

Questionnaire Survey Medical Futility and Termination of Resuscitation in Out-of-hospital-cardiac-arrest Patients Presenting to Emergency Department in Hospitals in Klang Valley

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Abstract

Aim: The knowledge and understanding of medical futility and decisions about termination of resuscitation (TOR) for out-of-hospital cardiac arrest (OHCA) are highly heterogeneous and dependent on the practice and beliefs of the attending emergency physicians. The objective of this study was to determine current practice, knowledge and attitude among emergency medical practitioners regarding medical futility and termination of cardiopulmonary resuscitation (CPR) in OHCA patients in Hospital Ampang, Pusat Perubatan University Malaya, Hospital Kuala Lumpur and Hospital Serdang.

Materials and Methods: A cross-sectional survey was conducted among medical practitioners in emergency departments in the Klang Valley. The questionnaire assessed the participants' demography, knowledge, attitudes and behaviors (KAB) about TOR of OHCA and identification of medical futility. Subgroup analysis regression analysis was used to identify the relationship between respondents' demography, KAB.

Results: The sample size of this survey was 152 taken at 90% confidence interval. Results show that those with more than 5 years of experience in emergency medicine (EM) had a higher attitude score compared to those with less than 1-year experience ($p < 0.001$) and 1-5 years' experience ($p = 0.003$). The behavior composite score was statistically significant between those with less than 1 year of EM experience and 1-5 years of EM experience ($p = 0.042$). Respondents who called off unsuccessful CPR were associated with higher attitude and behavioral composite scores ($p < 0.05$).

Conclusion: Behavior and practice on TOR do not have any association with the clinician's knowledge. However, more learning activities need to be done to empower medical practitioners on the medical futility of resuscitation and to understand the criteria for the termination of resuscitation.

Keywords: Cardiopulmonary resuscitation, CPR, resuscitation, medical futility, termination of resuscitation, out-of-hospital-cardiac-arrest patients, emergency department

Introduction

Resuscitation is practiced daily in emergency departments worldwide. Cardiopulmonary resuscitation (CPR) is an emergency first aid life-saving procedure performed when the heart stops beating. The resuscitation of victims demands significant resources in the emergency department in terms of workforce, time, and actual expense of medical bills.

Closed chest CPR was first described by Kouwenhoven et al. (1) more than half a century ago as a principal treatment of patients with cardiac arrest to improve cardiocerebral perfusion. CPR is an effort to restore spontaneous circulation by performing chest compression with or without ventilation. The implementation of the survival metaphor concept known as 'chain or survival' as an integrated and coordinated series of actions is essential to improve the survival rates (2). The art of resuscitation and performing CPR



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has evolved from the first introduction of CPR in 1700s called The bellows method to hands-only CPR in 2012 by the American Heart Association (AHA) and is currently the latest update on CPR guidelines by AHA produced in 2017 (3). The constant evolving changes in methods of CPR are focused on improving cardiac output and circulation in cardiac arrest victims.

The healthcare system has greatly improved over the last few decades. Some revolutionary steps have been taken in the field, with some great advancements in the field of CPR care. The most recent guidelines encouraged rescuers to perform chest compression at a rate 100-120 compressions/min (4). Despite numerous advancements, the data show that outcomes related to CPR are extremely poor. This involves both prehospital and in-hospital CPR care (5), especially in Malaysia (6). It is very difficult to decide whether to with hold CPR or to terminate resuscitation (TOR) by every medical practitioner in the emergency department, considering the limited resources and information available regarding the patient. However, more focus should be put on counseling and priming family members regarding the grave prognosis if the resuscitative effort has a poor success rate. Despite many studies suggesting predictive factors to TOR for in- and out-of-hospital cardiac arrest (OHCA) victims and after almost 50 years of progress in the science of resuscitation, the primary question on the best appropriate time to stop resuscitation remains unanswered. More often, resuscitative efforts continue from the emergency medical response team all the way to the resuscitative zone in the hospital despite the poor physiological survival of patients. It is important to distinguish between potentially reversible in the case of sudden unexpected cardiac arrest and cessation of circulation that occurs expected in a terminal condition. Whenever CPR is performed, the question arises on the duration of resuscitation should the victim remain in a state of cardiac arrest. Whether factors to be considered are based on specific duration alone or should it be terminated according to pre-arrest and clinical factors that lead to cardiac arrest or a combination of all factors should be considered before the decision on cessation of resuscitation is made. The TOR efforts should be made with the best clinical judgment guided by clinical decision rules to prevent futile resuscitation.

Ethical dilemmas are commonly faced by medical practitioners in day-to-day medical practice. Medical intervention is considered futile if medical treatment is ineffective or likely to not achieve the desired outcome that the patient could appreciate as a benefit (7). However, the degree of understanding of the term medical futility and the decision to terminate CPR, especially in emergency settings, remains diversified. Medical futility is complex, highly heterogeneous, and subject to a concept that is encircled by a certain degree of uncertainty. The patient's family

might request or demand treatment or care that is unlikely to improve health outcomes; however, medical practitioners are not obligated to provide such treatment if research and scientific evidence may suggest futility. Medical futility was defined objectively in 1990, where interventions and drug therapy result in <1% chances of survival (8).

The TOR will ensue once treatment or CPR is deemed futile. There are three clinical prediction rules for TOR, specifically for medical practitioners trained in using external defibrillators (9). These three clinical criteria are 1) Unavailability of trained personnel or appropriate equipment to provide effective resuscitative efforts 2) absence of spontaneous return of circulation prior to transportation to hospital 3) no defibrillation given to the patient prior to transportation and the arrest itself is not a witnessed arrest (10). Verbeek et al. (9) applied these clinical criteria to patients who suffered a cardiac arrest in a retrospective study and showed a sensitivity of 100% for prediction of patient outcome survival to hospital discharge. Despite numerous research and studies looking into TOR to form a guideline, they are all limited to patients who had received total OHCA care as per Advanced Cardiac Life Support (ACLS) (11-13).

Currently, there are no local guidelines regarding the termination of CPR in Malaysia. This study aims to investigate the current knowledge attitude and practices regarding medical futility and TOR during the management of OHCA in a few hospitals in Klang Valley, Malaysia, and correlate the results of this knowledge and attitudes to current practices

Materials and Methods

Study Design

This was an observational cross-sectional study. A survey on knowledge, attitude and behavior (KAB) concerning TOR in OHCA was conducted on emergency medical practitioners in four emergency departments in the Klang Valley area. The survey was conducted in the form of printed questionnaires written in English. The total duration of this study was 12 months and was conducted from February 8, 2021 to January 31, 2022. Informed consent was obtained from the participants. The questionnaire (Appendix 1) was provided after the respondents agreed to participate in this study. Participants were informed regarding their anonymity, and their personal information will not be published or accessible by anyone. Participants were given sufficient time to consider their participation in this study.

Population and Sample Size

The respondents of our study will include all emergency medical practitioners in Hospital Ampang, Hospital Serdang, Hospital

Kuala Lumpur and Pusat Perubatan University Malaya (PPUM) from whom we will be asking questions and collecting data.

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N} \right)}$$

N = population size • e = Margin of error (percentage in decimal form) • z = z-score

Population size: 280

Confidence interval: 90%

The margin of error: 5%

Dropout rate: 10%

Sample size+dropout rate=Total sample size of our study

139+13=152

The sample size of our study was 152 respondents.

- Medical practitioners from the emergency department Hospital Ampang,
- Medical practitioners from emergency department Hospital Kuala Lumpur,
- Medical practitioners from emergency department Hospital Serdang,
- Medical practitioners from emergency department PPUM.

Inclusion Criteria

- Registered medical practitioners who are medical officers working in the emergency departments consented to participate in this study.

Withdrawal Criteria

Participants who voluntarily withdraw their consent to participate in this study.

- Principal investigator ends subject's study participation.

Participants failed to complete the questionnaire by December 2021.

Exclusion Criteria

- Refusal to participate.
- Medical practitioners registered under other specialties who are working in the emergency departments.

Questionnaire Tool

A validated questionnaire (Appendix 1) used by Soar et al. (14) in 2019 was used in this study for evaluating the difference in current practices.

This questionnaire consisted of five domains of questions in the formats of binary (Yes/No) questions, 5-point Likert scale questions, and open-ended questions (Table 1). To avoid learning bias, the sequence of questions was rearranged in the final questionnaire.

The five domains included: (1) Demographic data of the participants; (2) knowledge on TOR; (3) attitudes toward TOR; (4) behaviors in TOR; and (5) miscellaneous.

The first domain contained questions that obtained the participants' baseline characteristics, including their fellowship status, clinical experience, and any courses attended on topics related to both resuscitation such as the ACLS course and TOR. The results were used to provide the study demographic data and to analyze the relationship between the participants' background and other variables, including KAB.

The second domain consisted of questions about the knowledge of TOR (Table 1). There were eight questions in this domain, which included facts about OHCA in Hong Kong, current validated rules for TOR, and issues related to medical futility. Correct answers were given 1 point for each question. A knowledge composite score ranging from 0 to 8 was calculated for each participant from the summation of individual questions. A higher score reflected a higher level of knowledge about OHCA outcomes and the concept of medical futility.

The third domain included questions assessing participants' attitudes toward TOR (Table 1). There was one binary question with a score of 5 for a positive answer and five Likert-type questions with scores from 1 (strongly disagree) to 5 (strongly agree). An attitude composite score ranging from 5 to 30 was calculated by the summation of individual questions. A higher score reflected more open-mindedness to accept the early termination of futile resuscitation and better provision of tender loving care to relatives.

The fourth domain contained ten clinical scenarios concerning OHCA (Table 1). Participants were asked their preferred duration of resuscitation in a range from 0 to 4, with 0 being no resuscitation and 4 being prolonged resuscitation. A behavioral composite score was calculated by the summation of individual questions. A higher score indicated higher aggressiveness toward attempting and continuing resuscitation. The behavioral composite score does not include any specification regarding medicolegal considerations, personal beliefs, or religious context.

Table 1. This questionnaire consisted of five domains of questions in the formats of binary (Yes/No) questions, 5-point Likert scale questions, and open-ended questions

No	Question	Remark and score
Knowledge on termination of resuscitation (score range: 0-8)		
K1	Do you know that there are validated rules for TOR? If the answer is Yes, please state the rule.	Positive response (1 point) if answered Yes and stated correct rules.
K2	Per 100 patients presenting to Accident & Emergency Departments in Malaysia with OHCA, how many patients do you think can survive until day 30, or until hospital discharge?	Positive response (1 point) if answered >0% and <5%.
K3	The following personnel can certify that a patient is dead: in-charge ambulance officer, other ambulance crew members, registered medical practitioner, registered nurse, police officer on scene.	Positive response (1 point) if answered both in-charge ambulance officer and registered medical practitioner.
K4	Do-Not-Attempt cardiopulmonary resuscitation order by OHCA patients can be overridden by the attending physician based on one's own clinical judgement.	Positive response (1 point) if answered Yes.
K5	Medical futility is a subjective decision.	Positive response (1 point) if answered Yes.
K6	Resuscitation is considered medically NOT futile if return of spontaneous circulation occurs after cardiopulmonary resuscitation.	Positive response (1 point) if answered No.
K7	Cardiac death patients usually can donate the same types and numbers of organs as brain death patients.	Positive response (1 point) if answered No.
K8	Termination of resuscitation is similar to euthanasia.	Positive response (1 point) if answered No.
Attitude on termination of resuscitation (score range: 5-30)		
A1	Do you think that a rule for termination of resuscitation should be implemented in Accident and Emergency Departments in Malaysia?	Positive response (5 points) if answered Yes.
A2	What is your attitude towards euthanasia?	Strongly agree=5 points Agree=4 points Neutral=3 points Disagree=2 points Strongly disagree=1 point
A3	No resuscitation should be performed on arrival at Accident and Emergency Departments for OHCA patients if they are considered medically futile?	
A4	In the case of cardiac arrest for >20 minutes with no reversible cause, do you think that nonphysicians (eg, ambulance personnel or nurses) can diagnose death at the scene?	
A5	In prehospital cardiac arrest, do you think that ambulance personnel could decide not to resuscitate a patient according to protocols (eg, unwitnessed arrest with no bystander CPR/shock, with asystole as the initial rhythm seen by the paramedics/medical practitioners)?	
A6	Ideally, selected family members (eg, calm relatives/parents of children) should be allowed to witness the resuscitation process with a nurse accompanying them.	
Behaviour on termination of resuscitation (score range: 0-40) For the following scenarios, please indicate how long you would resuscitate the patient?		
B1	Multiple co-morbidities, aged 85 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.	Score: 0 to 4 (0=no resuscitation; 4=prolonged resuscitation)
B2	Multiple co-morbidities, aged 85 years, witnessed arrest, bystander CPR, asystole as initial rhythm on scene.	
B3	Good past health, aged 85 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.	
B4	Good past health, aged 85 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.	
B5	Good past health, aged 85 years, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene.	
B6	Multiple co-morbidities, aged 40 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.	
B7	Good past health, aged 40 years, witnessed cardiac arrest, bystander CPR alone, asystole as initial rhythm on scene.	
B8	Good past health, aged 40 years, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene.	
B9	Good past health, aged 15 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.	
B10	Good past health, aged 15 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.	

Table 1. Continued		
No	Question	Remark and score
Other questions		
O1	Do you think the presence of relatives would prolong your duration of resuscitation?	Score: 0 to 4 (0=never; 4=always)
O2	In the past 6 months, how often have you allowed family members to be present during resuscitation?	
O3	In the past 6 months, you stopped your resuscitation for medically futile patients because relatives were calm and well accepting.	
O4	In the past 6 months, you prolonged your resuscitation for medically futile patients if relatives were not prepared to accept the death of their relatives.	
O5	If there is a departmental guideline for TOR, how frequently do you think you will follow the guideline not to initiate resuscitation?	
O6	What factor(s) concern you most when you follow/do not follow departmental guidelines for TOR?	Open-ended question
TOR: Termination of resuscitation, CPR: Cardiopulmonary resuscitation, OHCA: Out-of-hospital cardiac arrest		

The last domain of this questionnaire consisted of six questions about TOR that were not categorized into KAB domains. This domain included questions concerning the effects of the presence of relatives and the presence of departmental guidelines on TOR-related decisions.

Medical practitioners practicing in emergency departments of Hospital Ampang, Hospital Serdang, Hospital Kuala Lumpur, and PPUM during the study duration were recruited. Participants who did not meet the inclusion criteria were excluded from this study.

Domains of Questions in the Study Questionnaire

Data Collection

- The questionnaire was distributed in either Google Form or printed questionnaire written in English. Each participant was given a period of 14 days to answer the questionnaire.
- The questionnaire used in this study was validated and published (20).
- This validated questionnaire was obtained with the permission of author So et al. (20), 2019 via email correspondence.
- The questionnaire was distributed by the principal investigator to participants working in emergency departments at Hospital Ampang, Hospital Serdang, Hospital Kuala Lumpur, and PPUM.

Statistical Analysis

Descriptive analysis is reported for the questionnaire response for each domain. The median and standard deviation (SD) are reported for continuous composite scores, and between-subgroup comparisons are done using Mann-Whitney U tests. Spearman's correlation coefficients were determined between domains. Multiple regression was modeled to predict the behavioral composite score by entering the knowledge composite score,

attitude composite score, and relevant participants' background variables. All statistical analyzes for the study were performed using the statistical software Statistical Package for the Social Sciences (SPSS) version 24.0 (IBM SPSS Statistics 2017). A p value of <0.05 is considered statistically significant.

Results

Baseline Characteristics of Respondents

A total of 152 respondents answered the questionnaire. From that, 105 (69.1%) of the respondents were service medical officers, 60 (39.5%) had >5 years of experience in emergency medicine (EM), 24 (15.8%) had ≥10 years of practicing as a doctor, 79 (52.0%) had attended ACLS for more than 2 years, 25 (16.4%) were BLS/ACLS/PALS instructors, and 24 (15.8%) had attended courses on training on ethics or legal aspects on TOR/DNACPR (do not attempt CPR) (Table 2).

Descriptive Statistics of Survey Responses

A summary of the responses to the survey is shown in Table 3. The questions are categorized into KAB, and others. For the knowledge questions, the highest positive responses were K5 and K8, with 134 responses (88.2%).

Comparison of KAB Scores on Medical Futility and TOR Based on Groups

The mean (SD) KAB composite scores was 5.15 (1.25), 20.12 (2.95), and 27.59 (4.52), respectively. A comparison of the KAB composite scores in terms of years of practicing as doctors showed no difference. Based on gender, there was a significant mean difference in attitude composite scores between males (mean=21.33, SD=2.82) and females (mean=19.10, SD=2.67) (p<0.05). The attitude and behavioral composite scores differed based on years of experience in EM. It showed that those with

more than 5 years of experience in EM had a higher attitude score compared to those with less than 1-year experience ($p<0.001$) and 1-5 years' experience ($p=0.003$). The behavior composite score was statistically significant between those with less than 1 year of EM experience and 1-5 years of EM experience ($p=0.042$).

There was no difference between status based on knowledge and behavior score. However, there was a statistically significant difference in attitude composite scores between the master trainee and service MO ($p<0.001$) and master trainee and parallel pathway trainee ($p=0.008$). The results indicated that the master trainee had the highest attitude score (mean=21.79, SD=2.86). Otherwise, the attitude composite score also differed between those who were BLS/ACLS/PALS instructors or not, with mean (SD) 21.40 (2.68) and 19.87 (2.95), respectively. Respondents who received the training showed significant differences in attitude composite scores ($p=0.012$) compared with respondents who did not receive the training. In addition, respondents with called off unsuccessful CPR were associated with higher attitude and behavioral composite scores ($p<0.05$) (Table 4).

Associated Factors of Behavior Composite Score

Table 5 shows the application of simple and multiple linear regression in predicting the factors associated with the behavioral composite score. The results indicated that all predictors showed

Baseline characteristics	n (%)
Years of practicing as a doctor	
<10 years	128 (84.2)
≥10 years	24 (15.8)
Years of experience in EM	
Less than 1 year	26 (17.1)
1-5 years	66 (43.4)
More than 5 years	60 (39.5)
Current status	
Service medical officer	105 (69.1)
Master trainee	39 (25.7)
Parallel pathway trainee	8 (5.3)
Time of last ACLS course	
Never	20 (13.2)
More than 2 years	79 (52.0)
Less than 2 years	53 (34.9)
BLS/ACLS/PALS instructor	
No	127 (83.6)
Yes	25 (16.4)
Received training on ethics or legal aspects on termination of resuscitation/DNACPR	
No	128 (84.2)
Yes	24 (15.8)
ACLS: Advanced Cardiac Life Support, EM: Emergency medicine, DNACPR: Do not attempt cardiopulmonary resuscitation	

no statistically significant association with any difference in behavioral composite scores in multiple linear regression.

Association Between the Presence of Relatives Prolongs Resuscitation and Prolonging Resuscitation for Medically Futile Patients If Relatives were not Prepared to Accept the Death of Their Relatives

The results indicated no association between the presence of relatives and prolonged resuscitation for medically futile patients if relatives were not prepared to accept the death of their relatives ($p>0.05$). A total of 29 respondents (42.0%) answered no, and 19 patients (45.2%) responded yes for both questions O1 and O4 (Table 6).

Discussion

This is the first study in Malaysia looking for the correlation between KAB among medical practitioners in TOR in OHCA in an emergency setting. We focused on finding a correlation between the different characteristics of medical practitioners and the differences in the current practice of TOR efforts associated with futile CPR interventions. Since national and international guidelines have not specifically addressed the appropriate duration of CPR, clinicians are left to assess the ongoing resuscitation and make their own decisions when considering TOR. The European Resuscitation Council Guidelines for Resuscitation 2015 advised asystole for more than 20 min in the absence of a reversible cause and with ongoing advanced resuscitation constitutes a reasonable ground for stopping further resuscitation attempts (15). Scarcity of data on the fundamental issue of resuscitation has resulted in variation in clinical practice.

One of the most difficult obstacles for clinicians is the decision to stop resuscitation efforts in patients in cardiac arrest. Some clinicians are reluctant to continue efforts when ROSC does not occur shortly after the initiation of resuscitation, given the overall poor prognosis for such patients. In this multicenter study, we found that the attitude and behavioral composite scores differed based on years of experience in EM. It showed that those with more than five years of experience in EM had a higher attitude score compared to those with less than 1-year experience ($p<0.001$) and 1-to-5 years of experience ($p=0.003$). As expected, clinicians with more experience in the emergency department were less aggressive in resuscitating medically futile OHCA patients. The questions on attitudes toward TOR were assessed in participants toward aggressiveness of resuscitation and identification of medically futile resuscitation. Although participants who were trained as ACLS instructors were expected to have greater knowledge with regard to resuscitation, they were not associated with less aggressive resuscitation.

Table 3. Summary of the questionnaire survey responses on medical futility and termination of resuscitation in cardiac arrest patients who presents to emergency department in hospitals in Klang Valley (n=152)

Questionnaire question		Positive response n (%)	5-point Likert scale n (%)				
			Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Knowledge							
K1	Do you know that there are validated rules for TOR? If the answer is Yes, please state the rule.	40 (26.3)					
K2	Per 100 patients presenting to Accident & Emergency Departments in Malaysia with OHCA, how many patients do you think can survive until day 30, or until hospital discharge?	56 (36.8)					
K3	The following personnel can certify that a patient is dead: in-charge ambulance officer, other ambulance crew members, registered medical practitioner, registered nurse, police officer on scene.	112 (73.7)					
K4	Do-Not-Attempt cardiopulmonary resuscitation order by OHCA patients can be overridden by the attending physician based on one's own clinical judgement.	101 (66.4)					
K5	Medical futility is a subjective decision.	134 (88.2)					
K6	Resuscitation is considered medically NOT futile if return of spontaneous circulation occurs after cardiopulmonary resuscitation.	85 (55.9)					
K7	Cardiac death patients usually can donate the same types and numbers of organs as brain death patients.	121 (79.6)					
K8	Termination of resuscitation is similar to euthanasia.	134 (88.2)					
Attitude							
A1	Do you think that a rule for termination of resuscitation should be implemented in Accident and Emergency Departments in Malaysia?	149 (98.0)					
A2	What is your attitude towards euthanasia?		14 (9.2)	21 (13.8)	78 (51.3)	30 (19.7)	9 (5.9)
A3	No resuscitation should be performed on arrival at Accident and Emergency Departments for OHCA patients if they are considered medically futile?		15 (9.9)	63 (41.4)	40 (26.3)	28 (18.4)	6 (3.9)
A4	In the case of cardiac arrest for >20 minutes with no reversible cause, do you think that nonphysicians (eg, ambulance personnel or nurses) can diagnose death at the scene?		10 (6.6)	42 (27.6)	35 (23.0)	53 (34.9)	12 (7.9)
A5	In prehospital cardiac arrest, do you think that ambulance personnel could decide not to resuscitate a patient according to protocols (eg, unwitnessed arrest with no bystander CPR/shock, with asystole as the initial rhythm seen by the paramedics/medical personnel)?		12 (7.9)	66 (43.4)	35 (23.0)	34 (22.4)	5 (3.3)
A6	Ideally, selected family members (eg, calm relatives/parents of children) should be allowed to witness the resuscitation process with a nurse accompanying them.		6 (3.9)	38 (25.0)	31 (20.4)	53 (34.9)	24 (15.8)
			Scoring n (%)				
			0	1	2	3	4
Behavior B1	Multiple co-morbidities, aged 85 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.		69 (45.4)	50 (32.9)	31 (20.4)	2 (1.3)	0 (0.0)
B2	Multiple co-morbidities, aged 85 years, witnessed arrest, bystander CPR, asystole as initial rhythm on scene.		23 (15.1)	46 (30.3)	57 (37.5)	23 (15.1)	3 (2.0)
B3	Good past health, aged 85 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.		17 (11.2)	19 (12.5)	62 (40.8)	41 (27.0)	13 (8.6)

Table 3. Continued

Questionnaire question		Positive response n (%)	5-point Likert scale n (%)				
			Strongly agree	Agree	Neutral	Disagree	Strongly disagree
			Scoring n (%)				
			0	1	2	3	4
B4	Good past health, aged 85 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.		3 (2.0)	17 (11.2)	49 (32.2)	65 (42.8)	18 (11.8)
B5	Good past health, aged 85 years, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene.		0 (0.0)	13 (8.6)	48 (31.6)	61 (40.1)	30 (19.7)
B6	Multiple co-morbidities, aged 40 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.		1 (0.7)	3 (2.0)	40 (26.3)	73 (48.0)	35 (23.0)
B7	Good past health, aged 40 years, witnessed cardiac arrest, bystander CPR alone, asystole as initial rhythm on scene.		0 (0.0)	0 (0.0)	7 (4.6)	57 (37.5)	88 (57.8)
B8	Good past health, aged 40 years, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene.		0 (0.0)	0 (0.0)	2 (1.3)	31 (20.4)	119 (78.3)
B9	Good past health, aged 15 years, unwitnessed cardiac arrest, asystole as initial rhythm on scene.		0 (0.0)	1 (0.7)	7 (4.6)	20 (13.2)	124 (81.6)
B10	Good past health, aged 15 years, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene.		0 (0.0)	0 (0.0)	1 (0.7)	6 (3.9)	145 (95.4)
Others							
O1	Do you think the presence of relatives would prolong your duration of resuscitation?		26 (17.1)	26 (17.1)	42 (27.6)	35 (23.0)	23 (15.1)
O2	In the past 6 months, how often have you allowed family members to be present during resuscitation?		86 (56.6)	31 (20.4)	21 (13.8)	9 (5.9)	5 (3.3)
O3	In the past 6 months, you stopped your resuscitation for medically futile patients because relatives were calm and well accepting.		37 (24.3)	26 (17.1)	30 (19.7)	29 (19.1)	30 (19.7)
O4	In the past 6 months, you prolonged your resuscitation for medically futile patients if relatives were not prepared to accept the death of their relatives.		40 (26.3)	29 (19.1)	41 (27.0)	27 (17.8)	15 (9.9)
O5	If there is a departmental guideline for TOR, how frequently do you think you will follow the guideline not to initiate resuscitation?		0 (0.0)	0 (0.0)	32 (21.1)	64 (42.1)	56 (36.8)

TOR: Termination of resuscitation, CPR: Cardiopulmonary resuscitation, OHCA: Out-of-hospital cardiac arrest

This is probably due to expectations of the general public and family members regarding patients' conditions and the lack of emphasis on the futility of resuscitation during life support courses. The calculation of scores regarding TOR-related behavior was based on participants' self-reported behavior rather than their actual behavior during clinical practice. This might cause reporting bias due to the participants' knowledge of the objectives of this study. These results clearly show that the concept and understanding of TOR and medical futility should be introduced and discussed frequently during continuous professional development sessions to increase awareness of affect practice.

No correlation was found between medical practitioners' knowledge about TOR and their aggressiveness with resuscitation

(behavior score). This correlates well with the data showing that the respondents expressed concerns regarding TOR variables such as the patient's premorbid status, reactions from family members, and their concerns on medicolegal implications. These factors that influence clinicians their decision on TOR show the independence between clinicians' knowledge and behavior toward TOR.

Different guidelines and prediction rules on TOR have been developed over the years to identify patients who are medically futile for resuscitation. These guidelines, for example, are the AHA (16), the universal TOR guideline (17), the modified basic life support TOR rule (18) and the neurological TOR rule (19). Most of these guidelines were validated in prehospital

Table 4. Knowledge, attitude, and behavioral composite scores on medical futility and termination of resuscitation comparison based on groups among cardiac arrest patients who present to the emergency department in hospitals in Klang Valley (n=152)

Questionnaire question	Knowledge composite score		Attitude composite score		Behavioral composite score	
	Mean (SD)	p value	Mean (SD)	p value	Mean (SD)	p value
All (n=152)	5.15 (1.25)	-	20.12 (2.95)	-	27.59 (4.52)	-
Years of practicing as a doctor						
<10 years	5.20 (1.20)	0.320 ^a	19.98 (2.94)	0.153 ^a	27.49 (4.60)	0.530 ^a
≥10 years	4.92 (1.53)		20.92 (2.93)		28.13 (4.08)	
Gender						
Male	5.09 (1.15)	0.553 ^a	21.33 (2.82)	<0.001 ^a	27.74 (5.02)	0.705 ^a
Female	5.21 (1.34)		19.10 (2.67)		27.46 (4.07)	
Race						
Malay	4.98 (1.30)	0.097 ^b	19.91 (2.76)	0.040 ^b	27.17 (4.61)	0.357 ^b
Chinese	5.33 (1.07)		21.41 (3.35)		28.41 (4.05)	
Indian	5.48 (1.20)		19.67 (2.94)		28.09 (4.61)	
Years of experience in EM						
Less than 1 year	5.31 (0.97)	0.780 ^b	18.65 (2.31)	<0.001 ^b	29.58 (4.02)	0.043 ^b
1-5 years	5.11 (1.20)		19.62 (3.01)		27.02 (4.42)	
>5 years	5.13 (1.42)		21.32 (2.72)		27.37 (4.66)	
Status						
Service MO	5.17 (1.19)	>0.95 ^b	19.63 (2.69)	<0.001 ^b	27.70 (4.34)	0.406 ^b
Master trainee	5.10 (1.48)		21.79 (2.86)		27.74 (5.08)	
Parallel pathway trainee	5.13 (0.99)		18.50 (3.74)		25.50 (3.93)	
Time of ACLS course						
Never	4.95 (0.95)	0.745 ^b	19.50 (3.00)	0.200 ^b	29.20 (3.76)	0.211 ^b
More than 2 years	5.18 (1.33)		20.53 (3.08)		27.49 (4.91)	
Less than 2 years	5.19 (1.26)		19.75 (2.70)		27.13 (4.09)	
BLS/ACLS/PALS instructor						
No	5.09 (1.16)	0.261 ^a	19.87 (2.95)	0.018 ^a	27.82 (4.59)	0.164 ^a
Yes	5.48 (1.64)		21.40 (2.68)		26.44 (4.00)	
Received training						
No	5.08 (1.21)	0.097 ^a	19.87 (2.91)	0.012 ^a	27.73 (4.44)	0.398 ^a
Yes	5.54 (1.41)		21.50 (2.83)		26.88 (4.95)	
Called off unsuccessful CPR						
No	5.13 (1.31)	0.930 ^a	18.67 (2.51)	0.002 ^a	20.48 (2.95)	0.002 ^a
Yes	5.16 (1.25)		20.48 (2.95)		29.83 (4.32)	

^aIndependent t-test was applied; normality and equal variance assumptions were met, ^bOne-way ANOVA applied.
SD: Standard deviation, CPR: Cardiopulmonary resuscitation, ACLS: Advanced Cardiac Life Support, EM: Emergency medicine

Table 5. Associated factors of behavior composite score among cardiac arrest patients who presents to the emergency department in hospitals in Klang Valley using simple and multiple linear regression (n=152)

Predictors	Simple linear regression		Multiple linear regression	
	Crude B (95% CI)	p value	Adjusted B (95% CI)	p value
Service MO	0.334 (-1.237, 1.904)	0.675	0.201 (-2.208, 2.429)	0.859
BLS/ACLS/PALS instructor	-1.379 (-3.325, 0.567)	0.164	-1.068 (-3.235, 1.098)	0.331
Attended ACLS more than 2 years	-0.205 (-1.658, 1.248)	0.781	-1.567 (-4.407, 0.913)	0.214
Attended ACLS less than 2 years	-0.353 (-1.113, 0.407)	0.360	-0.935 (-2.118, 0.248)	0.120
Practicing as doctors for ≥10 years	0.633 (-1.356, 2.621)	0.530	1.135 (-1.246, 3.515)	0.348
EM experience ≥5 years	-0.372 (-1.857, 1.112)	0.621	0.302 (-2.290, 2.894)	0.818
Knowledge composite score	-0.373 (-0.951, 0.205)	0.204	-0.334 (-0.923, 0.255)	0.265
Attitude score	-0.229 (-0.573, 0.015)	0.066	-0.231 (-0.494, 0.031)	0.084

CI: Confidence interval, ACLS: Advanced Cardiac Life Support, EM: Emergency medicine

Table 6. Association between questions O1 and O4 on medical futility and termination of resuscitation based on cardiac arrest patients who presents to emergency department in hospitals in Klang Valley (n=152)

Variables	Question O4-In the past 6 months, you prolonged your resuscitation for medically futile patients if relatives were not prepared to accept the death of their relatives				p value ^a
	No n (%)	Neutral n (%)	Yes n (%)	Total n (%)	
Question O1-Do you think the presence of relatives would prolong your duration of resuscitation?					
No	29 (42.0)	13 (31.7)	10 (23.8)	52 (34.2)	0.363
Neutral	16 (23.2)	13 (31.7)	13 (31.0)	42 (27.6)	
Yes	24 (34.8)	15 (46.6)	19 (45.2)	58 (38.2)	

^aPearson chi-square applied; less than 20.0% have expected count <5

settings. In Malaysia, emergency services do not apply TOR in prehospital care except in conditions where injuries sustained are incompatible with life or in patients seen with obvious postmortem changes.

99% of participants in this study answered about the need to develop TOR rules in Malaysia. When they were further questioned regarding their concerns, many responded regarding medicolegal consequences during TOR. As the effects of litigation in medical practice increase, current medical practitioners often take on a defensive medicine mode, and this could contribute to the reluctance for TOR. However, it is also pertinent that practitioners know that continuing aggressive resuscitation for medically futile patients does not shield them from possible complaints and litigations. Emphasis on proper techniques of communication, bereavement support, and breaking bad news is key to helping family members understand the current medical conditions of their loved ones.

On the assessment of attitude toward TOR in this study, we found that there was a statistically significant difference in composite attitude scores between the master trainee and service medical officer ($p < 0.001$) and master trainee and parallel pathway trainee ($p = 0.008$). The results indicated that the master trainee had the highest attitude score (mean=21.79, SD=2.86). The master's training program in EM is a comprehensive program that instills knowledge regarding TOR, intended at coaching the trainees to adopt a positive attitude toward TOR with consideration of initiation of end-of-life care when managing a medically futile patient.

In this study, up to 50% of participants disagreed with having family members or relatives present during the resuscitation process, and 38% of respondents believed that the presence of family members or relatives during resuscitation would result in prolonged resuscitation despite the futility. DeWitt (19) suggested that family members who were present and witnessed the resuscitation process had better mental health outcomes

regardless of the patient's outcome (20). The process of witnessing the resuscitation of their family members was found to assist in the grieving process (20). The process of witnessing resuscitation by family members should be looked into and screened on the feasibility of the patient's condition, space available for family members to witness resuscitative efforts, and available personnel to accompany cooperative family members in the resuscitation room. These factors should be looked into to help family members through these stressful situations and help with their emotional reactions and well-being.

Study Limitations

This study only involves four hospitals around the Klang Valley area and does not represent the entire emergency services practice in the region.

Another drawback is that this study does not involve any respondents from emergency physicians who are specialized in emergency services in the emergency department. The results of this study may not reflect the true practice in the emergency department as most critically ill patients' ongoing CPR in the emergency department will be consulted by medical practitioners to the emergency physician for further steps to either terminate or continue resuscitative efforts.

Furthermore, the arbitrary scale scoring that is used to assess the behavior of respondents is descriptive, and a better objective assessment would probably be to quantify the duration of resuscitation in terms of minutes or the number of adrenaline injections.

Conclusion

Behavior and practice on TOR do not have any association with the clinician's knowledge. However, more learning activities need to be done to empower medical practitioners on the medical futility of resuscitation and to understand the criteria for the TOR.

Ethics

Ethics Committee Approval: This study has been approved by the Malaysia Medical Research and Ethics Committee through the National Medical Research Register (ID: NMRR-20-2912-57729, date: 19.4.2021).

Informed Consent: Written consent was obtained from participants who fulfilled the inclusion criteria.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: N.A.M.S., Concept: N.A.M.S., K.P., H.Z.A., T.Y.H.T., Design: N.A.M.S., K.P., H.Z.A., T.Y.H.T., Data Collection or Processing: N.A.M.S., Analysis or Interpretation: N.A.M.S., K.P., H.Z.A., T.Y.H.T., Literature Search: N.A.M.S., Writing: N.A.M.S., T.Y.H.T.

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Appendix 1. Validated questionnaire survey from So et al. (20) 2019

Questionnaire

Survey in TOR among medical practitioners in emergency department.

Thank you for participating in this survey.

It would take about **5-10 minutes** to complete this questionnaire. Individual personal data collected will be kept confidential, and will be used anonymously and solely for research purposes.

Should there be any enquiry, please contact Dr. Nur Aiza Binti Mohamed Salleh (draizasalleh@gmail.com)

Demographic data

Year of graduation:	Hospital:
Gender: Male / Female	Religion:

Year of experience in EM

- Less than 1 year 1-5 years more than 5 years

Current status

- EM physician EM trainee service MO contract MO

Time of last ACLS course

- >2 years ≤2 years never

Current instructor of BLS/ACLS/PALS

- Yes No

Received training on ethics or legal aspects on TOR/DNACPR

- Yes No

Received training on breaking news (i.e. lessons with instructors, exclude self-reading)

- Yes No

Questions**1. For the following scenarios, please indicate how long you would resuscitate the patient.**

[0: no resuscitation, 4: prolonged resuscitation]

Multiple co-morbidities, aged 85, non-witnessed cardiac arrest, asystole as initial rhythm on scene	0	1	2	3	4
Multiple co-morbidities, aged 85, witnessed arrest, bystander CPR, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 85, non-witnessed cardiac arrest, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 85, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 85, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene	0	1	2	3	4
Multiple co-morbidities, aged 40, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 40, witnessed cardiac arrest, bystander CPR alone, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 40, witnessed cardiac arrest, bystander CPR + defibrillation, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 15, non-witnessed cardiac arrest, asystole as initial rhythm on scene	0	1	2	3	4
Good past health, aged 15, witnessed cardiac arrest, bystander CPR, asystole as initial rhythm on scene	0	1	2	3	4

2. In the past 6 months (0: never, 4: always)

How often do you allow family members to be present in resuscitation?	0	1	2	3	4
You stopped your resuscitation for medically futile patients because relatives are calm and well accepted.	0	1	2	3	4
You prolonged your resuscitation for medically futile patients if relatives are not prepared to accept death of their relatives.	0	1	2	3	4

3. Will you prolong your resuscitation for patients with cardiac arrest if patient had organ donation card signed? Yes No**4. The following personal can certify patient dead: [tick the correct answers]**

- Ambulance driver	
- Medical attendant	
- Registered medical practitioner	
- Registered nurse	
- Police officer	

5. Do you think a departmental guideline on TOR will be useful to you? Strongly agree Agree Neutral Disagree Strongly disagree**6. For 100 patients presented to A&E with OHCA, how many patients do you think can survive until day 30, or until hospital discharge?**

7. Do you know that there are validated rules for TOR?

Yes No (Skip Q8 if answer is No)

8. Please briefly state the TOR criteria of any TOR rules that you know.

9. DNACPR order by OHCA patients can be overridden by the attending EM physician base on one's own clinical judgment.

Yes No

10. Resuscitation is considered medically not futile if ROSC occurs after CPR.

Yes No

11. Medical futility is a subjective decision.

Yes No

12. No resuscitation should be performed on arrival at A&E for OHCA patients if they are considered medically futile.

Strongly agree Agree Neutral Disagree Strongly disagree

13. Cardiac death patients usually can donate the same types and numbers of organs compared with brain death patients.

Yes No

Strongly agree Agree Neutral Disagree Strongly disagree

14. Hospital ethics / Q&S (quality and safety) Support team, if readily available, would provide you more confidence in early TOR.

Strongly agree Agree Neutral Disagree Strongly disagree

15. What is your attitude towards euthanasia?

Strongly agree Agree Neutral Disagree Strongly disagree

16. Please rate the importance of the below factors that you would consider while considering TOR.

(0: not important, 4: most important)

DNACPR card for OHCA

DNACPR (in-hospital) documented during previous hospitalization

Premorbid status and premorbid co-morbidities

Time from cardiac arrest to BLS initiation

Defibrillation by ambulance crew/layman

Age of the patient

Successful intubation

17. TOR is similar to euthanasia.

Yes No

18. In the case of cardiac arrest for more than 20 minutes with no reversible cause, do you think that non-physicians (e.g. ambulance men or nurse) can diagnose death in the field?

- Strongly agree Agree Neutral Disagree Strongly disagree

19. In prehospital cardiac arrest, do you think that ambulance men could decide not to resuscitate a patient according to protocols?

(e.g. non-witnessed arrest with no bystander CPR/shock, with asystole as initial rhythm by ambulance crew).

- Strongly agree Agree Neutral Disagree Strongly disagree

20. Ideally, selected family members (e.g. calm relatives/parents of kids) should be allowed to witness resuscitation process with a nurse as accompany.

- Strongly agree Agree Neutral Disagree Strongly disagree

21. Do you think that a rule for TOR should be implemented in accident and emergency departments on Malaysia?

- Yes No

22. If there is a departmental guideline for TOR, how frequency do you think you will follow the guideline not to initiate resuscitation?

(0: Never, 4: Always) (e.g. BLS TOR rules: arrest was not witnessed by EMS personnel, and no AED shock before transport. ALS TOR rule: Non-witnessed arrest, with no bystander CPR and no AED shock before transport)

- 0 1 2 3 4

23. Do you think the presence of relatives would prolong your duration of resuscitation?

(0: Never, 4: Always)

- 0 1 2 3 4

24. What factor(s) concern you most when you follow/not to follow departmental guidelines for TOR?

< This is the end of this questionnaire. Thank you for your participation. >

Abbreviations: EM: Emergency medicine, CPR: Cardiopulmonary resuscitation, ACLS: Advanced Cardiac Life Support, TOR: Termination of resuscitation, OHCA: Out-of-hospital cardiac arrest, DNACPR: Do not attempt cardiopulmonary resuscitation