Case Study

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Case Study on Exploration of Paediatric Cardiopulmonary Resuscitation among Involved Team Members in Paediatric Institute Jantung Negara (IJN), Malaysia

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ABSTRACT

Background: Paediatric in-hospital resuscitations also occur frequently and are associated with high morbidity and mortality. **Objectives:** To explore the Pediatric Intensive Care Unit (PICU) CPR current practices in PICU of Institute Jantung Negara (IJN) Malaysia. **Methods:** The research employed a qualitative approach, utilising case study research design. The data collection process involved in-depth interviews and reviewing the Resuscitation Feedback Form. Purposive sampling was used to select two cases consisting of 14 participants. The study participants comprised a cardiologist, one anaesthetist, and twelve nurses. The data collected were transcribed and entered into *NVivo* software to facilitate theme development. Subsequently, thematic analysis was conducted to analyse the data. **Results:** The research yielded significant findings for improving practices related to Cardio Pulmonary Resuscitation (CPR) in the Pediatric Intensive Care Unit (PICU). These findings are organised into four main themes: routine procedures, resuscitation techniques, team dynamics, and individual contributions. Participants emphasised the importance of establishing a cohesive team to enhance the efficiency of resuscitation efforts. They identified challenges of lack of confidence, skills, and knowledge as significant barriers to effective CPR in the PICU. **Conclusion:** The findings of this study indicate that the participants expressed satisfaction with the current practices of PICU CPR. However, the research also highlights the need for enhancements in various areas, including routine procedures, resuscitation techniques, and team and individual factors. Furthermore, it was suggested that additional training be conducted on the resuscitation process to enhance the preparedness of the medical team.

Keywords: Cardiopulmonary Resuscitation; Feedback; Nurses; Paediatric Intensive Care Unit

INTRODUCTION

Cardiovascular diseases have contributed to estimated 17.9 million deaths in 2019, and are the leading cause of deaths globally (WHO, 2021). The American Heart Association and the American College of Cardiology define 'cardiac arrest as the sudden cessation of cardiac activity so that the victim becomes unresponsive, with no normal breathing and no signs of circulation' (Mitropoulou & Fitzsimmons, 2022). Every year in United States only, more than 15,000 children received resuscitations in hospitals, with survival around 80-90% but mostly did not survive to hospital discharge (Morgan *et al*., 2021). In-hospital cardiac arrest (IHCA) is defined in the Utstein resuscitation registry reporting template as the delivery of chest compressions and/or defibrillation to patients admitted to inpatient beds (Nolan *et al*., 2019). There are

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notable distinctions between adult and paediatric populations regarding CPR protocols, medications administered, and post-cardiac arrest management (Yu *et al*., 2020).

Paediatric Intensive Care Unit (PICU) of Institute Jantung Negara (IJN) in Malaysia admits patients with Congenital Heart Disease (CHD) from the early hours of life. These patients are particularly susceptible to experiencing cardiac arrests. Furthermore, identifying paediatric patients at risk for cardiac arrest has cleared the way for team preparedness by allowing specialised training and situational awareness. The introduction of rapid response teams with good communications has been associated with safer patient care (Beichler *et al.*, 2024). The technology and defibrillator access continue to progress, thus increasing paediatric patients' survival (Penketh & Nolan, 2022). The non-technical skills are also undeniably the critical determinants of medical skill performance alongside the technical skills and have been shown to be improved with the implementation of high-fidelity simulations (Innocenti *et al*., 2022).

Most importantly, insights should be gathered from team members involved in CPR management to comprehensively understand how to enhance CPR's effectiveness, outcomes, and reporting system in the area. Team members engaged in paediatric resuscitation likely possess valuable experiences and insights that can contribute significantly to related studies (Ghavi *et al*., 2024). Based on 63 debriefing sessions following each cardiac arrest, several commonly discussed topics were identified, including communication, cooperation/coordination, equipment, clinical standards, situational awareness, Extracorporeal Membrane Oxygenation (ECMO), team climate, leadership, and adaptability, listed in descending order of frequency (Gillen *et al*., 2019). The Intensive Care Unit (ICU) nurses had a good experience with the debriefing sessions, and also their satisfactions with the debriefing methods were found to be high (Dogu *et al*., 2024). Therefore, conducting empirical research with these individuals through face-to-face interviews is imperative to delve deeply into each person's experiences and perspectives. Recent research and evidence regarding CPR are relatively limited in Malaysia. Still, specific research focussing on paediatric resuscitation in Malaysia is lacking. Hence, it is crucial to investigate strategies to enhance the effectiveness of PICU CPR to attain improved outcomes in paediatric resuscitation.

METHODOLOGY

The research employed a qualitative approach, utilising a case study design following Yin (2018) recommendations. The study was conducted in the PICU of IJN, utilising two case studies. This study's inclusion criteria for the participants are the medical team members formed at the bedside during the cases of paediatric resuscitation (less than 18-year-old patients), including the cardiologist, anaesthetist, and nurses. The cases selected involved chest compression and/or defibrillation. The patient in case 1 was intubated during resuscitation, while the patient in case 2 was already intubated prior to resuscitation. Both of the patients had central lines for giving medications. All of the team members have at least 2 years of experience in paediatric clinical areas. In this study, the participants were selected using the non-probability sampling method via purposeful sampling to gather an information-rich group. The list of team members involved during the PICU CPR settings in IJN was obtained from the documentation and contacted to obtain their agreement to participate in the study. Two cases consisting of 14 participants, which comprised of written characteristics, were included in this study. Both of the teams handling the cases consisted of the same PICU team but different persons.

Study Design

The research adopted a qualitative approach, employing a case study design in line with recommendations by Yin (2018). This design was chosen for its ability to provide in-depth insights into paediatric resuscitation practices.

Study Setting

The study took place in the Paediatric Intensive Care Unit (PICU) of IJN, utilising two distinct case studies. Conducting the research within this setting ensured the examination of real-life resuscitation scenarios.

Inclusion Criteria

Participants included medical team members present at the bedside during paediatric resuscitation cases, namely cardiologists, anaesthetists, and nurses. The selected cases involved instances of chest compression and/or defibrillation.

Sampling Methods

Participants were selected using a non-probability sampling method known as purposeful sampling. This method allowed for the deliberate selection of individuals with diverse experiences and perspectives. The list of team members involved in PICU CPR settings at IJN was obtained from the resuscitation documentation, and potential participants were contacted to obtain their agreement to participate in the study.

Explanation of the Case

Case 1 involved a patient who required intubation during resuscitation, while Case 2 involved a patient who was already intubated prior to the resuscitation process. Both cases included instances of chest compression and/or defibrillation, and both patients had central lines for medication administration. All team members involved in the study had a minimum of two years of experience in paediatric clinical areas. 14 participants were involved in these case studies characterised by their roles and experiences in paediatric resuscitation.

Data Collection Procedures

Upon identifying the participants, they were approached in person and asked to participate in the study. They were queried about their years of experience working in paediatric settings and their expertise in the specific case studies in which they were actively involved. The scheduling of interviews (time and place) was agreed upon by all parties involved and planned to not be more than 45 minutes. The method of data collection employed was semi-structured interviews. The interviews had an interview protocol as a standard introduction to all participants, which started with the question, 'What happened?'. From there, the interviews were then expanded according to the participants story flow. Open-ended, non-leading questions stemming from the conversation flows were used to build rapport and focused on the personal experiences of conducting PICU CPR. In these sessions, they were initially asked about how they were actually involved in the resuscitation and then what they contributed to the resuscitation process. It then grew into more meaningful conversations on what problems they did encounter in the resuscitation, what were in their minds during the time, and what they thought could be the solutions to the problems discussed.

The investigation of PICU CPR case studies involved conducting semi-structured interviews with team members to capture the essence of the concept. The data collected were derived from questions adapted from established tools such as the Utstein and Observation Skill-based Clinical Assessment Tool for Resuscitation (OSCAR). Paediatric Utstein reporting style as explained in Nolan *et al*. (2019) and also neonatal Utstein reporting style in Foglia *et al*. (2023) were referred to in understanding the ideal paediatric field optimal guidelines in resuscitation and the experiences of staffs of the best practices possible. Utstein-style guidelines in this research give priorities to the setting, patient, pre-event flow, resuscitation process, post-resuscitation process, and outcomes of CPR. Other than that, OSCAR has also been used to explore human attitude, focussing on the current practices of the team members guided by its six domains (communication, cooperation, coordination, monitoring, leadership, and decision-making) (Zaki *et al*., 2022).

The interviews were conducted in person, with the participant's consent obtained for video recording. The videos were only accessed by the main researcher and supervisor for translating and transcribing work. They were stored inside the main researcher's personal computer, which is protected by a password. The videos will also only be stored for a for a maximum 3 years after the first interview, after which they will be deleted to avoid leakage. The study operated on a triangulation approach, wherein interviews were conducted with individuals representing distinct professional roles within the healthcare field, specifically physicians, anaesthetists, and nurses. It was anticipated that there would be varying perspectives or angles regarding the

same event, encompassing the viewpoints of all members within the team. In order to avoid emotional outbursts during the interview, the participants were reminded to be professional during interview. They were informed that while some sharing sessions are welcome, excessive sharing could potentially interfere with the primary objective of gathering useful data from the interviews. In order to establish contact and secure their cooperation, permission was sought from the IJN to initiate communication with them.

Every participant was duly informed that their individual perspectives hold significance in shaping future knowledge and are advantageous for paediatric CPR events. The study also worked on the analyst triangulation method, which involved the collaboration of multiple coders, including the researcher and the supervisor, in analysing the gathered information. This study aims to shed light on areas of limited awareness within the analysis process. Data gathering was identified as another crucial aspect of research credibility.

Data Analysis

The data analysis was conducted promptly, as per Yin's (2018) conduct, which emphasised the importance of a comprehensive interpretation of the case studies. The 'codes and coding' technique followed the research question to establish connections between the data and the proposition (Bingham, 2023). This discussion's primary emphasis centres around utilising a thematic approach in data analysis through transcription. After the researcher has gathered all the recorded voice and video data, it is then transcribed into textual format. The researcher then began the analysis of the interview transcript and fieldnotes, which were in hardcopy format, to identify any significant findings or insights. Initially, the researcher composed a memo during and after the process of data collection to document personal insights, conceptual thoughts, and reflections.

Following the process of manual transcription, the resulting transcripts were subsequently inputted into *NVivo*, a software specifically designed for the management and analysis of qualitative data. The individuals comprising the data analysis team fulfilled the roles of both researcher and supervisor. The researcher employed conventional content analysis to analyse the data, starting with open coding of the initial transcript due to the semi-structured nature of the interview. The codes were generated and assigned in an inductive manner, with a systematic examination of the transcripts conducted on a line-by-line basis.

The researcher and her supervisor engaged in multiple meetings to iteratively refine the codebook, ultimately achieving agreement on the coding categories and assigning explicit definitions to each code. The overarching theme and initial code relationship structures were established. In order to resolve coding discrepancies, the researcher and supervisor engaged in discussions until a consensus was achieved. The process of recoding data in the form of code was implemented. The data was inputted manually into *NVivo*, and the code list was subsequently partitioned for code cleaning. The researcher and supervisor subsequently reconvened to develop the coding framework further. The codes were organised into initial codes based on shared thematic elements and were either grouped together or integrated in a manner that ensured each code represented a distinct conceptual idea. As the development of the theme progressed, certain codes underwent renaming, and final adjustments were made to the interconnections between the codes.

Ethical Consideration

The study was approved by the IJN Research Ethics Committee with reference number IJNREC/525/2021, on 22nd October 2021. The study was also approved by Research Ethics Committee, UiTM, Malaysia with reference number REC/09/2021 (MR/838) on 29th September 2021.

RESULTS

Table 1 described the study participants whether they were recruited for Case 1 or Case 2, also in terms of their age, position in the unit, years of experience in paediatrics, and the advanced resuscitation courses taken by them. Below is Figure 1, which is the mind mapping of the themes and subthemes of PICU CPR exploration. Figure 1 shows the major results from the interviews, themed as routine, team, individual, and resuscitation. From each of the themes, the subthemes that were derived from the transcription of the interviews were stated.

Table 1: Study Participants

Case Study 1 Or 2	Age	Position	Years of Experience in Paediatric	Advanced Course Enrolled
Case 1 Participant 1	27	In-Charge Staff Nurse	3	PALS
Case 1 Participant 2	41	Paediatric Specialist	15	PALS/ACLS
Case 1 Participant 3	37	Senior Staff Nurse	12	PALS/ACLS
Case 1 Participant 4	33	Anaesthetist	7	PALS/ACLS
Case 1 Participant 5	25	Staff Nurse	2	PALS
Case 1 Participant 6	43	Senior Staff Nurse	20	PALS/ACLS
Case 2 Participant 1	36	Senior Staff Nurse	11	PALS/ACLS
Case 2 Participant 2	25	Staff Nurse	2	PALS
Case 2 Participant 3	38	In-Charge Staff Nurse	15	PALS/ACLS
Case 2 Participant 4	27	Staff Nurse	3	PALS
Case 2 Participant 5	40	Nurse Mentor	16	PALS/ACLS
Case 2 Participant 6	35	Staff Nurse	10	PALS
Case 2 Participant 7	36	Senior Staff Nurse	11	PALS
Case 2 Participant 8	38	Nurse Mentor	15	PALS/ACLS

PALS=Paediatric Advanced Life Support
ACLS=Advanced Cardiovascular Life Support

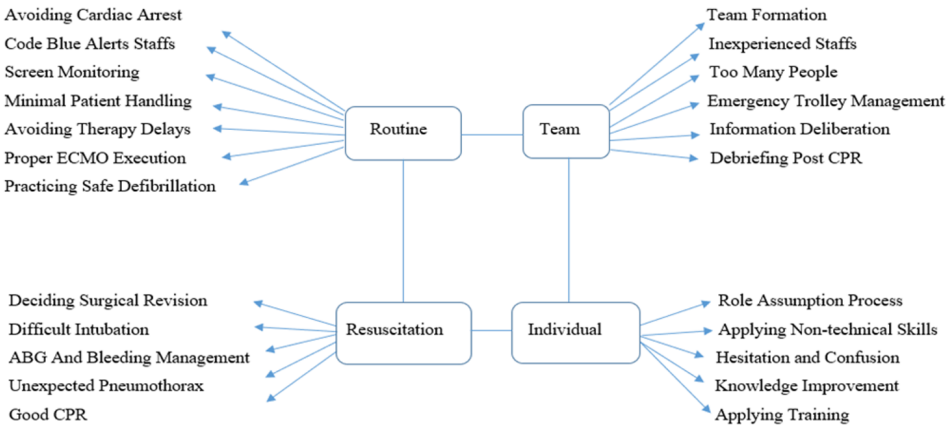

Figure 1: Themes and Subthemes of PICU CPR Exploration

Routine

The participants have identified several factors that contribute to the prevention of cardiac arrest. These factors include breakdowns in communication, hasty movements, proper management of respiratory function, and timely intervention to address haemodynamic instability. In general, enhanced communication has the potential to prevent such situations. According to one of the participants in referring to the communication breakdown:

Hmm. Maybe communication. The main barrier at the time was that the surgeon came late. 30 minutes of CPR. (Participant 4, Staff Nurse Case 2)

The participants emphasised a routine procedure known as "Code Blue Alerts Staffs." This procedure involves the detection of a cardiac arrest, followed by the announcement of a code blue to notify the staff members about the patient's condition. Based on the interviews conducted, the team members express the belief that although prompt action is necessary, the announcement was made relatively early, as several team members joined the project subsequent to the announcement. The participants have consistently emphasised the significance of alerting staff members during the interviews, as it facilitates the mobilisation of individuals possessing specialised knowledge to the designated location.

The 'Screen Monitoring' displays are among the indicators of arrest when the team is gathered around the patient. The staff had to monitor the patient's progress while continuing the procedures. In order to enable accurate monitoring, the emergency trolley, Electrocardiogram (ECG), and monitor wires should be appropriately assembled as soon as feasible. One participant reported,

I connected the patient to the emergency trolley, ECG cable, monitor, and all that. I made sure all the patient's vital signs could be seen on the screen monitor. (Participant 5, Staff Nurse Case 2)

Another practice that is frequently used is "minimum handling," as patients who are at higher risk should be handled with the utmost care. Examples of light handling for the airway include extremely careful patient airway area manipulation. As a professional put it,

Also, the suture side must always be handled lightly during transportation in order to not overextend the airway and again cause stenosis to rupture . (Participant 2, Paediatric Specialist Case 1)

Additionally, due to the hectic nature of resuscitation, people frequently inadvertently delay some treatments that ought to be administered sooner. Delays in the case studies include drug administration, equipment handling, effective intubation, pneumothorax detection, and surgical intervention.

So during the CPR, some of the bad side we had was that, in recognising the things that could have happened in the CPR, for example, we took a lot of time trying to intubate and failed. (frown) (Participant 4, Anaesthetist O, Case 1)

'Proper ECMO Execution' must be prepared for a patient receiving Extracorporeal Membrane Oxygenation (ECMO). In accordance with it, patients will be closely watched after ECMO discontinuation for signs of patient deterioration. When cardiac arrest actually occurred in this case, the doctors recommended opening the chest again and inserting a retractor to prevent the chest walls from squeezing the heart. The termination was completed relatively late, around 8 PM, and it was anticipated to be a difficult night shift.

Patient actually came back with ECMO, because in the surgery haemodynamics had become unstable and bleeding a lot, and then at the time I took over the patient, they had already terminated the ECMO around 8 in the evening. (Participant 3, In-Charge Staff Nurse Case 2)

So, when the patient has already terminated ECMO, one of the complications is the arrythmia. So, when the patient was on arrythmias, it can become cardiac arrest if we do not treat it. So, for the patient at that time, what happened was one of the complications post-ECMO termination. (Participant 8, Nurse Mentor Case 2)

Other than that, "Practicing Safe Defibrillation" is another crucial component of resuscitation. The primary worry is patient safety, heightened when the shock was administered several times at once because of fatal arrythmias. The participants stressed that clear communication with the doctor is needed to know the real order and avoid dosage or administration mistakes.

OK, we pulled the emergency trolley, and then we put it to the patient. Firstly, we start the CPR, then give Adrenaline. CPR, and the patient got VF right, and then we followed Dr's order; Dr said according to her weight, so we put 20 joules first. And then we continue CPR. Then, after a few seconds, observe the rhythm straight away and continue CPR. (Participant 3, In-Charge Staff Nurse Case 2)

Resuscitation

Challenged intubation is a common issue during paediatric resuscitation. To maintain the patient's airway, they encountered difficulties during intubation. Teamwork there is beneficial because they are working on something that is not possible to be managed by a single person only.

I think three times fail intubation. Because the patient has tracheoplasty. So tearing of tracheoplasty during transfer time. So there's lots of bleeding at the airway; after the third time using the glidescope, only it was successful. (maintaining eye contact) (Participant 6, Senior Staff Nurse Case 1)

In line with the previous sentence, managing the Arterial Blood Gas Analysis (ABG) and bleeding is another issue frequently arising during paediatric resuscitation. Priority should be given to resolving the most crucial factors for issues in a resuscitation from the ABG results and bleeding monitoring, as it may assist in resolving issues leading to cardiac arrest. According to the interviews, ABG was performed every 10 minutes, and the bleeding issues were treated as soon as possible.

In resuscitations, the team works to find solutions to issues to restore cardiac rhythm; in this research, the issue is an unanticipated pneumothorax. Similar to the case study, needle decompression was carried out in the emergency case utilising an angiocatheter. Overall, they ran across issues they were aware of,

After that, we realised the pneumothorax problem because the patient was still in arrest. The breath sound was reduced. It was difficult intubation, and did needle decompression on patient bedside. Surgeon Mr. A performed it. (Participant 5, Staff Nurse Case 1)

Furthermore, it is worth nothing that a team can also acquire knowledge and insights from a well-executed Cardiopulmonary Resuscitation (CPR). The teams were presented with arduous resuscitation scenarios, and their ability to effectively navigate these challenges elicited a sense of fulfilment. According to a senior staff nurse,

Absolutely fast. Meaning that at the time we started coding, resuscitating, intubating, airway, solving problems with pneumothorax, and doing needle aspiration, it was very fast. Even pushing to OT was fast. (Participant 6, Senior Staff Nurse Case 1)

Team

The team formation process often presents various challenges, including multitasking and simultaneously addressing multiple tasks. However, it was observed from the interviews that these issues appeared to have a lesser impact on senior individuals than junior staff members. The participant elucidates one potential approach to resolving this issue.

We already start to allocate who does medication who does CPR, right? We take over, and we see the board to see the assignment, so everyone understands their roles. Who is the compressor, who is in charge of the airway? Like me that day, I was on medication. So I stay for medication, but before I arrived there was someone doing it, so I take over. (Participant 1, Senior Staff Nurse Case 2)

Another notable issue pertained to the lack of experience among staff members, resulting in a sense of disarray and the need to abandon tasks when approached with inquiries. Furthermore, they experienced a sense of inadequacy in issuing directives and assigning responsibilities. The complexity arises from the scepticism of senior individuals towards their junior counterparts, leading to doubts regarding the juniors' ability to effectively and securely execute a given task. According to the assertions made by the participants, enhancing staff experience represents a potential solution to address this issue. As the staff said,

Sometimes I was disrupted because when I was documenting someone asked me to be a runner going to the store..because we did have a junior, but at that time she did not know what the thing was, and if she went to the store, she did not know where to find it. (Participant 4, Staff Nurse Case 2)

The presence of many individuals at the event poses a challenging issue, as it is difficult to address due to the influx of individuals offering assistance. Moreover, it is crucial for those providing aid to possess prior experience in managing cases of cardiac arrest. Nevertheless, excessive individuals can impede the team's productivity, and managing the headcount can pose challenges due to their indispensability.

Er, (hesitating) it's always really difficult for the event of cardiac arrest because everywhere people always try to make sure that we regulate the numbers, but at times practically it is difficult to really regulate the numbers like the way it is stated, the recommended, you need the manpower... (Participant 4, Anaesthetist Case 1)

Whereas the management task of the emergency trolley is a significant responsibility for the team since

the items that will be used in resuscitation mostly come from the trolley. The challenge of locating infrequently used items within a trolley arises from individuals' lack of familiarity with said items, so it is important to take the initiative to check the trolley regularly. A senior participant expressed,

Yes… I knew about it. I can provide with what you need. It is like this. So undoubtedly, I am good at it. But for the junior, the staff that did help at the time need to be alert (to improve). Because some of them did not know about the trolley. (Participant 3, Senior Staff Nurse Case 1)

Information deliberation is important in resuscitation efforts, as crucial information may not be readily accessible. Therefore, a leader must be designated to provide comprehensive briefings to all individuals arriving at the scene. Furthermore, the efficacy of medical practice is influenced by effective communication, which plays a pivotal role in effectively transmitting messages within the healthcare team. In this study, the anaesthetist has proposed that the supervising staff nurse provide a concise account of the events and pertinent patient background for individuals seeking medical attention.

... like an example, I am here, then Code Blue Paediatric Cardiac Intensive Care Unit (PCICU),, and then at night I am the only doctor. How do I get to know that? This is what happens, you understand? Someone has to be able to tell me quickly; as the bedside nurse, she should be able to tell me, What exactly has happened, doctor? We are doing this; this happened. Then you understand? (Participant 4, Anaesthetist Case 1)

Based on the findings of this study, it is evident that a limited number of participants possess knowledge regarding the PALS (Paediatric Advanced Life Support) recommendation to conduct debriefing following CPR. Furthermore, implementing this practice within the unit is notably scarce among participants. In alignment with the focus of this study, debriefing serves as a valuable approach for enhancing patient care through the process of reflection, encompassing an assessment of both successful aspects and areas for improvement in terms of collaborative teamwork.

So, the other thing we did not have was we could have done the debriefing. When we get through time, we debrief on what has happened, what we have done, and the things that we think are helpful. (Participant 4, Anaesthetist Case 1)

Individual

Regarding individual development, when considering the assumption of a role, the individual must possess a specific medical background or expertise. In resuscitation, it is imperative to acknowledge and effectively resolve any issues that may arise during the process, regardless of the specific role individuals assume. Each role within the resuscitation process serves a distinct purpose, and each individual's responsibilities must be clearly delineated based on their assigned role.

Meaning that, at that time, someone already stood by at the back because, even though the child was not so big, continuing CPR alone would be exhausting. Someone has standby for medicine. The Adrenaline. Medication (thinking). The anaesthetist at the bedside was taking care of the airway. (Participant 1, In-Charge Staff Nurse Case 1)

So, we really need to clear out the airway at that time (assume role based on what's really needed to be done), and some of them were diluting the adrenaline to be given to the child at that time. (Participant 2, Paediatric Specialist Case 1)

Utilising non-technical skills is imperative during real-life events, as evidenced by the insights gathered from interviews. These skills encompass effective communication, accurate information conveyance, harmonious cooperation, timely alertness to ensure coordinated actions, monitoring by individuals of higher hierarchical positions, demonstration of leadership qualities by the designated team leader, and the display of proficient decision-making abilities. As the participants said,

Coordinated yes, good because there was no screaming; everyone was changing chest compression smoothly. There was always someone on standby. This patient management was smooth—not bad, quite smooth. No screaming. (Participant 1, Senior Staff Nurse Case 1)

I think it's very important for the nurse in charge to communicate with other nurses because we work in a

team at that time. (Participant 6, Staff Nurse Case 2)

Furthermore, during a cardiac arrest incident, an individual may exhibit hesitancy and confusion while attempting to take action. Moreover, given the prevalence of uncertainties in the situation, it is imperative to conduct thorough verifications of any dubious elements. The anaesthetist has indicated that individuals are susceptible to experiencing hesitation.

It was an easy intubation; I was able to see, but until it was too much panic around, myself, I was asking the process of understanding what exactly has happened. (Participant 4, Anaesthetist Case 1)

In addition, enhancing knowledge is paramount in effectively addressing challenges encountered in the context of cardiac arrest. For instance, an unforeseen pneumothorax arose in this case study, causing panic among the individuals involved due to their lack of preparedness for such an eventuality. To acknowledge this,

So, let's say to improve, improve the knowledge. Improve the knowledge..maybe if the patient has the air leak, what will he end up as? (Participant 3, Senior Staff Nurse Case 1)

The staff members are expected to apply the training they have undergone; however, implementing it during a resuscitative process poses significant challenges. Nevertheless, it is imperative for all individuals to actively engage in the process of delimiting themselves to the various training sessions.

Code blue training... Sometimes we have input there. Sometimes maybe the real code blue is more helpful. (Participant 4, Staff Nurse Case 2)

...So to translate the knowledge and practice, so knowledge is the basis of BLS, ACLS, the basis of our training, and all. So when we go for training, we are on the mannequin. So go to real life; when it happens, she can hand on the thing. (Participant 8, Nurse Mentor Case 2)

DISCUSSION

This study has shown that the team members have experienced many details when working in resuscitations. These incidences left them guilty and uneasy feelings because they thought so many things should have been done in the events. Complementing the statements, in this study, miscommunication has become one of the regrets of the participants. Another important resuscitation part is the Code Blue announcement. From the study of Altaf *et al.* (2022), the mean duration of all in-hospital code blue events, from the time of activation to the time of announcement of termination is 21 minutes with a median of 16 minutes, reflecting the overall in-hospital resuscitation time. Every year in United States only, more than 15,000 children received resuscitations in hospitals, with survival around 80-90% but mostly did not survive to hospital discharge (Morgan *et al*., 2021). The timing of resuscitation has continuously become one of the significant parts always been meticulously revised, with the aim to promptly alert involved staffs and to aim starting the resuscitation immediately (Kanaris, 2024).

This study discovers problems with staff knowledge regarding the equipment, such as the location of the things inside the emergency trolley, and difficulties in applying the training to the actual situation. Supporting these, the findings of Kam *et al.* (2022) represented thematic analysis, which revealed six key themes: communication, quality of care, team function and dynamics, resource allocation, preparation and response, and support. Meanwhile, from this research finding, one special advantage in IJN is that they can start the patient with Extracorporeal Membrane Oxygenation (ECMO), an advanced resuscitation procedure. From the study findings, it was concluded that cardiac arrest risk can be reduced by terminating ECMO while the specialists are still present, putting a bridge/retractor to avoid heart compression, and avoiding unnecessary volume/blood transfusion.

This study found from the participants view that good Cardiopulmonary Resuscitation (CPR), means fast action in everything and maintaining airway even when the ETT cannot be inserted yet. Fast drug administration, especially Adrenaline, remains one of the strongest recommendations for a successful CPR, according to the research findings. Also, a good paediatric CPR focusses on giving 1 breath every 2 to 3 seconds, with the use of cuffed endotracheal tubes and lesser importance on cricoid pressure during intubation (Nave & Smola, 2022). Therefore, as this study concludes, enough staff training and confidence make way for successful CPR. One suggestion to overcome this problem is the presence of a dedicated CPR Quality Officer to

improve the quality of CPR compressions without a negative impact on time to first defibrillation, managing the airway, or adherence to local Advanced Life Support (ALS) protocols (Sumera *et al.*, 2024).

Debriefing benefit was also acknowledged, together with the difficulties in applying it in PICU, since there's so little time as everyone tries to finish documentation and provide post cardiac arrest care (if they are going to do hot debriefing). Therefore, another option is to do cold debriefing, where clinical staff would meet at a time later to discuss the cardiac arrest. It is beneficial since it positively affects knowledge, performance, and confidence. Why bother to do a debriefing, is something that every staff should understand, or they will just be uncomfortable about the idea. As Adamakos (2022) explained, debriefing session does not have to be a prolonged event where feelings are involved and eventually becomes very emotional. Even if emotional outbursts can help reduce the team members' stressful feelings, it must be done moderately and professionally to avoid demotivating the team and adding tension. When done correctly, debriefing has been shown to be effective in as little as 5–10 minutes, focusing on improvements of paediatric resuscitation.

This study highlights that individuals should focus on skills, roles, hesitations and knowledge improvements. Individuals can be setbacks during a resuscitation if they are not alert with the instructions or lack in their skills. This happens from feelings of insecurity about something, as Bala-Kerr, Sullivan & Martin (2023) commented that in-charge nursing staffs frequently identify patients in cardiac arrest but may not have the initial leadership and teamwork skills to organize their initial rescue response. For example, Dermer *et al.* (2023) has reported concerns from integrative review at common wards and highlighted that nurse hesitated to initiate Basic Life Support, giving the task to other health-care professionals. They opted to stand back once the arrest team arrived, where they should be participating in the resuscitation. In conclusion, as a human, someone can be scared, especially in a risky situation to any patient's life. Still, one should work through it and be braver so that all the interventions can be done confidently, and the team would work better.

Limitations

This study was conducted on only 2 cases of paediatric cardiac arrests. Collecting information from more resuscitation cases with different causes is possible if the work is being done by a bigger team of researchers. Furthermore, the data collection was done in the same unit, where possibly the participants have similar views of each paediatric resuscitation case. The participants also know each other, and probably feeling unable to critique the behaviour of other persons in the team. In spite of that, they were always reminded that every person interviewed was private and protected.

CONCLUSION

The study accomplished its objectives of investigating the current practice of PICU CPR at the IJN. This study has identified potential areas for improvement, particularly in improving communications, having coordinated team planning, and individual practice execution. The team should also be ready for unexpected discoveries during resuscitation and be open to new learning and experiences. This study findings are necessary to add improvements to current practice, for example, in this setting to do cold or hot debriefings, depending on the situation. In a busy tertiary hospital, a regular meeting may not be possible; thus, the team should find a way to discuss previously encountered resuscitations. In the future, it is recommended that debriefing sessions be conducted after each resuscitation to gain insights into the strengths and weaknesses of the paediatric cardiac arrest response teams, thereby facilitating ongoing improvement in this area.

It is recommended that researchers collect data prospectively for each of the paediatric cardiac arrest occurrences for future studies. To replicate this qualitative study, unstructured interview questions are recommended to give much more freedom to each participant. Furthermore, more case studies can be used to achieve a broader answer and more useful points for the themes and subthemes building. If more than one tertiary hospital PICU is chosen, the strategy probably can result in answers that cover paediatric cardiac arrests originating from various reasons, not only from congenital heart disease-related cardiac arrest.

Conflict of Interest

The authors declare that they have no competing interests.

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