

Introduction and aims

The PICU at the Royal Hospital for Children Glasgow (RHCG) has defined:

- Cardiac arrest: an episode “requiring CPR ± adrenaline ± supplementary resuscitation drugs/measures”.
- Peri-arrest: an episode in which there is “profound cardiovascular decompensation but because of resuscitative measures, i.e. rapid fluid bolus and 1:100,000 adrenaline, prevented a loss of cardiac output and requirement for CPR”.

In this audit, we explored the incidence and outcomes of, as well as the relationship between, cardiac arrests and peri-arrests in children in the PICU over the last 5 years.

Methods

- This was a single centre retrospective audit encompassing patients over 5 years (from 10/09/2018 to 15/05/2022).
- Patients with an event were initially identified from our daily PICU dashboard and then manually verified through a search of the patient’s records.
- We analysed the incidence of peri-arrests and cardiac arrests, the duration between first and second events, and outcomes after the said events, which were whether the patient survived, was put on extracorporeal membrane oxygenation (ECMO), or unfortunately died (all within 30 days of the event).

Results

- The combined incidence of peri-arrests and cardiac arrests was 4.45% (n=134).
- 26.4% (n=28) proceeded to have a second event.
- Patients were more likely to suffer from another cardiac arrest if their first episode was also a cardiac arrest.
- The median duration between any two events was 3 days.
- Single event mortality was higher in patients who had a cardiac arrest (31.5%) compared to those who had a peri-arrest (11.5%).
- In patients who had two events, mortality was higher in those with two peri-arrest episodes (57.1%).
- Patients who had a cardiac arrest were more likely to be put on ECMO, but they also had higher mortality rates.

Discussion

Recognising the potential for second events to occur and the general timeframe between events can provide insight into possible interventions. The use of warning tools, team huddles, and bedside signs have been shown to significantly reduce incidence of CPR and associated mortality. events.

There are several limitations in this study.

- Some events reported on the dashboard did not meet the criteria for peri-arrests or cardiac arrests.
- It was difficult to determine the exact timing of some events.

The audit poses new questions as well, in particular, how long after the primary event should the second event be considered as related, and whether the same interventions can be applied to both peri-arrests and cardiac arrests.

Conclusion

In summary, we report a significant increase in mortality after a second event, which emphasises the importance of prevention. We plan to use this data to implement a quality improvement process aiming to improve situation awareness.

Incidence of peri-arrests and arrests in the PICU over the last 5 years				
	Dashboard	1st event	2nd event	Total
Peri-arrests	86	52	15	67
Cardiac arrests	82	54	13	67
Total	168	106	28	134
Total number of patients in the PICU	2223			
Total number of admissions to the PICU	3008			

Number that progress to 2nd event				
	2nd event			
1st event	Peri arrest		Cardiac arrest	
Peri-arrest (n=52)	7	13.5%	3	5.8%
Cardiac arrest (n=54)	8	14.8%	10	18.5%

Duration between 1st and 2nd event (mean & median) (days)						
1st event	2nd event					
	Peri-arrest		Cardiac arrest		Either	
Peri-arrest	4.248028571	3.3889	29.4201	12.7083	11.79965	4.3507
Cardiac arrest	10.64193	2.3559	35.1118103	1.8906	24.23630794	2.18055
Either					19.79464439	3.22395

Outcomes after 1st events					
1st event	n	Outcome			
		Death		Survived	
Peri-arrest	52	6	11.5%	46	88.5%
Cardiac arrest	54	17	31.5%	37	68.5%
Total	106	23	21.7%	83	78.3%

ECMO outcomes after 1st events							
1st event	n	Outcome					
		ECMO		ECMO Mortality		ECMO Survived	
Peri-arrest	52	9	17.3%	4	44.4%	5	55.6%
Cardiac arrest	54	16	29.6%	9	56.3%	7	43.8%
Total	106	25	23.6%	13	52%	12	48%

Outcomes in patients with 2 events						
Event		n	Outcome			
1st event	2nd event		Death		Survived	
Peri-arrest	Peri-arrest	7	4	57.1%	3	42.9%
Peri-arrest	Cardiac arrest	3	0	0.0%	3	100.0%
Cardiac arrest	Peri-arrest	8	2	25.0%	6	75.0%
Cardiac arrest	Cardiac arrest	10	5	50.0%	5	50.0%
Total		28	11	39.3%	17	60.7%

ECMO outcomes in patients with 2 events							
Event		n	Outcome				
1st event	2nd event		ECMO		ECMO Mortality		ECMO Survived
Peri-arrest	Peri-arrest	7	0	0%	0	0%	0
Peri-arrest	Cardiac arrest	3	0	0%	0	0%	0
Cardiac arrest	Peri-arrest	8	0	0%	0	0%	0
Cardiac arrest	Cardiac arrest	10	2	20%	2	100%	0
Total		28	2	7.1%	2	100%	0