

臺灣兒童重症轉運專業培訓 發展與現況

The development and current situation of
pediatric transport medicine in Taiwan

Tseng, Wei-Chieh 曾偉杰 醫師

兒童急診科暨兒童轉院外接團隊/臺大兒童醫院



我們都知道的事 ~ It is Known~

- 兒童重難症資源少、專家難培養

「分層合作，**重難症集中化**」，才能做到最好。

As health care began to regionalize its specialty resources to a greater extent over the 1990s and 2000s, pediatric-specific resources were noted to be unevenly divided across the country.

我們都知道的事 ~ It is Known~

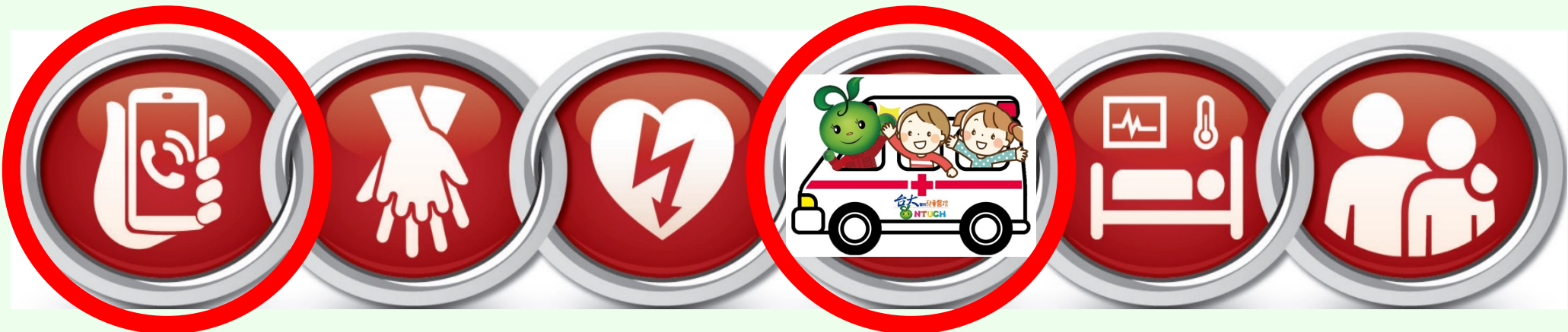
- 民眾期待醫療「**可近**」，但重難症需要「**集中**」。



我們都知道的事 ~ It is Known~

- 高效率而安全的「**兒童轉診**」來鍊結。

Specialty pediatric transport services are required to ensure that children are safely transported to an appropriate level of care in a timely manner.



Pediatric Specialized Team

- Pediatric critical care specialized team →
 - Improved survival rates
 - Fewer unplanned events during transport.

TABLE 6 Multivariate Logistic Regression Analysis of Remaining Transport Variables for Prediction of In-Hospital Death, With Adjustment for Pre-ICU PRISM Scores

Variable	OR (95% CI)	P
Nonspecialized team	2.45 (1.14–5.26) ^a	.02
Age	1.00 (0.95–1.05)	.99
Air transport	1.96 (0.58–6.61)	.28
Diagnosis		
Cardiac	1.0 (reference)	
Central nervous system	0.47 (0.20–1.11)	.08
Toxicological	0.48 (0.17–1.40)	.18
Hematologic	0.19 (0.02–1.58)	.12
Respiratory	0.68 (0.32–1.46)	.32
Shock	0.76 (0.19–3.03)	.70
Gastrointestinal	0.19 (0.02–1.59)	.13
Other	2.56 (1.13–5.78)	.02
Time of day	0.57 (0.35–0.94)	.03
Total transport time	1.00 (0.995–1.001)	.23

^a The estimated RR of in-hospital death with nonspecialized teams was 2.17 (95% CI: 1.13–3.80).

TABLE 4 Multivariate Logistic Regression Analysis of Remaining Transport Variables for Prediction of ≥1 Unplanned Event During Transport, With Adjustment for Pre-ICU PRISM Scores

Variable	OR (95% CI)	P
Nonspecialized team	245.57 (75.73–796.38) ^a	<.001
Air transport	1.96 (0.58–6.61)	.28
Diagnosis		
Cardiac	1.0 (reference)	
Toxicological	0.68 (0.04–12.61)	.79
Respiratory	1.38 (0.20–9.65)	.75
Gastrointestinal	2.76 (0.18–42.16)	.47
Intubated	0.33 (0.06–1.78)	.20
Response time	0.99 (0.98–1.01)	.26
Scene time	1.01 (0.99–1.04)	.50

^a The estimated RR of ≥1 unplanned event with nonspecialized teams was 53.44 (95% CI: 36.09–62.75).

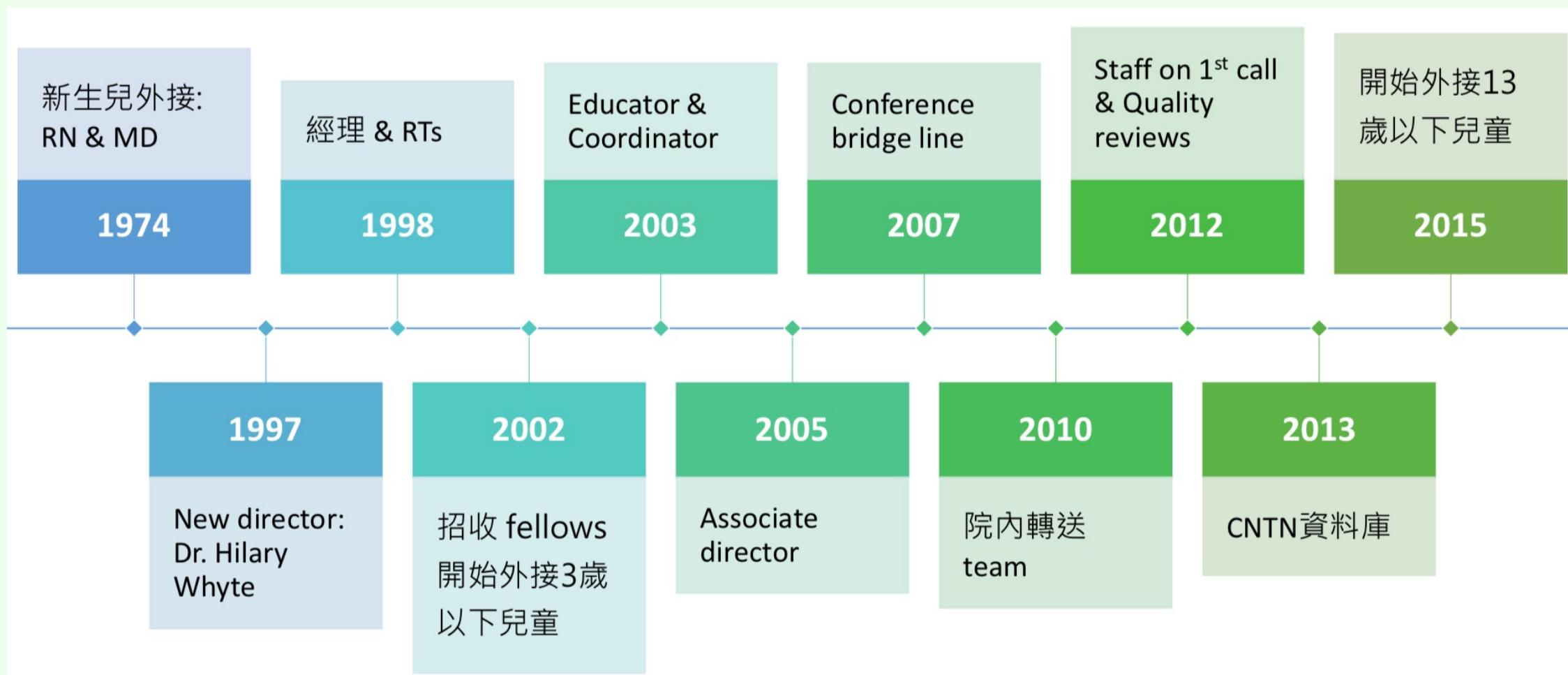
Ideal Team Configuration

- Still controversial.
- Physician/nurse, nurse/nurse, nurse/respiratory therapist, nurse/paramedic and so on.
- Adverse events during transports. ~12.3%

Programmed and Systematic Instruction

- Pediatric Advanced Life Support (PALS) training, recertification every 2~3 years → lose knowledge and skills quickly (EMS).
- Best approaches to educate and promote retention and competency → unknown.
- Simulation curriculum may improve learner competency. (ER residents)

History of SickKids ACTS



Needs of Neonatal Transport in Taiwan

產婦現在地	107 年出生通報活產人數	新生兒轉診外接需求量
臺北市	20,113	302
新北市	31,053	466
基隆市	2,133	32
宜蘭縣	3,130	47
金門縣	714	11
連江縣	65	1
桃園市	21,001	315
新竹市	4,360	65
新竹縣	5,469	82
苗栗縣	3,897	58

產婦現在地	107 年出生通報活產人數	新生兒轉診外接需求量
臺中市	24,151	362
彰化縣	9,945	149
南投縣	3,269	49
雲林縣	4,268	64
嘉義市	1,818	27
嘉義縣	2,956	44
臺南市	13,407	201
高雄市	19,809	297
屏東縣	5,096	76
澎湖縣	555	8
臺東縣	1,446	22
花蓮縣	2,414	36

北北基宜 Taipei/New Taipei

	臺大兒醫 NTUCH	馬偕兒醫	國泰綜合 醫院	亞東 醫院	市立 婦幼	基隆 長庚	羅東 博愛		
History (years)	>20	>20	>20	NA	7	<5	<5	產婦現在地	新生兒轉診外接需求量
Level of Institute	CH	CH	MC	MC	RH	RH	RH	臺北市	302
Team Composition	R+N	R or R+N	R+N	R+N	NA	R+N	R+N	新北市	466
								基隆市	32
Volume per year (recent)	~150	~200	200~250	4~7	1	~20	NA	宜蘭縣	47
								金門縣	11
Neonate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	連江縣	1
Pediatric	Yes	NA	Rare	No	No	No	No	桃園市	315
								新竹市	65
Education	Lecture, simulation, NRP, PALS	NA	Lecture, NRP, PALS	No	No	NA	NA	新竹縣	82
								苗栗縣	58

桃竹苗/Northern Taiwan

	部立桃園	新竹馬偕	新竹台大	新竹東元	苗栗大千
History (years)	NA	15	5	NA	NA
Level of Institute	RH	RH	RH	RH	DH
Team Composition	NA	NA	NP+VS	NA	R+N
Volume per year (recent)	<10	40~60	30~60	30~40	<5
Neonate	Yes	Yes	Yes	Yes	Yes
Pediatric	No	No	No	No	No
Education	NA	NA	NA	NA	NA

產婦現在地	新生兒轉診外接需求量
臺北市	302
新北市	466
基隆市	32
宜蘭縣	47
金門縣	11
連江縣	1
桃園市	315
新竹市	65
新竹縣	82
苗栗縣	58

中彰 雲嘉南/Central, Central-to-Southern

	中國醫兒醫	彰基兒醫	雲林台大	嘉基	成大
History (years)	24	20	<5	NA	31
Level of Institute	CH	CH	RH	RH	MC
Team Composition	NA	R+N	NP+VS	R+N	R+N
Volume per year (recent)	150	80~100	~10	60~70	120~150
Neonate	Yes	Yes	Yes	Yes	Yes
Pediatric	No	No	No	No	No
Education	NA	Lecture	NA	NRP PALS	Lecture

產婦現在地	新生兒轉診外接需求量
臺中市	362
彰化縣	149
南投縣	49
雲林縣	64
嘉義市	27
嘉義縣	44
臺南市	201
高雄市	297
屏東縣	76
澎湖縣	8
臺東縣	22
花蓮縣	36

高屏花東/Southern, Eastern Taiwan

	高雄醫大	屏東基督教	花蓮慈濟	台東馬偕
History (years)	NA	NA	NA	NA
Level of Institute	MC	RH	MC	RH
Team Composition	R+N	R+N	R+N	R+N
Volume per year (recent)	150~240	22	~10	~10
Neonate	Yes	Yes	Yes	Yes
Pediatric	Rare	No	No	No
Education	PALS	Lecture	No	NRP

產婦現在地	新生兒轉診外接需求量
臺中市	362
彰化縣	149
南投縣	49
雲林縣	64
嘉義市	27
嘉義縣	44
臺南市	201
高雄市	297
屏東縣	76
澎湖縣	8
臺東縣	22
花蓮縣	36

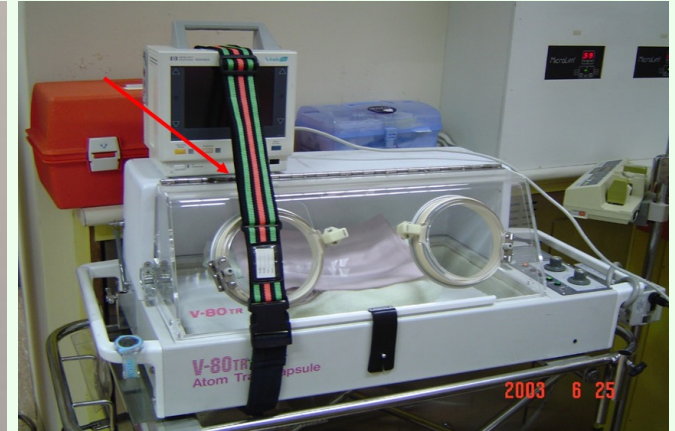
History of NTUCH PCCT

- Neonatal transport since 1990's.
- NICU physician/residents and nurse.
- 150~200 transports/year → 80~100/year (2018~).
- Declining transports due to lower birth rates and increased maternal transfer rates.

1st generation of transport incubator

項	目	日期				
		姓名				
1.輸送型保溫箱:						
	(1)有清潔					
	(2)重新鋪床					
	(3)歸位					
	(4)蓄電					
2.輸送型生命監視器:						
	(1)有清潔					
	(2)歸位					
	(3)蓄電					
3.點滴氣浦:						
	(1)有清潔					
	(2)歸位					
	(3)蓄電					
4.急救箱:						
	(1)有清潔					
	(2)歸位					
	(3)補充					
5.氧氣						
	(1)補充					
	(2)歸位					

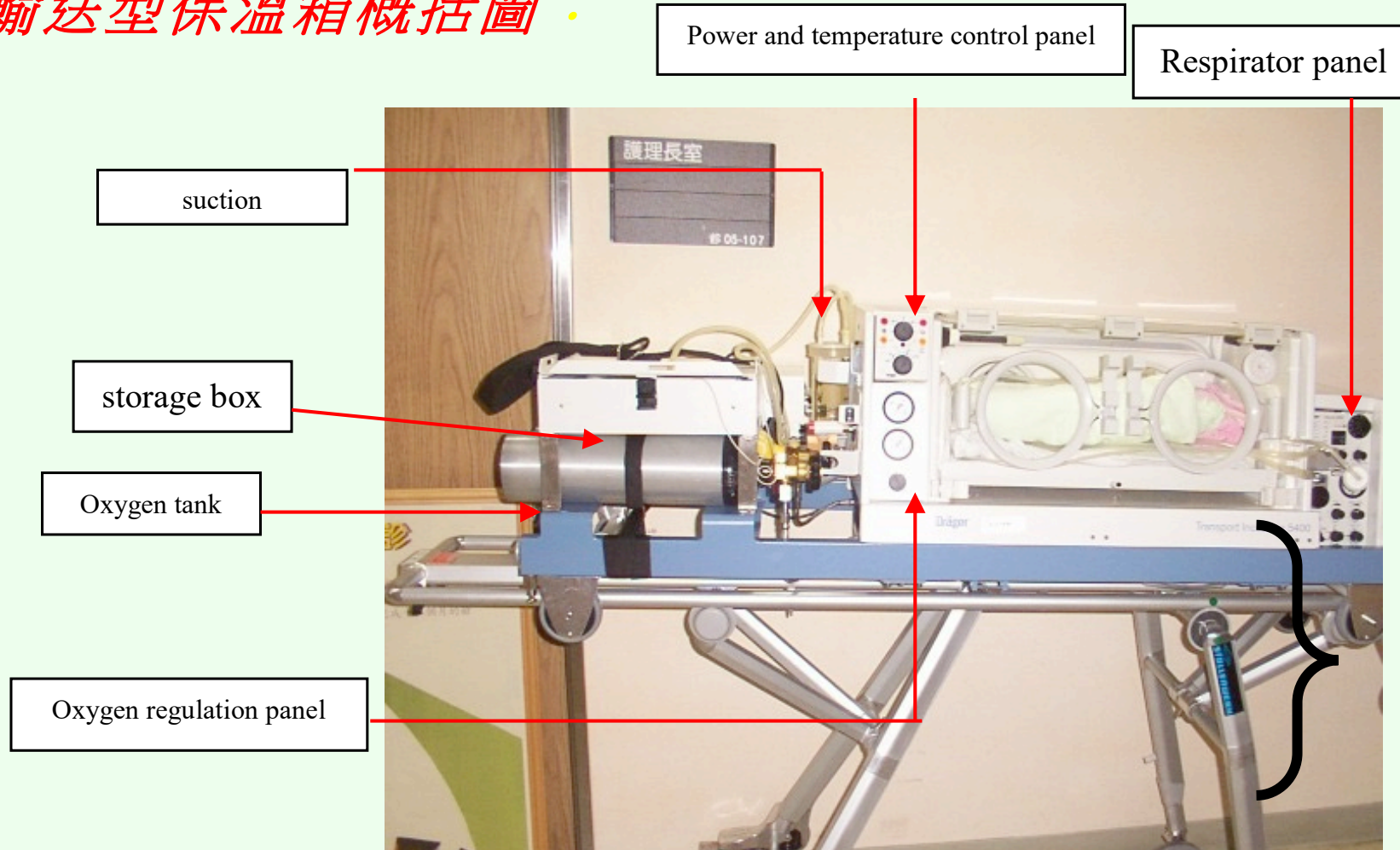
Check list



Courtesy of Prof. Chou Hung Chieh.

2nd generation of transport incubator

輸送型保溫箱概括圖：



Courtesy of Prof. Chou Hung Chieh.

Meeting
Children's Needs!



Special Thanks
to CTOT &
SickKids
ACTS team.



Courtesy of Dr. Lee Meng-Chang.

Session: April 10 (day 3) Room 10- 125 Burton Wing	Time
Check-in Meeting	800 – 830
Fetal Transition → Persistent Pulmonary Hypertension	830 – 1000

Advanced Neonatal Assessment
Septic Shock

Session: April 11 (day 4) RM 2844 CCU

Care of the Preterm Neonate in Transport
Break
Neonatal Congenital Heart Disease -Transport Lens

Lunch
Pediatric Assessment -Transport Factors

NRP: Learning and Technical Skills (OR Simulation Satellite)
--

Session: April 12 (day 5) RM 3803 NICU
GI Surgical Emergencies; Transport Considerations

Diabetic Ketoacidosis: Management in Transport
--

Neonatal Hypoxic Ischemic Brain Injury	1100 – 1200
Pediatric Respiratory Conditions	1300 – 1415
Transport Case Simulations (OR Simulation Satellite)	1545 – 1730

Session: April 8 (day 1) Room 10- 125 Burton Wing (830 – 1300)	Time
Meet at University Avenue entrance and Badging, Windows Service Desk Appointment	730-800
Welcome to ACTS: 3 rd floor ACTS Office Rm	800 – 830
Transport Operations & Scope of Service	830 – 930
Break	930 – 945
Regionalized Health Care System – Transport System & Processes	945 – 1100
Anatomy of A Transport Run: ACTS Operations	1100 – 1200
Lunch & Learn: Complete Needs Assessment	1200 – 1300
ACTS Transport Equipment Overview; Q & A	1300 – 1700

Session: April 9 (day 2) Room 10- 125 Burton Wing	Time
Transport Safety	830 – 930
Break	930 – 945
ACTS Education Programs	945 – 1200
Lunch	1200 – 1230
Neonatal Respiratory Conditions: Physiology & Transport Practice Principles of Ventilation in Transport Environment (neonatal & pediatric)	1230 – 1730

Date & Session: April 15 (day 6) Room 10- 125 Burton Wing	Time
Neonatal Neuro Assessment & Neurological Emergencies	830 – 1000
Transport Communication: SBAR-R	Integrated based on clinical activity

April 16: (Day 7)	800 – 1700
ACTS Team Meeting: Leadership Meeting, Operation Updates & Education Sessions	
PGCRL Event Room 2B & TBD	

April 17: (Day 8) Final Debrief/Delegate Report Back Meeting – SKI Boardroom 400B (180 Dundas Street West)	1000 – 1030
--	-------------

ACTS Quality Assurance & Improvement, Informatics: Overview	1100 – 1200
Room 2846 CCU	

Clinical Rotation: please come to ACTS transport office		
MD	RN 1	RN 2
April 10 → (1300 – 1900) with day 1 team	April 10 → (1300 – 1900) with intramural team	April 10 → (1300 – 2000) with intramural team
April 12 & 13 → Night (1900 – 0700)	April 13 & 14 → day (700 – 1900)	April 13 & 14 → Evening (1900 – 2200)
April 15 → Day (1000 – 1900) with day team	April 15 → Evening (1000 – 2200) with evening team	April 15 → (1000 – 1900) with intramural team

Courtesy of Dr. Lee Meng-Chang.

History of NTUCH PCCT

- Neonatal transport since 1990's.
- NICU physician/residents and nurse.
- 150~200 transports/year → 80~100/year (2018~).
- 0~18-years Pediatric Critical Care Transport since 2019.2
(sub-specialty fellow/residents and PICU nurse)

[訊息專區](#) [認識兒醫](#) [就醫指南](#) [醫療團隊](#) [特色醫療](#) [為民服務](#) [教學研究](#)[頁](#) / [就醫指南](#) / [轉院外接服務](#)

該看哪一科

掛號服務

>

門診看診

>

交通指南

健保部份給付

自費醫療項目

就醫須知

>

轉院外接服務

就醫權益

轉院外接服務

本服務提供醫療機構(醫院及診所)轉介新生兒/兒童病患至臺大兒童醫院。臺大兒童醫院有完整的兒童相關醫療專科與健全的兒童轉院外接團隊，我們將成為您與孩子的醫療照護中，最好的夥伴與後盾。

- 重症新生兒/兒童轉院與外接

如果您醫療機構中的病童需轉往臺大兒童醫院的加護病房，請您撥打專線：0972-651-579，專線人員確認病童的病況後，將立即啟動轉院團隊。由團隊中的主治醫師/研修醫師依照病童的病況，安排最適合其入住的床位。若病童需要「臺大兒童轉院外接團隊 (critical care transport team)」前往轉運，我們將於線上與您共同研擬轉院計畫，讓病童能以最安全而有效率的方式，轉院至臺大兒童醫院。

- 急、難症新生兒/兒童轉診

如果您醫療機構照顧中的病童，因病情需要欲轉往臺大兒童醫院急診室或一般病房接受診察與治療，請您撥打專線：0972-651-579，專線人員確認病童的病況後，將為病童聯繫相關專科醫師與單位，並為病童擬定安排最適合的轉診計畫。

透過您的轉介，我們將與您共同串起病童照顧的每一刻，打造緻密的醫療網絡，讓每一位孩子都能得到最安全、完善而有效率的醫療照護。

來自社會大眾的愛與力量

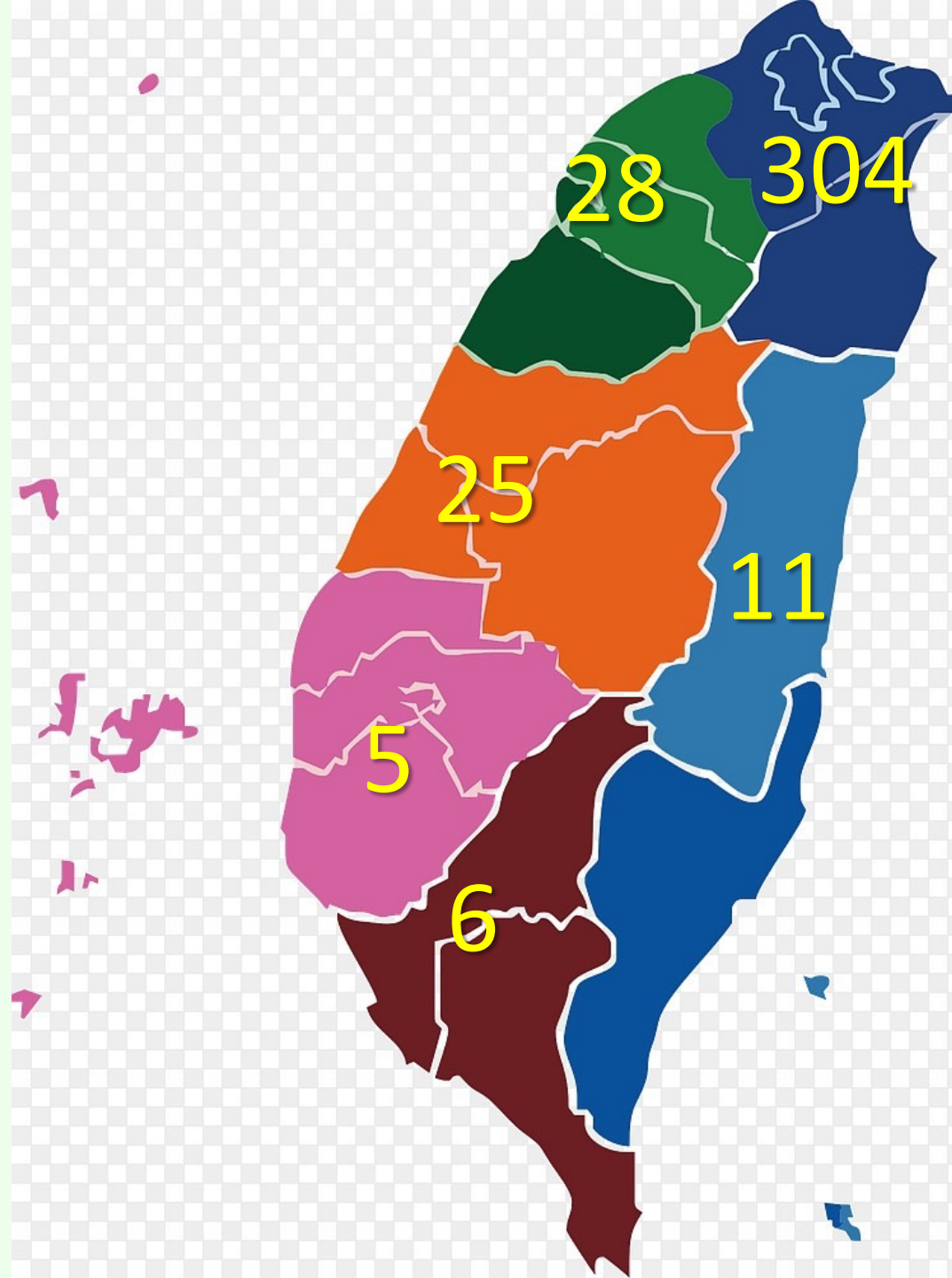


<https://www.youtube.com/watch?v=3jSk7vrnT08&list=LL&index=1>



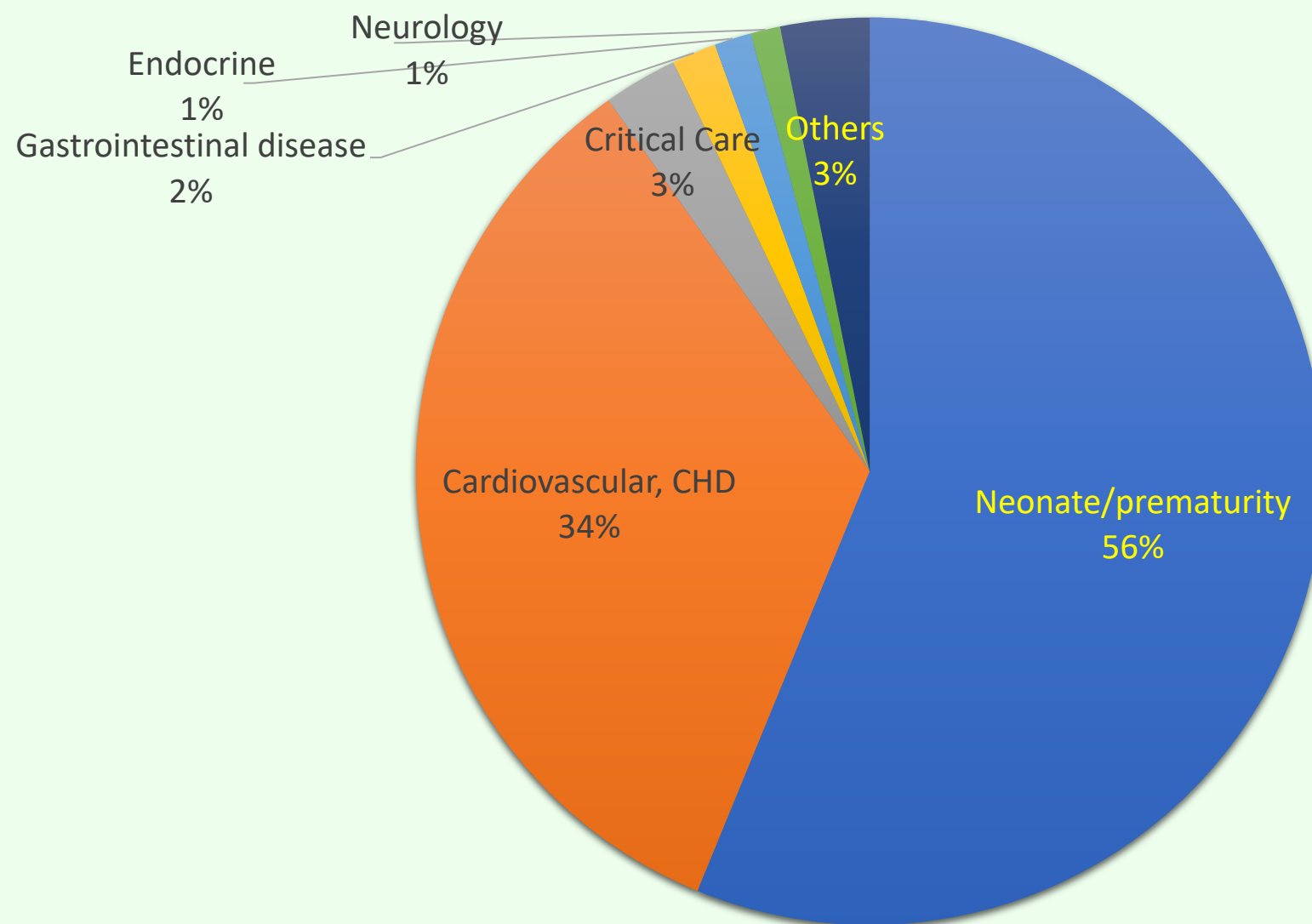
特別感謝

台大兒童健康基金會、台灣麥肯集團、吳念真導演



NTUCH
2019.2~2021.10

NTUCH 2019.2~2021.10



■ Neonate/prematurity

■ Cardiovascular, CHD

■ Critical Care

■ Gastrointestinal disease

■ Endocrine

■ Neurology

■ Others

Team Composition and Training

- Sub-specialty fellow/resident & PICU nurse
- In recruitment: coordinator & manager
- Training programs:
 - Specialty lecture
 - Simulation training
 - Regular case-based discussion/case conference
 - NRP, PALS & APLS

Our Goals

- 安全而有效率的轉診
 - 醫護 與 醫護 溝通~ Hotline!

台大兒童醫院急重難症病童轉診專線：
0972-651-579

- 共同擬定最佳轉診計畫
- 有經驗的單一窗口，更有效率。

Our Goals

Take our PICU/NICU into the community.
打造行動加護病房

還需要努力的事…

Sustainable Development

- Inheritance 建立系統化的訓練模式與課程
- Innovation 團隊持續進化（硬體、軟體、經驗）
- Manpower 更多人員/角色參與教學、訓練與服務





Acknowledgement

- 加拿大駐台北貿易辦事處 (CTOT)
- 台大兒童轉院外接團隊、NICU、PICU、IICU 團隊
- 台大兒童健康基金會
- 吳念真導演
- 亞東紀念醫院 王詩欣醫師、國泰綜合醫院 陳勇全醫師、市立聯合醫院婦幼院區 黃啟南醫師、彰化基督教兒童醫院 吳焜煌醫師、中國醫藥大學兒童醫院 陳映廷醫師、成大醫院 張毓珊醫師、嘉義基督教醫院 黃信儒醫師、高雄醫學大學附設中和紀念醫院 劉怡慶醫師、花蓮慈濟醫院 秦家翊醫師。

Thanks for your attention.