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Prehospital Blood in Ontario: Current State + Future Directions

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Faculty Disclosure

- Speaker disclosure
  - Physician Services Incorporated: Knowledge Translation Fellowship Salary Support Award
  - Operating Grants: Canadian Blood Services Blood Efficiency Accelerator Award, CIHR, Zoll Foundation, Laerdal Foundation

OBJECTIVES

1. Provide an overview and challenges to access to definitive hemorrhage control in Ontario
2. Review role of Ornge and Blood on Board program
3. Discuss Canadian Prehospital and Transport Transfusion (CAN-PATT) Network
4. Future Directions and Next Steps

Background

1 Hotel Dieu Grace Hospital, Windsor
2 London Health Sciences Centre
3 Hamilton Health Sciences
4 St. Michael's Hospital, Toronto
5 Sunnybrook & Women's College Hospital, Toronto
6 Kingston General Hospital
7 The Ottawa Hospital
8 Sudbury Regional Hospial
9 Thunder Bay Regional Hospital

In Ontario:

- 14.5 million people over 1.076 million km2
- 40% of patients do not have access to a trauma centre within 60 minutes by land
- 15% were not within 60 minutes by air transport


Kenora (YQK)
Sioux Lookout (YXL)
Thunder Bay (YQT)
Moosonee (YMO)
Timmins (YTS)
Sudbury (YBS)
Ottawa (YOW/CCLA)
Peterborough (CCLA)
Toronto/GTA (YTZ/CCLA)
Chatham-Kent (CCLA)
London (YXU)

Field Trauma Triage Standard

STEP ONE
Physiological

Measure vital signs and level of consciousness

Glasgow Coma Scale	<14 with evidence of trauma or a traumatic mechanism
Systolic blood pressure	<90 mmHg
Respiratory rate	<10 or ≥30 breaths per minute or need for ventilatory support (<20 in infant aged <1 year)

YES

Take directly to a LTH if it is <30 minutes land ambulance transport time[1]. Steps 1 and 2 attempt to identify the most seriously injured patients. These patients should be transported preferentially to a LTH[2].

NO

Assess anatomy of injury.

STEP TWO

Anatomical

- All penetrating injuries[3] to head, neck, torso and extremities proximal to elbow or knee
- Chest wall instability or deformity (e.g. flail chest)
- Two or more proximal long-bone fractures
- Crushed, de-gloved, mangled or pulseless extremity
- Amputation proximal to wrist or ankle
- Pelvic fractures
- Open or depressed skull fracture
- Paralysis

YES

Take directly to a LTH if it is <30 minutes land ambulance transport time. Steps 1 and 2 attempt to identify the most seriously injured patients. These patients should be transported preferentially to a LTH[4].

NO

Assess mechanism of injury and evidence of high energy impact.

See page 2

Field Trauma Triage Standard

STEP THREE
Mechanism[5]

1) Falls
    a) Adults ≥6 metres (one story is equal to 3 metres)
    b) Children (age<15) ≥3 metres or two or three times the height of the child
2) High Risk Auto Crash
    a) Intrusion ≥0.3 metres occupant site; ≥0.5 metres any site, including the roof
    b) Ejection (partial or complete) from automobile
    c) Death in same passenger compartment
    d) Vehicle telemetry data consistent with high risk injury (if available)
3) Auto vs. pedestrian/bicyclist thrown, run over, or with significant (≥30 Km/h) impact
4) Motorcycle crash ≥30 Km/h

YES → Transport to a LTH. Patching with the base hospital physician is an option.

NO → Assess special patient or system considerations.

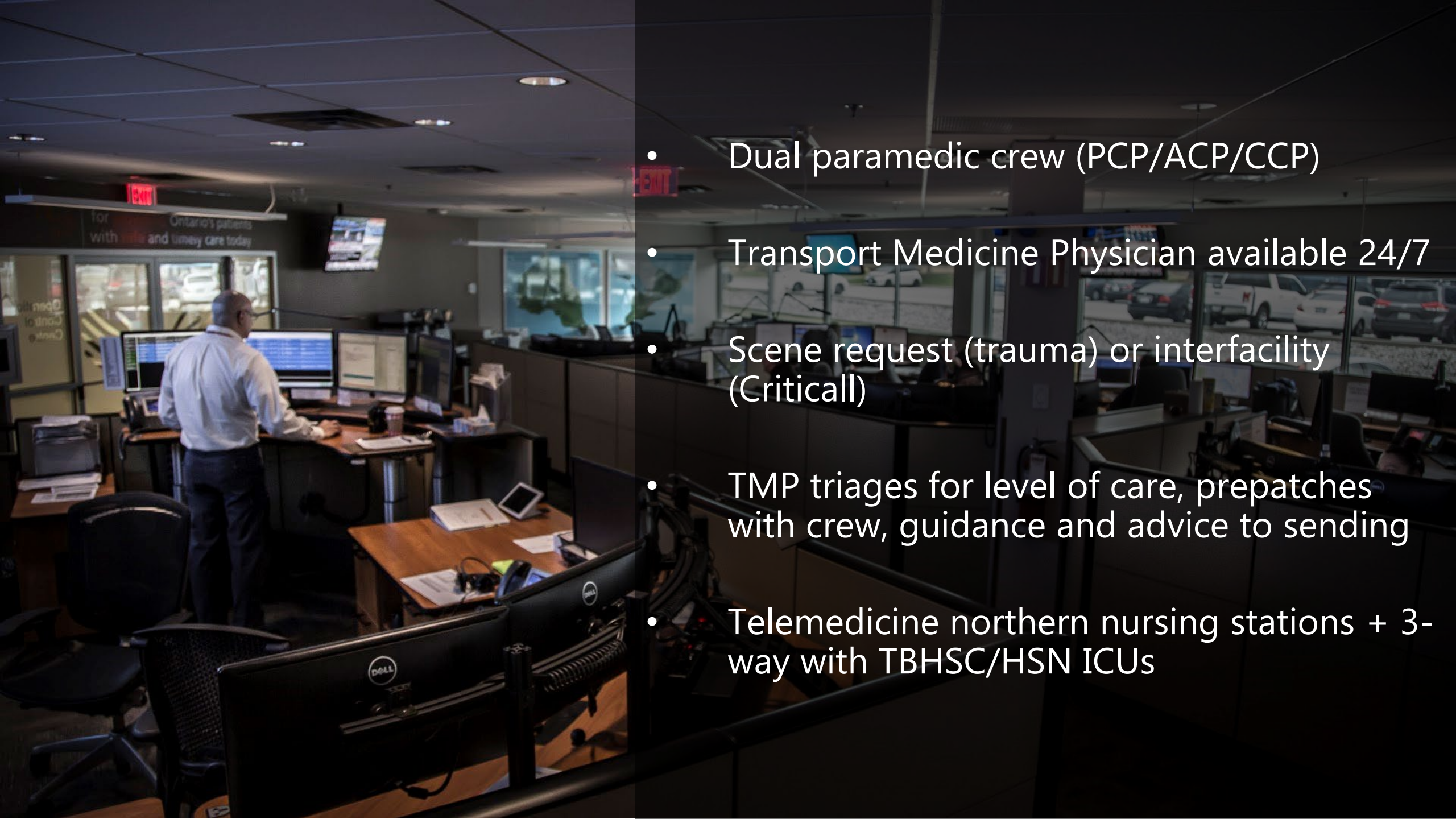
STEP FOUR

Special Consideration[5]

Air Ambulance Utilization Standard (AAUS)

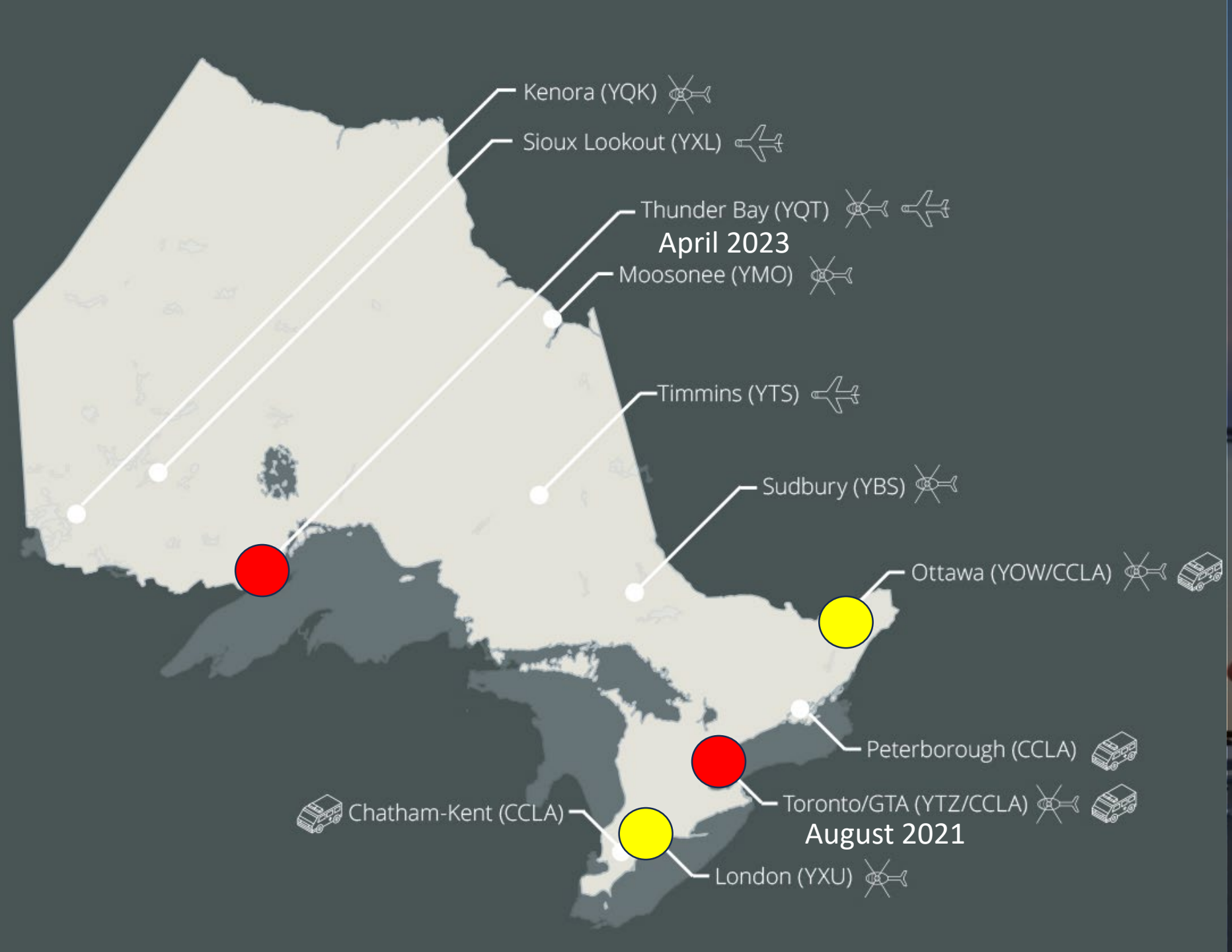
If more than 30 minutes drive, land paramedics to request an air ambulance (Ornge)

transport destination. Patching with the base hospital physician is an option.



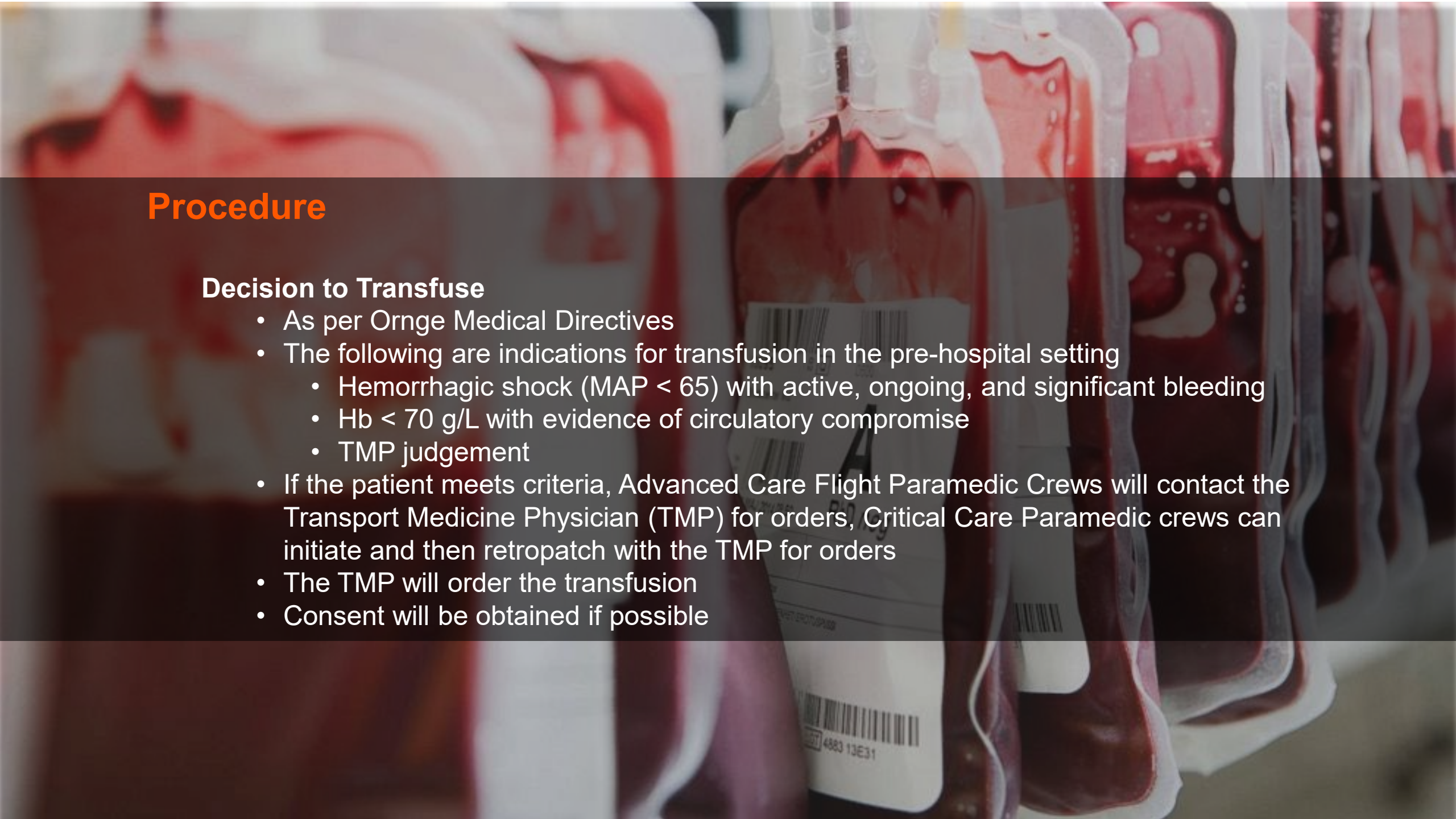
- Dual paramedic crew (PCP/ACP/CCP)
- Transport Medicine Physician available 24/7
- Scene request (trauma) or interfacility (Criticall)
- TMP triages for level of care, prepatches with crew, guidance and advice to sending
- Telemedicine northern nursing stations + 3-way with TBHSC/HSN ICUs

Blood on Board Program



- 2 units O-neg RBC
- 799: 50-60 patients transfused annually (virtually all trauma scene calls)
- 790/797: ~20 patients (50% trauma, 25% GI bleeds, 25% OB)

- Coolers prepared and delivered to Ornge bases by sponsoring transfusion medicine lab (SHSC/TBRHSC)
- Delivered 3x/week and PRN with use
- Always +1 extra cooler at base
- Internal temperature monitoring
- Program goal <1% wastage: meeting this target at both sites

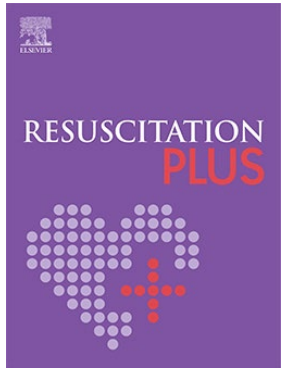


Procedure

Decision to Transfuse

- As per Ornge Medical Directives
- The following are indications for transfusion in the pre-hospital setting
  - Hemorrhagic shock (MAP < 65) with active, ongoing, and significant bleeding
  - Hb < 70 g/L with evidence of circulatory compromise
  - TMP judgement
- If the patient meets criteria, Advanced Care Flight Paramedic Crews will contact the Transport Medicine Physician (TMP) for orders, Critical Care Paramedic crews can initiate and then retropatch with the TMP for orders
- The TMP will order the transfusion
- Consent will be obtained if possible

CAN-PATT Network



Clinical paper

A descriptive analysis of the Canadian prehospital and transport transfusion (CAN-PATT) network

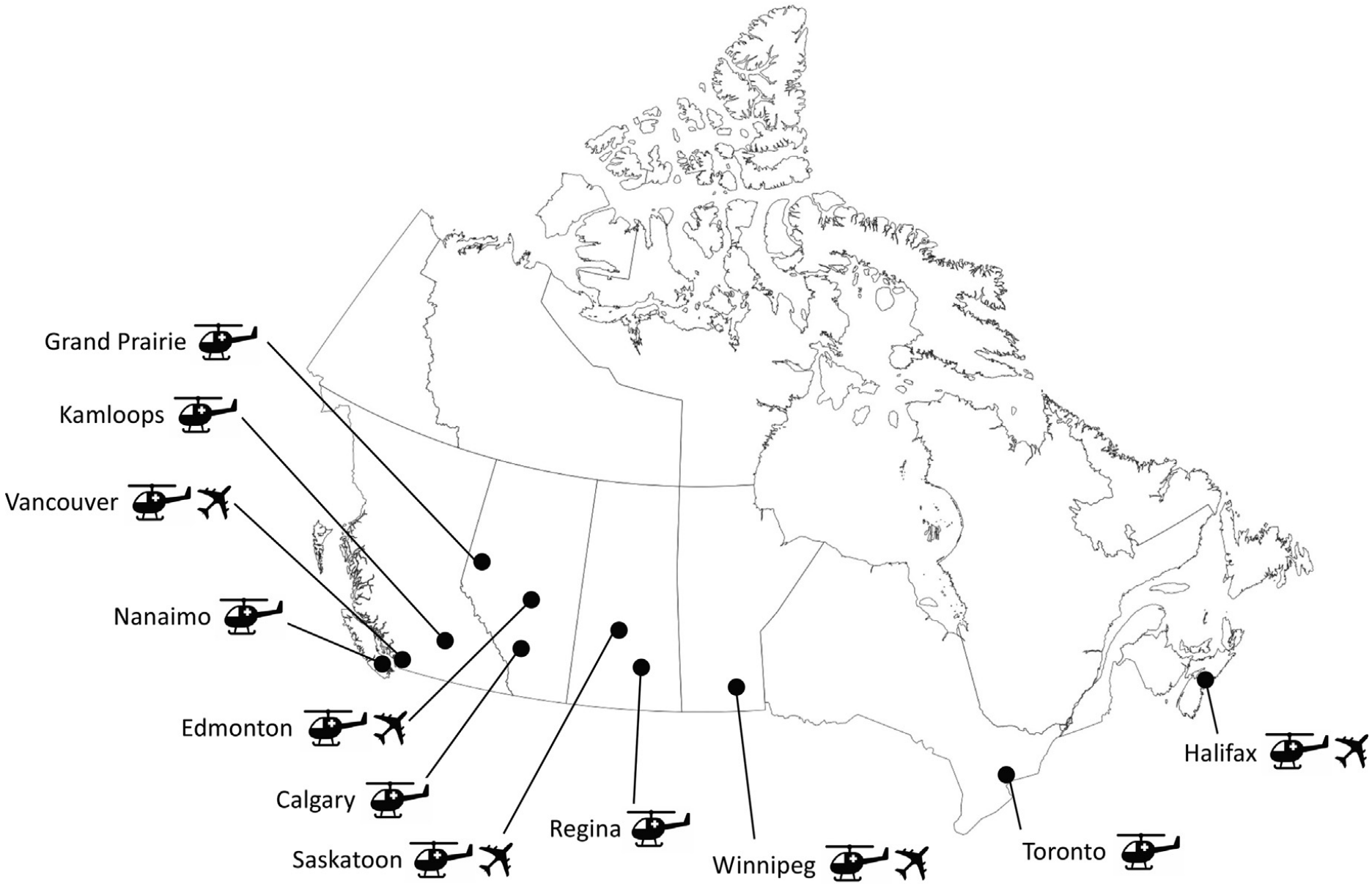

Grand Prairie
Kamloops
Vancouver
Nanaimo
Edmonton
Calgary
Saskatoon
Regina
Winnipeg
Toronto
Halifax

Table 3 - CAN-PATT out-of-hospital blood transfusion practices (by organization).

Organization	Start of OHBT program (year)	Annual transfusions [from OHBT only] (n, [% total patient calls])	Bases with OHBT program n (%)	Number of coolers per base	Blood products per cooler	Blood Group	Pharmacologic adjuncts used	Inventory exchange frequency	Internal cooler temperature monitoring	Method of cooler storage
Orange	2021	38 patients (<0.5%)	1 (7.1)	2	2 RBCs	O-negative, K-negative RBCs	TXA, Calcium	3 times/week	Yes	Room temperature
BCEHS	2019	26 patients (<0.5%)	3 (42.9)	2 (Vancouver)	2 RBC + 2 Plasma (Vancouver)	O-negative, K-negative RBCs; Group A Plasma	TXA, Calcium	2–3 times/ week	Yes	Cooler in pharmaceutical-grade fridge
				1 (Nanaimo, Kamloops)	2 RBC (Nanaimo, Kamloops)					
STARS Alberta	2014	102 patients (7.0%)	3 (100.0)	1	2 RBCs	O-negative, K-negative RBCs	TXA, Calcium	2 times/week	Yes	Room temperature
STARS Saskatchewan	2013	50 patients (3.3%)	3 (100.0)	2	2 RBCs per cooler + 3rd cooler with Fibrinogen Concentrate and PCC	O-negative, K-negative RBCs	TXA	3 times/week	Yes	Temperature controlled room
STARS Manitoba	2016	59 patients (4.7%)	2 (100.0)	3	2 RBCs per cooler + 3rd cooler with PCC	O-negative, K-negative RBCs	TXA	3 times/week	Yes	Room temperature
EHS LifeFlight	2020	17 patients (1.1%)	1 (100.0)	2	2 RBCs	O-negative, K-negative RBCs	TXA	3 times/week	Yes	Temperature controlled room

BCEHS: British Columbia Emergency Health Services, STARS: Shock Trauma Air Rescue Service, EHS: Emergency Health Services, TXA: tranexamic acid, RBC: red blood cells, PCC: prothrombin complex concentrate.

Table 4 – CAN-PATT indications for initiation of blood transfusion (by organization).

Organization	Defined trigger for transfusion
Ornge	Suspected or confirmed hemorrhage of traumatic etiology AND MAP < 65 or Hb < 70 or with physician order
BCEHS	Suspected or confirmed hemorrhage of traumatic etiology AND a EBTN score > 5; Suspected or confirmed hemorrhage of non-traumatic etiology AND signs of shock OR a Hb < 70 g/L
STARS Alberta	Clinically significant haemorrhage with any of 1) shock index $\geq$ 1.2, 2) Lactate $\geq$ 4, 3) Hb < 90
STARS Saskatchewan	Clinically significant haemorrhage with any of 1) shock index $\geq$ 1.2, 2) Lactate $\geq$ 4, 3) Hb < 90
STARS Manitoba	Clinically significant haemorrhage with any of 1) shock index $\geq$ 1.2, 2) Lactate $\geq$ 4, 3) Hb < 90
EHS LifeFlight	Known or suspected hypovolemic shock related to acute blood loss

BCEHS: British Columbia Emergency Health Services, STARS: Shock Trauma Air Rescue Service, EHS: Emergency Health Services, MAP: mean arterial pressure, Hb: hemoglobin, EBTN: early blood transfusion needs.

cmajOPEN

Research

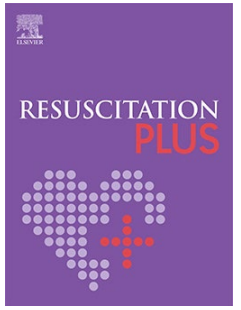
Development of a national out-of-hospital transfusion protocol: a modified RAND Delphi study

Johannes von Vopelius-Feldt MD PhD, Joel Lockwood MD, Sameer Mal MD, Andrew Beckett MD MSc, Jeannie Callum MD, Adam Greene MSc, Jeremy Grushka MD MPH, Aditi Khandelwal MD, Yulia Lin MD, Susan Nahirniak MD, Katerina Pavenski MD, Michael Peddle MD, Oksana Prokopchuk-Gauk MD, Julian Regehr MD, Jo Schmid BScN RN, Andrew W. Shih MD MSc, Justin A. Smith, Jan Trojanowski MD, Erik Vu MD, Markus Ziesmann MD, Brodie Nolan MD MSc

17 Subject Experts

39 statements were agreed on:

General oversight and clinical governance, Storage and transport of blood components and products, Initiation of OHT, Types of blood components and products, Delivery and monitoring of OHT, Indications for and use of hemostatic adjuncts, Resuscitation targets of OHT



Clinical paper

A comparative analysis of current out-of-hospital transfusion protocols to expert recommendations

Survey across CAN-PATT + Évacuations aeromedicales du Quebec (EVAQ)

Overall 89% adherence to 39 expert statements from Delphi study

Future Directions and Next Steps

LiTES

Linking Investigations in Trauma and Emergency Services

Task Order 0007

Type O Whole blood and assessment of AGE during prehospital Resuscitation (TOWAR) Trial

- 2u LrWB vs. standard care
- Primary outcome: 30d mortality

SWIFT

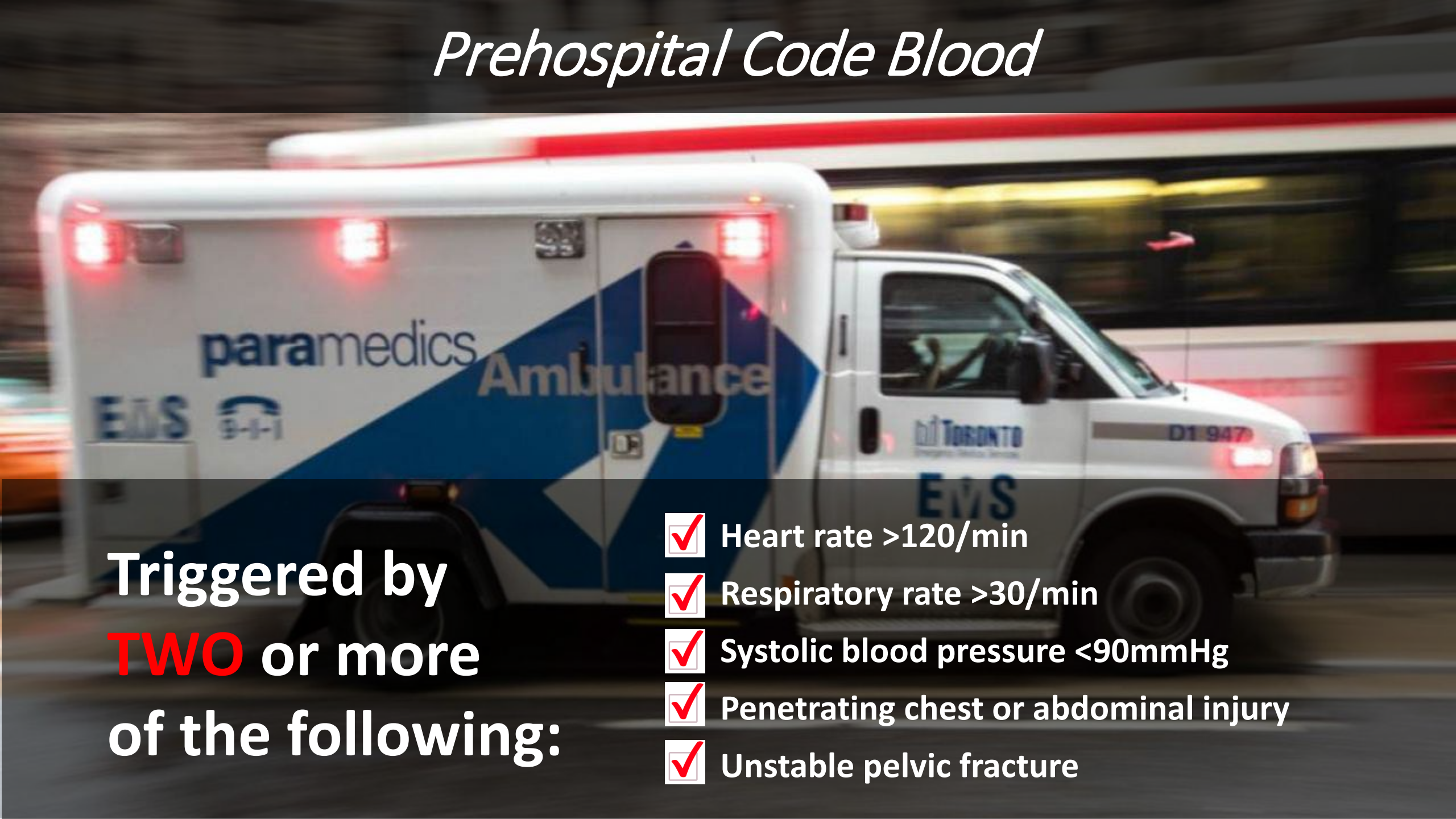
Study of Whole blood In Frontline Trauma

- 2u LrWB vs. 2u RBC + 2u plasma
- Primary outcome: composite outcome of 24h mortality OR need for massive transfusion

- Awaiting decision on funding and which study to participate in
- Tentative plan for go-live **Spring 2024**

- Coordinating with Canadian Blood Services (currently do not manufacture LrWB for civilian use)

Prehospital Code Blood



Triggered by TWO or more of the following:

- ☑ Heart rate >120/min
- ☑ Respiratory rate >30/min
- ☑ Systolic blood pressure <90mmHg
- ☑ Penetrating chest or abdominal injury
- ☑ Unstable pelvic fracture

Questions + Discussion

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