Role of data in improving outcomes in the neonatal surgical population

18th Hot Topics
February 2024

Kyong-Soon Lee

SickKids

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Objectives

01
Become familiar with projects to improve care in the neonatal surgical population

02
Share how data are utilized to drive quality improvement work

03
Stimulate ideas on how to best do data collection and reporting for your center

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SickKids Profile

- Quaternary NICU in Toronto, Canada
- Catchment area ~75,000 births/year
- No deliveries on site (100% outborn)
- 49 bed capacity, staffing for average census of 37 patients
- 800 NICU admissions/year
  - 30% surgical
  - 25% neurologic
- Hospital-based transport team conducts 2000 transports/year (1200 neonatal and 800 pediatric)

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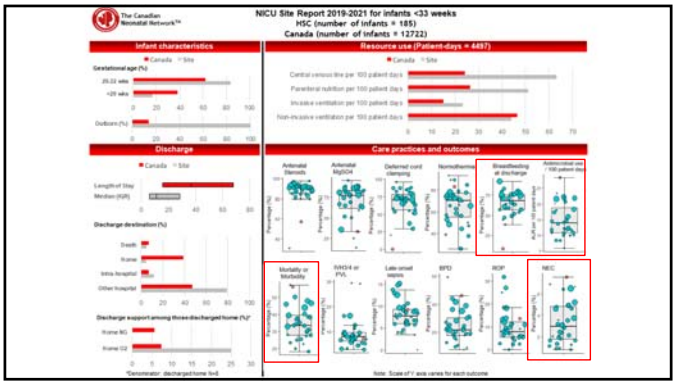

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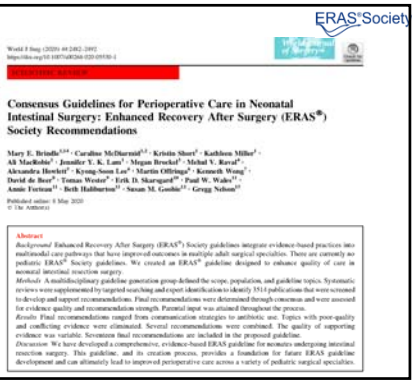
Enhancing Recovery after Surgery (ERAS) in Neonates

- Collaboration of Alberta Children's Hospital, Calgary, Canada
- Great Ormond Street London, UK
- SickKids, Toronto, Canada

- Bundle of interventions in surgical patients
- Intestinal surgery
- 17 recommendations



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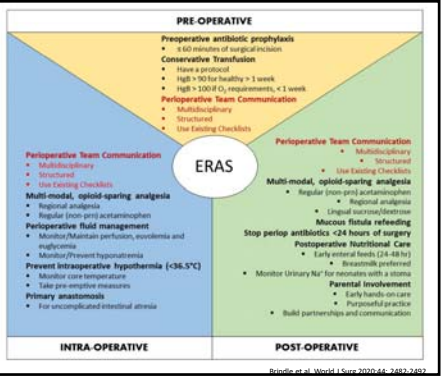
Elements of ERAS approach for neonatal intestinal surgery

Focus on
-Improving team dynamics

-Reducing perioperative physiologic stress and complications



Brindle et al. World J Surg 2020;44:2482-2492

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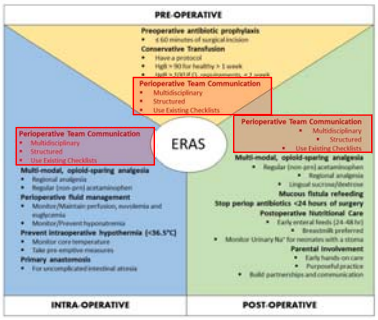
ERAS for neonatal intestinal surgery

1. Pre- and post-operative huddle



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Collaborative Quality Improvement Project

STEPP IN next STEPPs

Safe Transitions and Euthermia in the Peri-operative Period in Infants & Neonates

CHNC Children's Hospitals Neonatal Consortium

SickKids

Piazza AJ et al. Pediatrics 2021

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Children's Hospitals Neonatal Consortium (CHNC) Member Hospitals

Draws from NICUs providing highest level of care at Children's Hospitals throughout US and Canada

CHNC

Include hospitals with >50% outborn
>25 NICU beds, >400 admissions per year

1. Advent Health for Children
2. American Family Children's Hospital
3. Ann & Robert H. Lurie Children's Hospital of Chicago
4. Arkansas Children's
5. Atrium Health Levine Children's Hospital
6. Boston Children's Hospital
7. Brenner Children's Hospital
8. Children's Hospital Colorado
9. Children's Healthcare of Atlanta, Egleston
10. Children's Healthcare of Atlanta, Scottish Rite
11. Children's Hospital Los Angeles
12. Children's Hospital of Michigan
13. Children's Hospital of Orange County
14. Children's Medical Center Dallas
15. Children's National Hospital
16. Children of Alabama
17. Children's Wisconsin
18. Cincinnati Children's Hospital Medical Center
19. Cleveland Clinic Children's Hospital
20. Connecticut Children's
21. Cook Children's Healthcare System
22. CS Mott Children's, Ann Arbor, MI
23. Dell Children's Medical Center
24. Intermountain Healthcare Primary Children's Hospital
25. Johns Hopkins All Children's Hospital
26. Le Bonheur Children's Hospital
27. Mayo Eugenio Litta Children's
28. Minneapolis, Minnesota Children's
29. Nationwide Children's Hospital
30. Nemours Children's Hospital, Orlando
31. Nemours Children's Hospital, Delaware
32. Oklahoma Children's Hospital OU Health
33. Phoenix Children's Hospital
34. Rady Children's Hospital–San Diego
35. Riley Children's Health
36. Seattle Children's Hospital
37. St. Christopher's Hospital for Children
38. St. Louis Children's Hospital
39. St. Paul, Minnesota Children's
40. Texas Children's Hospital
41. The Children's Hospital of Philadelphia
42. The Children's Mercy Hospital
43. **The Hospital for Sick Children (SickKids)**
44. UCSF Benioff Children's Hospital Oakland
45. UNC Childrens Hospital
46. University of Iowa Stead Family Children's Hospital
47. UPMC Children's Hospital of Pittsburgh

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STEPPIN next STEPPs

Safe Transitions and Euthermia in the Peri-operative Period in Infants & Neonates

CHNC

Project Purpose for CHNC network

For all NICU patients undergoing transfer of care for surgery, optimize:

- Peri-operative teamwork
- Communication processes
- Patient management

SMART Aim for SickKids

- Decrease percentage of NICU surgical cases with post-operative hypothermia by half from 10% to 5% over 6 months and sustain for 12 months

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STEPPIN SickKids Team

General Surgery	Anesthesia	Neonatology
Annie Fecteau, MD	Conor McDonnell, MD	Kyong-Soon Lee, MD QI
Hazel Pleasants-Terashita, NP	Theresa Skelton, MD	Judy Hawes, NP NICU Quality Lead
Nicole deSilva, NP	Andrea Sepa, RN OR Senior Clinical Manager	Chris Elliott, RN NICU Quality Leader
	Judith Fanaken, RN OR Quality Leader	Michael Finelli, RRT NICU Educator
	Linda Nguyen, RN OR Educator	Lisa Fowler, RN NICU Educator
		Michelle Bertoni, RN NICU Educator
		Rita Visconti Parent Liaison
		Robin Knighton, RN Data Abstractor
		Loreto Lecce, NICU Systems Manager
		Christopher Tomlinson, MD Surgical Liaison & Andrew James, MD
		Enza Andreacchi, Admin Support

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Interventions implemented at SickKids

Intervention	When Implemented
1. Standardized pre- and post-op handoff process 2. Use of handoff tool	**Soft launch** Oct 10, 2017 M-F 8 am to 5 pm **Full launch** Nov 13, 2017 All cases 24/7

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Our First STEPPIN Pre-op Huddle
Oct 10, 2017

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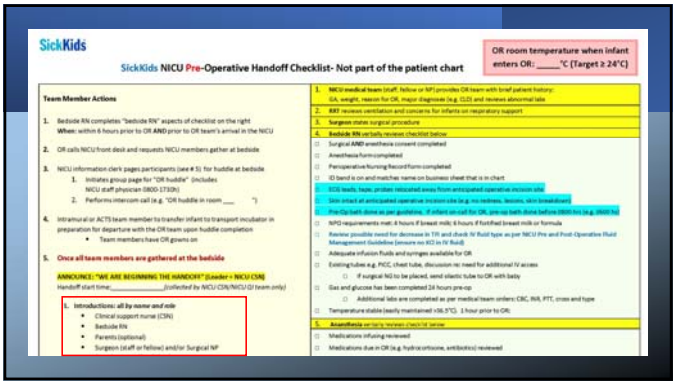

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Measures

Outcome Measure

1. Post-operative hypothermia (temp <36.0°C) within one hour of readmission to NICU

Process Measures

1. Wait time for handoff to start
2. Duration of handoff
3. Appropriate staff present at handoff
4. Handoff tool used
5. No interruptions during handoff
6. Staff satisfaction with handoff

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- Manual data collection by charge nurse who attends every pre- and post-op huddle
- Volume of surgical cases
  =10-30 per month
- Data collected in >90% surgical cases

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Process measures after implementation of project

	SickKids Oct 2017 - Sept 2018	CHNC Network July 2018 data
Waiting for huddle, in minutes: mean (max) range among months		
Pre-op	2-5 (5-25)	n/a
Post-op	1-3 (5-14)	n/a
Duration of handoff, in minutes: mean (max) range among months		
Pre-op	4-7 (7-20)	n/a
Post-op	3-5 (7-15)	n/a
Appropriate staff present		
Pre-op	91%	87%
Post-op	87%	84%
Handoff tool used		
Pre-op	99%	88%
Post-op	99%	82%
Interruptions during handoff		
Pre-op	6%	1%
Post-op	12%	2%

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Who attended the huddles? PRE-Op

	Oct	Nov	Dec	Oct to Dec
Surgical Staff	60%	100%	72%	76%
Surgical Fellow	100%	60%	67%	74%
Anesthesia Staff	90%	100%	89%	92%
Anesthesia Fellow/Res	90%	80%	67%	76%
NICU Staff Physician*	78%	38%	81%	70%
Team Fellow	40%	70%	67%	61%
Bedside RN	100%	100%	100%	100%
NICU CSN	100%	100%	100%	100%
Parent	70%	70%	61%	66%
OR nurse	100%	80%	78%	84%
NP/resident	90%	50%	39%	55%
NICU Surgical NP	50%	50%	17%	34%
NICU RRT	80%	100%	89%	89%
Intramural team	70%	70%	50%	61%
ACTS	80%	80%	44%	63%
Number of Huddles	**10**	**10**	**18**	**38**

*NICU staff MD present: M-F, 8 am-5:30 pm

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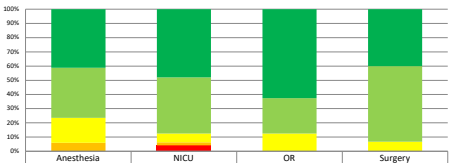
Satisfaction by Department



	Anesthesia	NICU	OR	Surgery
Very Satisfied	7	23	5	6
Satisfied	6	19	2	8
Neither satisfied or dissatisfied	3	3	1	1
Dissatisfied	1	1	0	0
Very dissatisfied	0	2	0	0
Number of respondents	17	48	8	15

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Comments from satisfaction survey

Very informative, effective communication. This makes operation safer.
Helpful for a clear summary before going to the OR. Good chance to ask questions.
It was well communicated beforehand the timing of the huddle and very helpful.
Great to formalise this, big positive improvement to previous.

- Increased exchange of information and cooperation
- OR huddles now a routine that anesthesia and surgery rely on for safer care

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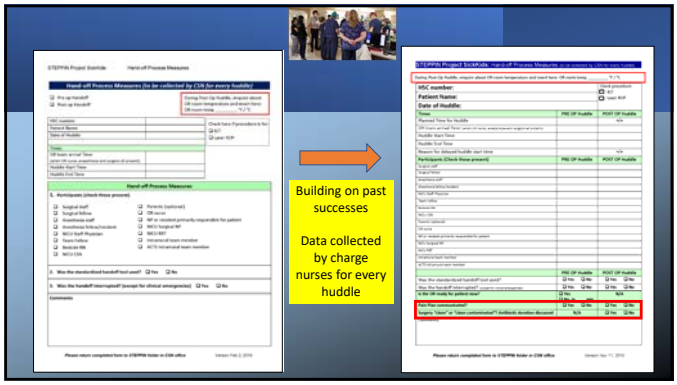

Building on past successes

Data collected by charge nurses for every huddle

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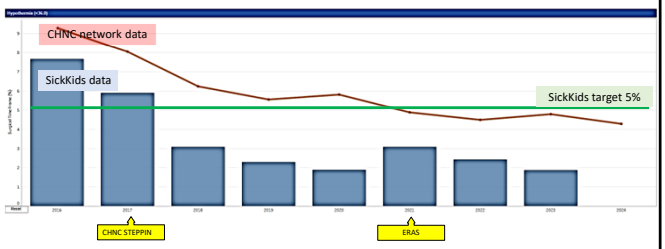
Postoperative hypothermia (temp <36.0°C) Within one hour of readmission to NICU



Post-op temperature data routinely collected and entered onto CHNC database
Available on webportal, almost real time

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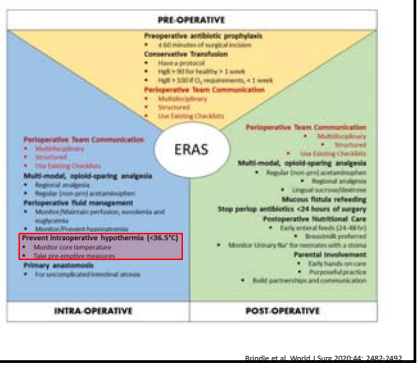
Elements of ERAS approach for neonatal intestinal surgery

Building on CHNC QI project using neonatal ERAS initiative

New interventions introduced Nov 2021



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Thermal Hats

Plastic inside barrier

Donned prior to transport

Induction warmer

Servo-control with skin probe

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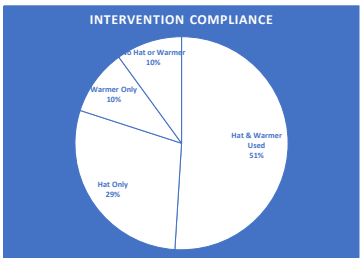
Intervention compliance and perioperative temperatures Nov 2021 to March 2023



Ramjist et al. J Pediatr Surg in press (May 2024 issue)

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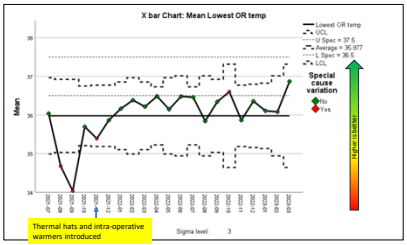
Intra-operative temperatures



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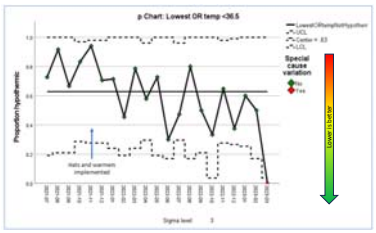
Proportion of intra-operative hypothermic events



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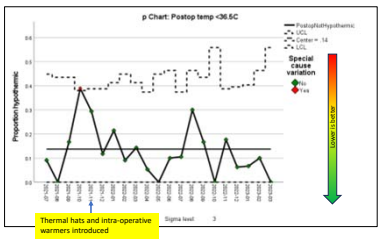
Post-operative temperature in the NICU (one hour post readmission)



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Data collection

EMR

Network databases

Electronic surveys, liberal use of QR codes

Paper forms

Reports

Excel

Power BI

Engaged and responsive IT support essential

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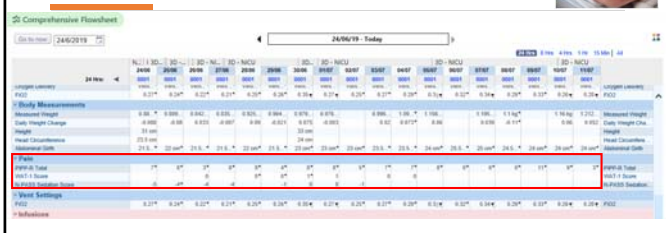
Pain score: data entered on electronic chart by bedside nurses



EMR data utilized for primary outcome of unrelieved pain
No manual data collection
Data exported to excel and interpreted by non-clinical personnel

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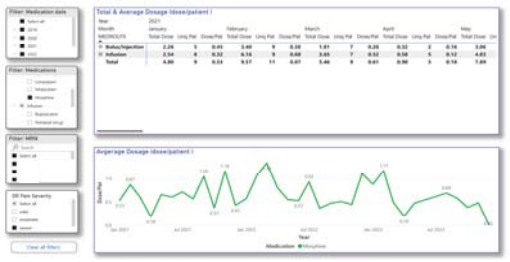
Total opioid dose data in mg/kg/patient
EMR medications exported to Power BI

Loreto Lecce
NICU IT Manager



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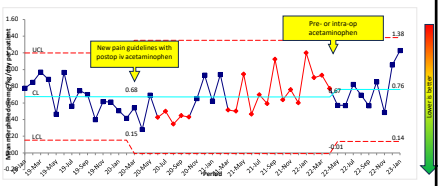
Secondary outcome
Mean morphine dose per kg/day per patient - x chart



Data from EMR and exported to Excel

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Machine learning for prediction of intra- and post-operative hypothermia

Machine Learning

- ML algorithms can identify patterns in data and make predictions or decisions without human intervention
- Can inform timely intervention and management strategies

Project in progress

- Utilizing EMR data, identify at time of pre-op huddle, patients at highest risk for intra- and post-operative hypothermia
- Once highest risk patients identified, promote clinical action to ensure optimization of interventions for thermoregulation

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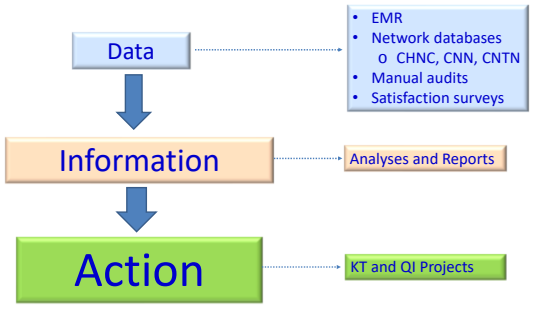

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Take Home Points

- Priority for QI projects should be determined by data on local population profile and performance
- Data entry mandated for network databases provide rich source of automated electronic data
  - -Try to ensure timely availability of data and reports
  - -Capitalize on available IT expertise to generate reports
- Automate data collection to minimize resources whenever possible
  - Find resources for manual data collection, especially when ramping up at start of project
  - Keep data collection simple, collect only what you need to show difference
- Network membership and collaboration essential
  - -Motivates change -Sharing of knowledge and resources -Benchmarking

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W. Edwards Deming

Nobody should try to use data unless he has collected data

I am forever learning and changing

Thank you for your attention!

Contact
Kyong-soon.lee@sickkids.ca

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