IRC 2021

CONGRESSO NAZIONALE

16•17•18 DICEMBRE

NUOVE LINEE GUIDA 2021: RIANIMAZIONE CARDIOPOLMONARE POST-LOCKDOWN

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Arresto cardiaco traumatico – la rete

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Conflict of interest

- Nothing to declare

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Objectives

- Traumatic cardiac arrest epidemiology and characteristics
- Pathophysiology and Frequently missed injuries
- The need for a TCA network
- Additional basic and advanced interventions
- Our algorithm

Traumatic cardiac arrest – an overview

- Up to 10% of CA cases
- Low survival– 1.5 – 2.6% → 6.6 - 9.7% in modern trauma systems
- 70% fatalities in prehospital settings

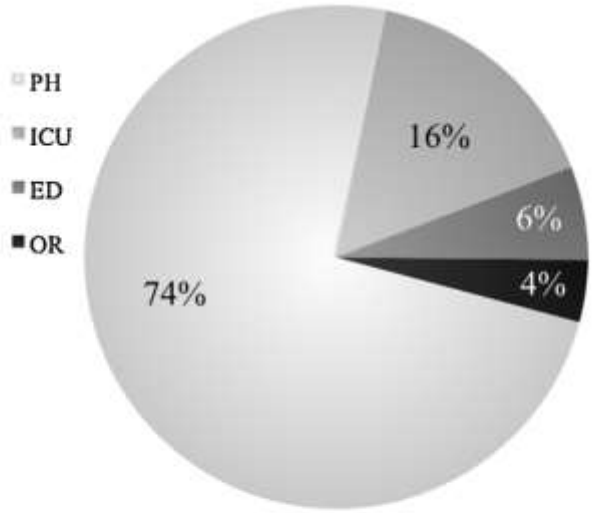
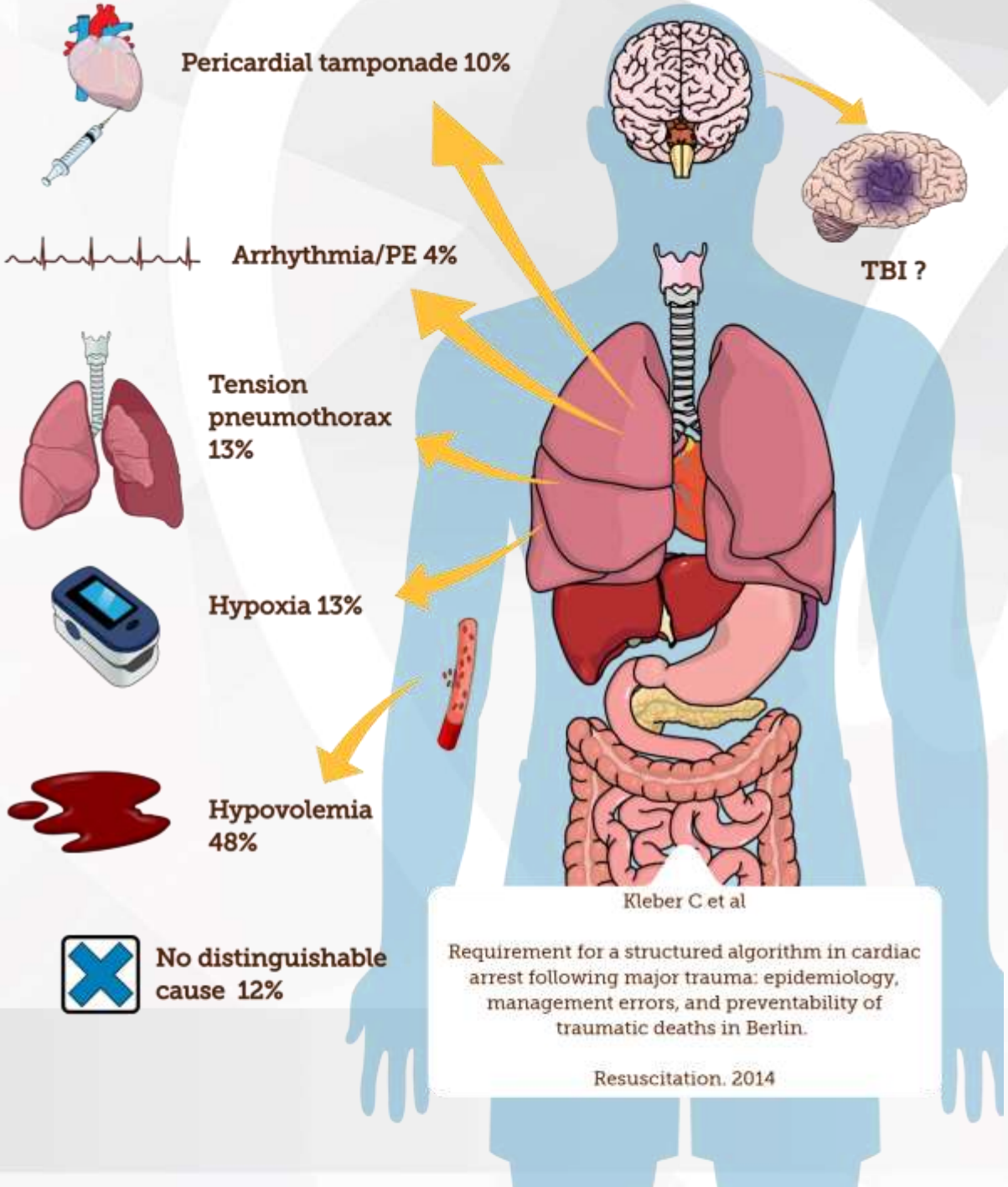


Fig. 1. Localization of death after tCPR. 74% die before reaching a hospital. After hospital admission, ICU is the predominant localization of death. PH = prehospital ($n = 75$), ICU = intensive care unit ($n = 16$), ED = emergency department ($n = 6$), OR = operating room ($n = 4$).

Traumatic CA Networks

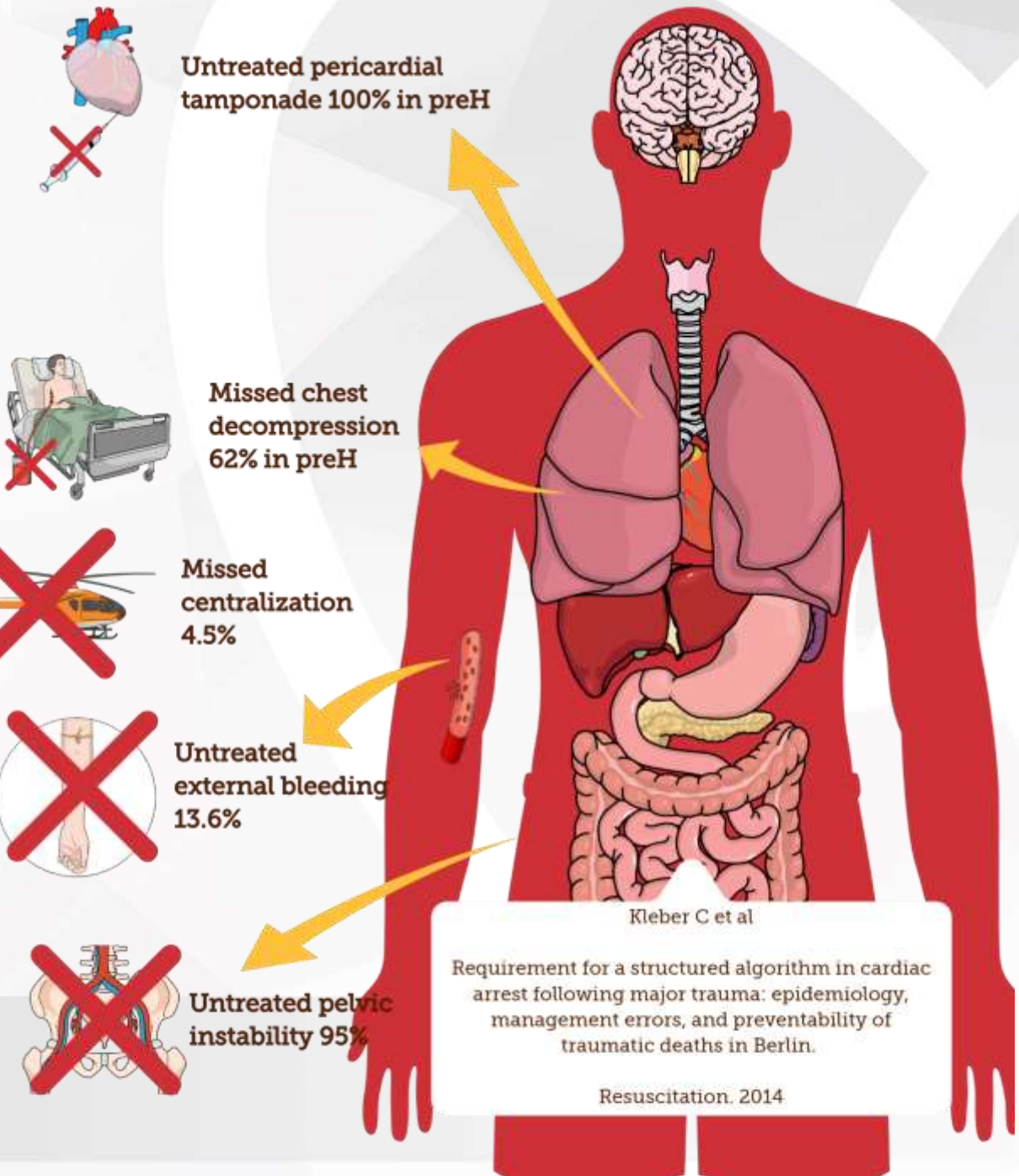
- TCA richiede un trattamento multidisciplinare
- Riconoscimento e trattamento precoce delle lesioni colpevoli
- Centralizzazione

Culprit lesions



Management errors

- Management errors: 73% of cases
- Need for a standardized algorithm
- Need for an established trauma network



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TCA algorithms

Table 2 – Clinical findings and out-of-hospital interventions in EMS-treated traumatic OHCA cases across the control and intervention periods.

	Overall n = 490	Control period n = 341	Intervention period n = 149	p-value	Missing
Clinical findings on arrival at scene, n (%)					
Pulse > 100/min	186 (38.9)	125 (38.0)	61 (40.9)	0.54	12 (2.5)
Systolic blood pressure < 90 mmHg	318 (70.0)	223 (72.2)	95 (65.5)	0.15	36 (7.4)
Respiratory rate > 23/min	123 (26.0)	80 (24.4)	43 (29.5)	0.25	16 (3.3)
GCS < 9	323 (67.3)	235 (71.0)	88 (59.1)	0.01	10 (2.0)
Clinical findings on arrival at hospital, n (%)[a]					
Pulse > 100/min	51 (58.6)	34 (54.8)	17 (68.0)	0.26	5 (5.4)
Systolic blood pressure < 90 mmHg	43 (51.2)	28 (47.5)	15 (60.0)	0.29	8 (8.7)
Respiratory rate > 23/min	8 (9.1)	5 (7.9)	3 (12.0)	0.55	4 (4.4)
GCS < 9	83 (94.3)	59 (93.7)	24 (96.0)	0.67	4 (4.4)
Pre-arrest interventions, n (%)					17 (3.5)
Airway clearance	149 (31.5)	99 (30.2)	50 (34.5)	0.35	
Supraglottic airway	40 (8.5)	13 (4.0)	27 (18.6)	<0.001	
Endotracheal intubation	94 (19.9)	67 (20.4)	27 (18.6)	0.65	
Needle thoracostomy	210 (44.4)	134 (40.9)	76 (52.4)	0.02	
Finger thoracostomy	21 (4.4)	2 (0.6)	19 (13.1)	<0.001	
External haemorrhage control	106 (22.4)	59 (18.0)	47 (32.4)	0.001	
IV/IO access	283 (59.8)	197 (60.1)	86 (59.3)	0.88	
Crystalloid administration	257 (54.3)	177 (54.0)	80 (55.2)	0.81	
Blood administration	38 (8.0)	12 (3.7)	26 (17.9)	<0.001	
Spinal motion restriction	233 (49.3)	169 (51.5)	64 (44.1)	0.14	
Splinting[b]	112 (23.7)	56 (17.1)	56 (38.6)	<0.001	
Sedation, paralysing, and/or pain relief agents[c]	139 (29.4)	84 (25.6)	55 (37.9)	0.007	
Intra-arrest interventions, n (%)					17 (3.5)
CPR[d]	445 (92.3)	315 (94.0)	130 (88.4)	0.03	
Airway clearance	78 (16.5)	48 (14.6)	30 (20.7)	0.10	
Supraglottic airway	70 (14.8)	29 (8.8)	41 (28.3)	<0.001	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Epinephrine administration	335 (70.8)	242 (73.8)	93 (64.1)	0.03	
Needle thoracostomy	200 (42.3)	140 (42.7)	60 (41.4)	0.79	
Finger thoracostomy	36 (7.6)	3 (0.9)	33 (22.8)	<0.001	
External haemorrhage control	13 (2.8)	7 (2.1)	6 (4.1)	0.22	
IV/IO access	145 (30.7)	98 (29.9)	47 (32.4)	0.58	
Crystalloid administration	183 (38.7)	127 (38.7)	56 (38.6)	0.98	
Blood administration	44 (9.3)	9 (2.7)	35 (24.1)	<0.001	
Spinal motion restriction	15 (3.2)	12 (3.7)	3 (2.1)	0.36	
Splinting[b]	47 (9.9)	17 (5.2)	30 (20.7)	<0.001	

Alqudah Z et al.
Survival outcomes in emergency medical services witnessed traumatic out-of-hospital cardiac arrest after the introduction of a trauma-based resuscitation protocol.
Resuscitation. 2021

In this study, we aimed to examine the impact of a trauma-based resuscitation protocol on survival outcomes after EMS-witnessed traumatic OHCAs in Victoria, Australia. Also, we investigated the frequency and timing of EMS interventions before and after the implementation of this treatment protocol.

The trauma-based resuscitation protocol was not associated with survival to hospital discharge (AOR 1.29, 95% CI: 0.51–3.23), event survival (AOR 0.72, 95% CI: 0.41–1.28) or pre-hospital ROSC (AOR 0.63, 95% CI: 0.39–1.03).

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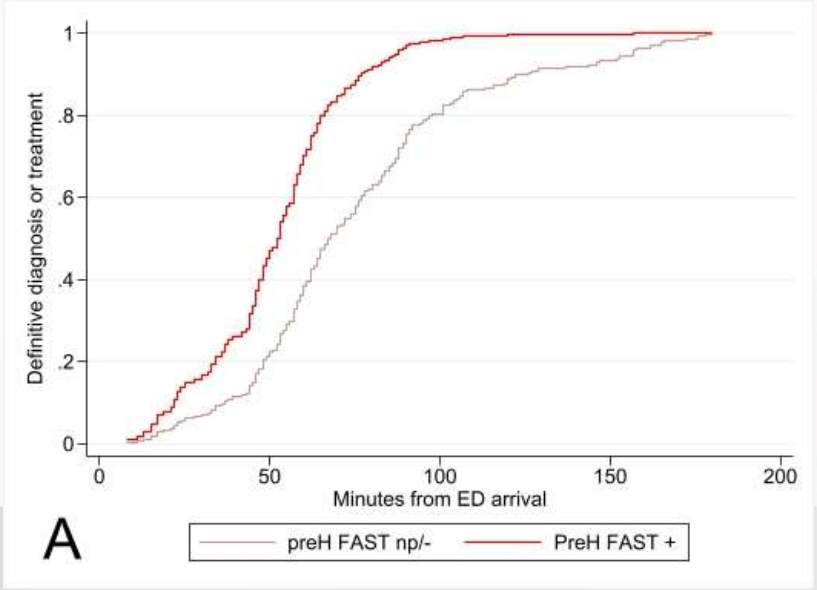
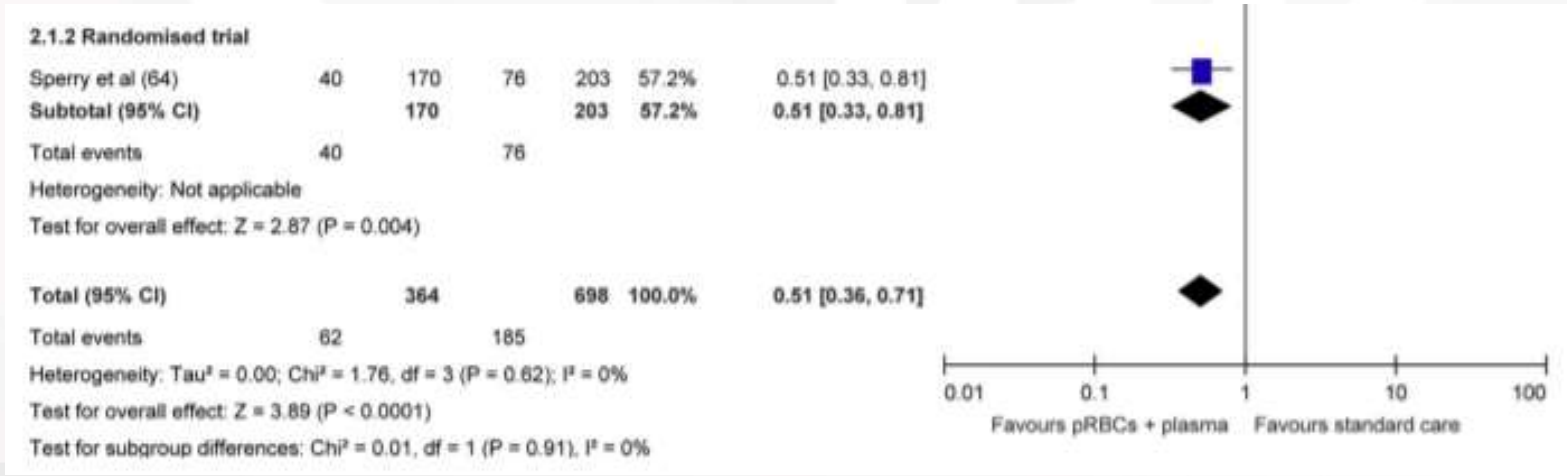
OTHER BASIC INTERVENTIONS

Prehospital EFAST



PreH Blood transfusions



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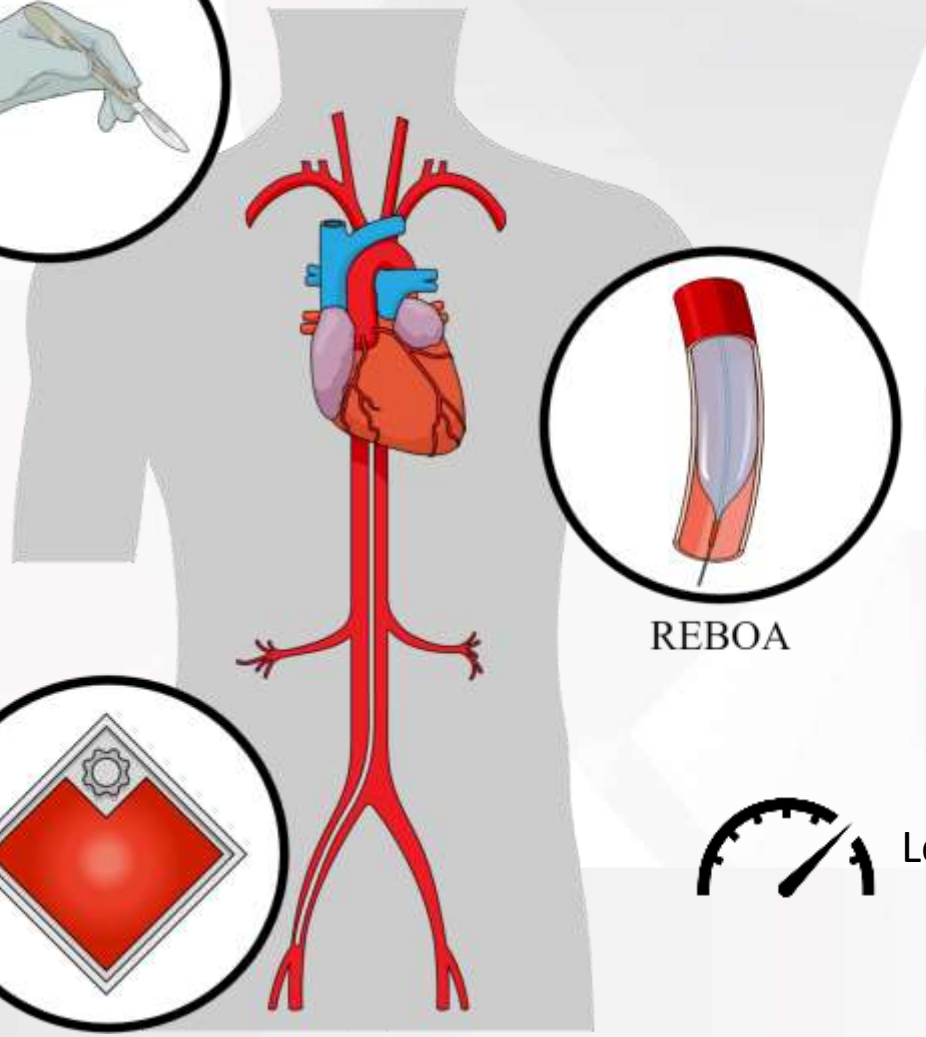
Advanced interventions

Resuscitative thoracoctomy



REBOA

ECMO

Level of evidence: low

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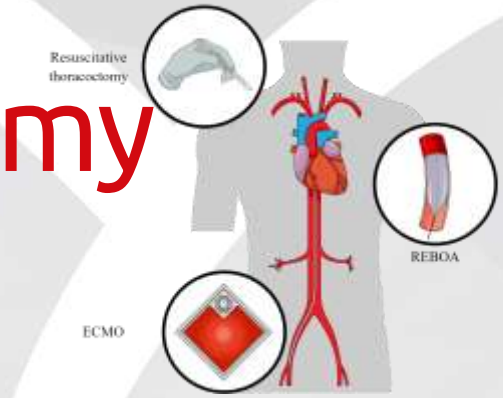
Resuscitative thoracotomy



Moore HB et al.
Establishing Benchmarks for Resuscitation of Traumatic Circulatory Arrest: Success-to-Rescue and Survival among 1,708 Patients. J Am Coll Surg. 2016 Jul.

- Advantages
  - Direct access to pericardium and heart
  - Direct access to major toracic vessels
  - Aortic cross clamp
- Disadvantages
  - Technically difficult
  - Difficult to translate into the prehospital environment
- Accepted indications
  - Penetrating torso trauma < 15 min CPR
  - Penetrating trauma to neck or extremity < 5 min CPR
  - Blunt trauma < 10 minutes CPR
  - Peri-arrest state in patients with chest injuries refractory to resuscitation

Penetrating trauma
- 35% survival for cardiac wounds
- 14% other penetrating injuries

Blunt trauma
- 2 -> 14% blunt trauma

Setting: In hospital (ED/OR)

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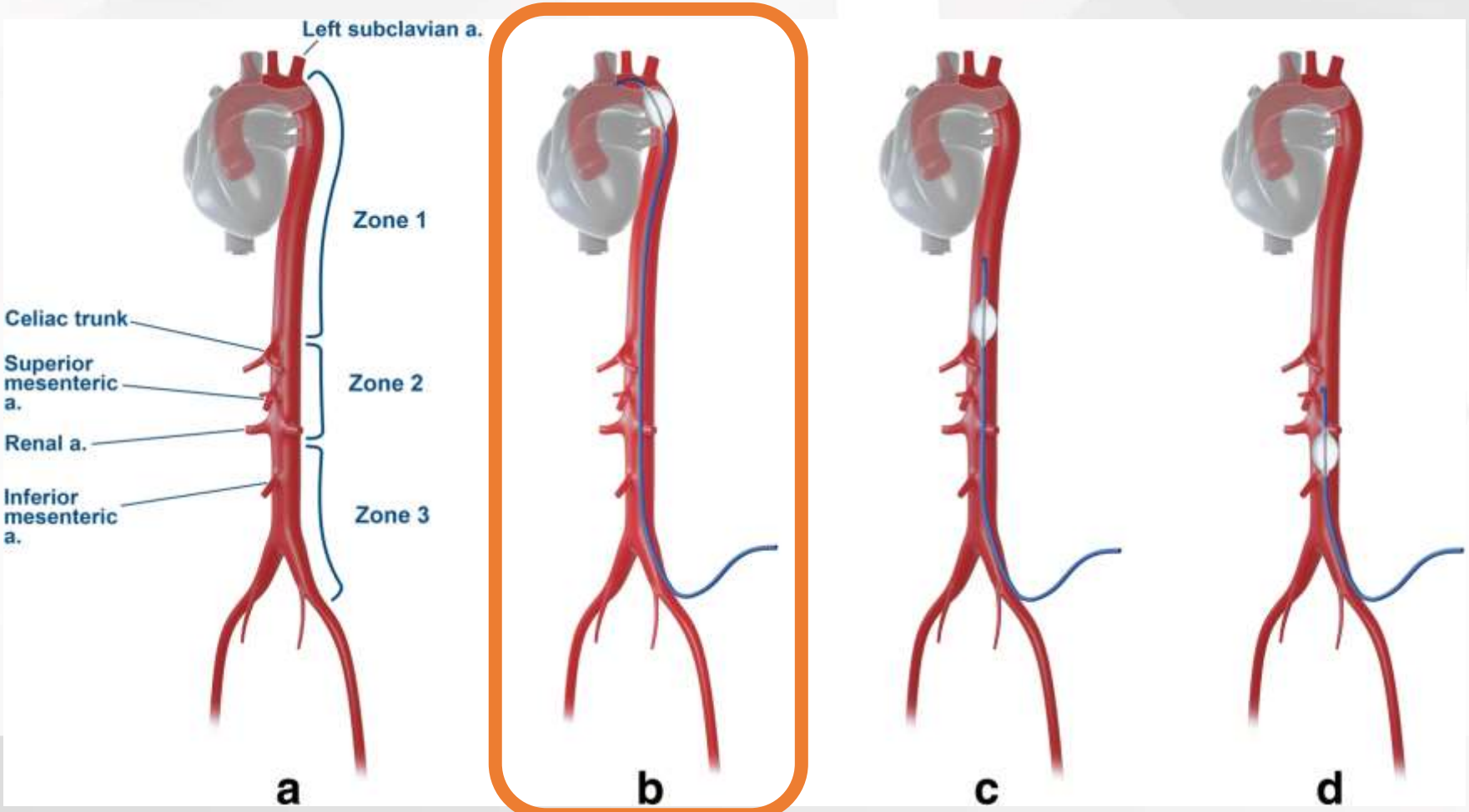
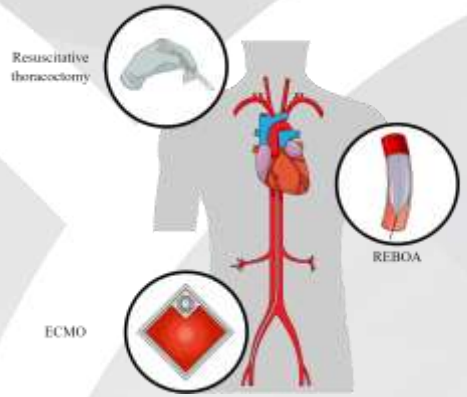
REBOA

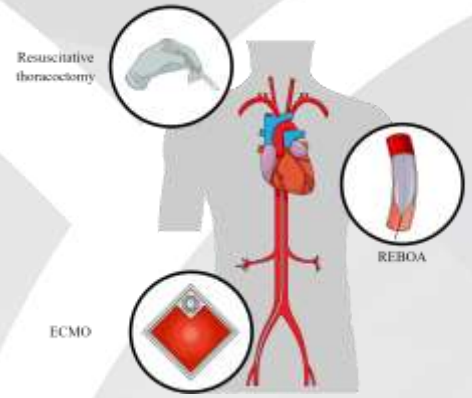




In hospital (ED)

HEMS/EMS

REBOA



Yamamoto et al.
Resuscitative endovascular balloon occlusion of the aorta and traumatic out-of-hospital cardiac arrest: A nationwide study.
J Am Coll Emerg Physicians Open. 2020 Jul 4

- Advantages
  - Technically easy
  - Prehospital application (EMS and HEMS) --> early positioning
  - Very useful for exanguinating lesions of the lower extremities and pelvis

- Disadvantages
  - Inability to directly treat the lesions
  - Unuseful for cardiac and intrathoracic lesions
  - Risk of damage to Aorta and large vessels

TABLE 3 Survival to discharge in sensitivity analyses

	Survival to discharge, % (95% CI)			
	REBOA	RT	OR	95% CI
IPW with restriction (0.1–0.9 of PS)	3.4 (1.7–5.1)	0.5 (0.0–1.2)	7.18	1.62–31.77
Generalized estimating equation			4.70	1.55–14.25

CI, confidence interval; IPW, inverse probability weighting; OR, odds ratio; PS, propensity score; REBOA, resuscitative endovascular balloon occlusion of the aorta; RT, resuscitative thoracotomy.

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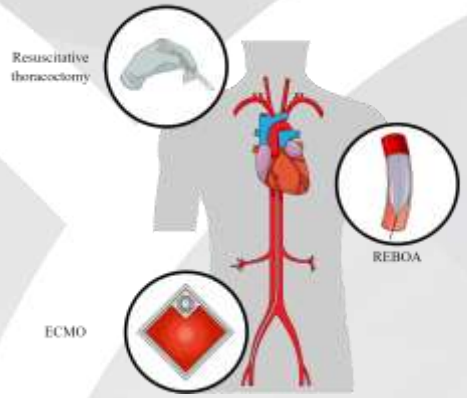
ECMO



- Extremely limited use
  - Isolated cardiac lesions
  - Post-traumatic cardiopulmonary failure
- Configurations: both V-A and V-V

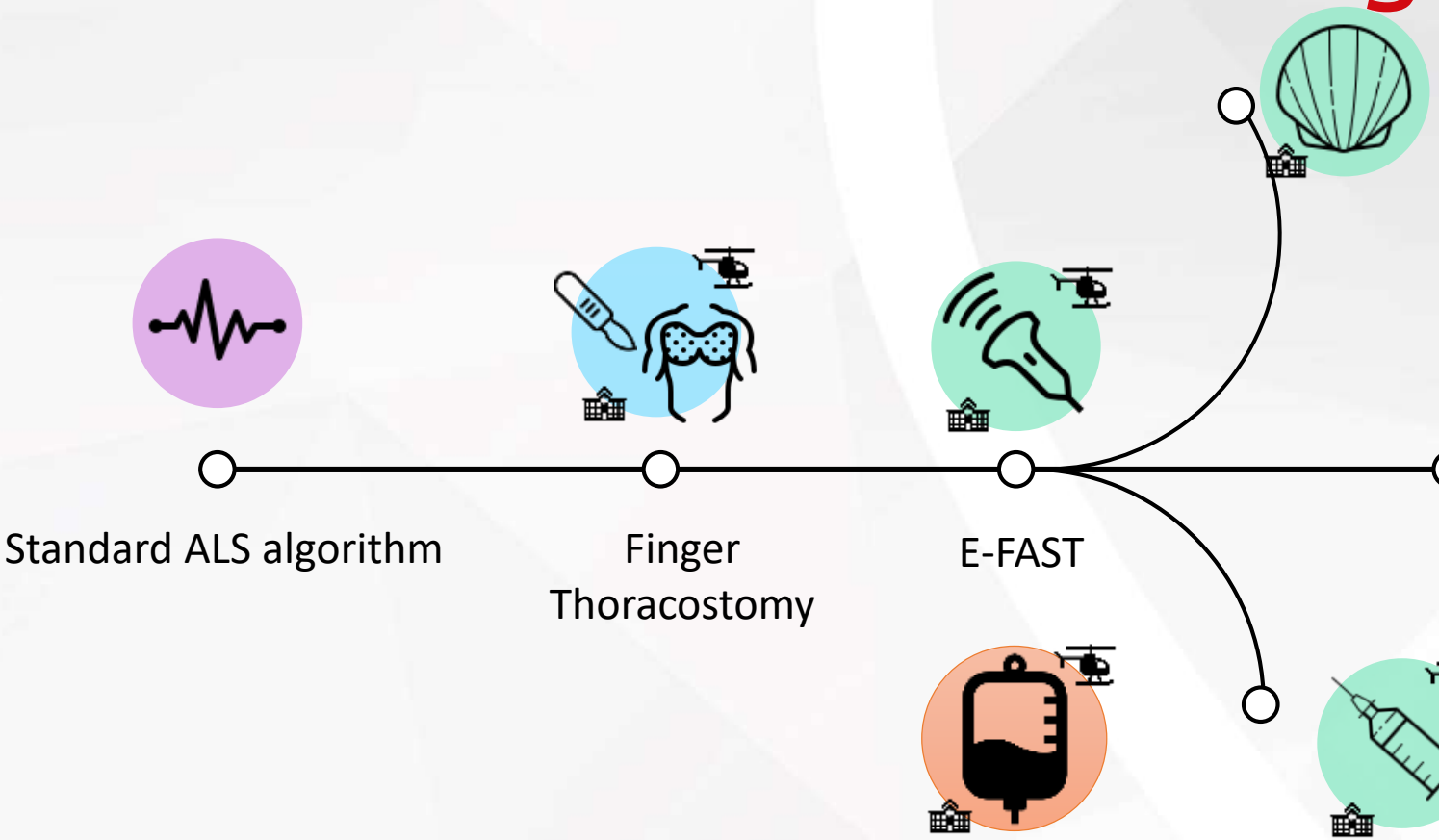
Lee et al.
Penetrating cardiac trauma and the use of emergent extracorporeal membrane oxygenation and therapeutic hypothermia: When cooler heads prevail. *T Trauma Case Rep*. 2015;1(9-12):95-98. Published 2015 Nov 27. doi:10.1016/j.tcr.2015.10.011

Conclusions

ECMO has been gradually utilized in a lifesaving capacity in severe trauma patients, and the feasibility and advantages of this technique are becoming widely accepted. The safety and effectiveness of ECMO in trauma require further study. Several problems with ECMO in trauma, including the role of VA-ECMO, the time to institute ECMO, and the anticoagulation strategy remain controversial and must be solved in future studies.

Wang, C., Zhang, L., Qin, T. et al. Extracorporeal membrane oxygenation in trauma patients: a systematic review. World J Emerg Surg 15, 51 (2020).

Our resuscitation algorithm



Resuscitative thoracotomy

- Penetrating torso trauma < 15 min CPR
- Penetrating trauma to neck or extremity < 5 min CPR
- Blunt trauma < 10 minutes CPR
- Peri-arrest state in patients with chest injuries refractory to resuscitation

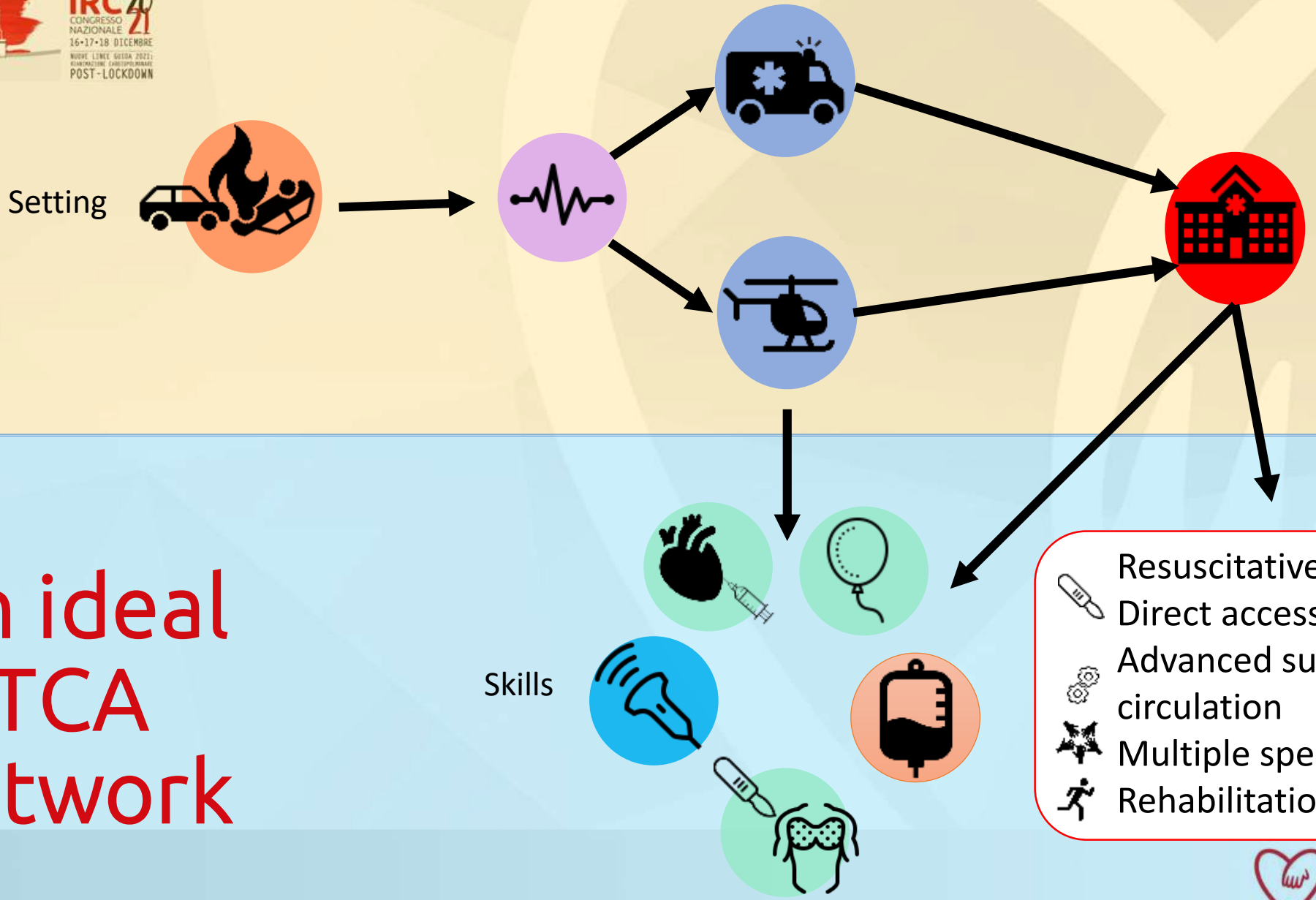
Zone1 REBOA

Pericardiocentesis

- Pericardial effusion +++

Prehospital transfusion

An ideal TCA network



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