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Cardiopulmonary resuscitation knowledge among resident physicians: comparison of internal and surgical departments

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ABSTRACT

Aims: This study aimed to evaluate self-reported cardiopulmonary resuscitation (CPR) knowledge, attitudes, and opinions among resident physicians and to compare findings between internal and surgical departments.

Methods: Participants completed a 30-item questionnaire developed according to contemporary European Resuscitation Council/American Heart Association (ERC/AHA) CPR guidelines and reviewed by experienced emergency medicine and anesthesiology faculty members for content validity. A pilot assessment was conducted before final implementation. The questionnaire evaluated self-reported CPR-related knowledge, previous training and experience, rhythm recognition, medication and defibrillation knowledge, airway-related knowledge, and peri-arrest arrhythmia management.

Results: Relatively lower self-reported CPR-related knowledge appeared more common among urology/gynecology and obstetrics, orthopedics, and otorhinolaryngology residents; however, these findings should be interpreted cautiously because detailed subgroup analyses were limited.

Conclusion: Surgical residents had significantly lower self-reported CPR-related knowledge than internal residents, particularly regarding rhythm assessment, drug administration, defibrillation, airway confirmation, and peri-arrest arrhythmia management. Department-specific, repeated, simulation-supported CPR training may be needed, especially in surgical departments with limited routine exposure to resuscitation.

Keywords: Cardiopulmonary arrest, cardiopulmonary resuscitation, resident physicians, resuscitation training

INTRODUCTION

Cardiopulmonary arrest is characterized by abrupt loss of effective cardiac activity and systemic circulation. It should be suspected in an unresponsive individual with absent or abnormal breathing and no signs of circulation. Out-of-hospital and in-hospital cardiac arrest remain major causes of mortality, and survival depends on early recognition, high-quality chest compressions, timely defibrillation when indicated, and appropriate advanced life support interventions.[1,2]

Current resuscitation guidelines available during the study period emphasize immediate initiation of cardiopulmonary resuscitation (CPR), minimization of interruptions in chest compressions, early rhythm assessment, appropriate defibrillation, correct use of adrenaline and antiarrhythmic drugs, and structured post-resuscitation care.[3-5]

For physicians, CPR is not only a basic clinical skill but also a professional responsibility across specialties. Nevertheless, previous studies have reported heterogeneous knowledge levels among physicians and resident physicians, with knowledge varying according to clinical exposure, specialty, previous training, and opportunities to participate in real-life resuscitation.[6-11]

In tertiary hospitals, resident physicians from both internal and surgical departments may encounter cardiopulmonary arrest in wards, outpatient units, emergency settings, operating rooms, and intensive care areas. However, the frequency and context of exposure may differ across specialties. Identifying knowledge gaps by department may therefore help institutions design targeted resuscitation training programs. This study aimed to evaluate the knowledge, attitudes, and opinions of resident physicians working at our hospital regarding CPR and to compare findings between internal and surgical departments.

METHODS

Ethics

After the study was approved by the Kırıkkale University Faculty of Medicine Ethics Committee (Date: 12.03.2025, Decision No: 2025.03.13), the study was conducted among resident physicians receiving specialty training at Kırıkkale University Faculty of Medicine. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

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Study Design

This study was designed as a single-center, cross-sectional questionnaire study. The study population consisted of 100 resident physicians: 50 from internal departments and 50 from surgical departments. Internal departments included family medicine, internal medicine, pulmonology, cardiology, and neurology. Surgical departments included anesthesiology and reanimation, general surgery, otorhinolaryngology, orthopedics, urology, and gynecology and obstetrics.

Participants completed a 30-item questionnaire developed according to contemporary European Resuscitation Council/American Heart Association (ERC/AHA) CPR guidelines and reviewed by experienced emergency medicine and anesthesiology faculty members for content validity. A pilot assessment was conducted before final implementation. The questionnaire evaluated self-reported CPR-related knowledge, previous training and experience, rhythm recognition, medication and defibrillation knowledge, airway-related knowledge, and peri-arrest arrhythmia management.

Statistical Analysis

All data analyses were performed using SPSS version 26.0. Descriptive statistics were presented as number and percentage, mean±standard deviation, or median (minimum-maximum), as appropriate. Categorical variables were compared between groups using Pearson Chi-square or Fisher exact tests. Nonparametric continuous variables were compared using the Mann-Whitney U test. A p-value below 0.05 was considered statistically significant. This exploratory study used convenience sampling, and no formal power analysis was performed. Because multiple comparisons were conducted across questionnaire items, the findings should be interpreted cautiously with awareness of potential type I error inflation.

RESULTS

Demographic Characteristics

A total of 100 resident physicians participated in the study, with 50 participants in the internal departments group and 50 in the surgical departments group. The mean age was similar between internal and surgical residents (28.36±2.77 vs. 28.78±2.48 years; p=0.545). Female gender was more frequent in the internal group, whereas male gender was more frequent in the surgical group (p=0.016). Residency year distribution was similar between groups (p=0.726) (**Table 1**).

Table 1. Demographic characteristics of the participants

Variable	Internal departments (n=50)	Surgical departments (n=50)	p-value
Age, mean±SD	28.36±2.77	28.78±2.48	0.545
Female gender, n (%)	28 (56.0)	16 (32.0)	0.016
Male gender, n (%)	22 (44.0)	34 (68.0)	0.016
Residency year 1, n (%)	18 (36.0)	17 (34.0)	0.726
Residency year 2, n (%)	9 (18.0)	9 (18.0)	0.726
Residency year 3, n (%)	11 (22.0)	11 (22.0)	0.726
Residency year 4, n (%)	8 (16.0)	5 (10.0)	0.726
Residency year 5, n (%)	4 (8.0)	8 (16.0)	0.726

SD: Standard deviation

Cardiopulmonary Resuscitation (CPR) Training and Previous Experience

Previous CPR training was reported by 47 internal residents (94.0%) and 39 surgical residents (78.0%), with a statistically significant difference favoring internal departments (p=0.021). Prior CPR application was reported by 49 internal residents (98.0%) and 43 surgical residents (86.0%); this difference did not reach statistical significance (p=0.059). However, the estimated number of previous CPR applications was significantly higher in internal residents than surgical residents [median 27 (5-100) vs. 4 (0-100); p<0.001]. All participants stated that they knew how to recognize cardiopulmonary arrest, and nearly all stated that they knew the first action to take after recognition (**Table 2**).

Knowledge of Cardiopulmonary Resuscitation (CPR) Algorithm, Rhythm Assessment, Drugs, Defibrillation, and Airway Management

Most residents in both groups reported knowing the compression-to-ventilation ratio and shockable/non-shockable rhythms. However, internal residents more frequently reported knowing how to perform effective chest compressions (100.0% vs. 80.0%; p=0.001) and when to check rhythm during CPR (96.0% vs. 64.0%; p<0.001) (**Table 3**).

Table 2. CPR training, experience, and cardiopulmonary arrest recognition

Variable	Internal departments (n=50)	Surgical departments (n=50)	p-value
Previous CPR training: Yes, n (%)	47 (94.0)	39 (78.0)	0.021
Previous CPR application: Yes, n (%)	49 (98.0)	43 (86.0)	0.059
Estimated number of CPR applications, median (min-max)	27 (5-100)	4 (0-100)	<0.001
Knows how to recognize cardiopulmonary arrest: Yes, n (%)	50 (100.0)	50 (100.0)	-
Knows first action after recognizing cardiopulmonary arrest: Yes, n (%)	50 (100.0)	49 (98.0)	1.000

CPR: Cardiopulmonary resuscitation, Min: Minimum, Max: Maximum

Table 3. Knowledge of CPR application and rhythm assessment

Variable: Yes responses	Internal departments (n=50)	Surgical departments (n=50)	p-value
Knows compression-to-ventilation ratio during CPR	50 (100.0)	46 (92.0)	0.117
Knows how to perform effective chest compression	50 (100.0)	40 (80.0)	0.001
Knows shockable rhythms	48 (96.0)	47 (94.0)	1.000
Knows nonshockable rhythms	49 (98.0)	46 (92.0)	1.000
Knows rhythm-check intervals	48 (96.0)	32 (64.0)	<0.001

CPR: Cardiopulmonary resuscitation

Major between-group differences were observed in medication-related knowledge. Internal residents more frequently knew the adrenaline dose used during CPR (98.0% vs. 52.0%; p=0.001), the interval for repeating adrenaline (98.0% vs. 54.0%; p=0.001), which drug should be used in shockable rhythms (88.0% vs. 40.0%; p<0.001), after which shock medication should be administered (74.0% vs. 28.0%; p<0.001), and the amount of drug administered after shock (62.0% vs. 22.0%; p<0.001) (**Table 4**).

Table 4. Knowledge of drug administration during CPR

Variable: Yes responses	Internal departments (n=50)	Surgical departments (n=50)	p-value
Knows adrenaline dose during CPR	49 (98.0)	26 (52.0)	0.001
Knows interval for repeating adrenaline	49 (98.0)	27 (54.0)	0.001
Knows drug used in shockable rhythms	44 (88.0)	20 (40.0)	<0.001
Knows after which shock medication should be given	37 (74.0)	14 (28.0)	<0.001
Knows amount of drug given after shock	31 (62.0)	11 (22.0)	<0.001

CPR: Cardiopulmonary resuscitation

Knowledge of defibrillator pad placement, applicable energy level, perceived ability to recognize intubation during CPR, and the gold standard for confirmation of tracheal intubation was also significantly higher among internal residents than surgical residents. Knowledge about the survival implication of elevated end-tidal carbon dioxide was low in both groups and did not differ significantly (28.0% vs. 22.0%; p=0.488) (**Table 5**).

Table 5. Knowledge of defibrillation and airway-related issues during CPR

Variable: Yes responses	Internal departments (n=50)	Surgical departments (n=50)	p-value
Knows defibrillator pad placement	45 (90.0)	22 (44.0)	<0.001
Knows applicable defibrillation energy level	39 (78.0)	17 (34.0)	<0.001
Believes they can recognize intubation during CPR	47 (94.0)	24 (48.0)	<0.001
Knows gold standard for tracheal intubation confirmation	27 (54.0)	13 (46.0)	0.004
Knows how elevated end-tidal CO_2 affects survival	14 (28.0)	11 (22.0)	0.488

CPR: Cardiopulmonary resuscitation, CO_2: Carbon dioxide

Peri-Arrest Arrhythmia Management and Specialty-Level Findings

Internal residents reported higher knowledge regarding unstable tachycardia management (68.0% vs. 26.0%; p<0.001), stable tachycardia and QRS-related vagal maneuver decision-making (64.0% vs. 20.0%; p<0.001), initial atropine dose in bradycardia (84.0% vs. 26.0%; p<0.001), maximum repeatable atropine dose (70.0% vs. 24.0%; p<0.001), recognition of the presented rhythm (98.1% vs. 78.0%; p=0.002), and treatment of the presented rhythm (80.0% vs. 40.0%; p<0.001) (**Table 6**).

Table 6. Knowledge of tachycardic and bradycardic patient management

Variable: Yes responses	Internal departments (n=50)	Surgical departments (n=50)	p-value
Knows what to do in unstable tachycardia	34 (68.0)	13 (26.0)	<0.001
Knows whether vagal maneuver in stable tachycardia depends on QRS width	32 (64.0)	10 (20.0)	<0.001
Knows initial atropine dose in bradycardia	42 (84.0)	13 (26.0)	<0.001
Knows maximum repeatable atropine dose	35 (70.0)	12 (24.0)	<0.001
Knows preliminary diagnosis of the visually presented rhythm	49 (98.1)	39 (78.0)	0.002
Knows treatment needed to correct the presented rhythm	40 (80.0)	20 (40.0)	<0.001

The original thesis table contained an apparent typographical error for maximum repeatable atropine dose in the internal departments group; it was harmonized here as 35 (70.0%) according to the reported percentage and abstract result. QRS: QRS complex (Q wave, R wave, and S wave)

In exploratory specialty-level observations, relatively lower self-reported CPR-related knowledge appeared more common among urology/gynecology and obstetrics, orthopedics, and otorhinolaryngology residents. However, detailed subgroup statistical analyses were limited because of the relatively small sample sizes within each specialty.

DISCUSSION

The main finding of this single-center cross-sectional study was that surgical residents reported lower self-assessed CPR-related knowledge than internal residents despite most participants previously receiving CPR training and participating in CPR practice.

Early CPR and early defibrillation are among the most important determinants of survival after cardiac arrest. High-quality CPR, appropriate recognition of shockable rhythms, and rapid defibrillation are repeatedly emphasized in resuscitation science and guideline documents.[3-6]

In this context, the finding that all residents reported knowing how to recognize cardiopulmonary arrest is encouraging. However, recognition alone is insufficient if algorithm steps, rhythm assessment intervals, drug timing, and defibrillation practices are not applied correctly.

The observed difference in previous CPR exposure may partially explain the knowledge gap. Internal residents reported a substantially higher median number of previous CPR applications than surgical residents. Although surgical residents frequently work in perioperative settings where acute deterioration can occur, their day-to-day roles may not uniformly include repeated exposure to ward-based cardiac arrest algorithms, defibrillator operation, or medical management of peri-arrest arrhythmias. By contrast, several internal departments may encounter deteriorating medical patients and cardiac arrest scenarios more frequently in wards, coronary care units, emergency consultations, and intensive care-related rotations.

Our findings are consistent with prior studies reporting that CPR knowledge varies by specialty, clinical experience, and previous training. Turkish studies evaluating physicians and resident physicians have similarly shown that knowledge is not homogeneous across branches and that specific groups require repeated education.[7-10]

In the present study, the weakest areas among surgical residents were not basic arrest recognition but applied components of advanced resuscitation: adrenaline dosing and timing, amiodarone use in shockable rhythms, defibrillation technique, confirmation of tracheal tube placement, and tachycardia/bradycardia algorithms. These are precisely the steps most likely to affect the quality and continuity of resuscitation during real-life team-based CPR.

The specialty-level findings are clinically relevant. Urology/gynecology and obstetrics, orthopedics, and otorhinolaryngology residents had the lowest knowledge levels in several items. These departments may have fewer routine opportunities to lead resuscitation events, but their patients may still experience perioperative, postoperative, obstetric, airway-related, traumatic, septic, or hemorrhagic deterioration. Therefore, training should not be limited to departments traditionally perceived as resuscitation-heavy. Instead, institution-wide training should be adapted according to departmental risk profiles and previously identified knowledge gaps.

A practical implication of these findings is that CPR education should be repeated, competency-based, and simulation-supported. Passive theoretical sessions may not be sufficient for long-term retention or for translating knowledge into performance under stress. Short, recurring workshops focusing on rhythm recognition, defibrillator use, drug timing, airway confirmation with waveform capnography, and peri-arrest arrhythmia algorithms may improve both knowledge and confidence. Department-specific scenarios may further increase relevance and retention.

Limitations

This study has several limitations. First, it was conducted at a single center with a relatively limited sample size, which may reduce generalizability. Second, the questionnaire primarily evaluated self-reported or perceived knowledge rather than objectively measured CPR competence or practical performance. Third, although the questionnaire items were developed according to current ERC/AHA recommendations and reviewed by faculty members, a Formal Large-Scale validation and reliability analysis such as Cronbach's alpha was not performed. Fourth, the study was exploratory in nature and no formal power analysis was conducted. Fifth, multiple statistical comparisons were performed without formal correction methods, which may increase the risk of type I error. Finally, specialty-level subgroup findings should be interpreted cautiously because detailed subgroup analyses were limited.

CONCLUSION

Resident physicians from surgical departments reported lower self-assessed CPR-related knowledge than residents from internal departments, particularly regarding rhythm assessment, medication use, defibrillation, airway confirmation, and peri-arrest arrhythmia management. These findings support the potential value of repeated, simulation-supported, department-specific CPR training programs.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Kırıkkale University Faculty of Medicine Ethics Committee (Date: 12.03.2025, Decision No: 2025.03.13).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights-including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

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Author Contributions

Concept: ZB, IG; Design: ZB, IG; Control: IG; Data Collection and/or Processing: ZB; Analysis and/or Interpretation: ZB; Writing the Article: ZB, IG; Critical Review: ZB, IG, KP.

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