BMJ Open Quality

Improving role allocation for cardiopulmonary resuscitation (CPR) in the emergency department: a quality improvement project

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To cite: Giri S, Gyeltshen D, Wangchuk N, *et al*. Improving role allocation for cardiopulmonary resuscitation (CPR) in the emergency department: a quality improvement project. *BMJ Open Quality* 2024;**13**:e002870. doi:10.1136/bmjoq-2024-002870

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjoq-2024-002870).

Received 20 April 2024
Accepted 22 September 2024

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ABSTRACT

Introduction In any healthcare setting, cardiopulmonary resuscitations (CPRs) stand out as demanding and chaotic resuscitation endeavours. Emergency departments (EDs) witness a significant volume of CPRs. Given the critical nature of CPR, content knowledge and procedural skills alone fall short in delivering optimal care. Effective teamwork, complemented by a well-coordinated response, is imperative for achieving favourable patient outcomes. A survey conducted in our ED highlighted that while the majority of staff acknowledged the significance of teamwork in CPR and were aware of the whiteboard for assigning team roles, only 19% were familiar with their individual roles during CPR.

Methods To address this gap, our project aimed to increasing the role delegation for CPR from 19% to 80% within 2 months. We formed an interprofessional team and implemented strategies through four plan–do–study–act cycles. Interventions encompassed increasing sensitisation, creating a simplified format for assigning team roles and entrusting the nursing team leader of each shift with the responsibility of role assignment for accountability. The sharing of progress charts for acknowledgment served as a motivating factor, leading to sustained adherence to the project goals without necessitating reminders in the final two weeks.

Results This project proved to be highly successful as our process indicator steadily increased and remained above the target for 4 consecutive weeks.

Conclusion Our results underscore the importance of patience and teamwork in achieving project objectives. It serves as a good example of the efficiency of simple and cost-effective interventions, one that can be replicated and implemented in other EDs.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Effective teamwork and clear role assignments are crucial in cardiopulmonary resuscitations (CPR). However, in practice, the assignment and communication of team roles are often neglected, leading to inefficiencies.

WHAT THIS STUDY ADDS

⇒ A systematic approach to assigning and communicating team roles can significantly improve adherence to preassigned roles during CPR in an Emergency Department (ED) setting.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ A structured format of assigning team roles can be adopted by other EDs.

⇒ Further research could focus on assessing the long-term impact of these interventions on patient outcomes, such as return of spontaneous circulation rates, and exploring the feasibility of replicating these interventions in different healthcare environments.

PROBLEM

Cardiopulmonary resuscitations (CPRs) are the most stressful and chaotic resuscitation activities that occur in any healthcare setting.[1] Emergency departments (EDs), by virtue of being at the front gate, see the maximum number of CPRs. The situation is no different in our ED. We have a 22-bed ED that serves patients of all age groups and subspecialties. Our records reveal that we are involved in at least 10 CPRs a month.

Although CPR guidelines provide a sequential algorithmic approach, a timely and coordinated response is needed to ensure optimal patient outcomes. Our ED has a few measures in place to ensure a coordinated CPR response. This includes a bell that is rung when a patient needs CPR; the bell sounds across all sections of the ED, enabling team members to rush to the resuscitation bay. Another measure is a white board that is hung in the resuscitation bay where names are assigned for each of the six main CPR roles, and a CPR form (see online supplemental appendix 3) that makes recording and communicating easier. Simulation exercises on CPR, which includes team dynamics, are conducted at least biannually. From anecdotal experience of having worked in the ED

for 7 years, team roles are not diligently assigned; even when assigned, it is often times not communicated to the team members. The CPR form is also not regularly used.

A baseline survey was done in the ED to get a snapshot of the extent of the problem. Findings revealed that nearly all respondents (42/43, 98%) were aware about the white board in the resuscitation bay, where names are assigned against team roles. However, only 19% of respondents (8/43) reported being aware about their role on the day the CPR was done. Only 13% followed preassigned team roles during CPR.

Therefore, the aim of this project was to increase the awareness of role delegation for CPR from 19% to 80% among ED healthcare providers in a time period of 2 months.

BACKGROUND

Teamwork is essential in activities with high risks to human life, such as healthcare. Content knowledge and procedural skills alone are not enough to provide optimal care during medical emergencies under intense pressure such as CPR; teamwork and other behavioural skills are crucial.[2]

When a cardiac arrest occurs, the recognition and immediate action of the first responder is critical. Once the resuscitation team arrives, a coordinated and rapid team effort is required for the best patient outcomes.[3] The American Heart Association (AHA), whose treatment guidelines we follow for all resuscitations, have included the core principle of assigning roles and ensuring role clarity within the curricula for resuscitation.[4]

The AHA recommends a 'six-person high performance team' for performing CPR. These include three key players who form a triangle and never leave the triangle—airway manager, chest compressor and monitor/defibrillator operator. The other three players are outside the triangle and take on the roles of administering medications, recorder and team leader.[4]

When roles are not clearly designated, team efficiency suffers. Critical responsibilities such as attaching chest leads and connecting the patient to the cardiac monitor are delayed or overlooked. Additionally, team members often take on multiple roles unnecessarily, even when there are adequate providers. Studies have reported significant deficiencies in CPR performance, which correlate with poorer patient outcomes. CPR is frequently interrupted as rescuers attempt to juggle multiple tasks, leading to reduced hands-on time.[5 6]

Furthermore, the process by which a team forms influences the quality of its performance. A randomised controlled trial was done as part of a simulation to compare the effects of ad hoc teams versus preformed teams on the adherence to guideline-based CPR algorithms.[7] Preformed teams were those that had undergone the process of team building prior to the onset of a cardiac arrest, while ad hoc teams were formed during the cardiac arrest. The study concluded that ad hoc teams had significant performance shortcomings compared with preformed teams. They exhibited considerably less hands-on time, and their first defibrillation and epinephrine administration were significantly delayed. Therefore, roles within CPR teams must be predetermined—all team members must be aware of their specific roles and can immediately spring into action when called for.[4]

A quality improvement project in a Canadian ED on improving healthcare provider's response to emergencies reported that after implementing the project, the proportion of nurses who believed their role was apparent to themselves or others when they attended to CPR improved from 30.8% to 63.6%. Similarly, the proportion of physicians who believed that an appropriate number of healthcare providers attended the resuscitation increased from 43.6% to 83.9%.[8]

Design

On identifying the magnitude of the problem regarding team dynamics in CPR, an interprofessional team comprising doctors, nurses and paramedics—all involved in CPR—was formed to help address the problem. We started off by conducting a root cause analysis in an attempt to identify all potential contributing factors.[9] Figure 1 illustrates the various contributory factors identified by the team.

While some of these causes were not amenable, for instance ED being a busy and crowded place, there were others that were amenable via small steps. Accordingly, we planned our plan–do–study–act (PDSA) cycles. When using the PDSA method, a four-stage approach is employed to implement improvements. In the 'plan' stage, an improvement (change) is identified; the change is tested in the 'do' stage; its impact is evaluated in the 'study' stage; and the change is adapted, adopted, or rejected in the 'act' phase.[10]

To measure the effectiveness of our interventions, our *process indicator* was 'percentage of team roles assigned for CPR'. We pasted a checklist (see online supplemental appendix 1) on the whiteboard where team roles are allocated, where the team leader places a tick mark when he assigns roles. The Point of Care Quality Improvement (POCQI) team members checked if team roles were assigned and marked the presence/absence of role assignment on the team's checklist (See online supplemental appendix 2).

Process indicator was calculated as:

$$\frac{\text{Number of times roles were preassigned in 1 week}}{\text{Total number of shifts during which the checklist on the white board was monitored}}$$

Our *outcome indicator* was 'percentage of CPR in the ED where preassigned team roles were followed'. It was calculated as:

$$\frac{\text{CPR where preassigned team roles were followed}}{\text{Number of CPR done during one week}}$$

To obtain the numerator (CPR where preassigned team roles were followed), the pre-existing CPR form (see online supplemental appendix 3) was used where a section is dedicated to assessing team role delegation.

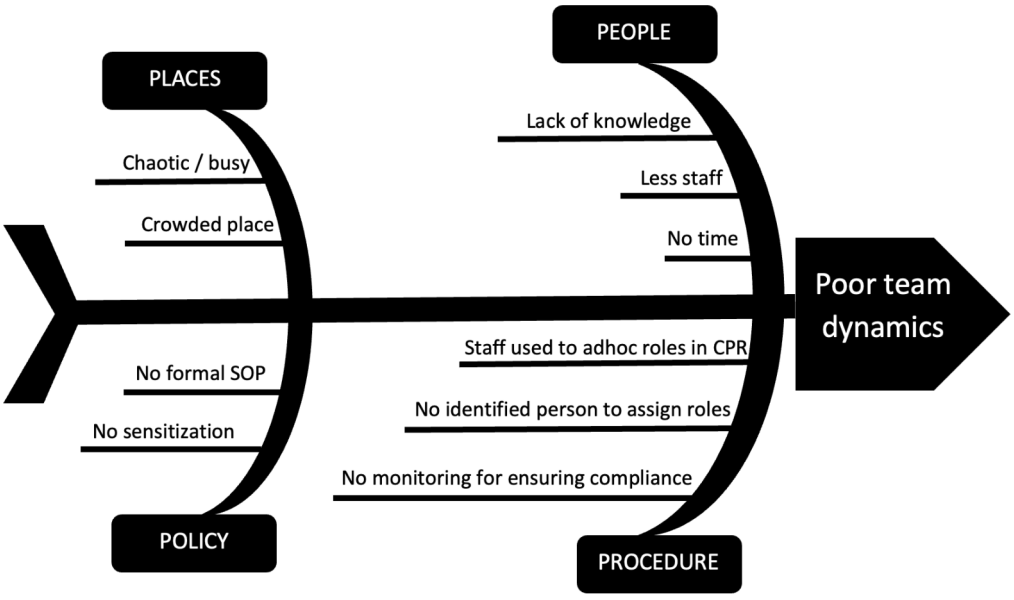

Figure 1 Fish bone analysis as a method of root cause analysis, identifying potential contributory factors of poor team dynamics for cardiopulmonary resuscitation (CPR). SOP,Standard Operating Procedure

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Strategy

First PDSA cycle: sensitisation on the importance of team dynamics

The first intervention was to educate the staff in the ED on the importance and benefits of team dynamics. This intervention was planned since lack of knowledge/awareness was identified as one of the causes of poor team dynamics. Sensitisation included raising awareness about the importance of team dynamics and its impact on improving CPR outcomes.

Following this intervention, team role allocation (process indicator) increased to 70% at the end of two weeks.

Second PDSA cycle: format for assigning team roles drawn up

On reviewing data from the initial 2 weeks, we observed that due to the absence of a standardised operating procedure for team allocation, role assignment occurred in a disorganised manner. For instance, roles such as medication administrator were assigned redundantly to two individuals, while technical responsibilities such as airway manager were entrusted to junior team members. Consequently, the subsequent intervention involved developing a structured format for assigning team roles. This format was devised through discussions with the POCQI team members and, once finalised, was prominently displayed on the whiteboard where team roles were allocated. It was anticipated that having a structured format to guide role assignment would streamline the process.

Furthermore, POCQI team members started sharing a picture of the allocated team roles on the department's social media group. This was done as a means of reminding the staff on the importance of assigning team roles, as discussed during the sensitisation at the start of the project. Gradually, the nurses who assigned team roles (non-POCQI team members) also started sharing pictures of the white board with assigned roles at the start of each shift.

By the end of the 4th week, team role allocation (process indicator) increased to 81%.

Third PDSA cycle: responsibility of assigning team roles accorded to nursing team leader

On analysing data from the 3rd and 4th weeks, it became apparent that shifts where team roles were unassigned typically occurred because one staff assumed that someone else would undertake the responsibility. Consequently, we recognised the necessity of designating a specific staff member to oversee the allocation of team roles. Given that each shift already has an appointed nursing team leader with specific duties, we entrusted them with the task of assigning team roles and sharing a picture of the whiteboard with assigned roles. As a result of this intervention, the allocation of team roles (process indicator) rose to 91% by the end of the sixth week.

Fourth PDSA cycle: sharing of progress charts

After achieving the target, the subsequent intervention aimed to sustain staff motivation in consistently allocating team roles. Time series charts illustrating the consistent improvement in both process and outcome indicators were shared among ED staff. POCQI team members expressed gratitude towards the nursing team leaders who regularly shared updated pictures of the whiteboard displaying assigned team roles within the department's group. By the end of the 8-week period, team role allocation (process indicator) had risen to 95%.

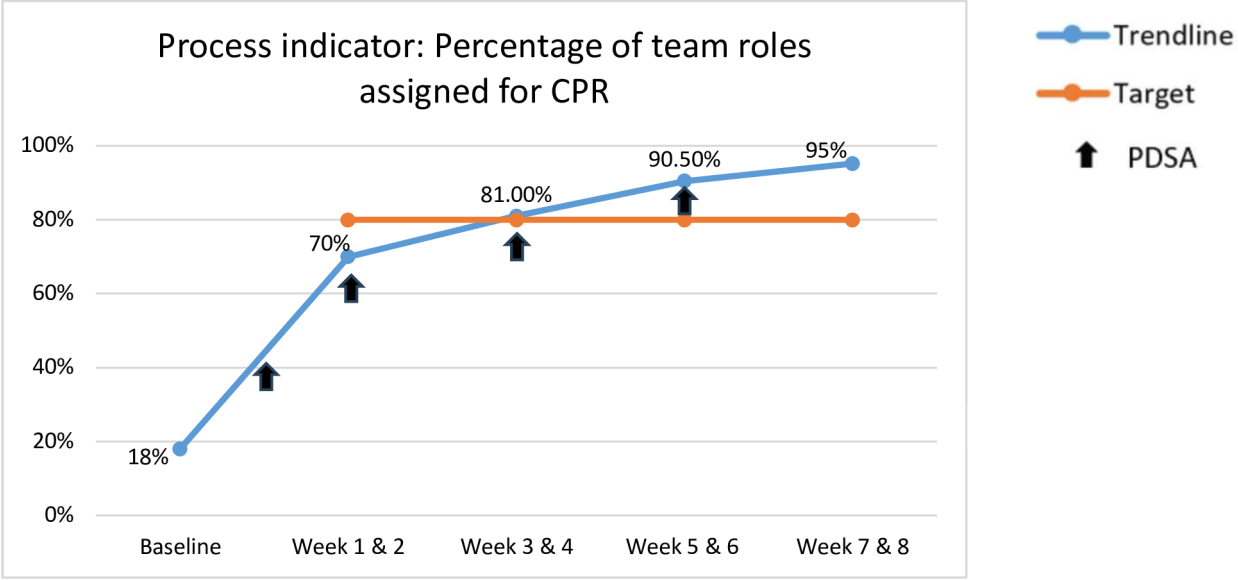

Figure 2 Process indicator (post intervention measurements after each PDSA cycle). CPR, cardiopulmonary resuscitation; PDSA, plan–do–study–act.

RESULTS

We had our post intervention measurements at the end of each PDSA cycles (2 weeks each). By the end of the third PDSA cycle, we had met our target for the process indicator, as illustrated in figure 2. Having met our target, we wanted our last intervention to be one that motivates the staff to continue this process. So, for the fourth PDSA cycle, time series charts that showed the improved trend were shared with the staff. And by the end of the 8 weeks, our process indicator was 95%.

At the end of every PDSA cycle, we checked the number of CPR where preassigned team roles were being followed. Data for this was derived from the pre-existing CPR form that is maintained in the ED (see online supplemental appendix 3). As illustrated in figure 3, by the end of the third PDSA cycle, healthcare workers in the ED always followed their preassigned roles for CPR.

The trend in the process indicator is reflected in the outcome indicator, showing that an increase in assigning team roles has corresponded with an increase in CPRs where preassigned team roles were followed.

Lessons and limitations

The project aimed at improving awareness of team dynamics during CPR via the implementation of steps that would be sustainable in the long run.

A key lesson learnt during the conduct of this project was that changes occur in small steps—what we need for these changes to occur is patience and teamwork. We also realised that in a big department such as ours,

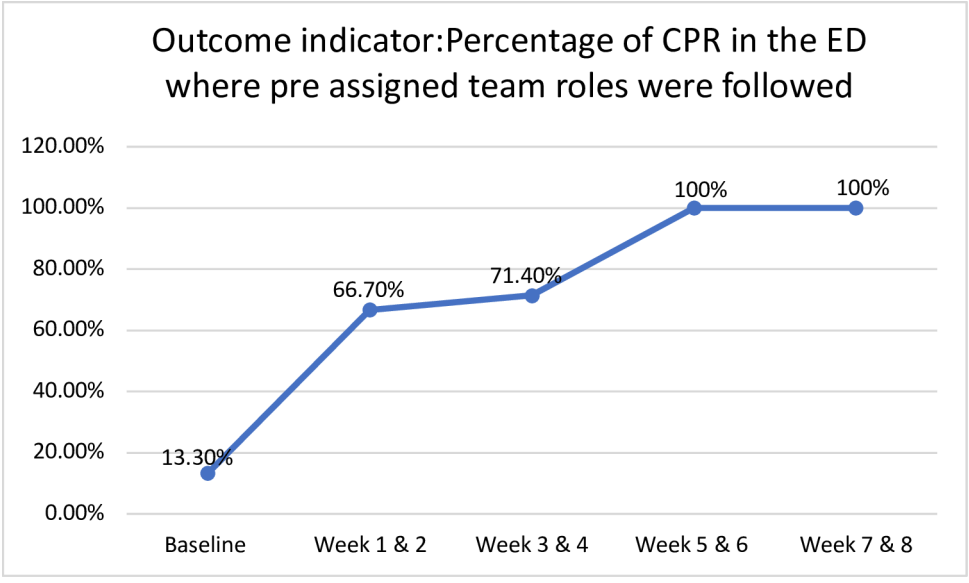

Figure 3 Outcome indicator (post intervention measurement after each PDSA cycle). CPR, cardiopulmonary resuscitation; ED, emergency department.

accountability is important. Thus, identifying one focal person to assign roles ensures accountability and in turn, effectiveness. Another major lesson was that creating a low-effort intervention helps promote sustainability.

Nonetheless, we understand that for our results to be sustainable in the long run, healthcare workers in the ED need frequent resensitisation, given the fact that there is a constant turnover of staff. The project members have proposed including the importance of team roles and team dynamics in CPR as part of the yearly departmental CME. This will serve the purpose of resensitisation and thus, enhanced compliance. Another limitation of our project is that it spanned only 2 months. Thus, we were not able to objectively measure retention and sustainability. Furthermore, we did not compare CPR outcomes before and after the intervention. While awareness of role delegation and adherence to assigned team roles is crucial, the most important patient-oriented outcome is whether CPR achieved return of spontaneous circulation. Therefore, we recommend conducting an audit to assess CPR outcomes before and after the intervention.

CONCLUSION

On unanimously identifying the importance of team dynamics in CPR, our team implemented measures to improve team dynamics, as it is an important contributor of patient outcomes. Having achieved successful assignment and following of team roles in 95% of CPRs during the 2-month project time, our interventions were successful. Due to its straightforward design and low-cost intervention, the method for nursing team leaders to assign roles, as well as the format for team role assignment, could be readily replicated in other wards/units and EDs nationwide.

Contributors SG: Concept and design, implementation, guarantor and responsible for overall content of the manuscript. DG: Collection and analysis of data and drafting of manuscript. SW: Collection and analysis of data and drafting of manuscript. KD: Collection and analysis of data and drafting and revising the manuscript. LD: Collection and analysis of data and drafting the manuscript. NW: Collection and analysis of data and drafting the manuscript. KBD: Collection and analysis of data and writing of manuscript and revisions. All authors approved the final manuscript as submitted.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable as the project did not involve human subjects. Healthcare workers in the ED who participated in the baseline data collection and during the various stages of the study were anonymised.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request.

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REFERENCES

1 Silverplats J, Strömsöe A, Äng B, *et al*. Attitudes towards cardiopulmonary resuscitation situations and associations with potential influencing factors-A survey among in-hospital healthcare professionals. *PLoS ONE* 2022;17:e0271686.
2 Weinstock P, Halamek LP. Teamwork during resuscitation. *Pediatr Clin North Am* 2008;55:1011–24.
3 Hunziker S, Johansson AC, Tschan F, *et al*. Teamwork and leadership in cardiopulmonary resuscitation. *J Am Coll Cardiol* 2011;57:2381–8.
4 American Heart Association. Advanced cardiovascular life support provider manual. In: *Resuscitation*. 2020.
5 Abella BS, Alvarado JP, Myklebust H, *et al*. Quality of cardiopulmonary resuscitation during in-hospital cardiac arrest. *JAMA* 2005;293:305–10.
6 Chan PS, Krumholz HM, Nichol G, *et al*. Delayed time to defibrillation after in-hospital cardiac arrest. *N Engl J Med* 2008;358:9–17.
7 Hunziker S, Tschan F, Semmer NK, *et al*. Hands-on time during cardiopulmonary resuscitation is affected by the process of teambuilding: a prospective randomised simulator-based trial. *BMC Emerg Med* 2009;9:3:1–10:.
8 Chartier LB, Hansen S, Lim D, *et al*. P023: code Resus - using a quality improvement approach to improve health care provider response during resuscitations. *CJEM* 2016;18:S86.
9 Karkhanis AJ, Thompson JM. Improving the Effectiveness of Root Cause Analysis in Hospitals. *Hosp Top* 2021;99:1–14.
10 Taylor MJ, McNicholas C, Nicolay C, *et al*. Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Qual Saf* 2014;23:290–8.