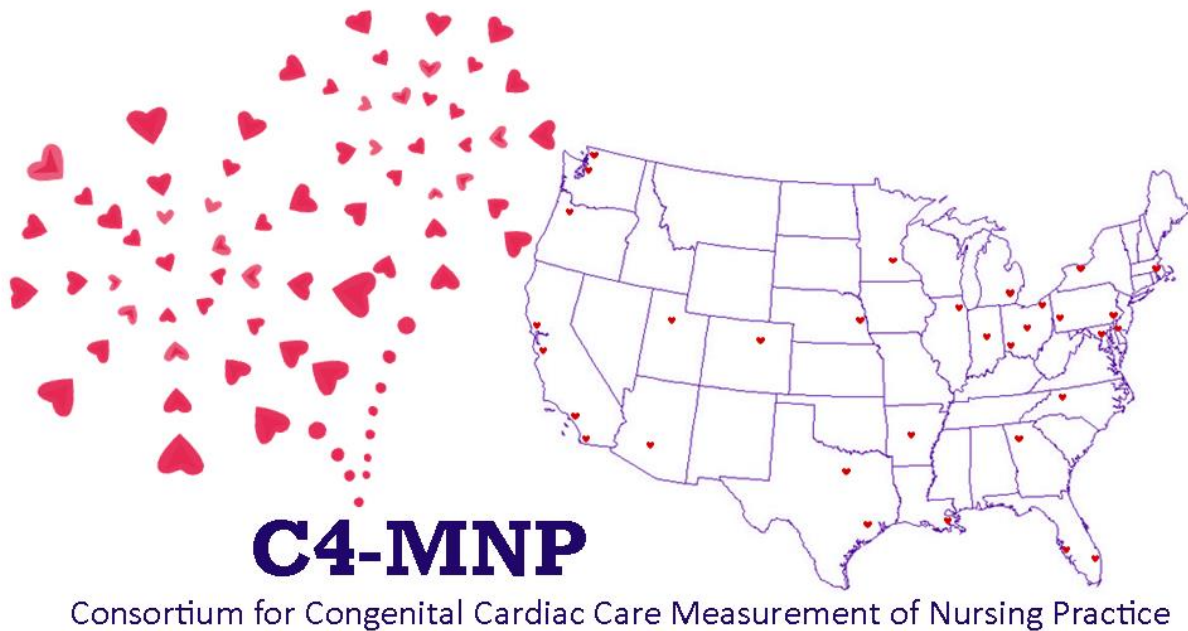


Consortium for Congenital Cardiac Care – Measurement of Nursing Practice

State of Nursing Practice Assessment Aggregate Result Report:

Targeted Temperature Management

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Executive Summary

Survey Overview

Temperature manipulation management is utilized with increasing frequency in pediatric cardiac surgery patients. In an effort to define the current state of this practice, an electronic survey was developed and sent to 41 intensive care units in free-standing children's hospitals in the US with 21 responses, resulting in a 51% response rate.

Key Findings

All responding nurses (100%) reported their institutions use temperature manipulation to achieve a patient temperature below normothermia in the post-operative period. Respondents overwhelmingly agreed that the degree of measurement of temperature was Celsius, the interval for temperature monitoring during patient cooling was continuous or every hour, and for use of temperature manipulation below normothermia for arrhythmia management. However, variation exists in several important areas:

- 76% of institutions indicated there was a policy at their institution regarding care and monitoring of a patient receiving targeted temperature management.
 - 95% of sites have patient orders for cooling
 - 85% of sites have patient orders that specify cooling temperatures
 - 47% of sites have patient orders for re-warming after active cooling
- 71% of institutions utilize a cooling blanket for patient cooling
 - 14% of sites utilize some other type of cooling device
 - 10% of sites bathe patient in cool water/apply ice to patient
 - 5% of sites decrease the environmental temperature
- 81% of institutions monitor rectal temperatures in the patient being actively cooled
 - 76% of sites utilize bladder temperatures
 - 52% of sites utilize esophageal temperatures
 - 10% of sites utilize other (temporal, tympanic, axillary, oral)
- Besides temperature management for arrhythmia management
 - 33% of sites use temperature management to improve cardiac output
 - 24% of sites use temperature management to decrease metabolic needs
 - 19% of sites use temperature management for seizure prevention
- 81% of institutions do not have a specific temperature at which a patient is re-warmed
- 67% of institutions do not have a policy for duration of patient cooling
 - 19% of sites have a policy for number of hours of patient cooling
 - 14% of sites have a policy for number of days of patient cooling
- 90% of institutions indicated that patients being actively cooled receive sedation
 - 62% of patients being actively cooled receive neuromuscular blockade

Conclusion

These findings support the need for further research on the use of temperature manipulation in the pediatric cardiac surgery patient and the development of guidelines to inform best practice and promote standardization of care. Survey results demonstrated a lack of agreement on type of patients for which this therapy would be beneficial, accurate sites for patient monitoring, effective methods for cooling, and use of adjunct medications.

Next Steps

The next steps based on this state of practice are to address the variation in practice regarding policies/guidelines, methods of cooling and rewarming, sites for monitoring, indications besides arrhythmia management, duration, and the use of sedation and neuromuscular blockade.

Demographics

1. What type of unit do you represent?

Respondents (N=21)	
Unit Type	Frequency (%)
PICU	3 (14.3%)
CICU	17 (81.0%)
Mixed acuity or acuity adaptable	1 (4.8%)
Step down/acute care	0 (0.0%)

2. What is your current job title?

Respondents (N=21)	
Job Title	Frequency (%)
Staff Nurse	8 (38.1%)
Nurse Educator	5 (23.8%)
Other	8 (38.1%)

Of the those responding 'Other', 8 provided other current job title:

Other Current Job Title
CNS
Quality Manager
Clinical Quality Leader
CNS
CNS fellow
Manager
Nurse practitioner
Clinical nurse specialist

3. Please identify overall years of nursing experience.

Respondents (N=21)	
Years of Experience	Frequency (%)
< 1 Year	0 (0.0%)
1-4 Years	2 (9.5%)
5-9 Years	5 (23.8%)
10-14 Years	6 (28.6%)
> 15 Years	8 (38.1%)

4. Identify all types of cardiac patients that your unit cares for:

Respondents (N=21)	
Type of patient	Frequency (%)
Heart transplant	18 (85.7%)
Single ventricle physiology	21 (100.0%)
ASD/VSD	21 (100.0%)
TOF	21 (100.0%)
TGA	20 (95.2%)
CAVC	20 (95.2%)
Biventricular repair	19 (90.5%)
VAD placement	18 (85.7%)
Other	2 (9.5%)

If other type of cardiac patient, please describe.

Type
ECMO
ECMO support

Temperature Monitoring

5. What is the degree of measurement in which you monitor temperature?

Respondents (N=21)	
Measurement	Frequency (%)
Celsius	21 (100.0%)
Fahrenheit	0 (0.0)

6. Does a policy exist at your facility regarding the care and monitoring of a patient receiving targeted temperature management?

Respondents (N=21)	
Response	Frequency (%)
Yes	16 (76.2%)
No	5 (23.8%)

7. At any point during post-operative care is a patient temperature manipulated so that it is below normothermia?

Respondents (N=21)	
Response	Frequency (%)
Yes	21 (100.0%)
No	0 (0.0%)

8. What are the indications for a patient's temperature to be manipulated so it is below normothermia?

Respondents (N=21)	
Indications	Frequency (%)
Arrhythmia management	21 (100.0%)
Heart rate control to decrease metabolic needs	5 (23.8%)
Heart rate control to improve cardiac output	7 (33.3%)
Seizure prevention	4 (19.0%)
Cardiac arrest	16 (76.2%)
Other	0 (0.0%)

9. In which post-operative patient is temperature manipulation routine?

Respondents (N=21)	
Type of patient	Frequency (%)
Heart transplant	2 (9.5%)
ASD	0 (0.0%)
VSD	5 (23.8%)
TOF	9 (42.9%)
TGA	4 (19.0%)
CAVC	3 (14.3%)
Norwood	5 (23.8%)
Glenn	2 (9.5%)
Fontan	1 (4.8%)
Biventricular repair	3 (14.3%)
VAD placement	1 (4.8%)
Other	8 (38.1%)

If other post-operative temperature manipulation routine, please describe:

Type
Any cardiac surgery that had a prolonged bipap time
Normothermia routine
Patient dependent, not repair
It isn't routine in any post-operative patient, it occurs when a patient has arrhythmias
Patient specific/dependent indication
None routine unless complication occurs
None routinely
None unless indicated to prevent arrhythmia

10. How do you monitor temperature in a patient that is **not** actively being cooled?

Respondents (N=21)	
Monitoring	Frequency (%)
Bladder	15 (71.4%)
Esophageal	3 (14.3%)
Oral	8 (38.1%)
Rectal	17 (81.0%)
Temporal	4 (19.0%)
Tympanic	1 (4.8%)

Axillary	13 (61.9%)
Other	2 (9.5%)

11. How do you monitor temperature in heart transplant patient that is **not** actively being cooled?

Respondents (N=21)	
Monitoring	Frequency (%)
Bladder	14 (66.7%)
Esophageal	3 (14.3%)
Oral	6 (28.6%)
Rectal	7 (33.3%)
Temporal	4 (19.0%)
Tympanic	2 (9.5%)
Axillary	12 (57.1%)
Other	2 (9.5%)

If other monitoring of patient temperature, please describe:

Monitoring
Neonatal radiant warmer skin probe over abdomen
bladder
axillary
Selected axillary not other

12. How often do you monitor patient temperature in the patient that is **not** actively being cooled?

Respondents (N=21)	
Frequency	Frequency (%)
Continuous	4 (19.0%)
Q1 hour	3 (14.3%)
Q2 hours	2 (9.5%)
Q4 hours	6 (28.6%)
Q8 hours	0 (0.0%)
Other	6 (28.6%)

If other monitoring of patient temperature, please describe:

Monitoring
Minimum q4, continuous in some pts

Immediately post-operative continuous temp monitoring is performed (typically as long as the temperature sensing foley is in place) then transition from continuous to q4h if normothermic
Q4hr unless the temp is out of range, then Q1-2hrs depending on the amount of degrees out of range
Anywhere from continuous to Q4
Dependent on post-op course, acuity, etc. Standard is q4hr
Temperature is monitored based on MD order, any post-op patient will have continuous temp monitoring for at least the first 12 hours via foley temp probe, once foley removed either rectal temp probe is placed if continued monitoring is necessary or axillary temps are completed as ordered

13. How do you monitor patient temperature in the patient that is being actively cooled?

Respondents (N=21)	
Monitoring	Frequency (%)
Bladder	16 (76.2%)
Esophageal	11 (52.4%)
Oral	0 (0.0%)
Rectal	17 (81.0%)
Temporal	0 (0.0%)
Tympanic	0 (0.0%)
Axillary	0 (0.0%)
Other	2 (9.5%)

14. How do you monitor temperature in a heart transplant patient that is not being actively cooled?

Respondents (N=21)	
Monitoring	Frequency (%)
Bladder	12 (60.0%)
Esophageal	9 (45.0%)
Oral	1 (5.0%)
Rectal	9 (45.0%)
Temporal	1 (5.0%)
Tympanic	0 (0.0%)
Axillary	2 (10.0%)
Other	4 (20.0%)

15. How often do you monitor temperature in a patient that is being actively cooled?

Respondents (N=21)	
Frequency	Frequency (%)
Continuous	20 (95.2%)
Q1 hour	1 (4.8%)
Q2 hours	0 (0.0%)
Q4 hours	0 (0.0%)
Q8 hours	0 (0.0%)
Other	0 (0.0%)

If 'other', please specify:

Frequency
Temperature is monitored based on MD order, any post-op patient will have continuous temp monitoring for at least the first 12 hours via foley temp probe, once foley removed either rectal temp probe is placed if continued monitoring is necessary or axillary temps are completed as ordered.
Dependent on post-op course, acuity, etc. Standard is q4hr
Anywhere from continuous to Q4
Q4hr unless the temp is out of range, then Q1-2hrs depending on the amount of degrees out of range
immediately post-operative continuous temp monitoring is performed (typically as long as the temperature sensing foley is in place) then transition from continuous to q4h if normothermic
minimum q4, continuous in some pts

16. How often is there a situation when you use more than one site for temperature monitoring?

Respondents (N=21)	
Frequency	Frequency (%)
Never	11 (52.4%)
Always	3 (14.3%)
Only when the patient is being actively cooled	6 (28.6%)

Only when the patient is being actively warmed	1 (4.8%)
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17. Please list the primary site used for temperature monitoring:

Site
axillary if infant, otherwise oral
Rectal probe
esophageal
Rectal
Axillary
Rectal, bladder
axillary
rectal
For continuous, bladder, tympanic for intermittent
esophageal
Core temp (bladder/esophageal/rectal)
Rectal
esophageal
Bladder
for continuous monitoring bladder, for intermittent monitoring axillary is the most common
rectal or bladder
bladder
axillary
axillary
bladder
Rectal (esophageal is being cooled)

18. Please list the secondary site used for temperature monitoring:

Site
Bladder postop while Foley in place
bladder
rectal
axillary
rectal
axillary
n/a

bladder
esophageal
rectal
Toe temp
axillary
rectal
toes
For continuous, rectal; for intermittent, rectal or oral depending on age
esophageal
rectal
esophageal
rectal
skin
bladder

Initiation of re-warming or cooling

19. If continuous temperature monitoring is being used, is it discontinued at a specific/routine time postoperatively?

Respondents (N=21)	
Response	Frequency (%)
Yes	5 (23.8%)
No	16 (76.2%)

If continuous temperature monitoring is used and routinely discontinued, at what time is this done?

Time
After 24 hours
After 24 hours
After 72 hours
After 48 hours
After 72 hours

20. Do you perform interval temperature measurements once you are no longer using continuous temperature monitoring?

Respondents (N=21)	
Response	Frequency (%)
Yes	21 100.0%)
No	0 (0.0%)

21. What is the timing of your interval temperature measurements once you are no longer using continuous temperature monitoring?

Respondents (N=21)	
Frequency	Frequency (%)
Q1 hour	5 (23.8%)
Q2 hours	6 (28.6%)
Q4 hours	10 (47.6%)
Q8 hours	0 (0.0%)

22. What are the criteria to start patient cooling?

Respondents (N=21)	
Frequency	Frequency (%)
Elevated heart rate	3 (14.3%)
Arrhythmia	17 (81.0%)
Normal temperature (37 C)	0 (0.0%)
Above normal temperature	1 (4.8%)
Fever (> 38.5 C)	15 (71.4%)

23. Do you have patient orders for cooling?

Respondents (N=21)	
Response	Frequency (%)
Yes	20 (95.2%)
No	1 (4.8%)

24. Do you have patients orders that specify specific cooling temperatures?

Respondents (N=20)	
Response	Frequency (%)
Yes	17 (85.0%)
No	3 (15.0%)

25. Do you have patient orders for re-warming after active cooling?

Respondents (N=21)	
Response	Frequency (%)
Yes	10 (47.6%)
No	11 (52.4%)

26. Do you have patient orders that specify specific warming temperatures?

Respondents (N=10)	
Response	Frequency (%)
Yes	10 (100.0%)
No	0 (0.0%)

27. Do you have a specified temperature at which you begin to cool a patient in the setting of a fever?

Respondents (N=21)	
Response	Frequency (%)
Yes	3 (14.3%)
No	18 (85.7%)

If yes, what is the temperature at which you begin to cool a patient in the setting of a fever?

Temperature
39 centigrade
38.5
40.5

If yes, what method do you use to begin to cool a patient in the setting of a fever?

Method
Cooling blanket
blanketrol cooling/warming blanket. (38.5-40.5 will attempt environmental modifications and antipyretics, if fever persists .4hours cooling with blanketrol is indicated
Cooling (water) blanket

28. Do you have a specified temperature at which you begin to warm a patient?

Respondents (N=21)	
Response	Frequency (%)
Yes	4 (19.0%)
No	17 (81.0%)

If yes, what is the temperature at which you begin to warm a patient?

Temperature
35
36.5
34.9
<35.5 centigrade

If yes, what method do you use to begin to warm a patient?

Method
Warming blanket
Warm blankets
active rewarming with blanketrol or bair hugger, will consider passive rewarming if >35degrees
Bair hugger

Methods for cooling and re-warming

29. What is your primary process for patient cooling?

Respondents (N=21)	
Primary Process	Frequency (%)
Decrease environmental temperature	1 (4.8%)
Bathe patient in cool water	2 (9.5%)
Apply ice to patient	0 (0.0%)
Utilize cooling blanket	15 (71.4%)
Utilize cooling device	3 (14.3%)
Cool fluid bolus	0 (0.0%)
Other	0 (0.0%)

30. What other processes are used for patient cooling?

Respondents (N=21)	
Primary Process	Frequency (%)
Decrease environmental temperature	16 (76.2%)
Bathe patient in cool water	4 (19.0%)
Apply ice to patient	10 (47.6%)
Utilize cooling blanket	8 (38.1%)
Utilize cooling device	5 (23.8%)
Cool fluid bolus	0 (0.0%)
Other	3 (14.3%)

Of other processes are used for patient cooling, please describe:

Method
antipyretic
Decrease temp on ECMO circuit
fans

31. What is your primary process for patient re-warming?

Respondents (N=21)	
Primary Process	Frequency (%)
Allow patient to warm on own	9 (42.9%)
Increase environmental temperature	1 (4.8%)

Utilize warmed blanks	2 (9.5%)
Utilize warming lights	1 (4.8%)
Utilize warming blanket (electric)	3 (14.3%)
Utilize warming device	4 (19.0%)
Other	1 (4.8%)

Of other primary processes are used for patient re-warming, please describe:

Method
really depends on reason for cooling and age of patient. Environment vs. Stryker device
Bear hugger
Bear hugger
Bair hugger
Bair hugger, h2o warming blanket (similar to cooling blanket)
none

32. What are other processes for patient re-warming?

Respondents (N=21)	
Process	Frequency (%)
Allow patient to warm on own	6 (28.6%)
Increase environmental temperature	11 (52.4%)
Utilize warmed blanks	13 (61.9%)
Utilize warming lights	4 (19.0%)
Utilize warming blanket (electric)	7 (33.3%)
Utilize warming device	9 (42.9%)
Other	2 (9.5%)

Of other processes are used for patient re-warming, please describe:

Method
really depends on reason for cooling and age of patient. Environment vs. Stryker device
bear hugger
Bear Hugger
bair hugger
Bair hugger, h2o warming blanket (similar to cooling blanket)

33. As per unit/institution policy, please select if patient cooling occurs over a maximum of hours, days, or if there is no policy

Respondents (N=21)	
Policy	Frequency (%)
Hours	4 (19.0%)
Days	3 (14.3%)
No Policy	14 (66.7%)

If hours were selected, please describe the maximum number of hours a patient is cooled for:

Method
if cooling to 33degrees, 48. not specified in the policy for controlled normothermia
24-48

If days was selected, please describe the maximum number of days a patient is cooled for:

Method
2
no limit if JET tx
3?

Accompanying Procedures

34. Do patients that are actively cooled receive sedation?

Respondents (N=21)	
Response	Frequency (%)
Yes	19 (90.5%)
No	2 (9.5%)

35. If a patient is receiving sedation during cooling, is it intermittent sedation, continuous sedation, or both?

Respondents (N=21)	
	Frequency (%)
Intermittent	0 (0.0%)
Continuous	5 (26.3%)
Both	14 (73.7%)

36. Do patients that are actively cooled receive neuromuscular blockade?

Respondents (N=21)	
Response	Frequency (%)
Yes	13 (61.9%)
No	8 (38.1%)

37. If a patient is being actively cooled is receiving NMB (neuromuscular blockade), is it intermittent, continuous, or both?

Respondents (N=13)	
	Frequency (%)
Intermittent	2 (15.4%)
Continuous	6 (46.2%)
Both	5 (38.5%)

38. In your experience, has a patient that was being actively cooled experienced shivering?

Respondents (N=21)	
Response	Frequency (%)
Yes	15 (71.4%)
No	6 (28.6%)

39. If yes, was any medication administered to treat the shivering?

Respondents (N=15)	
Response	Frequency (%)
Yes	12 (80.0%)
No	3 (20.0%)

Additional Comments

Additional Survey Comments
The survey does not allow for N/A answer for heart transplant patients, our center does not care for transplant so all questions were answered other, In addition, the question for more than one temp monitoring site should provide an option for sometimes, this is done occasionally.
CV patients cooled much less often than our status epilepticus or trauma patients. We have cooled post VF/VT teens with good results but that was before the conclusion of the Tropijian et. al. study.
My organization has a thermoregulation pathway targeting neurologic injury--a pathway does not exist for cardiac indications (outside of cardiac arrest included in the previously mentioned pathway). Two site temperature monitoring required if cooling to 33degrees, not controlled normothermia (36degrees (cardiac arrest), 36.8 (no arrest)). Only have re-warming orders when rewarming after cooling to 33degrees. sedation/paralysis only utilized if patient requires it. cooling to 33degrees is not utilized routinely but remains in the pathway/ when done in the past this is the population where sedation/paralytic was needed for shivering.