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## Exploration of Pediatric Cardiopulmonary Resuscitation: A conceptual paper

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### Abstract

Cardiopulmonary resuscitation (CPR) flow interventions are required as pediatric CPR tends to be chaotic, and documentation systems are inclined to adults. This paper presents the conceptual framework for exploring CPR and evaluating the Resuscitation Feedback Form of the Pediatric Intensive Care Unit Institut Jantung Negara. The theory of Planned Behaviour will be used in this study to explore team members' thoughts about PICU CPR and documentation. The case study method will be used to explore two CPR events. The expected findings are the comments from team members on PICU CPR weaknesses and inputs in improving the documentation.

Keywords: pediatric cardiopulmonary resuscitation 1; Resuscitation Feedback Form 2; Theory of Planned Behaviour 3

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### 1.0 Introduction

Cardiopulmonary resuscitation (CPR) is a sequential algorithm that is the basis of achieving the return of spontaneous circulation (ROSC) (Ujevich, 2022). A CPR event is a complex situation where team members come together and require interventions in terms of CPR and shock or synchronized cardioversion for the arrhythmias. As CPR is dependent on quick and timely management, the team member thought pattern is fundamental to ensure essential areas of resuscitation can be improved. These critical areas to be explored include routine and documentation when managing pediatric CPR. Then, after CPR is commenced, generally, all hospitals have their system of documenting the event. In Institut Jantung Negara (IJN), the form is called the Resuscitation Feedback Form. However, this form is shared for both adult and pediatric CPR events. Sharing the form is a problem since they differ in terms of CPR quality, medications used, and post-cardiac arrest care (Yu et al., 2020). Thus, this paper highlights the theoretical, conceptual framework for exploring PICU CPR case studies and documentation improvement, taking IJN's Resuscitation Feedback Form as the study tool. Ajzen (2020) claims that in the Theory of Planned Behaviour (TPB), behavioral intention and actual control are the only factors determining behavior. The only predictors

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of behavioral intention are attitude toward the behavior, subjective norm, and perception of behavioral control (self-efficacy related to the behavior). Theoretically, these are enough to secure the prediction of intention and behavior (Ajzen, 2020).

### 1.1 Problem Statement

There are significant problems with current PICU CPR management in any hospital, starting from identifying factors of cardiac arrest and fatal arrhythmias, managing respiratory emergencies, ad hoc team formation, skills of teamwork, and post-CPR management. Moreover, adult and pediatric CPR are undoubtedly different. Special considerations for pediatrics regarding other diagnoses, weight-based medication, procedures, and progressive care make this subject dissimilar (Ujevich, 2022). The study also stated that there are deficits in nontechnical skills, such as miscommunication and misunderstanding, non-clear handover information, mismatched team management, and staff unfamiliarity with health center protocol.

Furthermore, the IJN Resuscitation Feedback Form is designed to cater to adult and pediatric CPR documentation, derived from the Utstein template from International Liaison Committee on Resuscitation. Utstein-style reporting templates provide a structured framework to compare systems of care for cardiac arrest (Nolan et al., 2019). The now-adapted IJN Resuscitation Feedback Form has yet to receive feedback from the pediatric resuscitator.

### 1.2 The Objectives

This paper describes the conceptual framework incorporating the Theory of Planned Behavior (TPB) and its elements. TPB guides the study objectives to explore PICU CPR practices and evaluate the Resuscitation Feedback Form currently used in the pediatric setting.

## 2.0 Literature Review

Cardiac arrest is the cessation of blood circulation resulting from absent or ineffective cardiac mechanical activity, associated with loss of consciousness, spontaneous breathing, and circulation (Nichol et al., 2017). Arrest rhythm may be associated with the following rhythms; asystole, pulseless electrical activity, ventricular fibrillation, and pulseless ventricular tachycardia. Bradycardia with poor perfusion is the initial rhythm in half of pediatric CPR events in the hospital, with approximately 10% of arrests having an initial shockable rhythm (Morgan et al., 2021). Modern CPR was founded in the late 1950s and early 1960s to create artificial ventilation and perfusion for victims (Gabr, 2019). In pediatric cases, cardiac arrest is possibly associated with resuscitation when cardiopulmonary arrest requires chest compressions and/or defibrillation due to pulseless Ventricular Tachycardia. Also, when an acute respiratory compromise requiring emergency assisted ventilation leads to cardiopulmonary arrest requiring chest compression and/or defibrillation (Alten et al., 2017).

Conceptual framework importance is increasingly acknowledged to be steering the whole research activity. TPB starts with an explicit definition of the behavior of interest in terms of its target, the action involved, the context in which it occurs, and the time frame (Ajzen, 2020). This theory has been cited almost 90,000 times as of 2019 (Yuriev et al., 2020). Examples of qualitative studies using TPB include Geleta & Meshesha (2019), Omura et al. (2018), and Alhamami (2017). Bonsnjak et al. (2020) written article explains that TPB outlines human behavior as being guided by three branches. First is the beliefs about the likely consequences of the behavior (behavioral beliefs); second, the beliefs about the normative expectations of others (normative beliefs); and lastly, beliefs about factors that may facilitate or impede the performance of the behavior (control beliefs). Respectively, behavioral beliefs cause chosen attitude toward the behavior; normative beliefs result in perceived social pressure or subjective norm, and control beliefs lead to perceived behavioral control or self-efficacy.

In CPR protocol, Observational Skill-based Clinical Assessment Tool for Resuscitation (OSCAR) and Utstein are used as the guidelines. OSCAR domains are about the teamwork and outcome of CPR. In order to help with improvements and studies of pediatric resuscitation, it is recommended that researchers use the Pediatric Utstein Reporting Style, which has helped narrate a structured framework for cardiac arrest (Nolan et al., 2019). Utstein template for in-hospital cardiac arrest use was developed by representatives of the International Liaison Committee On Resuscitation (ILCOR) through teleconferences and online surveys between 2013 and 2018 (Nolan et al., 2019). Therefore, stemming from the existing conferences, the pediatric Utstein guideline was developed as pediatric arrests have various causes, unlike adults.

## 3.0 Methodology

### 3.1 Study Design

A qualitative case study is a research methodology that helps to explore a phenomenon within a particular context through various data sources. Semi-structured interviews and document reviews will be used to explore two case studies of pediatric CPR and evaluate the current Resuscitation Feedback Form in IJN.

### 3.2 Study Setting

The study will be conducted at PICU IJN. As a referral hospital, most congenital heart disease patients from all over Malaysia are admitted to PICU IJN.

### 3.3 Participants Characteristics

In these case studies, all the team members must have at least two years of experience in pediatrics, meaning that they must have encountered a few numbers of pediatric CPR before. The staffs were at least involved in chest compression, defibrillating, medication administration, intubation, heart rhythm identification, ordering blood products and administering them, and recording the event's flow. The second inclusion criterion is that the team members are the cardiologist, anesthetist, surgeon, and nurses involved in criteria number one. The exclusion criteria is a case of a patient with multiple series of CPR and CPR team members who are not trained with PALS.

### 3.4 Determination Of Sample Size

The team members involved in the CPR of selected case studies will be included in this study. Each of the informants is the sampling unit. 15-20 informants are expected before the point is achieved for data saturation.

### 3.5 Sampling Method Procedure

In this study, the non-probability sampling method, which is purposeful sampling, will be used to gather an information-rich group.

### 3.6 Data Collection

After a selected case study, informants will be chosen and contacted to set up the time for an interview. The time for the interview should not exceed seven days post-cardiac arrest event and should take about 30 minutes. TPB constructs will drive in-depth interviews with the informants. Guided with Utstein style reporting of the PICU CPR on the resuscitation practice elements, as written on the current Resuscitation Feedback Form filled by the in-charge nurse, the interview will be started. An interview guide will be the starter, continued with open-ended questions for exploring the whole event according to the informants' thoughts. OSCAR tool that contains suggestions in communication, cooperation, coordination, monitoring, leadership, and decision-making would be referred to while asking the first question.

### 3.7 Data Analysis

After all the interviews are conducted with informants and data saturation is achieved, it will be transcribed in words. Thematic data analysis will be done, and subcodes will be determined.

## 4.0 Material and Procedure

### 4.1 Conceptual Framework Intervention In Exploring PICU CPR

A conceptual framework is developed for this exploration from a theory. The Theory Of Planned Behaviour is used as the conceptual study framework. The model claims that a favorable attitude, subjective norm, and perceived behavioral control toward the behavior would lead to a stronger intention to perform the behavior (Velde et al., 2022). This model demonstrates the broad range of factors that influence behavior adoption, stemming from intention, sub stemmed by attitude, subjective norms, and perceived control (Ajzen, 2020). The TPB fundamental concept is that the behavior is intended to be performed, much more substantial the intention, so much more the probability of performing the behavior. Using this model will help to indicate how nontechnical skills will influence a team's steps in cardiac arrest.

### 4.2 Modified Adaptation Ajzen's (1988, 1991) Theory Of Planned Behaviour

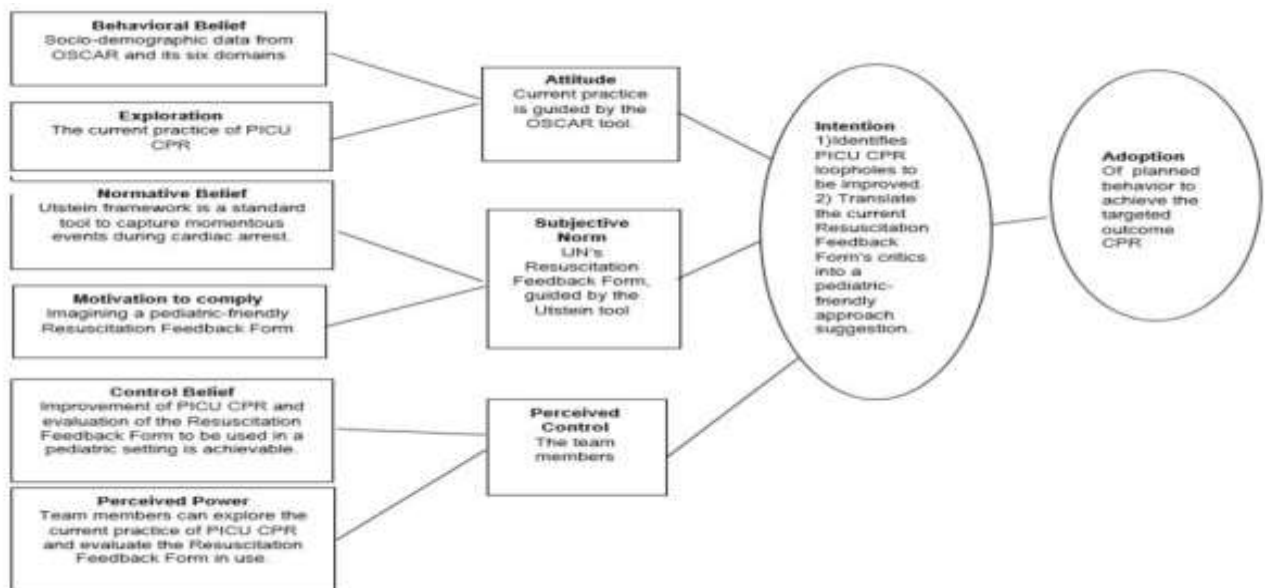


Figure 1: Modified Adaptation Ajzen's (1988,1991) Theory Of Planned Behaviour As The Study Framework (Source:) *Theory of Planned Behaviour* by Ajzen

#### 4.2.1 Attitude

The first element of TPB is the person's attitude towards the behavior, theorizing that there are reasons why an attitude is believed to be taken by a clinician (Ajzen, 2020). The higher the degree of favorable attitude towards someone's behavior, the more probability that someone will perform a particular behavior (Verma & Chandra, 2017). (Gabr, 2019) has been using the OSCAR as guidance in their study of the importance of nontechnical skills in leading CPR, as responses from the team members can be so diverse. Globally, the practices of CPR were reviewed by debriefing after the pediatric cardiac arrest event, acting as informal meetings, which included reviewing team performance, educating team members, identifying errors, providing emotional support, and preparing for future occurrences (Nocera & Merritt, 2017).

##### 4.2.1.1 Behavioural Belief

In understanding human attitude, this study will focus on the current practices of the team members guided by OSCAR tools from its six domains (communication, cooperation, coordination, monitoring, leadership, and decision-making). This behavioral belief of attitude in the Modified Adaptation of Ajzen's model theorizes people's attitudes. Their current practice in PICU CPR depends on what they believe is agreeable. In that term, the attitude taken by a clinician towards the situation reflects the current practice of PICU CPR. CPR is a complex set of interventions requiring leadership, coordination, and best practices (Nassar & Kerber, 2017). Sweberg et al. (2018) did immediate debriefings after in-hospital cardiac arrest and found positive comments regarding cooperation/coordination, communication, and clinical standards. Negative comments come from equipment management, cooperation/coordination, and clinical standards. There were also medication administration, clinical standards, and equipment management delays.

##### 4.2.1.2 Exploration

Institutions committed to improving CPR processes always make way for research exploring CPR. Exploration of PICU CPR, as guided by TPB, is the main reason for this study. The interviewing strategy to find valuable information originates from the American Heart Association (AHA) recommendation of conducting debriefing after a CPR occurrence. Ideally, post-resuscitation debriefing provides participants with immediate feedback regarding resuscitation so that defects in care processes can be identified and addressed (Malik et al., 2020). Concerns and questions related to pre-code and code events improve patient management and enhance unit safety culture. While guidelines from the AHA are primarily based on the best evidence, real-world performance often needs to be improved (Nassar & Kerber, 2017).

#### 4.2.2 Subjective Norms

TPB also considers the social context via subjective norms, which refer to perceived social pressures to behave in a certain way (Ajzen, 2020). In order to help with improvements and the studies of pediatric resuscitation, it is recommended that researchers use the Pediatric Utstein Reporting Style, which has helped narrate a structured framework for cardiac arrest (Nolan et al., 2019). In this situation, clinicians may have normative beliefs about how a case should be handled, which may be asked in the semi-structured interview. Wolfe et al. (2020) in their study ask and found that, in an ad hoc team formation, any deviation from AHA may happen when there is a lack of expertise in ad hoc intubations or defibrillating, medication and vascular access incompetence, or the team is just having poor professionalisms. The Resuscitation Feedback Form is used to study the subjective norm, normative belief, and motivation to comply with constructs will be utilized.

##### 4.2.2.1 Normative Belief

In this study, the individual's belief of normative social pressures, or in other words, what should have been done and what should have been avoided, will be discussed in upcoming interviews. Normative belief in this study is using the Utstein framework as a universal tool in capturing essential incidents during the PICU CPR. In capturing important events during the management, the National Registry of Cardiopulmonary Resuscitation in North America (NRCPR) uses the Utstein template, which has been used widely worldwide to record appropriate data (Jones et al., 2017). Also, to help with improvements and studies of pediatric resuscitation, it is recommended that researchers use the Pediatric Utstein Reporting Style. In response to this recommendation, this research will compare the current usage of Ustein-based IJN's Resuscitation Feedback Form to the original pediatric Utstein template from the informants' perspectives.

Nocera & Merritt (2017) studied pediatric critical event debriefing in an emergency: the opportunity for educational improvement. The semi-structured meeting was held to review and discuss team performance and education, identify errors and emotional responses, and support and plan development for the future. In addition to that, the respondents felt that emotional support and stress reduction should be included in the debriefing.

##### 4.2.2.2 Motivation To Comply

It is also theorized from the modified TPB that people will likely be motivated to comply appropriately with recording the events when the form has features applicable to pediatric settings and parameters. However, while the motivation to comply is also one of the theory's constructs, it does not have a way of measuring it (Branscum & Senkowski, 2019). As one of the elements of TPB, the intention to study motivation to comply is to identify the loopholes to improve and write up valuable academic writing comments. We postulated that rules should be essential for individuals highly motivated to have structured and clear answers (Szumowska, Kossowska & Roets, 2018). For people to have motivation, they should know the importance of doing it that way.

#### 4.2.3 Perceived Control

The third element of TPB concerns the person's perceived control—in other words, whether he feels capable of managing certain circumstances. Furthermore, as in most studies, the actual behavioral control is not measured, instead relying on perceived behavioral control as a proxy due to the difficulties in measuring actual behavioral control operationally (Ajzen, 2020). Actual behavioral control derives from his perceptions of barriers to the action and his confidence in overcoming such barriers, a notion that resembles self-efficacy (Ajzen, 2020). Control factors include the required skills and abilities, which require everyone to be familiar with a CPR event. Involved team members will explore improvements in a PICU CPR practice in the selected case studies to go in-depth regarding the potential improvement aspects.

#### 4.2.3.1 Control Belief

This study also implements the concept of control belief, where it is believed that improvement of PICU CPR and evaluation of the Resuscitation Feedback Form to be used in pediatric settings is achievable. The control belief is the individuals' belief that the presence of factors may facilitate or hinder the performance of a behavior. Just like Jin et al. (2022), generalized self-efficacy is chosen rather than specific self-efficacy because it had reliable measurement tools suitable for the study population and had connotations consistent with the theory. Wolfe et al. (2020) study on interdisciplinary ICU debriefing proves that debriefing improves survival outcomes. Resuscitation data (quantitative), chest compression duration, and patient outcome were included in structured debriefing sessions, assuming all participants had the patient's best interest in mind.

#### 4.2.3.2 Perceived Power

The Perceived Power of this study is that the team members can explore the current practice of PICU CPR and evaluate the Resuscitation Feedback Form. (Ajzen, 1988) defined Perceived Power as the beliefs about the power of situational and internal factors to inhibit or facilitate the performing of the behavior. The team members involved in PICU CPR are perceived as influential in providing good discussions of the current practice of PICU CPR and evaluating the Resuscitation Feedback Form they have been using.

#### 4.3 Intention

According to the TPB, behavior is influenced by the intention to perform the behavior (Velde et al., 2022). In other words, the behavior directly results from the intention (Combs & Ickes, 2021). There are two intentions of this research. First, identifying PICU CPR loopholes to be improved and second, translating critics of the current Resuscitation Feedback Form into a pediatric-friendly form construction recommendations. When the informants understand these intentions, they intend to think according to the research questions. Moreover, TPB helps to understand the intention of an individual to behave at a particular time and place (Nurhuda et al., 2021).

#### 4.4 Adoption

Starting from considering variables in TPB, analysis confirmed the incidence of attitude, subjective norm, and perceived behavioral control on people's behavioral intention, ultimately influencing the behavior adopted (Tommasetti et al., 2018). In this study, the planned behavior to be adopted aims to achieve the targeted outcome of PICU CPR, which is a successful resuscitation. The planned behavior is the perfect plan of behavior and actions, which may not be achieved in the actual situation, so an exploration of PICU CPR is needed.

#### 5.0 Pilot Study

Table 1. Codes obtained from the pilot study

Research Questions	Codes
1) What can be improved in current practice during PICU CPR that can be explored from the involved team member's thoughts?	1) CPR compressions 2) Training received by staff 3) Delay of action 4) Patient close monitoring 5) Initial event recognition 6) Drug administration 7) Problems in managing lethal arrhythmias 8) Team formation 9) Prognostication and confidence
2) How is the Resuscitation Feedback Form evaluated by the team members of PICU CPR in pediatric settings?	1) Need to copy the events on the other paper first before transferring it into the form 2) CPR Faculty roles 3) Need better online form management

(Source:) *Pilot Study of Proposed Exploration Of Pediatric Cardiopulmonary Resuscitation*

A pilot study of PICU CPR exploration was implemented to see if the research plan could be conducted in the setting. A case study involving chest compression and defibrillation was chosen with two team members involved. An appointment was set with each of them,

and in-depth semi-structured interviews were implemented. Pilot study findings are tabulated as per the below table. Two case studies will be selected. In the fundamental study, the duration of each interview is expected to be 25 minutes, with real informants number of 13 people. Most informant stops the interview at minute 25, and each case study only involves about six people.

## 6.0 Limitation

The time frame to do the interview is only one week to make sure they remember, and it is challenging to get all the work done in such a short time. Some informants may have to reschedule the interview according to their time. Therefore, plans need to be readjusted in order to get the best time for everyone. Thus, the actual study can compromise the ideal time and place.

## 7.0 The Future Outcome Of The Study

Qualitative data collection about PICU CPR problems needs to be done in research, especially in Malaysia. Following this study, a new pediatric Resuscitation Feedback Form can be designed to suit IJN's needs. Moreover, this study will help IJN optimize its data collection for pediatric resuscitation for future studies. This study can be a referral for a study constructing a new pediatric-focused Resuscitation Feedback Form and trying to imply the newly built form in a pediatric ward environment.

## 8.0 Ethical Consideration

The study design was approved by the Research Ethics Committee (REC) of UiTM with reference number: REC/09/2021 (MR/838) and REC IJN with project registration ID: IJNREC/525/2021.

## 9.0 Conclusion

In IJN, patients admitted to PICU are either unstable in the ward or during admission from the other hospital, unable to be extubated post Invasive Cardiac Laboratory Procedure and postoperative patients. Therefore, there is a high possibility of a cardiac arrest event during their stay in PICU. Exploring PICU CPR identifies many current practice shortcomings and can provide better safety around pediatric cardiac arrest. The Theory of Planned Behaviour is used to understand the improvement of PICU CPR and the currently used Resuscitation Feedback Form. This theory provides a road map about how the research questions shall be answered.

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## Paper Contribution to Related Field of Study

At this time of the study, no published studies were found to explore PICU CPR and documentation in Malaysia. Also, the existing Resuscitation Feedback Form could be more pediatrics-friendly. Thus, this study will provide ideas for solving these problems.

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