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Letter to the Editor

High-fidelity simulation training with PPE may optimise resuscitation outcomes in the COVID-19 era

To the Editor,

We previously reported that high-fidelity simulation training in cardiopulmonary resuscitation (CPR) could identify weaknesses in pre-coronavirus disease 2019 (COVID-19) Code Blue (CB) practices.[1] Importantly, donning of personal protective equipment (PPE) may delay CPR thus worsening patient outcomes.[2,3] To that end, we sought to determine the effect of our high-fidelity COVID-19 CPR simulation training (CPR-HFST) within our centre on clinical practice.

We conducted a retrospective review of CB events in a 1000-bedded acute care hospital, pre- and intra-pandemic. Onset of the pandemic was taken as the 4th February 2020 - date of the first local COVID-19 case and implementation of a modified CB pandemic protocol; full PPE, powered air-purifying respiratory (PAPR) and McGrath® video laryngoscope. Ethical approval was granted. Cases from 1 st May 2019 to 3rd February 2020 served as pre-pandemic controls. Cases from 4 February 2020 to 30 October 2020 were the intra-pandemic test group. Data collection periods were identical (approximately 9 months pre- and post- 4th February 2020). CPR-HFST commenced in January 2020. The primary objective was to determine pre- and intra-pandemic response times. Response time was defined as the time our switchboard sent out CB notifications until the arrival of the CB team by the bedside. Intubation times, patient outcomes quantified by CB survival rates and the Cerebral Performance Category (CPC) score, and the incidence of healthcare worker (HCW) infection were our secondary objectives. The Charlson Comorbidity Index (CCI) score was used to stratify patients with similar comorbidities. When CCI scores were evaluated against CB episode survival, our dataset demonstrated the Youden index was CCI $>$ 10. Therefore, this was used to distinguish patients with high and moderate-to-low pre-morbid risks. Data were not normally distributed; two-tailed Chi-square tests and Mann–Whitney tests were used for statistical comparisons, alpha = 0.05.

158 CB events were reviewed (74 intra-pandemic, 84 pre-pandemic). The median response time was longer intra-pandemic compared to pre-pandemic; 4.0 min. (IQR: 3–5) vs. 3.0 min. (IQR:1–4), p = 0.0007. Cardiac rhythms were asystole (25.5%), pulseless electrical activity (53.8%), ventricular tachycardia (5.7%), and

Table 1 – Pre-pandemic and intra-pandemic summary of results.

Time taken for CB response (mins)

Parameter	Pre-pandemic group (N = 84)	Intra-pandemic group (N = 74)	p-value
Code blue team response time: median (IQR)	3.0 min. (1.0–4.0)	4.0 min. (3.0–5.0)	**0.0007**
Survival rates and per-morbid risks			
Parameter	Pre-pandemic group (N = 62)	Intra-pandemic group (N = 42)	p-value
Survival rates in CB events, total	59.7%	71.4%	0.22
High risk patients (CCI $>$ 10)	36.4%	85.7%	0.07
Non-high risk patients (CCI $\leq$ 10)	64.7%	68.6%	0.71
Survival rates to hospital discharge, total	14.1%	21.4%	0.33
High risk patients (CCI $>$ 10)	18.5%	19.0%	1.00
Non-high risk patients (CCI $\leq$ 10)	10.8%	23.8%	0.26
CPC Score, median (IQR)	5 (5–5)	5 (5–5)	0.12
Survival rates and laryngoscopy methods			
Parameter	Direct laryngoscope (N = 20)	Video laryngoscope (N = 59)	p-value
Survival rates, total	55.0%	66.1%	0.38
High risk patients (CCI $>$ 10)	50.0%	77.8%	0.49
Non-high risk patients (CCI $\leq$ 10)	55.6%	64.0%	0.53

ventricular fibrillation (11.3%). 67.1% (106/158) of patients required CPR, of which, 88.7% (94/106) were intubated. There were no significant difference in the median intubation times pre- and intra-pandemic; 12.0 min. (IQR:5–13) vs. 11.0 min. (IQR:4–12) respectively, $p = 0.89$. Difficulties in auscultation, HCW communication, and reduced peripheral vision were experienced as previously reported with PAPR use.[4] Survival to hospital discharge were similar pre- and intra-pandemic; 14.1% vs. 21.4% respectively, $p = 0.33$. We did not find any significant differences in CB survival rates and CPC scores pre- and intra-pandemic (Table 1). There were no HCW infections.

Survival rates to hospital discharge of all patients requiring in-hospital CPR may be lower intra-pandemic than pre-pandemic; Miles et al. (2020) reported 3.2% vs 12.8% respectively, $p < 0.01$.[5] These estimates were significantly different compared to our intra-pandemic cohort (3.2% vs. 21.4%, $p < 0.01$) but not in our pre-pandemic cohort (12.8% vs. 14.1%, $p = 0.82$). Reasons for the differences are likely multifactorial. Nonetheless, in our experience and data, we believe CPR-HFST prevents deterioration in the standards of care and may help in optimising CPR outcomes. Further large scale studies are welcomed to evaluate the generalisability of our findings.

Conflicts of interest

None.

Funding

Not applicable.

Ethics approval

Singhealth's Centralised Institutional Review Board (Ref: 2019/2496) Acknowledgement: Smita Pathare, Department of Clinical Governance, Sengkang General Hospital

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http://dx.doi.org/10.1016/j.resuscitation.2020.12.015