Canada-Wide Neonatal & Pediatric Transport Systems

3rd Canada-Taiwan Symposium for Children's Health 2021



**Presenter: Kyong-Soon Lee** 

Outline

State of **pediatric** transport in Canada

State of **neonatal** transport in Canada

Utilization of national database and network for benchmarking and quality improvement

Future directions in neonatal and pediatric transport



		Surface area in km <sup>2</sup>	Births per year	Births /km2
Canada	*	9,980,000	388,000	0.039
Taiwan	*	36,000	200,000	5.556

# **Transport Regions**

	Surface a	roa in km²	Births	Rirths /km2
	Surface al		per year	DII (IIS / KIIIZ
England & Wales				
		240,000	772,000	3.217
United States				
Office States	000000	9,830,000	4,036,000	0.411
Sweden				
Sweden		450,000	120,000	0.267
Canada				
Canada	-	9,980,000	388,000	0.039
Australia	* *			
Australia	* *	7,690,000	316,000	0.041
Taiwan	×.			
Tarwan	271	36,000	200,000	5.556

### **Transport Teams Bring Critical Care to Referral Sites**



#### **Skilled team + efficient system = effective transport**

hypothermia

Wide variation in training, processes and quality assurance activities Karlsen et al. Pediatrics 2011;128:685-691

Pediatric transport in Canada

## Hospital-based pediatric transport teams in Canada n=8, survey from Aug 2015

Transport program	Total transports	Pediatric transports	%Pediatric/ total transports	Population serviced	%pediatric to PICU (marker of acuity)
А	2300	1100	48	Peds & neo	18
В	1300	200	15	Peds & neo	75
С	714	117	16	Peds & neo	51
D	462	462	100	Peds only	45
E	350	150	43	Peds & neo	30
F	265	265	100	Peds only	65
G	250	240	96	Peds only	60
Н	45	42	100	Peds only	100

Non-hospital based provincial systems support majority of pediatric transport

Kawaguchi et al. Ped Emerg Care 2019;35(1)

## Team composition

## Among 8 hospital-based pediatric teams

	Number of teams Total = 8	%transports operated by the team composition
Registered nurse (RN); one only Respiratory therapist (RT); one only	0	
Paramedic only	1	85%
RN-RN	2	20% and 99%
RN-RT	5	Median 85%; range 70-98%
RN-paramedic	0	
RN-physician	0	
RN-RT-physician	6	Median 2%; range 2-100%
Other	3	

Team composition: most common: RN-RT Physicians rarely

Kawaguchi et al. Ped Emerg Care 2019;35(1)

# Data recorded in database of 8 hospital-based transport teams

Data elements	N (%)
Patient demographics (ID, name, etc.)	8 (100%)
Referral site information (name, postal code etc.)	7 (87%)
Details of transport times/dates of transport	8 (100%)
Vital signs during transport	5 (63%)
Bloodwork result (blood gas etc.)	4 (50%)

Need for common database with standardized elements and definitions to study associations between systems and outcomes for improvement in practice and outcomes

### Mode of transport for 8 hospital based pediatric transport teams

Mode of transport	N (%)
Ground – local EMS	8 (100%)
Ground – private transport service	2 (25%)
Ground – dedicated to transport team	2 (25%)
Helicopter -dedicated to transport team	4 (50%) 2 (25%)
Fixed wing propeller -dedicated to transport team	4 (50%) 2 (25%)
Fixed wing jet -dedicated to transport team	5 (63%) 1 (13%)
Mode of transport used	Proportion of transports Median (range)
Ground	43% (15-100%)
Helicopter	10% (0-39%)
Fixed wing jet/propeller	38% (0-65%)

Kawaguchi et al. Ped Emerg Care 2019;35(1)

# Who does the triaging for pediatric transports?

- For decisions re: mode of transport and team composition
  - PICU staff 6/8 (75%)
    - Rest: PICU fellows, transport RNs and RTs
  - Pediatric emergency physician not involved for decisions, but are involved in discussion for 2/8 programs

# Pediatric transports in Canada

- Challenging to determine current state due to wide variation in types of teams
  - Few hospital based teams
  - Majority of transports by non-hospital based teams (provincial) or local emergency medical systems
  - Lack of standardization of data collection and elements



Neonatal transport in Canada

# **CNTN**

## Canadian Neonatal Transport Network

## A National Quality Collaborative



Funded by the Canadian Institute for Health Research PHSI PHE293626



- Network created 2013, includes all 16 neonatal transport teams in Canada
- Currently, data collection ongoing from all 16 sites
- Captures majority of critically ill transports for neonates

Volume of transports entered onto CNTN Fiscal year 2019/20, 15/16 teams 16<sup>th</sup> team restarted entering data in 2021



# Team configuration for majority of acute neonatal transports



CNTN Survey Feb 2018

# **Distances Travelled**



#### CNTN 2015

# Mode for First Leg of Transport by Distance



# Respiratory support at destination site Neonatal transports, FY 2019/20, n=4768







🗪 CNTN - Demo Hospital									_ 8 ×
File Tools Help									
🗋 New Call 🔎 Hide Sear	ch 🛃 Save								
Search Date Created	Date 🔽				Search	Results (16	6 Calls Fou	nd)	
C Past 2 Weeks C Past	t Month 💿 Past 3 Months	CNTN CaseId	Last Name	Date of Birth	H. Transpo	H. Record No.	Date of Call	Ref. Site	Validal 📥
C Specific Date Range Fro	m: Jul 06, 2015 🔽 To: Jul 06, 201	T00000016					Jun 13, 2015		
Case Status All Cases	Hosp, Transport No.				200550	25	Mar 26, 2015		
CNTN Case ID	Hosp. Record No.	T00000014			200330	25	Mar 26, 2015		
Last Name		T00000012					Mar 26, 2015		
1	Clear Search	70000011					M 04, 0015	1	
First Name:	Last Name:	DOC:	Jun 13, 2015		Hos	o. Transport No	:	Hosp. Record No:	
Admin	Admin					_			<u> </u>
Patient	Admin					Reviewed			
Team	CNTN Case ID T0000	016							
Transport	Date ( Time of Call Jun 13.	2015 - 13:37							
Acuity	Call Taken by								
Medications/Interventions	Staff Neopatologist op Call								
Complications/Outcome	Hospital Trapsport Number								
Validate	Referral Site	<b></b>			<b>.</b>				
	Acuity at Time of Call	nent Urgent	Elective		<u>`</u>				
	Reason classified emergent								
				-					
				<u> </u>					
	Outcome of Run  Admit to	another hospital		•					
	Destination Site				<u> </u>				
	Unit of Admission		<b>_</b>	Type of Run -	Deferr	al? ————————————————————————————————————			
	Team Referred to			Extramur	ral 🗌 N	D			
	to Another Team		$\overline{}$	Repatrial		nknown			
	Delivery								
	Attendance at Delivery Requested	M	lissed opportunity f	or Maternal Transf	er				
	Yes No	Jnknown	Yes	No l	Jnknown				
	Arrived Prior to Delivery		If Yes, Reaso	n(s) 📋 Imminent	: delivery oo unstable to tr	ansfer			
	No No			Maternal	transport not av	ailable			-

# Acuity at Time of Call CNTN Definition

	Descriptor	Examples				
Emergent	<ol> <li>Referral site are having difficulty with resuscitation or stabilization; OR</li> <li>Infant born or to be born in a facility where resources (equipment/expertise) are unavailable/inadequate to meet resuscitation or stabilization needs</li> </ol>	<ul> <li>Ongoing cardiorespiratory arrest, shock neurologic unresponsiveness, inadequat ventilation or oxygenation</li> <li>Bilious vomiting</li> <li>Request for attendance at delivery for</li> <li>&lt;28 wk infant in non-tertiary center</li> </ul>				
	Reason emergent: 1. medically unstable; 2. surginadequate; 4. other (specify as free text)	ical emergency; 3. local medical resources				
Urgent	Patient with an <b>ACUTE</b> condition which requires a higher level of care (medical, surgical or diagnostic) than locally available	<ul> <li>30 wk ventilated infant with RDS with stable saturations in a non-tertiary centr</li> </ul>				
Elective	Patient whose initial medical/surgical needs have been met, whose condition has stabilized but requires transfer to access resources (medical / surgical / diagnostic) that are not available locally	<ul> <li>Infant with cleft palate, stable airway referred for Plastics Team consultation</li> </ul>				

Transport Time Definitions								
Dispatch time	Time of call	Time of dispatch (team 'decision						
		to go' from home base; team						
		must be available to dispatch)						
Vehicle response time –	Time vehicle called to depart	Time vehicle arrived at home						
home base	home base	base						
Wheels up time: home	Take off from home	Landing from home						
to referral								
Vehicle response time –	Time vehicle called to depart	Time vehicle arrived at referral						
referral site	referral site	site						
Wheels up time: referral	Take off from referral	Landing from referral						
to destination								
Vehicle response time –	Time vehicle called to depart	Time vehicle arrived at						
destination site	destination site	destination site						
Wheels up time:	Take off from destination	Landing from destination						
destination to home								
Mobilization time	Time of dispatch	Time depart from home base						
Travel time	Time depart home	Time arrival at referral site						
Response time	Time of call	Time of arrival at referral site						
Stabilization time	Time of arrival at referral site	Time of departure from referral						
		site						
Time to NICU admission	Time of call	Time of arrival at destination						
		site						
Total transport time	Time of dispatch	Time of arrival back to home						
		base						



# **Quality Indicators**

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

# Institute of Medicine's Six Domains of Quality



#### Figure 1: CNTN Scorecard - 2015 Data

#### **TRANSPORT TEAM**

																National	National
	а	b	С	d	е	f	g	h	i	j	k	I	m	n	0	IQR	Median
INDICATOR																	
SYSTEMS (median, in minutes)																	
Dispatch time, emergent or urgent runs	5	8	0	5.5	0	0	5	15	12	10	8	2	5	15	14	0, 19*	8
Vehicle response time, emergent or urgent runs	84	50	29.5	0	37.5	30	29	45	10	36	25	53	56	30	12	11, 50	25
Mobilization time, emergent or urgent runs	75	58.5	50	13	56.5	30	38	90	25	31	30	60	45	50	25	21, 56	35
Stabilization time, emergent or urgent runs	95	58	57	50	85	- 30	90	175	85	87	55	65	70	130	89	47, 115	75
Total transport time	411	351	240	251	350	180	320	580	215	321	160	350	342	300	223	175, 380	260
CLINICAL (%)																	
Parent accompanied transport	12.82	2.7	0	40.33	2.7	0	0	0	10.12	6.12	1.5	0	1.86	0.86	6.2	0, 6.2†	1.86
Hypothermia temp <36.0°C	0.00	0.00	6.25	0.24	0.00	2.81	0.45	0.00	0.96	1.02	4.49	4.42	0.47	4.01	0.16	0, 4.01*	0.47
Unplanned tube dislodgements	0.00	0.00	0.00	0.71	1.35	1.61	1.36	3.13	0.72	2.04	0.90	2.65	1.63	1.43	1.24	0.71, 1.63	1.35
Intubation success any number of attempts	100	100	50	100	100	80	100	100	85	86	85	100	97	93	82	85,100*	97
Intubation success, first attempt	94	100	0	70	78	80	85	80	65	86	59	60	79	60	56	60, 85	78
Intravenous success any number of attempts	98	100	100	74	59	81	100	100	62	73	29	91	88	83	69	69,100*	83
Intravenous success, first attempt	93	100	100	42	24	43	79	86	41	63	13	45	66	59	59	42, 86	59



Within interquartile range (IQR 25-75%)

Worse than IQR

\*values of zero or 100 categorized as green rather than yellow

 $\ensuremath{^\dagger\!values}$  of zero categorized as red rather than yellow



## **CNTN** Webportal - launched for Ontario in 2021



# **CNTN Webportal - Dashboards**



## **CNTN Webportal - Dashboard for Call Volumes**

wer BI CNTNReporting	CNTN Dashboard Call Volumes 🗸	, P Search ♀ 戀 ¥	
] File \vee 🔞 Chat in Teams 📮 Comment 🖾 Subscribe \cdots			
Referring Hospital Location	Call Volume by Hour & Day of week		
Cala hy Behring Headed The Ca			
Call Volume by Call Outcome	Call Volume by Presenting Problems	Call Volume by Referral Hospital	
Call Volume by Call Quisme	Call Volume by Presenting Problems	Party	
Pedatawa In 1976 1970 1078 1977 1928 JULI Juli Juli Juli Juli Juli Juli Juli Juli	a v In Non No 100 m 100 m	1011 b 4 19 19 10 10 10 10 10 10 10 10 10 10 10 10 10	
Alexandry 119 (FE 16)	Personal Annual	ter Bart Barting Barti	
And Anti-Anti-Anti-Anti-Anti-Anti-Anti-Anti-	4 V bitem 20 R A 10 D D	AT THE ARE DATA LOOP IN THE AT A THAT	
The second secon	Differentiation the second sec	Op/En         Op/En <th< td=""></th<>	
Teleforme telefo	a	Dia         Plane Date State Date: Industry law         N	
Adverse dags 100 tips 110 tips	Appendix designed in a second rate of the second ra		
NerGener Alexandra andre fangel bert Alexandra en alexa	Apriliance of the second secon	Introduction         Distribution         Distribution<	
	Resident R Resident Resident R	The second secon	
4 * Inspection conduct	Appling Appling Application (1) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2	0 Otheres Papel Anton No. 10 Otheres 0 Otheres 0 Otheres 0 Otheres	
0         1         0	The second	The second secon	
0         1         0	The conductor of A II A II A	Tabland Teacher 0 10 10 20 14 20 24 20	
0         10 </td <td>Difference         U         O         O         U         O         U         O         U         O         U         O         U         O         U         O         U         O         <tho< td=""><td>N Reference Text (Second Second Secon</td></tho<></td>	Difference         U         O         O         U         O         U         O         U         O         U         O         U         O         U         O         U         O <tho< td=""><td>N Reference Text (Second Second Secon</td></tho<>	N Reference Text (Second Second Secon	
0         10         0	Image: Constraint of the second of	N         No Lease topic         0         3         4         A           N         A	
m         m<	Inter-space         U         //         U         //         U         // <th <="" th=""></th> //         //		Interface         Interface <thinterface< th="">         Interface         <th< td=""></th<></thinterface<>
0         10         0	Imposite problem         O         Λ         O         C         C         C         A           0	No.	
Backage is to consolute         10         01         01         01         02         02         03         03         04         05	Interspective         U         Λ         U         Λ         U         Λ         U         Λ         U         Λ         U         Λ         U         Λ         L         L         Λ         L         L         Λ         L <thl< thr="">          L         L&lt;</thl<>	No.         No. Line & Longing         No. Line & Line	

#### Improvement in vehicle response time after funding for dedicated ambulances



#### Median Team Response Time - Land Fiscal Year Multiple selections 131+ Team 123 All 90-130 Age Category Minutes All Mode of Land Transport All 0-89 0 ..... 15/16 16/17 17/18 18/19 19/20 20/21 ONT Median Team Response Time - Land Team 15/16 16/17 17/18 18/19 19/20 20/21 Total **124** 145 131 145 140 147 ONT 98 100 101 98 93

#### Improvement in response time for land transports after funding for dedicated ambulances

# Improving family presence on run





# Severe IVH Rates for Transported Infants GA <33 wk by Province; n=781



2014 & 2015 CNTN and CNN data linked

# **Risk Factors for Severe IVH**

#### **Multivariable Analysis**

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	0.83 (0.51, 1.33)
to delivery	
Fluid bolus received	1.61 (1.00, 2.58)
Hypothermia	1.89 (0.83 <i>,</i> 4.35)
Transport team	Significant for 3 teams

Risk factors were

- Condition at birth
- Immediate postnatal management
- NOT related to transport factors

Redpath et al. on behalf of CNTN & CNN. J Perinatol 2019;40:385-393

#### Procedures performed by transport team & success rates CNTN 2014-16

Procedure	<b>Frequency</b> 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)

Contents lists available at ScienceDirect

Air Medical Journal

journal homepage: http://www.airmedicaljournal.com/

#### **Original Research**

Procedural Interventions and Stabilization Times During Interfacility Neonatal Transport

Aravanan Anbu Chakkarapani, MD<sup>1,2,3</sup>, Hilary E. Whyte, MB<sup>1,4</sup>, Edith Massé, MD<sup>5</sup>, Michael Castaldo, MD<sup>6</sup>, Junmin Yang, MSc<sup>7</sup>, Kyong-Soon Lee, MD<sup>1,4,\*</sup>, on behalf of the Canadian Neonatal Transport Network

1 Division of Neonatology, The Hospital for Sick Children, Toronto, Ontario, Canada <sup>2</sup> Division of Neonatology, Sidra Medicine, Doha, Oatar, United Arab Emirates

<sup>3</sup> Department of Pediatrics, Weill Cornell Medicine, Doha, Qatar, United Arab Emirates

<sup>4</sup> Department of Paediatrics, University of Toronto, Toronto, Ontario, Canada

<sup>5</sup> Centre intégré universitaire de santé et de services sociaux de l'Estrie, Centre hospitalier universitaire de Sherbrooke, Sherbrooke, Quebec, Canada <sup>6</sup> Division of Neonatology, British Columbia Women's Hospital and Health Centre, Vancouver, British Columbia, Canada

<sup>7</sup> Maternal-Infant Care Research Centre, Department of Paediatrics, Mount Sinai Hospital, Toronto, Ontario, Canada

- Canadian national transport data ٠
- Identified most common procedures during neonatal transport
- Type and frequency of procedures had impact on stabilization time
- Limit non-essential and lower success rate procedures such as **UAC** insertion

#### ABSTRACT

Objective: Transport teams perform multiple procedural interventions during the stabilization of critically ill neonates. The setting of this study was a national cohort of interfacility neonatal transports from nontertiary centers.

Methods: A retrospective cohort study of neonatal transports having interventional procedures using the Canadian Neonatal Transport Network database during 2014 to 2016. Demographics and procedures associated with stabilization times < 120 versus > 120 minutes were analyzed. Predictors of stabilization time were evaluated using multivariable logistic regression analysis.

Results: Among 3,350 neonatal transports analyzed, the 3 most frequently performed procedures were peripheral intravenous insertion, arterial blood gas sampling, and endotracheal tube insertion, with success rates of 85.2%, 89.1%, and 95.3%, respectively. The frequency of procedures varied across gestational age subgroups, and success rates were lower for umbilical arterial catheter insertions. After adjustment for confounders, more invasive procedures and a higher number of interventions were associated with longer stabilization times.

Conclusion: The type and frequency of procedures performed had a significant impact on stabilization time. Any procedures that are nonessential for stabilization at the nontertiary center, such as umbilical arterial catheter insertion, could be minimized to promote timely admission to tertiary centers. The demonstrated variations in procedural success among teams provide useful information for benchmarking and promote the sharing of training practices.

© 2020 Air Medical Journal Associates. Published by Elsevier Inc. All rights reserved.





Paediatrics & Child Health, 2021, 1–7 doi: 10.1093/pch/pxab019 Original Article

#### OXFORD

#### **Original Article**

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

Mohamed Abdelmawla MD<sup>1,4</sup>, Gregory Hansen MD MSc MPH<sup>2,3</sup>, Michael Narvey MD<sup>1,4</sup>, Hilary Whyte MD MSc<sup>5,6</sup>, Don Ilodigwe MSc<sup>5</sup>, Kyong-Soon Lee MD MSc<sup>5,6</sup>, On behalf of the Canadian Neonatal Transport Network

<sup>1</sup>Division of Neonatology, Children's Hospital of Manitoba, Winnipeg, Manitoba, Canada; <sup>2</sup>Division of Critical Care, Royal University Hospital, Saskatoon, Saskatchewan, Canada; <sup>3</sup>Department of Pediatrics, University of Saskatchewan, Saskatoon, Saskatchewan, Canada; <sup>4</sup>Department of Pediatrics, University of Manitoba, Winnipeg, Manitoba, Canada; <sup>5</sup>Division of Neonatology, Hospital for Sick Children, Toronto, Ontario, Canada; <sup>6</sup>Department of Pediatrics, University of Toronto, Toronto, Ontario, Canada

Correspondence: Kyong-Soon Lee, Division of Neonatology, Room 38102, Hospital for Sick Children, Toronto, Ontario, M5G 1X8, Canada. Telephone 416-813-7488, e-mail Kyong-soon.lee@sickkids.ca

#### Abstract

 $\label{eq:objective: The aim of this study was to evaluate if the presence of a physician in the neonatal transport team (NTT) affects transport-related outcomes and procedural success.$ 

Design: Retrospective cohort study with propensity score matching.

Setting: Canadian national study.

**Patients:** Neonatal transports from nontertiary centres between January 2014 and December 2017. **Interventions:** Comparison of transports conducted by NTTs with physicians (MD Group) and without physicians (noMD Group).

**Main outcome measures:** The primary outcome was the change in patient acuity as measured by the transport risk index of physiologic severity (TRIPS) score. Secondary outcomes included mortality within 24 hours of NICU admission, clinical complications during transport, procedural success, and stabilization time.

**Results:** Among 9,703 eligible cases, 899 neonatal transports attended by NTTs with physicians were compared to 899 neonatal transports without physicians using propensity score matching. No differences were seen in the improvement of TRIPS score or mortality  $\leq$ 24 hours of NICU admission. The MD Group had more clinical complications (7.7% versus 5.0%, P=0.02). No differences were seen in success rates of invasive procedures. The MD Group had shorter stabilization times. In multivariable analysis, the MD Group was not a significant predictor for the improvement in TRIPS score after adjustment for covariates.

**Conclusions:** Neonatal transports conducted by teams including physicians compared to teams without physicians, did not have higher improvement in TRIPS scores and had similar success rates for procedures. These results provide insights for the planning of the structure and training of specialized interfacility neonatal transport programs.

- 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



## March 26, 2018 12:00-13:00 EST

Focus on Metrics:

Procedural Skills and Team Training in Neonatal Transport: A review of network data and survey results

Hosted by: Kyong-Soon Lee, MD Director of CNTN Join from PC, Mac, Linux, iOS or Android: https://zoom.us/j/784125430 Canada: +1-647-558-0588 Meeting ID: 784 125 430

> \*\*participants joining via phone need to press \*6 to mute or unmute

# Intubations first attempt success



Canadian Neonatal Transport Network

# Intubation teaching for new team members



BC	Time in OR paired with anaesthetist
Saskatoon	Under direction supervision they attempt on live neonates
Regina	Under supervision, should have 10 intubations before working in NICU
Hamilton	Didactic class & simulation, followed by observation of 10 successful intubations prior to certification
Toronto	Training in the OR with staff anesthetists
Ottawa	Skills day - low fidelity and hi fidelity 3 days in OR
Montreal	Minimum 5 intubations under observation
Halifax	Cadavers also
Nfld & Lab	RTs must show competency for intubation in NICU before being certified to do independent transport

Transport Network

#### CNTN Survey Dec 2014 Responses n=15/16 teams

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

- First pass intubation success rates pre and post 72% and 77% (p=0.37)
- Overall intubation success improved from 89% to 99% (p=0.002)
- VL made intubation easier in 7/7 (100%) known difficult airway cases
- Adverse events during intubation with VL rare n=2/103



Somewhat disagree

Completely agree

■ Completely disagree ■ Disagree

Agree

Somewhat agree

#### Figure 1. User evaluation responses

# PIV first attempt success





## US guided PAL insertion

Marko Culjat (Senior Fellow), N Ruse, M Soreta, H Colangelo, J Gardiner, H Whyte, K-S Lee

- Improved first-attempt success rates
- Overall success rate of 96%
- Decrease in #attempts
- Lower complication rates
- Currently training more NICU providers
- Goal of making USgPAL new standard of care for our NICU
- Also using US for PIVs

	Traditional PAL N=159	USgPAL N=93	p-value
1 <sup>st</sup> attempt success rate [%]	53.0% (79/149)	84.9% (79/93)	<0.00001
Overall success rate [%]	unknown	95.7% (89/93)	n/a
Line days, median [IQR]	2.7 [1.3, 4.1]	2.9 [1.9, 4.0]	0.25
Complication rate [%]	47.1% (66/140)	30.4% (24/79)	0.02
Major complication rate [%]	16.7% (11/66)	16.7% (4/24)	1.00
Time to failure days, median [IQR]	1.9 [0.4, 3.5]	1.5 [0.2, 2.8]	0.79



Marko Culjat. Ultrasound-guided Vascular Access in Acute Care Transport Services and Neonatal Intensive Care Unit, March 2021



### 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

## Active Cooling during Transport? Survey Feb-Mar 2018

Team	Active cooling	
BC	Yes	Cool packs
Calgary	Yes	Tecotherm
Toronto	Yes	Cool packs
Ottawa	Yes	Tecotherm since Aug 2017
Sherbrooke	Yes	Cool packs
Halifax	Yes	Cool packs
Nfld & Lab	Yes	Cool packs
Edmonton	No	stopped using cool packs due to overcooling
Saskatoon	No	
Regina	No	stopped using cool packs due to overcooling
Winnipeg	No	
London	No	
Hamilton	No	
Montreal Children's	No	
Quebec City	No	stopped using cool packs due to overcooling

CNTN Survey Feb 6 - March 5, 2018 - Responses 15/16 teams

# Proportion of cases where target temperature of 34.0°C reached at ≤6 hours age



2014-2016

# Neo-Paeds Virtual Critical Care Pilot Project







#### Goal to improve neonatal & paediatric health care



Enhanced patient stabilization and care



Optimize patient transfers



Improved patient and provider experiences



Enhanced capacity to deliver quality care closer to home Reduce risk infection spread



Health system savings



## How adding video enhances the transport process...

- Teams are able to determine if the patient can safely be kept closer to home at the local community hospital or if more specialized care is required
- The addition of video allows the consulting team to provide direction to keep the patient stable until the ACTS team arrives



**PN7**N **Pediatric Neonatal** 

**Transport Network** 

Database Upgrade

File       Search       Ig Search         File       Text Name       D/f of Calk. Nov 20, 2021/24         Addmin       Addmin       Case D         Maternal Ibandrei       Case D       D0000001         Text       Deter/Time of Call. Nov 20, 2021 IV       2.244         Complexations       Deter/Time of Call. Nov 20, 2021 IV       2.244         Complexations       Call Resort Ibandrei       Ibandrei         Complexations       Deter/Time of Call. Nov 20, 2021 IV       2.244         Complexations       Deter/Time of Call. Nov 20, 2021 IV       2.244         Complexations       Deter/Time of Call. Nov 20, 2021 IV       2.244         Complexations       Deter/Time of Call. Nov 20, 2021 IV       2.244         Call Resort Number       Pester Lat. Name       Ibandrein         Pest Timmport       Data/Time of Kain IF       Hospital Resord Number         Part Timmport       Aper Type       Maining       Ibandrein         Outer Timmport       Search       Ibandrein       Ibandrein         Data/Time of Kinn King Kain       Outer       Ibandrein       Ibandrein         Complex Timmport       Search       Ibandrein       Ibandrein         Data/Time of King King Kain       Ibanon       Ibanon       Ib	PNTN - Demo Hospital					
Next cit © Starth   Port Name: Lat Name:   Adam: Paient M     Adam: Reviewed     Material Tiansfor   Tamport   Adain   Teamport   Adain   Teamport   Complications   Pott Tamport   Adain   Pott Tamport  <	File Tools Help					
Int Name Lat Name Duff of at Nove 20,201     Action Care 0   Maternal bander   Step Not-Hasse Bander   Term   Tanapott   Acuity   Carl Taken by   Poster Las Normer   Poster Las Normer <th< th=""><th>New Call 👂 Search</th><th>🛃 Save</th><th></th><th></th><th></th><th></th></th<>	New Call 👂 Search	🛃 Save				
Admin       Checkin       Determed Call       Pelsert U	First Name:		Last Name:	D/T	of Call: Nov 20, 2021 21:44	
Mercent Tander   is by NorrH Sased Team   Team   Tansport   Aciny   Aciny   Hogist Teamport   Complications   Post Teamport   Aciny   Hogist Teamport   Aciny   Post Teamport   Ag Type   Mater   Det/Time of Elicht   Complications   Ag Type   Metric   Det/Time of Elicht   Complications   Ag Type   Metric   Outcome of Elicht   Complications   Complications   Ag Type   Mining   Complications   Complications   Ag Type   Mining   Complications   Contom of Cat	Admin	Admin				Reviewed
ms by Non-H based Team Team Team Team Deter Time of Cell Nor 20, 2021 2 214 Critical Involved   Yes No Unknown Acuty Saff Mo on Cell Safe Mo or Cell Safe Mo o	Maternal Transfer					
Term       Dete/Time of call Nev 20, 2021 * 21:44       Coticall Involved () Yes       No       Ushnoon       N/A         Teagopot       Call Taken by       Telemedicine Used       Yes       No       Ushnoon       N/A         Aculty       Saft M0 on Call       Telemedicine Used       Yes       No       Ushnoon       N/A         Complications       Fast Transport       Hospital Transport Number       Hospital Exected Number       Saft M0 on Call       Saft M0 on Ca	ins by Non-H based Team	Case ID	T00000001	Patient UI		
Tansport Call Taken by   Authy Safe Mo Call   Hospital Record Number Patient Dista Mane   Complications Patient First Name   Post Tansport Age Type   Maile Maile   Post Tansport Age Type   Validate Gender   Post Tansport Age Type   Maile Image of the date in the first first Name   Post Tansport Date/Time Eliste   Deter Time Eliste Image of the date in the first first Name   Post Tansport Date/Time Eliste   Validate Offer of the date in the first first first in the intervention   Current Weight (grams) Unknown   Current Weight (grams) U	Team	Date/Time of Call	Nov 20, 2021 🔍 🗸 21:44	Criticall Involved	Yes No	Unknown N/A
Acuiy Staff MD on Cal   Hespital Tansport Number Hospital Tansport Number   Pott Tansport Patient First Name   Pott Tansport Age Tpe   Vididat Age Tpe   Age Tope (warr)   Complications Age Tope   Pott Tansport Age Tope   Age Tope (warr)   Birth Weight (gramt) (thoknown   Birth Weight (gramt) (thoknown   Birth Weight (gramt) (thoknown   Birth Weight (gramt) (thoknown   Birth Response Tope Graue   Outcome of Cal Problems   Outcome of Cal Problems   Outcome of Cal Problems   Contone of Cal Problems   Patient Earth Tion Contacted Strangert Deterfine Contacted Strangert   Outcome of Cal Problems   Outcome of Cal Problems   Provincial/External Taes Involved (ORNEE, Lifelight, ES, etc)   Bart Referred to Provincial/External Taes Involved (ORNEE, Lifelight, ES, etc)   Bart Time Contacted Strangert Determine for concided Strangert   Charter Earth Provincial/External Taes Involved (ORNEE, Lifelight, ES, etc)   Bart Time Contacted Strangert Determine for concided Strangert   Bart Time Contacted Strangert Problems   Outcome of Ral Provincial/External Taes Involved (ORNEE, Lifelight, ES, etc)   Bart Time Contacted Strangert Determine Response Received   Bart Time Contacted Strangert Determine Response Received   Contorne of Ral	Transport	Call Taken by		. Telemedicine Used	Ves No	Unknown
tedescions/Interventions Hospital Tansport Number   Orniglications   Post Tansport   Validate     Patient List Name   Patient List Name   Date/Time of Birth   Complications   Gestational Age (u) as Birth   Outcome of Birth   Birth Weight Granss   Current Weight   Gestational Age (u) as Birth   Outcome of Birth   Birth Weight Granss   Current Weight   Gestational Age (u) as Birth   Outcome of Call   Patient Problems   Group   Most Responsible Problem   Outcome of Call   Patient Reserved   Patient Reserved   Referral Site   Veried Jointown   Birth Reserved an outber run   Date Time Referrated   Referral Site   Veried Jointown   Birth Reserved an outber run   Date Time Referrated   Patient Problem   Outcome of Call   Patient Referrated   Referral Site   Veried Jointown   Birth Referrated   Referral Site   Veried Pitter Birth   Concernet of Birth   Birth Referrated   Patient explicit pitter Birth   Referral Site   Veried Firent Grant   Referral Site   Veried Firent Grant   Referral Site   Outcome of Rational Problem   Date Time Response Referrated   Undate Admission	Acuity	Staff MD on Call				
Complications       Patient First Name       Patient First Name         Pot Transport       Age Type       Mising         Vididate       Age Type       (store)         Vididate       Age Type       (store)         Age Type       (store)       (dsys)         Birth Weight (grams)       Uhknown       Birth Weight (grams)         Current Weight       Grans       Closers         Patient Problems       Outer       Other         Additional Problems       Group       Most Responsible Problem       Other         Additional Problems       Corce       Trans Referral Ste       Image: Transport         Outcome of Call       Transport       Vertice attention of the canceled transport       Deter Problem         Resensor for Gerard       Transport       Image: Transport       Determine Constance       Image: Transport         Patient epired prior to team arrival Berlief te pired prior to team arrival Berlief epired priorite to another run       Deterlin	ledications/Interventions	Hospital Transport Number		Hospital Record Number		
Post Transport       Age Type       Missing       Gender         Volidate       Date/Time of Birth       [Enter date]       :       Unknown         Age       (years)       (days)       Birth       Birth       (days)         Birth       Weijdt       Grans       :       Nambiguous         Current Weight       Grans       :       Nambiguous         Current Weight       Grans       :       Nambiguous         Additional Problems       Current Weight       Grans       :         Patient Problems       Group       Most Responsible Problem       Other         Additional Problems       Group       Problems       Other Problem         Cutcome of Call       Image: Problems       Provindal/External Team Involved (RNKG, Ufsfight, Pis, etc)         Referral Ste       Image: Problems       Date/Time Contacted Internantic explice diprior to team arrival         Beason for carceled trampot       Date/Time Contacted Internantic explice diprior to team arrival       Date/Time Respons Received         Beason for carceled trampot       Image: Im	Complications	Patient First Name		Patient Last Name		
Validate       Date/Time of Birth       [Enter date]       *       :       Unknown         Age       (years)       (days)	Post Transport	Age Type	Missing		Gender	
Age (verr) (months) (days)   Arbitiguous Arbitiguous   Gestational Age (w) at Birth Unknown   Birth Weight (grams) Unknown   Current Weight Grams   Patient Problems Group   Most Responsible Problem Other   Additional Problems   (select all that apply) froup   Problems   Outcome of Cal Province/External Team Involved (CRNEE, Lifefight, ERS, etc)   Team Referred to Province/External Team Involved (CRNEE, Lifefight, ERS, etc)   Referral Ste Verial   It Another Team Province/External Team Involved (CRNEE, Lifefight, ERS, etc)   Point Contacted Information for conceled transport Date/Time Contacted [Enter date] 2 Unknown Time   Patient ream Patient conceled transport   Patient ream Resound for to team atrivial   Patient ream Patient conceled transport   Patient ream Resound transport   Patient ream Result on to tam atrivial   Patient ream Result on to tam atrivial   Patient conceled transport Infere date] 2 Unknown Time   Patient conceled transport Infere date] 2 Unknown   Unt of Admission Yes	Validate	Date/Time of Birth	[Enter date] 🔲 🛛 🗌 Unkno	own	Male	
Gestational Age (w) at Birth   Birth Weight (grams)   Current Weight   Group   Most Responsible Problem   Outcome of Call   Referral Ste   Outcome of Call   Referral Ste   Patient Froblem   Referral Ste   Dutcome of Call   Referral Ste   Providal/External Tean Involved (DRNEE, Ufefight, BrS, etc)   Referral Ste   Patient erior   Dutcome of Call   Referral Ste   Providal/External Tean Involved (DRNEE, Ufefight, BrS, etc)   Dutcome of Call   Referral Ste   Providal/External Tean Involved (DRNEE, Ufefight, BrS, etc)   Berouted to another run   Patient explore prot team arrival   Patient explore proto team arrival   Outcome of Run   Regular   Extramural   Repatitation   Stacked trip   Contents   Contents		Age	(years) (months)	(days)	Ambiguous	
Birth Weight (grams)   Current Weight   Group   Most Responsible Problems   Other   Additional Problems   (select all that apply)     Group   Problems        Referral Site   Outcome of Call   Provincial/External Team Individue (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Referral Site   Provincial/External Team Individue (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Outcome of Call   Provincial/External Team Individue (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Cutome of Call   Provincial/External Team Involved (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Outcome of Call   Provincial/External Team Involved (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Outcome of Call   Provincial/External Team Involved (ORNGE, Lifefight, BFS, etc)   Team Referral Site   Outcome of Call   Provincial/External Team Involved (ORNGE, Lifefight, BFS, etc)   Decime Contented   Unknown Time   Batient extended   Proteinen Response Received   Unknown Time   If decimed, reason   Figure data   Respon for concelled   Outcome of Run   Respon for concelled   Unt of Admission		Gestational Age (w) at Birth	Unknown		Unknown	
Current Weight    Grams    Most Responsible Problem Other Patient Problems Group Most Responsible Problem Other Additional Problems    Group    Problems    Other Problem (select all that apply) Referral Site    Provincial/External Team Involved (ORNGE, Lifefight, EHS, etc)    Ves    No    Unknown    DeterTime Contacted [Enter date]    Contacted I transport    Patient expired prior to team arrival    Response Received    Internet expired prior to team arrival    Patient expired prior to team arrival    Referral cancelled    futer date    Comments    Comments    Outcome of Rum    Repatriation    Stacked trip    Comments    Outcome of Rum    Patient expired prior to team arrival    Repatriation    Stacked trip    Comments    Comments    Patient expired priore    Pati		Birth Weight (grams)	Unknown			
Patient Problems Group Most Responsible Problem Other     Additional Problems     Group Problems     Other Problems     Outcome of Call     Contracted     Team Referred to     Provincial/External Team Involved (ORNGE, Lifefight, PLS, etc)     Provincial/External Team Involved (O		Current Weight	Grams Kile	ograms .		
Additional Problems (select all that apply)  Group Problem Pr		Patient Problems	Group Mo	ost Responsible Problem		Other
Additional Problems   (relect all that apply)     Referral Site     Referral Site     Outcome of Call     Provincial/External Team Involved (ORNOE, Uf=fight, ErS, etc)     Provincial/External Team Involved (ORNOE, Uf=fight, ErS, etc)   Patient expired prior to team arrival   Patient expired prior to					•	
(select all that apply)       User Frozenia         Referral Site           Outcome of Call           Team Referred to           Reason for Referral to Another Team           Patient expired prior to team arrival           Patient expired prior to team arrival           Reformation and the run           Referral to another run           Reformation and the run           Referral concelled transport           Referral concelled transport           Bate/Time Response Received         Unknown Time         If declined, reason         Type of Run         Regular         Extramural         Destination Site         Unit of Admission		Additional Problems	Group	Problems		Other Problem
Referral Site     Outcome of Call     Team Referred to   Reason for Referral   to Another Team     Reason for canceled transport   Patient expired prior to team arrival   Reformation canceled   Outcome of Run   Regular   Extramural   Regular     Restore for canceled transport   Comments     Comments     Outcome of Run   Destination Site     Unit of Admission		(select all that apply)	*	Froblems		
Referral Site <ul> <li></li></ul>						
Referal Site       Image: Comments         Outcome of Call       Image: Comments         Team Referred to       Image: Comments         Reason for Referral to Another Team       Image: Comments         Image: Comments       Image: Comments         Outcome of Run       Regular         Type of Run       Regular         Duttorne of Run       Image: Comments         Outcome of Run       Image: Comments         Image: Comments       Image: Comments         <						
Referal Site          Outcome of Call          Team Referred to          Reason for Referal to Another Team          Patient expired prior to team arrival          Patient expired prior to team arrival          Referral cancelled          Unknown Time          Accepted       Declined         Unknown Time          Accepted       Declined         Unknown Time          Image: Contract Team          Referral cancelled          Unknown Time          Image: Type of Run       Regular         Type of Run       Regular         Destination Site          Unit of Admission						
Outcome of Call <ul> <li>Provincial/External Team Involved (ORINGE, Lifeflight, EHS, etc)</li> <li>Ves</li> <li>No</li> <li>Unknown Time</li> <li>Contents</li> <li>Comments</li> <li>Outcome of Run</li> <li>Regular</li> <li>Extramural</li> <li>Restraintion Site</li> <li>Comments</li> <li>Comments</li> <li>Comments</li> <li>Comments</li> <li>Comments</li> <li>Contents</li> <li>C</li></ul>		Referral Site	× ×		~ .	
Team Referred to       Provincial/External Team Involved (CRNCE, Lifeflight, EHS, etc)         Reason for Referral to Another Team       Vec       No         Patient expired prior to team arrival       Patient expired prior to team arrival       Patient expired prior to team arrival         Referral cancelled       Unknown       Date/Time Response Received         Type of Run       Regular       Extramural       Repatriation         Destination Site       Outcome of Run       Comments         Unit of Admission       Vec       Comments		Outcome of Call		~		
Reason for Referral to Another Team Patient expired prior to team arrival Referral cancelled Other Type of Run Destination Site		Team Referred to		Pi	rovincial/External Team Involved (O	RNGE, Lifeflight, EHS, etc)
to Another Team Reason for canceled transport Patient expired prior to team arrival Referral cancelled Other Type of Run Regular Extramural Repatriation Stacked trip Outcome of Run Destination Site Outcome of Run Destinati		Reason for Referral			Yes No	
Type of Run       Regular       Extramural       Repartiation       Stacked trip         Outcome of Run       Destination Site       Stacked trip       Comments		to Another Team	- Reason for cancelled transport			
Rerouted to another run       Date Time Response Received         Referral cancelled       [Enter date] * 2 Unknown Time         Other       If declined, reason         Type of Run       Regular         Destination Site       Comments         Unit of Admission       V			Patient expired prior to team arriv	/al	Accepted Declined	Unknown
Referal cancelled       If declined, reason         Other       If declined, reason         Type of Run       Regular         Destination Site       Comments         Unit of Admission       V			Rerouted to another run		Date/ Time Response Received	
Type of Run     Regular     Extramural     Repatriation     Stacked trip       Outcome of Run     Outcome of Run     Outcome of Run     Outcome of Run       Destination Site     Outcome of Run     Outcome of Run			Referral cancelled		If declined reason	latej Unknown Time
Type of Run Regular Extramural Repatriation Stacked trip Outcome of Run Destination Site						~
Outcome of Run Destination Site Unit of Admission		Type of Run	Regular Extramural R	epatriation 🔲 Stacked trip		
Destination Site		Outcome of Run		~	Comments	
Unit of Admission		Destination Site	~ ~ ~		~ .	
		Unit of Admission		×		

# PRNTN Pediatric Neonatal Transport Network

Runs by non-hospital based team screen

🚪 PNTN - Demo Hospital		
File Tools Help		
) New Call 🛛 🔎 Search	🛃 Save	
First Name:	Last Name:	D/T of Call: Nov 20
Admin		
Maternal Transfer	Runs Completed by Non-hospital Based Team	Reviewed
uns by Non-H based Tean	n	
Team	<ul> <li>Team Configuration</li> <li>Highest level of ventilatory supp</li> <li>Physician</li> <li>Provincial/External Team</li> <li>destination</li> </ul>	ort at arrival at
Transport	Nurse EMS Artificial Airway	
Acuity	Unknown	~
/ledications/Interventions		
Complications	V access during run Ves No Unknown Respiratory Support	
Post Transport	Mode of Transport - Referral to destination	
Validate	Land Rotor Fixed wing	
	Arrive at Referral Site Nov 20, 2021 V : Unknown time Response Time N/A	A Mins.
	Depart Referral Site Nov 20, 2021 V : Unknown time Stabilization Time N/A	A Mins.
	Arrive at Dest. Site Nov 20, 2021 V : Unknown time Adm to Dest. Time N/A	A Mins.

# **PNT**N **Pediatric Neonatal Transport Network**

Acuity screen

💈 PNTN - Demo Hospital						
File Tools Help						
New Call 🔎 Search	🚽 Save					
First Name:		Last Nan	ne:		D/T of Call: Nov 20, 20	21 21:44
Admin	A					
Maternal Transfer	Acuity					Reviewed
uns by Non-H based Team						
Team	CIAS		~	Elective admission	Ves No	
Transport	A		· ·	Recovery from surgery or		
Acuity	Access		Unknown	procedure is main reason		~
fedications/Interventions				low-risk diagnosis		
Complications	0 I F	IV Other		main reason for ICU		~
Post Transport	Inotropes			High-risk diagnosis		~
Validate	Yes	No Unknow	vn			
	Severity of Illness at Temperature (°C) Systolic BP (mm Hg) Respiratory Status - Severe (apnea, Mod (RR > 60/- None (RR <= 61 Unknown GA Appropriate Resp None Seizure Muscle relaxan Lethargic respo Withdraws vige Unknown	Time of Call  Unknown  Unknown  Unknown  gasping, intubated)  nin and/or SpO2 < 85)  //min and SpO2 >= 85)  onse to Stimuli  t nse, no cry prously, cries  TRIPS Score = N/A	Lowest pH	Unknown Unknown Unknown un Unknown un	Highest Level of Ventilatory Artificial Airway	Data N/A Support
					Glasgow Coma	Scale = N/A

Pediatric Neonatal Transport Network

Materna data screen

PNTN - Demo Hospital		
File Tools Help		
) New Call 👂 Search	Jave Save	
First Name:	Last Name:	D/T of Call: Nov 20, 2021 21:
Admin	Motornal Transfer Dataila	
Maternal Transfer		
luns by Non-H based Team	Maternal Transfer Info available?	
Team	Yes No Unknown	
Transport	Date / Time of Maternal Admission at referral site	
Acuity	Attempt for maternal transfer	
Medications/Interventions	Yes No Other Unknown	
Complications		
Post Transport	If Yes Date / Time Attempt made [Enter date] . Unknown Time	
Validate	Outcome of request for maternal transfer	
	$\sim$	
	Reason aborted	
	Other outcome	
	If no maternal transfer attempted, reason	
	Imminent delivery	
	Need for urgent delivery for fetal reason	
	Need for urgent delivery for maternal reason	
	Not attempted based on referral level of care	
	Uther	

### Volume of preterm transports <32 weeks & <3 days old from CNTN non-tertiary sites – as surrogate of outborn deliveries



# **Canadian Pediatric Transport Initiatives**



Outreach education

#### Team education

Royal College transport certificate

Database/research

# **Future Directions in Canadian Transport**

Expansion of neonatal database to facilitate data collection for

- Pediatric transports
- Non-hospital based transports

Increase utilization of database through webportal

- Timely reporting of utilization data and metrics
- Benchmarking and trends over time

Increase collaboration across neonatal and pediatric transport networks to share resources and practices





Thank you and best wishes from Toronto to Taipei