Median (IQR)	4.0 (2.0, 20.75)
Age	Mean (SD)	8.105 (3.707)
	Median (IQR)	7.0 (5.0, 11.0)
Total Surgical Time	Mean (SD)	395.4 (278.7)
	Median (IQR)	318.5 (178.0, 567.8)
Temperature upon Arrival	Mean (SD)	36.86 (0.4818)
	Median (IQR)	36.8 (36.6, 37.2)
Temperature at Incision	Mean (SD)	36.22 (0.7663)
	Median (IQR)	36.0 (36.0, 37.0)
Temperature at PACU/PICU	Mean (SD)	36.82 (5.134)
	Median (IQR)	36.3 (36.1, 36.7)
Warming Method Used	Yes	121 (88.97%)
	No	15 (11.03%)
Warming Method Area	Full body	3 (2.586%)
	Lower body	35 (30.17%)
	Under body + Lower body	1 (0.862%)
	Under body	35 (30.17%)
	Upper body	40 (34.48%)
	Upper body + Under body	2 (1.724%)
Warming Method Used	Bair Hugger	75 (96.15%)
	Room Temp set at 73°F	1 (1.282%)
	Warming Blanket	2 (2.564%)



Type of Warming Device		Bair Hugger	Room set at 73°F	Warming Blanket	P-Value
		75	1	2	
Temperature Upon Arrival (Baseline)	Mean (SD)	36.81 (0.5288)	37.6 (NA)	36.55 (0.2121)	0.2036
	Median (IQR)	36.8 (36.5, 37.1)	37.6 (37.6, 37.6)	36.55 (36.47, 36.62)	
Incision Temperature	Mean (SD)	36.1 (0.8502)	36.0 (NA)	36.5 (0.7071)	0.7176
	Median (IQR)	36.0 (35.9, 36.52)	36.0 (36.0, 36.0)	36.5 (36.25, 36.75)	
PACU/PICU Temperature	Mean (SD)	36.39 (0.4402)	35.5 (NA)	35.85 (0.07071)	**0.02497**
	Median (IQR)	36.3 (36.1, 36.7)	35.5 (35.5, 35.5)	35.85 (35.82, 35.88)	

DISCUSSION

- Traditionally, the biggest drop in temperature occurs during incision. This was not the case in our study. Our study showed that the biggest drop in temperature occurred during arrival to PACU.
- Temperature handoff is the most important tool to use in recognizing and preventing hypothermic events

Limitations:
- Missing data such as recorded temperatures at first incision, use of warming methods
- Specialties were not factored in for which subgroup had the biggest temperature drop
- Paper charting→Epic charting
  - Not all of the flowsheets were uploaded, making data inconclusive

FUTURE STUDIES

- Intervention and Prevention Strategies for Pediatric Hypothermia
- Temperature monitoring and Management Protocol
- Longitudinal Studies to assess long-term complications of pediatric hypothermia post-trauma surgery
- Evaluating accuracy and feasibility of different temperature monitoring methods in the pediatric population
- Study the role of pre-hospital interventions to reduce the risk of pediatric hypothermia (EMS using warming methods, warmed IV fluids), etc.
- Intraoperative warming measurements/protocol being followed to prevent the drop in temperature from OR→PACU

REFERENCE

THEORY

Donabedian Healthcare Quality Model

Structure

The pediatric hypothermia prevention protocol from the moment of ED arrival through intraoperative and postoperative care.

Process

Implementation of warming measures, including blanket coverage, temperature regulation, and monitoring

Outcome

Reduction in hypothermia and related risks, such as shorter hospital stays and fewer complications