International Journal of Emergency Medicine

REVIEW

Open Access

Determinants of decision-making for the initiation of resuscitation: a mixed-methods systematic review of barriers and facilitators

Golshan Moghbeli[1], Fariborz Roshangar[1], Amin Soheili[3], Fazlollah Ahmadi[4], Hossein Feizollahzadeh[1] and Hadi Hassankhani[1*]

Abstract

Aim This study aimed to comprehensively examine the factors influencing healthcare providers' decision-making for initiation of resuscitation (IOR).

Background In-hospital resuscitation survival hinges on timely and effective interventions. Despite guidelines, decision-making during resuscitation remains challenging, impacted by both clinical and non-clinical factors.

Methods A mixed-methods systematic review (MMSR) was conducted, searching PubMed, Web of Science, Scopus, and Embase in May 2024. Twenty peer-reviewed studies of adult in-hospital resuscitation decision-making (≥ 18 years) were included. Data were extracted and synthesized using the Joanna Briggs Institute (JBI) convergent integrated approach.

Results A database search yielded 4398 studies, of which 1216 were duplicates. After screening 3182 unique studies, 20 articles (five qualitative, 12 quantitative, three mixed methods) were included. Data synthesis identified three overarching themes: patient, provider, and system factors. These themes encompassed barriers and facilitators to IOR.

Conclusion This review underscores the importance of understanding patient-related, provider-related, and system-related factors influencing IOR. By addressing these factors, healthcare organizations can improve resuscitation practices and outcomes. Future research should focus on enhancing collaboration, communication, and resource availability while considering non-medical factors in decision-making for IOR.

Relevance to clinical practice Understanding the multifaceted barriers and facilitators identified in this study can enhance the effectiveness of resuscitation protocols and ultimately improve patient outcomes during critical care situations.

Keywords Decision-making, Resuscitation, Initiation of resuscitation, Barriers, Facilitators

*Correspondence:
Hadi Hassankhani
hassankhanihadi@gmail.com
[1]Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran
[3]Department of Nursing, Khoy University of Medical Sciences, Khoy, Iran
[4]Nursing Department, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, Iran

Introduction

In-hospital cardiac arrest (IHCA) constitutes a substantial global health challenge, impacting hundreds of thousands of individuals annually. The incidence of IHCA exhibits geographical variability, with European studies reporting rates of 1.5 to 2.8 cases per 1,000 hospital admissions [1], while US studies indicate a higher prevalence, ranging from 6 to 7 cases per 1,000 admissions [2, 3]. Limited data exists from low- to middle-income countries, however, emerging evidence suggests potentially high IHCA rate [4].

Survival following IHCA critically depends on several factors, including the initial rhythm, arrest location, and monitoring level [1]. With each passing minute without resuscitation following IHCA, the likelihood of survival decreases, along with neurological and functional outcomes [5]. Building on the critical role of early intervention, the timely initiation of resuscitation (IOR) is crucial for maximizing survival rates [6, 7], and delays in these interventions can have significant and often preventable consequences for individuals, families, and communities [5]. For instance, one study found a significant drop in survival probability from 33 to 14% when resuscitation was initiated after one minute compared to within the first minute [8].

Consequently, early IOR is the most critical factor for IHCA survival [9], as evidenced by the American Heart Association's recommendation for chest compressions within one minute of IHCA [10]. This underscores the importance of a chain of survival, including prompt recognition, early cardiopulmonary resuscitation (CPR), and early defibrillation [11, 12]. In light of these findings, ongoing research on preventative strategies and improved resuscitation practices remains crucial in addressing this global challenge [13–15].

Background

Decision-making in acute care nursing, particularly during resuscitation, is a complex and error-prone process [16]. Nurses must weigh numerous factors, including contextual limitations, competing interests, and patient safety while navigating organizational culture, time constraints, and high-pressure environments. Their experience, education, understanding of patient status, situational awareness, resource availability, and degree of autonomy further influence their decisions [17]. This multifactorial process is further complicated by the diverse perspectives of individual resuscitation team members [18].

Despite a growing body of research in this area, errors in resuscitation decision-making persist, leading to suboptimal patient outcomes even in developed countries [17]. These errors can manifest as incorrect initiation, continuation, or termination of CPR. Notably, non-medical factors play a significant role in these decisions, emphasizing the need for a deeper understanding of the underlying complexities [18].

Furthermore, it is imperative to consider that the nature of clinical decision-making, particularly in critical care settings, is a complex process influenced by a variety of factors. Traditionally, decision-making has been viewed through a positivist lens, as a linear, logical process. However, more recent perspectives emphasize the role of intuition and tacit knowledge, recognizing the nonlinear and context-dependent nature of clinical decision-making [19, 20]. A complex interplay of medical and non-medical factors influences clinical decision-making for IOR. These factors encompass both direct determinants, such as the patient's clinical status and the healthcare provider's (HCPs') knowledge and experience, as well as indirect influences, including organizational culture, resource availability, and the broader healthcare environment [18].

Previous research has primarily focused on decision-making for IOR in pre-hospital settings [18, 21, 22], while studies examining hospital-based decision-making have often centered on the continuation or termination of resuscitation efforts [23, 24].

Aims and objectives of study

This mixed-methods systematic review (MMSR) aimed to examine the factors influencing HCPs' decision-making for IOR comprehensively.

Design and methods

This study employed a convergent integrated MMSR approach, guided by the Joanna Briggs Institute (JBI) methodology [25–27]. MMSR offers a comprehensive synthesis of quantitative, qualitative, and mixed-methods evidence, providing a deeper understanding of complex phenomena like decision-making in resuscitation [25]. As a powerful tool for evidence-based practice, MMSR can inform healthcare decision-making and policy development. By identifying "barriers and facilitators" and capturing personal perspectives, this approach enables a more nuanced understanding of the subject matter [28]. The results were reported under the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [29].

Eligibility criteria

This review employed the SPIDER framework (Sample, Phenomenon of Interest, Design, Evaluation, Research type) to define inclusion and exclusion criteria [30]. This framework, a modification of PICO, was specifically designed for qualitative research. We focused on studies investigating the decision-making process for in-hospital IOR (Table 1). Studies on out-of-hospital resuscitation

Table 1 Inclusion and exclusion criteria

SPIDER framework	Included	Excluded
Sample (Population)	Healthcare providers (nurses and physicians) Adult Patients/medical records	Patients < 18 years Patient's Family
Phenomenon of interest (Intervention)	Participants' own experiences of decision-making in the initiation of resuscitation in qualitative studies or perceptions of pre-defined dimensions of decision-making in the initiation of resuscitation measured in quantitative studies.	Out-of-hospital resuscitation Hospice resuscitation Decision-making regarding the continuation or termination of resuscitation
Design	Primary studies	Studies that were not primary research
Evaluation	Effective factors in deciding to initiate cardiopulmonary resuscitation	
Research type	Quantitative, Qualitative, and Mixed Methods	Reviews, commentary, or opinion paper

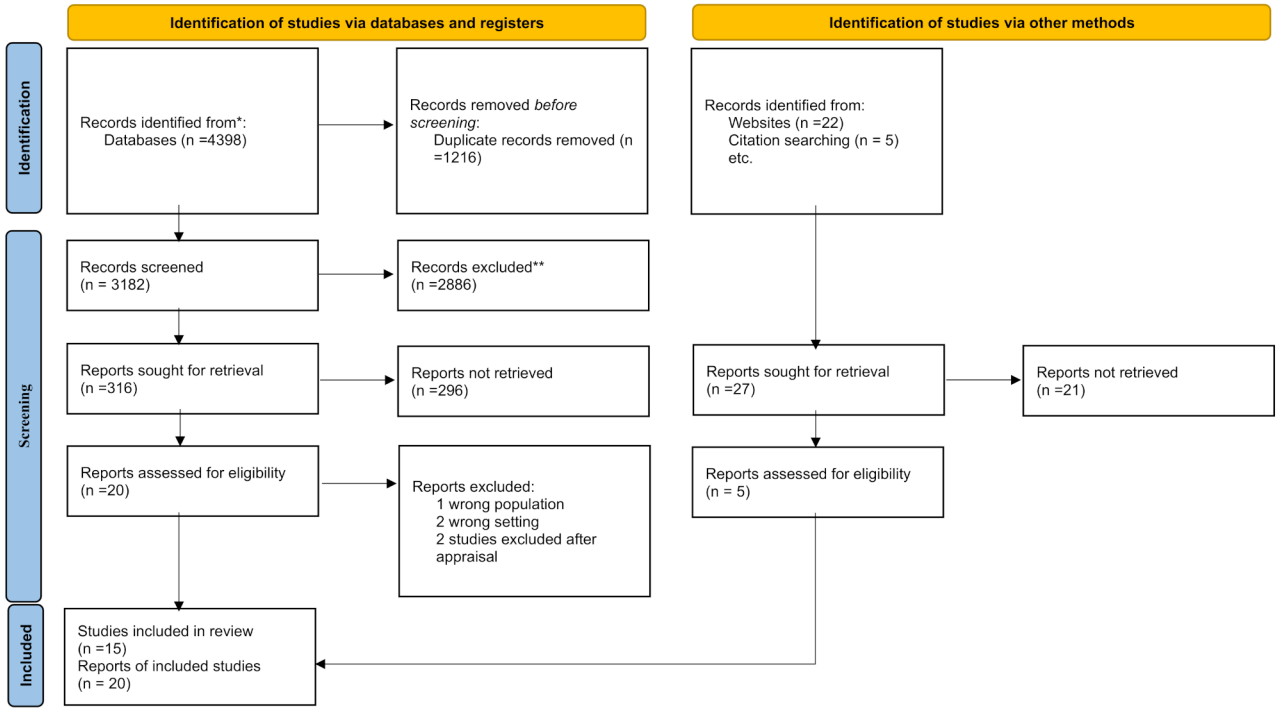

Fig. 1 PRISMA flowchart of the inclusion process

or the continuation/termination of resuscitation were excluded.

Search strategy

We employed a three-step search strategy following JBI recommendations to identify both published and unpublished studies [25]. This strategy included searching electronic bibliographic databases (PubMed, Web of Science, Scopus, and Embase), grey literature sources, relevant journals, and websites of relevant organizations (details in Appendix A). A preliminary search of PubMed identified relevant keywords by analyzing titles, abstracts, and MeSH terms. Subsequently, three researchers comprehensively searched the four databases in May 2024. An information specialist collaboratively developed the search strategy. Finally, the reference lists of included studies were screened for additional relevant studies.

Study screening and selection process

Following the database searches, the results were organized using Endnote 20 (citation management system) and duplicates were removed. Two reviewers (GM and AS) independently screened all titles and abstracts to identify the studies that met the initial criteria. Discrepancies were resolved through discussion with the supervisor (HH). GM and AS independently retrieved and assessed full-text versions of potentially relevant studies. Any disagreements during the selection process were resolved through discussions or by a supervisor. A PRISMA flow diagram detailing the search process is shown in Fig. 1. The reasons for excluding full-text papers documented by GM and verified by a researcher experienced in conducting systematic reviews are presented in the results section.

A total of 4398 studies were initially identified through a database search, of which 1216 duplicates

were removed, yielding 3182 studies for further screening. Of these, 17 were deemed relevant based on titles and abstracts, with an additional five identified through manual reference-list searches. Twenty-two articles underwent a full-text review. However, two studies did not meet the inclusion criteria and were excluded. Ultimately, 20 articles (five qualitative, 12 quantitative, and three mixed methods) were included in the review. The PRISMA flow diagram (Fig. 1) details the study selection process.

Quality appraisal

Two independent reviewers (the first author, GM, and the co-author, AS) conducted a quality appraisal using the Mixed Methods Appraisal Tool (MMAT; version 2018) to minimize the risk of selection bias and ensure that the included studies met rigorous quality and relevance criteria. This tool is considered efficient in appraising the methodological quality of different research traditions (including qualitative, quantitative, and mixed-methods studies). Each template contained five criteria to be assessed, thus allowing one robust score to be used for multiple study types. This enables appraisal scores ranging from 0% (no criteria met) to 100% (all five criteria met) [31]. Any disagreements during the appraisal were resolved through discussion with the study supervisor (HH). However, two studies [32, 33] did not meet the quality threshold and were excluded from further review. (Appendix B)

For each included study, methodological quality was assessed using the MMAT criteria (Appendix B). MMAT scores varied across the study designs. Quantitative studies had a median score of 85% (range: 60–100%), qualitative studies had a median score of 96% (range: 80–100%), and mixed methods had a perfect score of 100%.

Data extraction

Data from the included studies, quantitative, qualitative, and mixed methods, were extracted using a standardized data extraction form to facilitate synthesis. Extracted data included author, year of publication, country of origin, study purpose, study design, participants, and key findings. These data were independently verified by other reviewers and are presented in a tabular format for further analysis (Table 2).

Data synthesis

Data were collected from 12 quantitative, five qualitative, and three mixed-method studies and synthesized by GM, AS, and HH. This review employed a convergent integrated approach to the JBI methodology for a mixed-methods systematic review using the JBI SUMARI. This method allows reviewers to combine quantitative and qualitative data through data transformation [34]. This involved assembling the 'qualitized' data with qualitative data. The assembled data were categorized and pooled based on similarity in meaning to produce a set of integrated findings in the form of line-of-action statements [35]. Subsequently, a three-step thematic analysis was conducted to develop an a priori set of themes to report the findings of this review. First, the extracted initial data were coded line-by-line. Second, the coded data were organized into categories based on their similarities. Finally, these categories were further developed into subthemes and main themes [36].

Ethical and research approvals

This study was approved by the ethics committee of Tabriz University of Medical Sciences (code of ethics: IR.TBZMED.REC.1402.614). All methods were carried out under relevant guidelines and regulations for the JBI methodology for MMSRs and reported according to the PRISMA guidelines.

Results

Summary of the studies

The key characteristics of the included studies (author, year, country, aim, design, participants, main findings, and quality assessment score) are presented in Table 1. Geographically, eight studies were conducted in Europe [37–44], four in the USA [45–48], six in Asia [49–54], and two in Africa [55, 56]. The participant characteristics varied considerably. Nine studies focused on nurses [42, 45–47, 50, 51, 54–56], six on physicians [38, 39, 43, 48, 52, 53], two on multidisciplinary resuscitation teams [40, 41], and three on medical records [37, 44, 49].

Findings of the review

Data synthesis and integration were rigorously conducted across all the included studies to identify overarching barriers and facilitators. This process yielded 19 categories, four subthemes, and three themes: patient-related, HCP-related, and healthcare system-related factors (Table 3).

Themes

Patient-related factors

Based on the literature review, an important factor influencing the decision-making for IOR is patient-related factors [37–39, 41, 43, 45, 47, 48, 52–54]. This theme emerged from three categories:

Demographic characteristics Patient age is a significant demographic factor influencing resuscitation decisions. Older age often hinders the IOR [38, 39, 41, 52, 54], whereas younger age tends to facilitate resuscitation [39, 41, 54]. Resuscitation is initiated more frequently in younger individuals. This discrepancy in treatment

Table 2 Study characteristics and critical appraisal scores

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
1	Hong et al. (2013) Korea	Association between ED crowding and delay in resuscitation effort	Evaluate whether ED crowding is associated with delayed resuscitation efforts (DREs) that result in hospital mortality	Retrospective observational study	1296 patients underwent resuscitative procedures in the resuscitation room	This study indicates that the incidence of DRE was significantly higher on crowded days (OR, 2.00; 95% CI, 1.28–3.15). Mortality during the ED stay or during the total hospital stay was significantly higher in the DRE group (OR, 3.39; 95% CI, 1.22–9.45 and OR, 3.96; 95% CI, 2.28–6.88, respectively) compared with the non-DRE group	100
2	MoslemiRad et al. (2017) Iran	Investigating the effect of two evidence-based and routine-based learning techniques on the clinical competency of cardiopulmonary resuscitation on emergency ward nurses in Imam Khomeini Dehdasht Hospital in 2017	Determining the Effect of Two Evidence-Based and Routine-Based Learning Techniques on the Clinical Competency of Cardiopulmonary Resuscitation on Emergency Ward Nurses in Imam Khomeini Dehdasht Hospital in 2017.	Semi-experimental interventional study	44 nurses	This study demonstrates that the evidence-based learning group exhibited greater clinical competence in several areas, including the principles of CPR onset and conclusion, the implementation of artificial airways, advanced pulmonary CPR, and the principles of continuous CPR compared to the routine workshop group.	80
3	Lauridsen et al. (2021) Denmark	Barriers and facilitators for in-hospital resuscitation: a prospective clinical study	We aimed to characterize challenges occurring during IHCA and identify barriers and facilitators perceived by actual team members immediately following IHCA events.	Mixed method prospective multicenter clinical study	Data-related adult CPR events	This study identified overcrowding (27%) and poor ergonomics/choreography of people in the room (17%) as the most common challenges. Narrative comments were grouped into 24 unique themes related to barriers and facilitators across four domains: six themes related to treatment (most common: CPR, rhythm check, equipment), seven for teamwork (most common: role allocation, crowd control, collaboration with ward staff), six for leadership (most common: visible leader, multiple leaders, leader experience), and five for communication (most common: closed loops, room atmosphere, clarity of speech).	100
4	Tyrer et al. (2009) UK	Factors that influence decisions about cardiopulmonary resuscitation: the views of doctors and medical students	To investigate factors that influence decisions about CPR	A qualitative study	17 doctors and four medical students	This study found that doctors and medical students deemed several factors important in CPR decisions, including the patient's diagnosis, prognosis, age, quality of life, and the opinions of medical staff, as well as the wishes of patients and their families. The significance of each factor varied notably and was influenced by the doctors' personal beliefs and values.	80

Table 2 (continued)

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
5	Ganz et al. (2013) Israel	Resuscitation in general medical wards: who decides	To investigate nurse experiences and attitudes regarding resuscitation while focusing on intentional avoidance of action during a futile cardiac arrest.	Quantitative correlational.	117 Nurses	This study reveals that nearly one-fifth (19 out of 117) of participants reported not initiating futile resuscitations. Nurses who opted against such actions tended to score higher on the Support Do Not Attempt Resuscitation Questionnaire, had previously consulted with a doctor about resuscitation initiation, and expressed a desire to be part of a multidisciplinary team focused on resuscitation decision-making. No other variables appeared to influence this outcome.	80
6	Gazarian et al. (2010) USA	Nurse decision-making in the prearrest period	The purpose of the study was to describe the cues and factors that influence the decision-making process used by nurses when identifying and interrupting a potential cardiopulmonary arrest in the acute-care setting	Qualitative descriptive study	13 Nurses	This study shows that nurse characteristics aiding in the interruption of adverse events included prior experience in prearrest situations and the ability to work as part of a team. Organizational factors that facilitated this interruption comprised the availability of nurse-initiated monitoring equipment, staff experience and flexibility, collaborative teamwork, and access to knowledge resources.	100
7	Brims et al. (2009) UK	Resuscitation decisions among hospital physicians and intensivists	This study was designed as a pilot to establish if there were differences in attitudes and confidence in decision-making among senior clinicians in general internal medicine, elderly care, and intensive care medicine in CPR decisions using six fictitious clinical scenarios.	Survey	54 physicians	There were significant differences between specialties in making the decision to perform CPR and the confidence in doing so, with three cases producing polarized results within the specialties, despite equal confidence in the decision. There is a lack of consensus with the CPR decisions made between specialties and within them. Formal training in recognition of futility should be encouraged for all clinicians	80
8	Robinson et al. (2007) UK	Implementing a resuscitation policy for patients at the end of life in an acute hospital setting: qualitative study	To explore attitudes and experiences of doctors and nurses regarding cardiopulmonary resuscitation for patients with end-stage illness in an acute hospital	Qualitative study	Seven nurses and nine doctors	This study reveals that varying interpretations of policy implementation led to communication difficulties in initiating, documenting, and executing cardiopulmonary resuscitation decisions. Participants expressed concerns about the potential consequences of Do Not Attempt Resuscitation (DNAR) decisions on patient care. The more disease-centered approach of doctors contrasted with the patient-centered perspective of nurses, contributing to inter-professional conflicts within teams. Doctors identified a need for training in applying resuscitation policies and ethical principles in practice, while nurses sought ongoing professional support, often viewed as less accessible to junior doctors. Additionally, personal relationships between staff and patients, cultural reluctance to address sensitive issues, and local community expectations for family involvement in decisions further complicated policy implementation.	100

Table 2 (continued)

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
9	Brummell et al. (2016) UK	Cardiopulmonary resuscitation decisions in the emergency department: an ethnography of tacit knowledge in practice	The purpose of this ethnographic study was to explore how HCPs working in two emergency departments in the UK, make decisions to commence, continue or stop resuscitation.	Ethnography	Staff member's involvement in resuscitations	Findings show that emergency department staff use experience and acquired tacit knowledge to construct a typology of cardiac arrest categories that help them navigate decision-making. Categorization is based on 'less is more' heuristics which combine explicit and tacit knowledge to facilitate rapid decisions.	100
10	Pantazopoulos et al. (2011) Greece	Factors influencing nurses' decisions to activate medical emergency teams	To evaluate the relationship between nurse demographics and correct identification of clinical situations warranting specific nursing actions, including activation of the medical emergency team.	Descriptive, quantitative design	150 Nurses	This study demonstrates that nurses who graduated from a four-year educational program identified clinical situations requiring medical emergency team activation at a significantly higher rate than those who completed a two-year program. Additionally, these nurses scored significantly higher on questions related to clinical evaluation. The activation of the medical emergency team is influenced by various factors, including the level of education and attendance in CPR courses.	100
11	Bae et al. (2008) Korea	The ethical attitude of emergency physicians toward resuscitation in Korea	This study was conducted to assess the various ethical attitudes of emergency specialists in Korea toward resuscitation.	Survey	104 Emergency Medicine	This study identified several key themes: (1) The social and hospital environment surrounding resuscitation; (2) Withdrawal of life-sustaining treatment; (3) Factors influencing decisions to initiate or terminate CPR; (4) The presence of family members during resuscitation attempts; and (5) The use of recently deceased patients for training. Various factors influenced the decision not to start or to terminate CPR, including persistent asystole for more than 20 min with no reversible cause (37.8%), time from collapse to Basic Life Support (35.1%), the underlying disease or medical condition (19.2%), time from Basic Life Support to defibrillation (4.6%), and patient age (3.3%).	60
12	Hart et al. (2014) USA	Medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in acute patient deterioration events	To explore and understand medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in recognizing and responding to clinical deterioration before the arrival of an emergency response team.	Prospective, cross-sectional, descriptive quantitative design	148 Nurses	This study shows that nurses felt moderately self-confident in recognizing, assessing, and intervening during clinical deterioration events. In addition, nurses felt moderately comfortable performing leadership skills before the arrival of an emergency response team. A significant, positive relationship was found between perceived self-confidence and leadership abilities. Age and certification status were significant predictors of nurses' leadership ability	60

Table 2 (continued)

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
13	Hinkka et al. (2001) Finland	To resuscitate or not: a dilemma in terminal cancer care	The purpose of this survey is to study physicians' decisions on CPR in terminal care with a hypothetical case vignette describing the sudden death of a young terminal cancer patient	Survey	730 Physicians	This study reveals the proportion of surgeons, internists, general practitioners, and oncologists who said they would have started CPR was 16%, 10%, 19%, and 14%, respectively. Among physicians aged under 35 years, from 35 to 49 years, and over 49 years, the proportions of physicians choosing active CPR were 29%, 14%, and 13%, respectively ($P < 0.001$). As for those with personal experience of terminal care, 13% indicated they would have started CPR compared with 23% of those who had no experience ($P < 0.01$). Those who decided in favor of CPR showed a significantly ($P < 0.001$) more negative attitude toward withdrawing life-sustaining treatment and valued length of life to a much greater extent ($P < 0.01$).	100
14	Engels et al. (2020) USA	Impact of do-not-resuscitate orders on nursing clinical decision-making	Our objective was to determine whether code status affects decision-making by nursing staff	Survey	358 Nurses	This study shows that nurses are significantly less likely to call rapid response or a physician when a patient undergoes certain changes in clinical status if the patient is labeled as DNR/DNI rather than full code. For all of the vignettes, respondents were less likely to say they would call rapid response or a physician for patients with a DNR/DNI status who developed tachycardia ($P < 0.001$). Nurses also were less likely to escalate care for patients with DNR/DNI status who developed tachypnea or mental status changes. Finally, we examined whether specific nursing characteristics affected responses to each question. This study demonstrates the impact that the number of years of experience has on how likely a nurse would be to call rapid response or a physician.	80
15	Starr et al. (1986) USA	Quality of life and resuscitation decisions in elderly patients	We determined whether quality-of-life assessments were associated with resuscitation decisions.	Comparative study	50 physicians	This study substantiates the influence of the quality of life as perceived by the physician at the initiation of resuscitation. Physicians rated current patients' quality of life more negatively than did patients. These results indicate that elderly patients and their physicians may differ on patient quality of life assessments and that these assessments may be associated with resuscitation decisions.	80
16	Rajeswaran et al. (2009) South Africa	Cardiopulmonary resuscitation: perceptions, needs, and barriers experienced by the registered nurses in Botswana	This study aims to describe and explore the perceptions, barriers, and needs experienced by nurses in Botswana during the provision of CPR.	Both quantitative and qualitative research designs	102 registered nurses and patients' records	The study highlights critical challenges in the provision of CPR, noting that the unavailability of essential equipment and medications delays resuscitation efforts and increases stress levels among nurses. Nurse managers reported that workforce shortages of both doctors and nurses further compromise the quality of post-cardiac arrest care and hinder timely CPR initiation. Additionally, the dynamics within the hospital environment, particularly the unprofessional attitudes of some physicians who delay CPR, negatively impact overall patient survival outcomes and the effectiveness of care provided.	100

Table 2 (continued)

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
17	Ozeret al. (2019) Israel	Culture and personal influences on cardiopulmonary resuscitation- results of international survey	The main objective of this work was to study whether local culture and physician preferences may affect spur-of-the-moment decisions in unexpected in-hospital cardiac arrest.	Cross-sectional study	617 physicians	This study examines the country of practice and level of knowledge about resuscitation that was strongly associated with avoiding CPR performance. Mexican physicians were almost twice as likely to forgo CPR than their Israeli and Indonesian/Malaysian counterparts [OR1.84 (95% CI 1.03, 3.26), $p=0.038$]. Mexican responders also placed greater emphasis on personal and patient quality of life ($p<0.001$). In multivariate analysis, degree of religiosity was most strongly associated with willingness to forgo CPR; orthodox respondents were more than twice more likely to report having forgone CPR for a patient they do not know than secular and observant respondents, regardless of the country of practice [OR 2.12 (95%CI 1.30, 3.46), $p=0.003$]. In unexpected in-hospital cardiac arrest, the decision to perform or withhold CPR may be affected by physician knowledge and local culture as well as personal preferences.	100
18	Silverplats et al. (2024) Sweden	Compliance with cardiopulmonary resuscitation guidelines in witnessed in-hospital cardiac arrest events and patient outcomes on monitored versus non-monitored wards	This study aimed to evaluate if compliance with initial CPR guidelines and patient outcomes of witnessed IHCA events were associated with the place of arrest defined as a monitored versus non-monitored ward.	Retrospective observation study	956 witnessed IHCA events	This study demonstrates that compliance with initial CPR guidelines was higher on monitored wards than on non-monitored wards for witnessed arrests, which indicates that HCPs on monitored wards are quicker to recognize a cardiac arrest and initiate treatment. When initial guidelines are followed, the place of arrest does not affect the patient outcome.	100

Table 2 (continued)

R	Author/year/country	Title	Aim	Design	Participants	Results	Quality assessment score
19	Isa Muhammad et al. (2023) Northwest Nigeria.	Assessment of factors influencing nurses' initiation of cardiopulmonary resuscitation on in-hospital cardiac arrest patients in selected health facilities of kano state metropolis: a mixed study	1. To assess nurses' level of knowledge on cardiopulmonary resuscitation among nurses in secondary health facilities in Kano State Metropolis. II. To assess nurses' level of knowledge on cardiac arrest among nurses in secondary health facilities of Kano State Metropolis. III. To assess the level of cardiopulmonary resuscitation on in-hospital cardiac arrest patients among nurses in secondary health care facilities of Kano State Metropolis IV. To explore the barriers to nurses' decision to initiate cardiopulmonary resuscitation on in-hospital cardiac arrest patients in selected secondary health facilities of Kano State Metropolis V. To explore the facilitators to nurses' decision to initiate cardiopulmonary resuscitation on in-hospital cardiac arrest patients in selected secondary health facilities of Kano State Metropolis	Mixed method	211 Nurses	The result of the study revealed an overall good knowledge of 71% of CPR. On initiation of CPR 37.9% conduct CPR monthly, 37.9% of nurses use a defibrillator some of the time, while 70.1% of nurses accept CPR within the nursing practice. Some of the barriers to CPR initiation were lack of self-confidence, workload, and ethical dilemmas. On the other hand, the facilitators had good CPR knowledge, good teamwork, availability of advanced resuscitative gadgets, and adequate manpower. There is statistical significance between knowledge of CPR and initiation of CPR ($r = 0.966$; $p < 0.01$). It can be concluded that a significant percentage of nurses have knowledge of both CPR and Cardiac arrest, but only a few of them initiate CPR, based on this there is a need to improve on the factors that facilitate the initiation of CPR.	100
20	Janatolmakan et al. (2021) Iran	Barriers to the success of cardiopulmonary resuscitation from the perspective of Iranian nurses: A qualitative content analysis	This study aimed to explore the barriers to the success of CPR from the perspective of Iranian nurses	Qualitative content analysis	14 nurses	According to this study, the barriers to successful CPR were developed in three main categories and nine subcategories. Some of the barriers to CPR success were "delayed attendance of the CPR team and start of CPR," "inadequate experience and skill of the CPR team," "poor access to special units," "insufficient and deficient CPR equipment," "poor CPR location," "critical clinical conditions of the patient," and "interference of the patient's family members." The results showed that human and environmental factors can result in CPR failure. These barriers can be minimized by measures such as empowerment of the CPR team and providing the necessary facilities and equipment.	100

Note: DNR: Do not resuscitate, DNI: Do not intubate, IOR: initiation of resuscitation, CPR: Cardiopulmonary resuscitation, IV: Intravenous, IO: intraosseous, DRE: delayed resuscitation efforts, USA: United States of America, UK: United Kingdom, OR: Odds ratio, ED: Emergency Department, IHCA: In-hospital cardiac arrest

Table 3 Barriers and facilitators of decision-making in initiation of resuscitation

Themes	Subthemes	Categories	Codes	
			Barriers	**Facilitators**
Patient-related factors		Patient's demographic characteristics	- Elderly	- Young adults - Social status
		Patient's clinical characteristics	- Having terminal illnesses	- Acute conditions
			- Positive past medical history	- Altered level of consciousness
			- The underlying disease, ongoing treatment status, or medical condition as the cause of arrest	- Low oxygenation saturation
			- Asystole persisting for more than 20 min with no reversible cause	- Altered systolic blood pressure
			- Pre-morbid state or diagnosis of cancer	
			- Being labeled as DNR/DNI	
			- Unfavorable quality of life	
		Patient and family members' desires		- Patients' previous preferences
				- Having living wills (advance directives)
				- Family members' previous preferences
				- Family members inappropriately insisting on IOR
HCP-related factors	HCP characteristics	Nurses' characteristics	- Lack of self-confidence	
			- Lack of nurse attentiveness	
			- Stress and anxiety	
		Physicians' characteristics	- High job satisfaction (OR = 1.17)	- Physician's specialty (internal medicine specialists made fewer decisions for active CPR (10%) compared with general practitioners (19%) Physician nationality
			- Experience with terminally ill patients	- Physician's country of practice
			- Physicians who were not parents	- Young physicians
	HCP worldview	HCP attitude	- Considering a futile resuscitation	- Consideration of the length of life as an important factor opted by physicians
			- Physician's positive attitudes and life experiences to withholding life-sustaining treatment	
			- Unprofessional attitude and behavior of some physicians	
		HCP beliefs and values	- Physician's beliefs and values regarding unfamiliarity with the patient	- Religious beliefs of HCPs
			- Religious values of physicians, degree of religiosity	
		HCP ethics	- Ethical dilemma	- Ethical and cultural norms
				- Fear of litigation
	HCP dynamics	Teamwork/culture of teamwork	- Lack of coordination	- Delegation of tasks/allocation of roles in resuscitation
				- Effective collaboration between the ward staff
				- lack of consensus among team members
				- Good teamwork
		Leadership	- Power struggles or leadership conflicts	- Nurses leadership skills
				- Flexibility
				- Presence of a specific leader with clear roles and responsibilities
				- Leadership competency
				- Situational leadership

Table 3 (continued)

Themes	Subthemes	Categories	Codes	
			Barriers	**Facilitators**
		Communication	- Absence of verbalization/ silence	- Effective information exchange through closed-loop communication
			- Interprofessional conflict within teams	- Situational awareness through effective verbalization
		Interprofessional collaboration	- Nurses prior consultation with physicians about DNR	- The presence of experienced nurses on the morning shift
				- Nurses consultation and seeking input from colleagues
				- Collegial support
				- Impact of nurses on physicians' decisions to initiate resuscitation
				- Physician-nurse interactions
	HCP competence	Knowledge	- Incomplete patient information	- Knowing the patient
			- Nurses' Insufficient Knowledge of Resuscitation	- Knowing the condition
				- Knowledge from experience
				- Knowledge about the organization
				- Knowledge of the patient's baseline
				- Possessing tacit knowledge
				-Physician's level of knowledge about resuscitation
				- Nurse's good CPR knowledge
		CPR performance	- Took a long time to first rhythm check	- Adherence to CPR guidelines
			- Strictly adhering to a set of pre-established guidelines without clinical judgment	- Proficiency in the implementation
			- Lack of nursing skills	- Swift rhythm check
				- Algorithmic decision-making in resuscitation
		Education/ training		- Nurses' level of education
				- Attending in CPR courses
				- Using evidence-based learning methods for nurses' continuous education
		Experience	- Novice nurse	- Previous experience
Healthcare system-related factors		Healthcare staffing shortages	- Insufficient number of HCPs	- Adequate manpower
			- Heavy workload	
			- ED crowding	
		Communication system deficiencies	- Inadequate and ineffective communication systems	
		Equipment availability	- Malfunctioning of equipment or delays or absence of equipment	- Monitored wards
				- Availability of advanced resuscitative gadgets

Note: DNR/DNI: do not resuscitate/do not intubate, DNI: do not intubate, IOR: initiation of resuscitation, CPR: Cardiopulmonary resuscitation, IV: Intravenous, IO: intraosseous

approaches can be partly attributed to the resuscitation team's experiences, which often indicate that the likelihood of successful CPR diminishes with age. As a result, older patients may face a bias in resuscitation decisions, reflecting a perception that their chances of recovery are less favorable compared to their younger counterparts [39, 54]. Furthermore, a patient's advantageous social status may facilitate the decision-making process regarding the in-hospital IOR [41].

Clinical characteristics The clinical profile of a patient, which encompasses their medical condition and history, is important in guiding HCPs' decisions to IOR. Patients in advanced terminal stages, designated as do-not-resuscitate/do-not-intubate (DNR/DNI), as well as those with a cancer diagnosis and comorbidities, may present challenges in the decision-making process regarding IOR [38, 39, 45, 47, 52, 54]. HCPs identified the poor physical condition of patients, especially those suffering from

vital organ failure, as a significant factor in CPR failure [54]. Acute disease can facilitate decision-making for IOR measures [38]. Moreover, patients' quality of life can significantly influence HCPs' decision-making for IOR. A patient experiencing diminished quality of life may present a barrier to resuscitation efforts [38, 48, 51, 53].

Desires of patients and their family members In the context of resuscitation decisions, HCPs have indicated that the expressed desires of the patient's family or their legally authorized representative and their unwavering advocacy for resuscitation, particularly within certain cultural frameworks, may significantly influence HCPs' decisions on IOR even in advanced stages of illness [38, 52]. Having a living will (advance directive) can facilitate decision-making for IOR measures. When a patient has an advance directive, decisions are rendered more swiftly due to the clear expression of the patient's wishes. This clarity, particularly regarding resuscitation preferences, simplifies the decision-making process for HCPs, making it easier to determine whether to initiate resuscitation efforts [43, 52].

HCP-related factors

The overarching theme comprises four key categories: HCP characteristics, HCP worldview, HCP dynamics, and HCP competence. These categories are clarified in detail in the following subsections.

HCP characteristics This subtheme emerged from two categories: the nurses' and physicians' characteristics. nurses' lack of self-confidence, stress, and anxiety can hinder their ability to voice concerns or IOR [46, 54, 56]. Additionally, a lack of nurse attentiveness is a barrier to decision-making for IOR [54].

Physician specialty also influences IOR decisions. Internal medicine specialists are less likely to initiate resuscitation than general practitioners [39, 43]. Moreover, nationality, country of practice, and job satisfaction can affect these decisions, reflecting cultural and healthcare system differences [43, 53]. Young physicians are more likely to initiate resuscitation, possibly due to their inexperience with end-of-life care [43]. The parental status of HCPs may influence their perspectives on resuscitation decisions. Being a parent could heighten empathy and emotional involvement, potentially shaping their judgments regarding the perceived quality of life or outcomes for patients. Physicians without children may hold distinct perspectives on resuscitation, which may negatively impact their decision-making regarding IOR. Collectively, these HCP characteristics significantly influenced resuscitation decisions. Understanding these factors is crucial for optimizing patient-care outcomes [53].

HCP worldview HCPs' perceptions of futility, positive attitudes toward withholding life-sustaining treatments, and a strong association between these factors ($P<0.001$, OR = 0.84) also influence resuscitation decisions [43]. However, unprofessional behavior among some physicians can negatively impact IOR decision-making. This includes instances of delayed response, reluctance to initiate CPR, and deliberate tactics to avoid performing CPR [55]. Additionally, religious beliefs and values significantly influence resuscitation decisions and can serve as both barriers and facilitators in HCPs' decision-making regarding sIOR [40, 53].

HCPs frequently encounter complex ethical dilemmas shaped by cultural and legal considerations [56]. The fear of litigation, particularly in jurisdictions without legal DNR orders, further complicates decision-making. Balancing clinical decisions with ethical principles amidst cultural and legal complexities is challenging [40, 52, 56].

HCP dynamics In a critical resuscitation setting, teamwork is undeniably influential on successful outcomes. Delegating tasks and allocating roles within the resuscitation team is paramount for optimizing efficiency and maximizing patient outcomes. Providers described the sense of working within a collaborative team as a facilitator for effective communication, coordination, and cohesive decision-making [37, 45].

Nurses' leadership skills are another factor in guiding resuscitation teams with confidence and clarity, ensuring smooth coordination, and enabling rapid decision-making [46]. A flexible leadership approach allows swift adaptation to changing circumstances and diverse patient needs [45]. A designated leader with clear roles and responsibilities fosters a sense of direction and unity within the team, thereby promoting efficient teamwork and task allocation. Leadership competency is essential for providing guidance and support in high-pressure situations and inspiring confidence and trust among team members. However, power struggles or leadership conflicts can disrupt the resuscitation process, leading to confusion and inefficiency. Embracing situational leadership techniques can help HCPs navigate through such challenges, fostering a harmonious and effective resuscitation response [37].

A study utilizing closed-loop communication demonstrated that accurate and acknowledged information exchange promotes a clear understanding of each team member's responsibilities and patient's condition. Effective verbalization enhances situational awareness, enabling a team to remain informed and proactive in response to evolving circumstances. Conversely, the absence of verbalization or silence within a team can impede the flow of critical information, potentially

leading to misunderstanding and delayed decision-making [37].

HCPs report that interprofessional collaboration is pivotal in IOR decision-making [38, 45, 51]. Nurses actively engage in consultations and seek input from colleagues, fostering a collaborative environment in which diverse perspectives can be considered. Collegial support among HCPs strengthens teamwork and enhances IOR decision-making [45]. The influence of HCPs' decisions for IOR highlights the significance of physician-nurse interactions in these critical moments [38, 51]. Prior consultations between nurses and physicians regarding DNR orders demonstrate a proactive approach to aligning patient care preferences, emphasizing the importance of effective communication and shared decision-making within interdisciplinary teams [51].

HCP competence Competence, a multifaceted construct, is essential for informed decision-making in IOR. It encompasses a range of domains, including understanding patient status, applying medical knowledge, and adhering to organizational protocols [45, 53, 56]. Experienced HCPs with tacit knowledge often excel in these areas. Additionally, familiarity with organizational protocols and guidelines is beneficial [41, 53, 56]. However, deficiencies in resuscitation proficiency, non-adherence to guidelines, inadequate implementation techniques, and inefficient decision-making algorithms can hinder effective IOR and negatively impact CPR performance [37, 54]. Furthermore, insufficient continuous education and training [42, 50, 55], as well as limited resuscitation experience, can impair competence and hinder the ability to navigate complex clinical scenarios and make sound judgments [45, 54].

Healthcare system-related factors

Studies have indicated that insufficient HCPs, exacerbated by staffing shortages, pose significant challenges within emergency departments [54–56]. This scarcity can lead to delayed IOR, particularly during ED crowding [49]. Delayed resuscitative interventions owing to limited staff availability may negatively impact patient outcomes and complicate IOR decision-making in high-pressure environments [49, 54, 55].

HCPs reported that communication system deficiencies hindered the coordination and timely IOR decision-making [55].

The availability of medical equipment plays a pivotal role in IOR decision-making [56]. Challenges such as malfunctioning equipment, delayed access to essential resources, and the absence of critical equipment can impede the prompt and effective delivery of life-saving interventions during resuscitation scenarios, potentially compromising patient care outcomes and complicating decision-making during emergencies [37, 44, 45, 54, 56].

Discussion

This mixed-method systematic review identified facilitators and barriers to decision-making for IOR. We identified various themes influencing HCPs' decision-making, including patient-related, HCP-related, and healthcare system-related factors. Additionally, we observed conflicts between the influences of various actors and differences between findings from qualitative and quantitative studies. Our findings underscore the importance of both methodologies for a comprehensive understanding of the decision-making process and its various effects. The aims and topics in the included studies varied from end-of-life care to sudden cardiac death, which may explain the variation in study results. However, this reflects the diverse range of cardiac arrest scenarios encountered by providers.

Our analysis revealed that patient-related factors, such as the presence of advance directives and expressed patient or family preferences, significantly influenced HCPs' decisions to initiate resuscitation. However, factors such as social status and unprofessional provider attitudes and behaviors can compromise ethical principles of justice. While eliminating these factors may be challenging in complex healthcare environments, encouraging providers to engage in conscious reflection on their decision-making processes can help mitigate their impact. Additionally, this study demonstrated that HCPs' perceptions of a patient's quality of life can influence resuscitation decisions. Interestingly, studies show that patients perceive their quality of life more positively than HCPs. Therefore, decisions regarding IOR should prioritize patient preferences and values [57].

Moreover, healthcare provider-related factors played a crucial role in shaping healthcare providers' approach to IOR decisions. HCPs' personal attributes and perspectives can influence resuscitation decisions, particularly when they view resuscitation as futile. This perspective may intersect with ethical considerations such as the principle of beneficence. Effective communication with patients and their families as well as upholding patient autonomy are essential elements to consider. Therefore, establishing institutional guidelines grounded in the cultural values of community and organizational policies is advisable [58–60].

The religious convictions of HCPs can serve as barriers or facilitators to IOR decision-making. For example, Christianity generally supports the notion that patients have the right to refuse resuscitation if they choose, emphasizing personal autonomy and Judaism often adheres to principles that when death is inevitable it should not be interfered with. It respects the natural

dying process, which may influence decisions against aggressive resuscitation in certain contexts [53]. However, in Islam, according to verse 32 of Surah Ma'idah in the Qur'an, whoever takes a life - unless as a punishment for murder or mischief in the land - it will be as if they killed all of humanity, and whoever saves a life, it will be as if they save all of humanity. Therefore, Islam places a strong emphasis on preserving life and may advocate for all possible measures to prevent premature death, which can lead to a preference for aggressive treatment options [61]. In the Iranian healthcare system, like many other Islamic countries, the DNR order is not legally recognized. It is currently informal and implemented as a verbal directive. The lack of a legal standing for DNR orders can create challenges for HCPs. When faced with such situations, nurses must navigate complex legal, ethical, and clinical considerations to determine whether to initiate or withhold resuscitation efforts. Consequently, there is a pressing need to formulate a contextual guideline that is informed by cultural and religious nuances specific to Islamic nations. This guideline can help ensure that resuscitation decisions are aligned with patient values and preferences [62].

Additionally, this study demonstrates the impact of human factors, specifically teamwork and leadership, on the decision-making process for IOR efforts. Studies have shown that effective teamwork, communication, and leadership can improve the speed and efficiency of emergency responses such as cardiac arrest. A separate review found a strong link between leadership behavior and the speed of IOR. These findings emphasize the importance of implementing leadership development programs, simulated training, fostering leadership support, and continuous quality improvement [63, 64].

Healthcare system-related factors, such as inadequate communication and equipment shortages, significantly impacted IOR decisions. These deficiencies can hinder the timely dissemination of information, leading to delays in decision-making and intervention. Clear and efficient communication channels are essential to coordinating resuscitation efforts and ensuring optimal patient care. Furthermore, equipment availability plays a crucial role in resuscitation decisions. Malfunctioning equipment, delays, or the absence of necessary items can impede resuscitation efforts. Conversely, monitored wards and the presence of advanced resuscitative gadgets are associated with an increased likelihood of resuscitation. These findings highlight the importance of well-equipped facilities and the availability of advanced technology in supporting resuscitation efforts [37, 45, 54]. Additionally, a critical concern is the shortage of HCPs, particularly physicians and nurses. In many hospitals, nurses are the first responders to cardiac arrests [65]. Thus, a low nurse-to-patient ratio coupled with staffing shortages can inadvertently contribute to delays in IOR [54, 66].

Limitation

This systematic review included qualitative, quantitative, and mixed-methods studies to provide a comprehensive understanding of factors influencing decision-making for IOR. By incorporating diverse research designs, we aim to achieve a broader and deeper understanding of the issues at hand. Despite our rigorous search methods, the review may have missed some relevant literature owing to variations in indexing or publication practices. Additionally, we were unable to include studies published in non-academic journals or languages other than English because of the limitations of our database search and language skills. To mitigate potential bias, the first author, an ICU nurse, was counterbalanced by independent reviews of two additional team members.

Implications and recommendations for practice

This review highlights the complex interplay of patient-related, HCP-related, and healthcare system-related factors that influence resuscitation decisions. By recognizing and addressing these factors, healthcare organizations can inform healthcare practices and policies, leading to improved decision-making for IOR. Future research should continue to explore these themes, with a focus on developing strategies that enhance collaboration, communication, and resource availability within healthcare systems. A holistic understanding of these factors is essential for optimizing the quality of resuscitation care and enhancing patient outcomes in critical situations. By fostering an environment that acknowledges and addresses these diverse influences, we can pave the way for more effective and compassionate resuscitation practices. It is recommended that future research should consider non-medical factors and their role in decision-making for IOR.

Implications of the study for Iran

The ambiguous legal status of DNR orders in Iran presents significant challenges for HCPs. While physicians ultimately bear responsibility for resuscitation decisions, the absence of formal guidelines can lead to inconsistent practices and potential violations of patient autonomy. To address these issues, it is imperative to establish a clear legal framework for DNR orders and develop standardized protocols for their implementation. Additionally, creating institutional support systems and conducting ongoing research on attitudes toward DNR orders can foster a more informed and compassionate approach to end-of-life care in Iran.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12245-024-00788-x.

Supplementary Material 1

Supplementary Material 2

Acknowledgements
This study was extracted from the PhD dissertation of the first author (GM) approved and supported by the research deputy of Tabriz University of Medical Sciences (grant number: 72351). The authors thank the "anonymous" reviewers for their valuable insights.

Author contributions
GM and HH contributed in original concept and study design, data extraction, data analysis and interpretation, manuscript preparation and final critique. AS, FR, HF, and FA performed the data extraction, data analysis and interpretation and were major contributors in writing the manuscript. HH and FR supervised the study. All authors read and approved the final manuscript.

Funding
The present study was financially supported by Tabriz University of Medical Sciences, Tabriz, Iran.

Data availability
The data supporting the findings of this study are available upon request from the corresponding author.

Declarations

Ethics approval and consent to participate
This study was part of a PhD dissertation approved by the ethics committee of Tabriz University of Medical Sciences (code of ethics: IR.TBZMED.REC.1402.614). All methods were carried out under relevant guidelines and regulations for the JBI methodology for MMSRs and reported according to the PRISMA guidelines.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 26 October 2024 / Accepted: 7 December 2024
Published online: 20 December 2024

References

1. Gräsner J-T, Herlitz J, Tjelmeland IB, Wnent J, Masterson S, Lilja G, et al. European Resuscitation Council guidelines 2021: epidemiology of cardiac arrest in Europe. Resuscitation. 2021;161:61–79.
2. Rey JR, Caro-Codón J, Sotelo LR, López-de-Sa E, Rosillo SO, Fernández ÓG, et al. Long term clinical outcomes in survivors after out-of-hospital cardiac arrest. Eur J Intern Med. 2020;74:49–54.
3. Andersen LW, Holmberg MJ, Berg KM, Donnino MW, Granfeldt A. In-hospital cardiac arrest: a review. JAMA. 2019;321(12):1200–10.
4. Goodarzi A, Khatiban M, Abdi A, Oshvandi K. Survival to discharge rate and favorable neurological outcome related to gender, duration of resuscitation and first document of patients in-hospital cardiac arrest: a systematic meta-analysis. Bull Emerg Trauma. 2022;10(4):141–56.
5. Verberne D, Moulaert V, Verbunt J, van Heugten C. Factors predicting quality of life and societal participation after survival of a cardiac arrest: a prognostic longitudinal cohort study. Resuscitation. 2018;123:51–7.
6. Soar J, Böttiger BW, Carli P, Couper K, Deakin CD, Djärv T, et al. European Resuscitation Council guidelines 2021: adult advanced life support. Resuscitation. 2021;161:115–51.
7. Donnino MW, Salciccioli JD, Howell MD, Cocchi MN, Giberson B, Berg K, et al. Time to administration of epinephrine and outcome after in-hospital cardiac arrest with non-shockable rhythms: retrospective analysis of large in-hospital data registry. BMJ. 2014;348:g3028.
8. Bircher NG, Chan PS, Xu Y. Delays in cardiopulmonary resuscitation, defibrillation, and epinephrine administration all decrease survival in in-hospital cardiac arrest. Anesthesiology. 2019;130(3):414–22.
9. Ali B, Zafari AM. Narrative review: cardiopulmonary resuscitation and emergency cardiovascular care: review of the current guidelines. Ann Intern Med. 2007;147(3):171–9.
10. American Heart Association. (AHA) guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) of pediatric and neonatal patients: pediatric basic life support. Pediatrics. 2006;117(5):e989–1004.
11. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart disease and stroke statistics-2021 update: a report from the American Heart Association. Circulation. 2021;143(8):e254–743.
12. Cartledge S, Saxton D, Finn J, Bray JE. Australia's awareness of cardiac arrest and rates of CPR training: results from the Heart Foundation's HeartWatch survey. BMJ Open. 2020;10(1):e033722.
13. Chan PS, Greif R, Anderson T, Atiq H, Bittencourt Couto T, Considine J, et al. Ten steps toward improving in-hospital cardiac arrest quality of care and outcomes. Resuscitation. 2023;193:109996.
14. Pearson DA, Bensen Covell N, Covell B, Johnson B, Lounsbury C, Przybysz M, et al. Effectiveness of team-focused CPR on in-hospital CPR quality and outcomes. Resusc Plus. 2024;18:100620.
15. Adams NB, Mittag M, Stosch C, Bornemann S, Adams J, Böttiger BW, et al. DECIDE - are medical students capable of recognizing ECG-rhythms and deciding about defibrillation during cardiac arrest: an observational study. Resusc Plus. 2024;18:100637.
16. Kumar N, Fatima M, Ghaffar S, Subhani F, Waheed S. To resuscitate or not to resuscitate? The crossroads of ethical decision-making in resuscitation in the emergency department. Clin Exp Emerg Med. 2023;10(2):138–46.
17. Nibbelink CW, Brewer BB. Decision-making in nursing practice: an integrative literature review. J Clin Nurs. 2018;27(5–6):917–28.
18. Anderson NE, Gott M, Slark J. Commence, continue, withhold or terminate? A systematic review of decision-making in out-of-hospital cardiac arrest. Eur J Emerg Med. 2017;24(2):80–6.
19. Wiest DA. Application of a decision-making model in clinical practice. Adv Emerg Nurs J. 2006;28(2):149–51.
20. McCallum J, Duffy K, Hastie E, Ness V, Price L. Developing nursing students' decision making skills: are early warning scoring systems helpful? Nurse Educ Pract. 2013;13(1):1–3.
21. Milling L, Kjær J, Binderup LG, de Muckadell CS, Havshøj U, Christensen HC, et al. Non-medical factors in prehospital resuscitation decision-making: a mixed-methods systematic review. Scand J Trauma Resusc Emerg Med. 2022;30(1):24.
22. Bijani M, Abedi S, Karimi S, Tehranineshat B. Major challenges and barriers in clinical decision-making as perceived by emergency medical services personnel: a qualitative content analysis. BMC Emerg Med. 2021;21(1):11.
23. Hansen C, Lauridsen KG, Schmidt AS, Løfgren B. Decision-making in cardiac arrest: physicians' and nurses' knowledge and views on terminating resuscitation. Open Access Emerg Med. 2018;11:1–8.
24. Lauridsen KG, Baldi E, Smyth M, Perkins GD, Greif R, Bigham BL, et al. Clinical decision rules for termination of resuscitation during in-hospital cardiac arrest: a systematic review of diagnostic test accuracy studies. Resuscitation. 2021;158:23–9.
25. Stern C, Lizarondo L, Carrier J, Godfrey C, Rieger K, Salmond S, et al. Methodological guidance for the conduct of mixed methods systematic reviews. JBI Evid Synth. 2020;18(10):2108–18.
26. Institute JB. Joanna Briggs Institute reviewers' manual: 2014 edition. Australia: The Joanna Briggs Institute. 2014:88–91.
27. Pearson A, White H, Bath-Hextall F, Salmond S, Apostolo J, Kirkpatrick P. A mixed-methods approach to systematic reviews. Int J Evid Based Healthc. 2015;13(3):121–31.
28. Uhm JY, Choi MY. Barriers to and facilitators of school health care for students with chronic disease as perceived by their parents: a mixed systematic review. Healthc (Basel). 2020;8(4).
29. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71.
30. Cooke A, Smith D, Booth A, Beyond PICO. The SPIDER tool for qualitative evidence synthesis. Qual Health Res. 2012;22(10):1435–43.

31. Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The mixed methods appraisal tool (MMAT) version 2018 for information professionals and researchers. Educ Inform. 2018;34(4):285–91.
32. Marco CA, Bessman ES, Kelen GD. Ethical issues of cardiopulmonary resuscitation: comparison of emergency physician practices from 1995 to 2007. Acad Emerg Med. 2009;16(3):270–3.
33. Patil A, Kadam S, Monnaiah P, Sethiya S, Singh S. The impact of simulation-based training on the knowledge and skills of postgraduate medical students in the management of cardiac arrest. Anaesth Pain Intensive Care. 2023;27(4):496–501.
34. Hong QN, Pluye P, Bujold M, Wassef M. Convergent and sequential synthesis designs: implications for conducting and reporting systematic reviews of qualitative and quantitative evidence. Syst Reviews. 2017;6:1–14.
35. Lizarondo L, Stern C, Carrier J, Godfrey C, Reiger K, Salmond S et al. Mixed methods systematic reviews. 2019.
36. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med Res Methodol. 2008;8:45.
37. Lauridsen KG, Krogh K, Müller SD, Schmidt AS, Nadkarni VM, Berg RA, et al. Barriers and facilitators for in-hospital resuscitation: a prospective clinical study. Resuscitation. 2021;164:70–8.
38. Tyrer F, Williams M, Feathers L, Faull C, Baker I. Factors that influence decisions about cardiopulmonary resuscitation: the views of doctors and medical students. Postgrad Med J. 2009;85(1009):564–8.
39. Brims FJ, Kilminster S, Thomas LM. Resuscitation decisions among hospital physicians and intensivists. Clin Med. 2009;9(1):16–21.
40. Robinson F, Cupples M, Corrigan M. Implementing a resuscitation policy for patients at the end of life in an acute hospital setting: qualitative study. Palliat Med. 2007;21(4):305–12.
41. Brummell SP, Seymour J, Higginbottom G. Cardiopulmonary resuscitation decisions in the emergency department: an ethnography of tacit knowledge in practice. Soc Sci Med. 2016;156:47–54.
42. Pantazopoulos I, Tsoni A, Kouskouni E, Papadimitriou L, Johnson EO, Xanthos T. Factors influencing nurses' decisions to activate medical emergency teams. J Clin Nurs. 2012;21(17–18):2668–78.
43. Hinkka H, Kosunen E, Metsänoja R, Lammi U-K, Kellokumpu-Lehtinen P. To resuscitate or not: a dilemma in terminal cancer care. Resuscitation. 2001;49(3):289–97.
44. Silverplats J, Källestedt M-LS, Äng B, Strömsöe A. Compliance with cardiopulmonary resuscitation guidelines in witnessed in-hospital cardiac arrest events and patient outcome on monitored versus non-monitored wards. Resuscitation. 2024;196:110125.
45. Gazarian PK, Henneman EA, Chandler GE. Nurse decision making in the prearrest period. Clin Nurs Res. 2010;19(1):21–37.
46. Hart PL, Spiva L, Baio P, Huff B, Whitfield D, Law T, et al. Medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in acute patient deterioration events. J Clin Nurs. 2014;23(19–20):2769–78.
47. Engels R, Graziani C, Higgins I, Thompson J, Kaplow R, Vettese TE, et al. Impact of do-not-resuscitate orders on nursing clinical decision making. South Med J. 2020;113(7):330–6.
48. Starr TJ, Pearlman RA, Uhlmann RF. Quality of life and resuscitation decisions in elderly patients. J Gen Intern Med. 1986;1(6):373–9.
49. Hong KJ, Do Shin S, Song KJ, Cha WC, Cho JS. Association between ED crowding and delay in resuscitation effort. Am J Emerg Med. 2013;31(3):509–15.
50. MoslemiRad M, Zaker MA, Elahi N, Haghighizadeh MH. Investigating the effect of two evidence-based and routine-based learning techniques on the clinical competency of cardio-pulmonary resuscitation on emergency ward nurses in Imam Khomeini Dehdasht hospital in 2017. J Res Med Dent Sci. 2019;7(1):52–60.
51. Ganz FD, Kaufman N, Israel S, Einav S. Resuscitation in general medical wards: who decides? J Clin Nurs. 2013;22(5–6):848–55.
52. Bae H, Lee S, Jang HY. The ethical attitude of emergency physicians toward resuscitation in Korea. J Emerg Med. 2008;34(4):485–90.
53. Ozer J, Alon G, Leykin D, Varon J, Aharonson-Daniel L, Einav S. Culture and personal influences on cardiopulmonary resuscitation-results of international survey. BMC Med Ethics. 2019;20:1–8.
54. Janatolmakan M, Nouri R, Soroush A, Andayeshgar B, Khatony A. Barriers to the success of cardiopulmonary resuscitation from the perspective of Iranian nurses: a qualitative content analysis. Int Emerg Nurs. 2021;54:100954.
55. Rajeswaran L. Cardio-pulmonary resuscitation: perceptions, needs and barriers experinced by the registered nurses in Botswana. University Of South Africa; 2009.
56. Muhammad GI, Ibrahim B, Sani DK, Salihu AK, Dalhatu A, Saleh S. Assessment of factors influencing nurses' initiation of cardiopulmonary resuscitation on in-hospital cardiac arrest patients in selected health facilities of Kano State Metropolis: A mixed study. International Journal of Scientific and Research Publications. 2023;13(03):362-70
57. Frank C, Heyland DK, Chen B, Farquhar D, Myers K, Iwaasa K. Determining resuscitation preferences of elderly inpatients: a review of the literature. CMAJ. 2003;169(8):795–9.
58. Hall CC, Lugton J, Spiller JA, Carduff E. CPR decision-making conversations in the UK: an integrative review. BMJ Support Palliat Care. 2019;9(1):1–11.
59. Sayers GM, Schofield I, Aziz M. An analysis of CPR decision-making by elderly patients. J Med Ethics. 1997;23(4):207–12.
60. Imhof L, Mahrer-Imhof R, Janisch C, Kesselring A, Zuercher Zenklusend R. Do not attempt resuscitation: the importance of consensual decisions. Swiss Med Wkly. 2011;141:w13157.
61. Cheraghi M, Bahramnezhad F, Mehrdad N, Zendehdel K. View of main religions of the World on; don't attempt resuscitation order (DNR). Int J Med Reviews. 2016;3(1):401–5.
62. Assarroudi A, Heshmati Nabavi F, Ebadi A, Esmaily H. Do-not-resuscitate order: the experiences of Iranian cardiopulmonary resuscitation team members. Indian J Palliat Care. 2017;23(1):88–92.
63. Kuzovlev A, Monsieurs KG, Gilfoyle E, Finn J, Greif R. The effect of team and leadership training of advanced life support providers on patient outcomes: a systematic review. Resuscitation. 2021;160:126–39.
64. Hunziker S, Tschan F, Semmer NK, Marsch S. Importance of leadership in cardiac arrest situations: from simulation to real life and back. Swiss Med Wkly. 2013;143:w13774.
65. Coady EM. A strategy for nurse defibrillation in general wards. Resuscitation. 1999;42(3):183–6.
66. Nakweenda M, Anthonie R, van der Heever M. Staff shortages in critical care units: critical care nurses experiences. Int J Afr Nurs Sci. 2022;17:100412.

Publisher's note