Neonatal transport metrics and quality improvement

18th Hot Topics February 2024

Kyong-Soon Lee

1

Objectives

01
Become familiar with quality metrics in neonatal transport

02
Obtain insight into projects conducted to improve performance

03
Appreciate the importance of data measurement and benchmarking

2

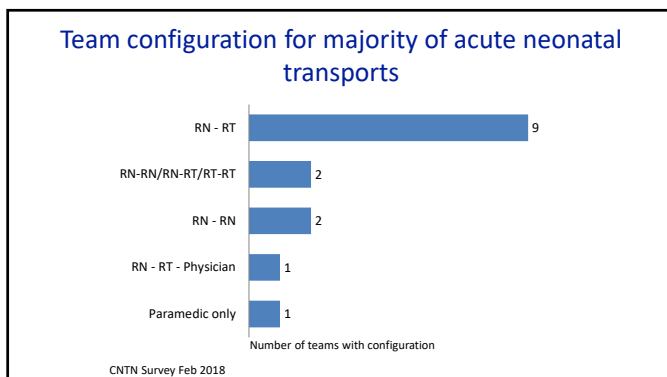---

Neonatal transport in Canada

3

Network created 2013, includes all 16 neonatal transport teams in Canada

National database captures majority of neonatal transports in Canada

National webportal to view trends and benchmark with other teams

4

Team configuration for majority of acute neonatal transports

Configuration	Number of teams
RN - RT	9
RN-RN/RN-RT/RT-RT	2
RN - RN	2
RN - RT - Physician	1
Paramedic only	1

Number of teams with configuration

CNTN Survey Feb 2018

5

Original Article

Evaluation of transport-related outcomes for neonatal transport teams with and without physicians

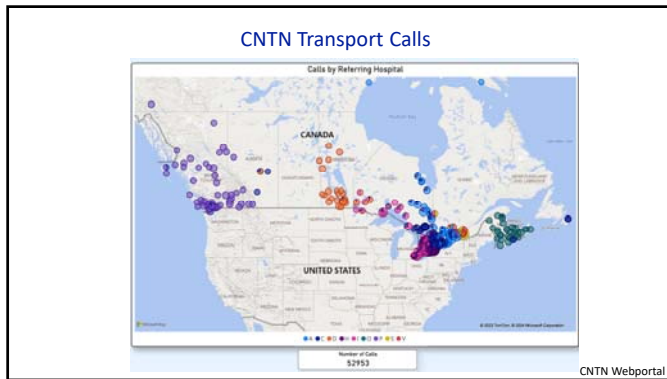Mohamed Abdelmawla MD¹, Gregory Hansen MD MSc MPH²,³, Michael Narvey MD¹,³, Hilary Whyte MD MSc⁴,⁶, Don Bodgean MSc⁵, Kyong-Soon Lee MD MSc⁴,⁶, On behalf of the Canadian Neonatal Transport Network

¹Division of Neonatology, Children's Hospital of Manitoba, Winnipeg, Manitoba, Canada; ²Division of Critical Care, Royal University Hospital, Saskatoon, Saskatchewan, Canada; ³Department of Pediatrics, University of Saskatchewan, Saskatoon, Saskatchewan, Canada; ⁴Department of Pediatrics, University of Manitoba, Winnipeg, Manitoba, Canada; ⁵Division of Neonatology, Hospital for Sick Children, Toronto, Ontario, Canada; ⁶Department of Pediatrics, University of Toronto, Toronto, Ontario, Canada
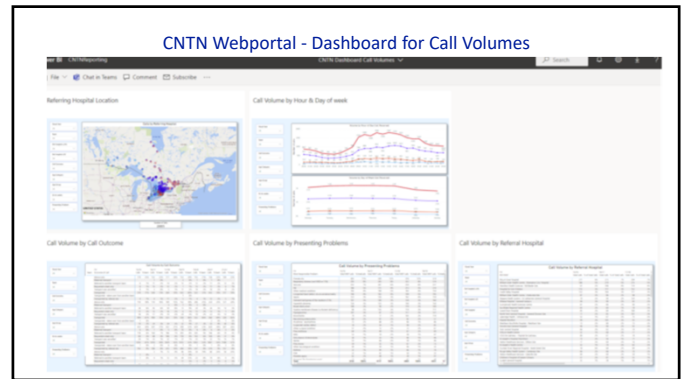
- Canadian national transport data
- Propensity-score matched analysis for more acute transport runs

- Runs with MDs vs noMDs have no difference in procedural success
- MD group had more clinical complications e.g. hypothermia
- Supports current Canadian model of noMD routinely on transport runs
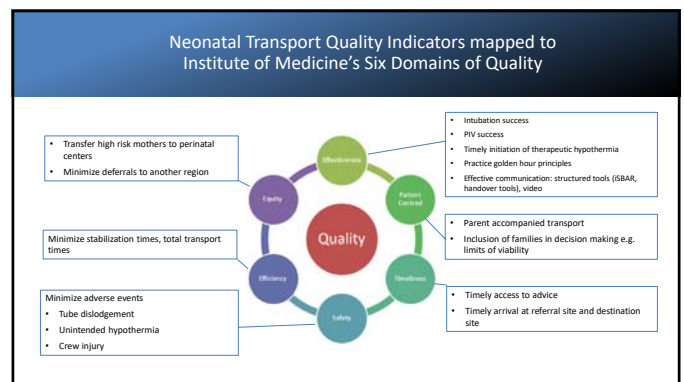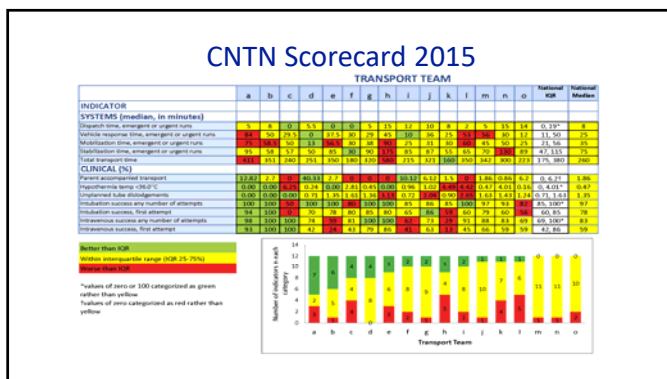
6

Slide 7

CNTN Transport Calls

Calls by Referring Hospital

CNTN Webportal

7

Slide 8

CNTN Webportal - Dashboard for Call Volumes

8

Slide 9

Quality Indicators

Systems	Clinical
Dispatch time • Time of referral call to team dispatch	**Parent accompanied transport**
Vehicle response time: home to referral	**Unintended hypothermia temperature <36.0°C**
Mobilization time • Time of dispatch to leave home base	**Dislodgment of therapeutic tubes**
Response time • Time of call to team arrival at bedside	**Patient or crew injury**
Stabilization time	**Intubation success first attempt**
Total transport time • Time team dispatched to return to home site	**PIV insertion success first attempt**
Number of deliveries GA <32 wk and age <3 days (measure of potentially preventable outborn deliveries)	**Age when therapeutic hypothermia initiated** **Age when target temperature of 34.0°C reached**

Lee KS. Translational Pediatr 2019;8(3):233-245

9

Slide 10

Neonatal Transport Quality Indicators mapped to Institute of Medicine's Six Domains of Quality
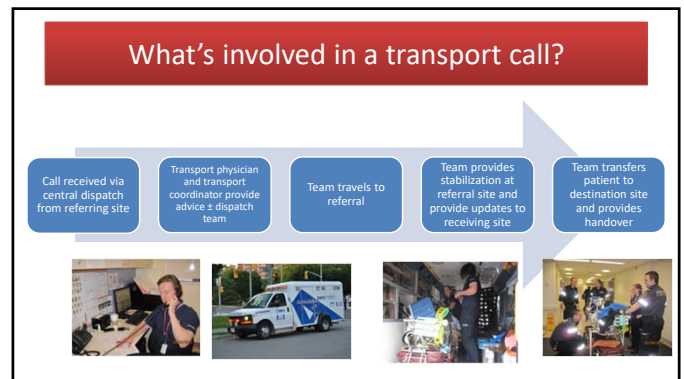

10

Slide 11

CNTN Scorecard 2015

11

Slide 12

12

Slide 13

CNTN Webconference

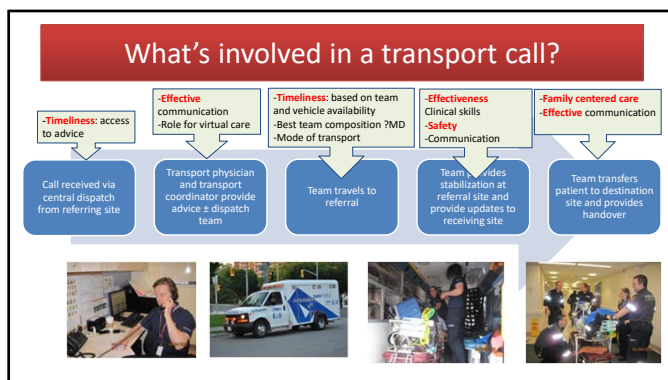**Wednesday November 28, 2018 12:00-13:30 EST**

Therapeutic hypothermia in transport:
Review of our network data and sharing our practices including Tecotherm

Presenters:
Sumesh Thomas/Renee Paul, Calgary
Stephanie Redpath, Ottawa
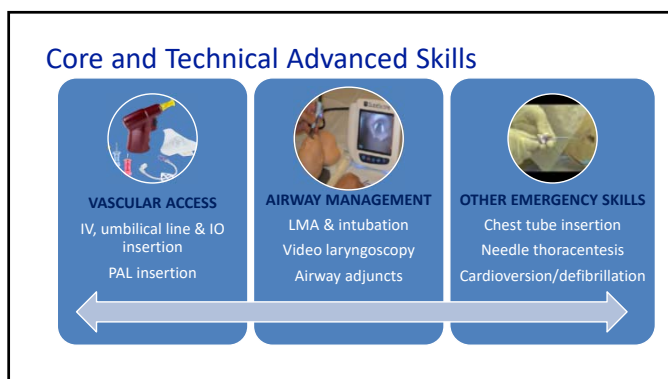Kyong-Soon Lee, Toronto

13

Slide 14

What's involved in a transport call?

| Call received via central dispatch from referring site | Transport physician and transport coordinator provide advice ± dispatch team | Team travels to referral | Team provides stabilization at referral site and provide updates to receiving site | Team transfers patient to destination site and provides handover |

14

Slide 15

What's involved in a transport call?

- **-Timeliness**: access to advice
- **-Effective** communication / -Role for virtual care
- **-Timeliness**: based on team and vehicle availability / -Best team composition ?MD / -Mode of transport
- **-Effectiveness** Clinical skills / **-Safety** / -Communication
- **-Family centered care** / **-Effective** communication

| Call received via central dispatch from referring site | Transport physician and transport coordinator provide advice ± dispatch team | Team travels to referral | Team provides stabilization at referral site and provide updates to receiving site | Team transfers patient to destination site and provides handover |

15

Slide 16

Neonatal transport teams bring critical care to referral sites

16

Slide 17

Core and Technical Advanced Skills

VASCULAR ACCESS
IV, umbilical line & IO insertion
PAL insertion

AIRWAY MANAGEMENT
LMA & intubation
Video laryngoscopy
Airway adjuncts

OTHER EMERGENCY SKILLS
Chest tube insertion
Needle thoracentesis
Cardioversion/defibrillation

17

Slide 18

Original Research

Procedural Interventions and Stabilization Times During Interfacility Neonatal Transport

Aravanan Anbu Chakkarapani, MD [1,2,3], Hilary E. Whyte, MB [1,4], Edith Massé, MD [5], Michael Castaldo, MD [6], Junmin Yang, MSc [7], Kyong-Soon Lee, MD [1,4], on behalf of the Canadian Neonatal Transport Network
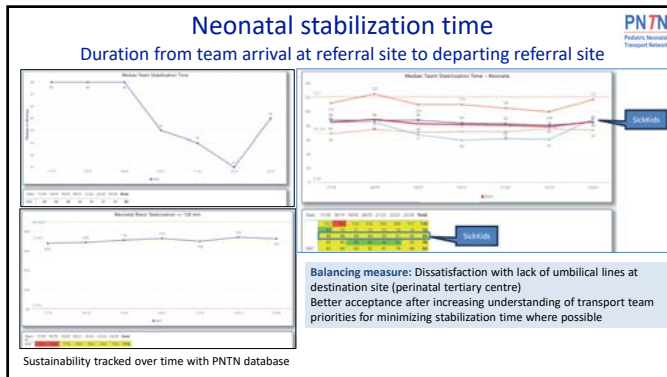
Procedure	Frequency N (% of transports)	Success N (% attempts)
Peripheral intravenous	1586 (47.3)	1351 (85.2)
Arterial blood gas	1410 (42.1)	1257 (89.1)
Endotracheal intubation	829 (24.8)	790 (95.3)
Venipuncture	569 (17.0)	511 (89.8)
Umbilical venous catheter	293 (8.8)	273 (93.2)
Umbilical arterial catheter	170 (5.1)	121 (71.2)
Peripheral arterial line	99 (3.0)	48 (48.5)
Oral airway	64 (1.9)	60 (93.8)
Chest tube	48 (1.4)	47 (97.9)
Laryngeal mask airway	8 (0.2)	8 (100)

Results: Higher number of invasive procedures associated with increased stabilization time

Conclusion: Limit non-essential and lower success procedures such as UAC to decrease time to definitive care

Air Med J 2020;39:276-282

18

Slide 19

Neonatal stabilization time
Duration from team arrival at referral site to departing referral site

PN7N Pediatric Neonatal Transport Network

Balancing measure: Dissatisfaction with lack of umbilical lines at destination site (perinatal tertiary centre)
Better acceptance after increasing understanding of transport team priorities for minimizing stabilization time where possible

Sustainability tracked over time with PNTN database

19

Slide 20

Use of video laryngoscopy to improve intubation success during neonatal and pediatric transport
Nicole Coutu RRT, L Yap, M Culjat, H Whyte, K-S Lee

Objective
- To improve first pass intubation success rates through implementation of video laryngoscopy (VL)

Methods
- VL training
  - Didactic teaching
  - Simulation using task trainers
- VL competency demonstrated after
  - Successful simulated intubations and
  - Completion of written test with score ≥80%
- Intubations video-recorded and used to provide feedback and content for ongoing teaching

Presented at Annual Air Medical Conference Fort Worth Texas, Oct 2021

20

Slide 21

Teaching video: laryngeal manipulation for better access to airway

Nicole Coutu, RRT
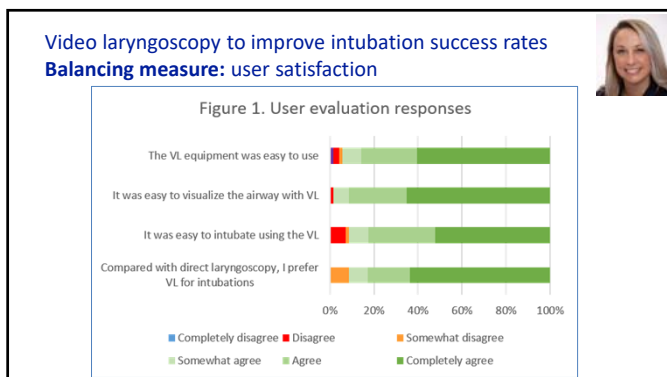ACTS Clinician

21

Slide 22

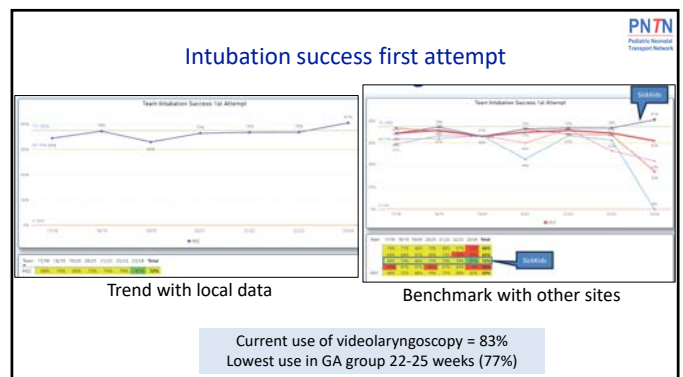### Video laryngoscopy to improve intubation success rates
Results

- Trained 30/32 (94%) team members
- VL used in 90% of transport intubations
- #intubations
  - Baseline n=163, post VL n=103
- No significant difference in first attempt success, but increased overall success
- VL made intubation easier in 7/7 (100%) known difficult airway cases
- Adverse event data only available post VL
  - Rare n=2 (2%, airway bleeding, main stem intubation)

22

Slide 23

Video laryngoscopy to improve intubation success rates
Balancing measure: user satisfaction

Figure 1. User evaluation responses

23

Slide 24

PN7N Pediatric Neonatal Transport Network

Intubation success first attempt

Trend with local data

Benchmark with other sites

Current use of videolaryngoscopy = 83%
Lowest use in GA group 22-25 weeks (77%)

24

Slide 25

Implementing ultrasound-guided peripheral arterial line (PAL) insertion in neonates

Marko Culjat, N Ruse, M Soreta, H Colangelo, J Gardiner, H Whyte, K-S Lee
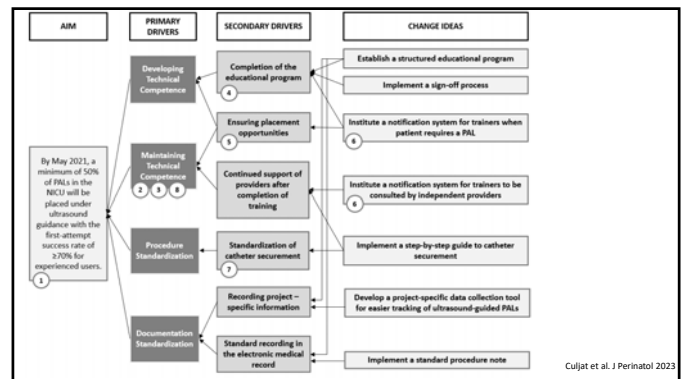
Objective

- To improve success of PAL insertions through implementation of US-guided approach

Methods

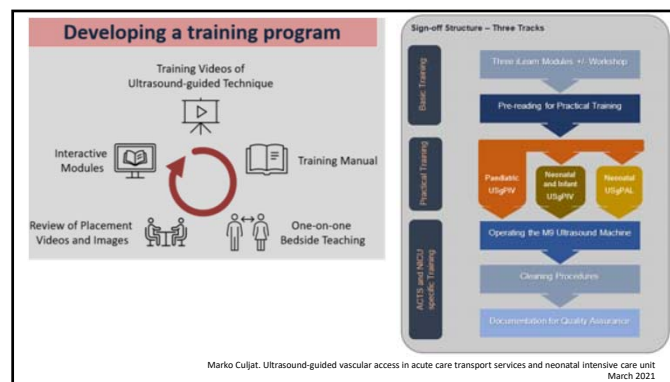- Educational program with online modules, simulations with task trainers, and beside teaching
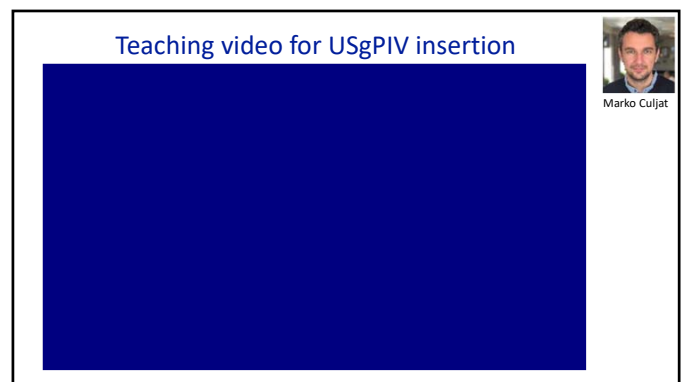
Culjat et al. J Perinatol

25

Slide 26

Culjat et al. J Perinatol 2023

26

Slide 27

Marko Culjat. Ultrasound-guided vascular access in acute care transport services and neonatal intensive care unit
March 2021

27

Slide 28

Teaching video for USgPIV insertion

Marko Culjat

28

Slide 29

By implementing the USgPAL project…

- ~63% PALs placed under US-guidance
- Improved first-attempt success rate from 50% to 84%
  - Successful placement (any number of attempts) improved from 74% to 96% with USgPAL compared with traditional approach
- Lower complication rates from 48% to 29% (p<0.01) No statistically significant difference in complications with potential limb compromise 8% vs 3% (p=0.23)

Culjat et al. J Perinatol 2023

29

Slide 30

Peripheral arterial lines inserted during transport

30

Slide 31

PIV success first attempt

PN7N Pediatric Neonatal Transport Network

Team PIV Success 1st Attempt
Trend with local data

Team PIV Success 1st Attempt
Benchmark with other sites

Current use of ultrasound for PIV in neonates 27% (increasing)
Highest use in full term (50%) and pediatric infants (67%)
Success rate (any #attempts with and without ultrasound: 80% vs 61%

31

Slide 32

Do transport factors increase the risk of severe brain injury in outborn infants <33 weeks gestational age?

Stephanie Redpath[1] · Prakesh S. Shah[2] · Gregory P. Moore[1] · Junmin Yang[3] · Jennifer Toye[4] · Thérèse Perreault[5] · Kyong-Soon Lee[6] · Canadian Neonatal Transport Network and Canadian Neonatal Network Investigators   J Perinatol 2019;40:385-393

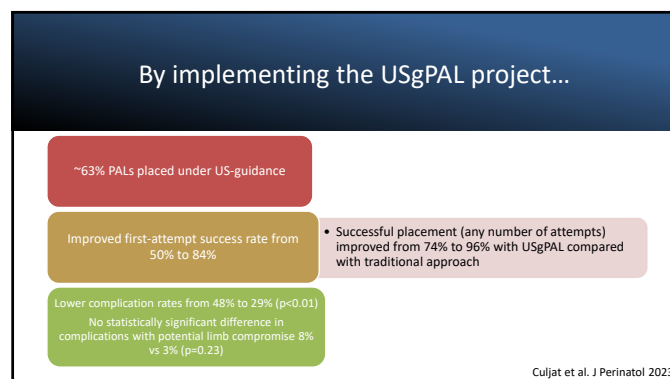| Variable	Adjusted OR (95% CI)
GA (per week)	0.77 (0.71, 0.85)
Compressions or epinephrine	1.81 (1.08, 3.05)
Transport team arrived prior to delivery	0.83 (0.51, 1.33)
Fluid bolus received	1.61 (1.00, 2.58)
Hypothermia	1.89 (0.83, 4.35)
Transport team	Significant for 3 teams

N=781

32

Slide 33

Summary of some QI projects conducted in neonatal transport

Communication	Clinical Care	Administrative
• Support antenatal counselling at non-tertiary sites for deliveries at limits of viability • Video use during transport calls • Use SBAR for different communication interactions • Promote bringing the MAR • Conduct extramural huddles • Conduct intramural huddles	• **Procedural success: intubation, vascular access** • **Reduce non-essential procedures for shorter stabilization time** • Golden hour practices • Bring colostrum for outborns • Promote enteral feeding during therapeutic hypothermia	Data to show variation and benchmark across teams to motivate change locally and by government • Central dispatch response time • Ambulance response time, transport team response time • Time of day shift change and impact on refusals and dispatch time

33

Slide 34

ACTS QR CODES

REDCap surveys with QR codes for QI data collection

- Virtual critical care survey
- Vascular access tracking
- Tertiary repatriation
- Debrief feedback
- Equipment tracker
- Criticool mini
- Flight transports
- Neo peds availability

34

Slide 35

Summary

Metrics in neonatal transport are key to monitor quality of care and benchmark across teams

-Neonatal transport = highly specialized, high acuity, high resource utilization

Reports from standardized databases promote collaboration and quality improvement

Utilize limited QI resources to high priority areas based on data and benchmarking

35

Slide 36

Thank you for your attention!

Questions?
Kyong-soon.lee@sickkids.ca

36