

Does Profession Matter After Basic Life Support Training? Interprofessional Differences in Female Healthcare Providers' Chest Compression Quality in an Oncology Setting: A Mixed-Methods Secondary Analysis

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Abstract

Background

High-quality chest compressions are a core Basic Life Support (BLS) competency, yet trained healthcare professionals may still have difficulty achieving guideline-consistent depth, rate, recoil, and sustained performance. In oncology settings, resuscitation requires coordinated action across professional groups. Evidence is limited on whether professional discipline is associated with post-training chest-compression quality among female healthcare providers and how interprofessional learning conditions shape performance.

Methods

This secondary mixed-methods analysis used data from a larger convergent study conducted in a tertiary oncology center in Jordan. The quantitative component included 370 female healthcare providers who attended BLS training and completed objective chest-compression assessment. Professional groups included nurses, physicians/doctors, pharmacists, radiology technicians, laboratory technicians, and other providers. Outcomes included compression depth, rate, full recoil, hand position, posture, and a composite core-quality indicator. Categorical outcomes were compared using chi-square tests and continuous metrics using Kruskal-Wallis tests. A secondary qualitative thematic analysis examined how exposure, hierarchy, role opportunity, teamwork, feedback, and shared female experience shaped performance. Findings were integrated using narrative weaving and a joint display.

Results

Correct hand positioning was achieved by 100.0% of assessed participants, straight arms/posture by 99.4%, and target compression rate by 79.3%. However, 62.0% met the depth criterion, 34.0% achieved full recoil, and 34.0% achieved composite core quality. Profession was not significantly associated with depth ($p = 0.165$), rate ($p = 0.287$), recoil ($p = 0.635$), or composite quality ($p = 0.635$), and continuous performance metrics also did not differ significantly by profession. Five qualitative themes explained the findings: Different Badges, Same Hands; It Is the Exposure, Not the Title; Who Steps Forward, Who Steps Back; Same Push, Different Pressures; and One Code, Many Voices.

Conclusions

Post-training chest-compression quality gaps were shared across professions rather than concentrated in one discipline. Interprofessional CPR education should prioritize deliberate practice, objective feedback, role rotation, equitable opportunities to compress and lead, fatigue management, and

oncology-relevant team simulation. The findings support treating CPR performance as a shared educational competency rather than a profession-specific capability.

Background

High-quality chest compressions are among the most important modifiable components of cardiopulmonary resuscitation (CPR). Current guidance emphasizes adequate compression depth, a rate of 100–120 compressions per minute, full chest recoil, correct hand positioning, minimal interruptions, and avoidance of leaning [1, 2]. Although these skills are routinely taught during Basic Life Support (BLS) education, training completion does not necessarily mean that every quality component is achieved consistently in performance assessment or retained over time [3–5].

For healthcare educators, this gap matters because CPR is not a profession-specific procedure. In a clinical emergency, nurses, physicians, pharmacists, technicians, and other trained healthcare professionals may all become part of the resuscitation team. Oncology settings add complexity because cardiac arrest may occur in the context of sepsis, hypoxia, treatment complications, bleeding risk, or organ failure, often with family presence and high emotional intensity. Effective resuscitation therefore depends on both individual psychomotor competence and coordinated interprofessional performance.

Interprofessional education aims to prepare healthcare professionals to learn with, from, and about one another so that collaborative practice improves. During resuscitation, professional hierarchy, expectations about who leads or performs chest compressions, prior exposure to real codes, and access to simulation may influence learning opportunities. These factors may be especially important when the workforce includes professional groups with very different frequencies of bedside emergency exposure.

Female healthcare providers may also encounter gendered expectations related to physical strength, stamina, leadership, or visibility in physically demanding tasks. Recent resuscitation literature has highlighted gender-related issues in CPR response and training, including representation in manikins and perceptions of physical contact [6–9]. In Middle Eastern settings, cultural and religious considerations may further shape confidence, public visibility, and role allocation during resuscitation [10–12]. From an educational perspective, these influences are relevant because unequal exposure and role opportunity can affect confidence, deliberate practice, and skill retention.

Most CPR education studies focus on learner performance, feedback devices, or overall training outcomes, while fewer examine whether profession is associated with objective chest-compression quality among female healthcare providers. Quantitative comparisons alone also cannot explain why professional differences are present or absent. A mixed-methods approach can connect objective performance with learners' accounts of exposure, hierarchy, fatigue, teamwork, feedback, and role opportunity [13–15].

This secondary mixed-methods analysis therefore examined whether professional group was associated with objective post-training CPR chest-compression quality among female healthcare providers in an

oncology setting and used secondary qualitative themes to explain the educational and interprofessional conditions shaping performance. The study addressed four questions: (1) Are there profession-based differences in objective chest-compression quality? (2) Which CPR-quality indicators are most commonly achieved or missed across professional groups? (3) How do interprofessional qualitative themes explain role allocation, confidence, hierarchy, exposure, teamwork, and gendered assumptions? and (4) What are the implications for interprofessional CPR education in oncology settings?

Methods

Study design and setting

This paper reports a secondary mixed-methods analysis from a larger convergent mixed-methods study on female healthcare providers' CPR performance and cultural influences. The parent study included objective assessment of chest-compression quality after BLS training and qualitative interviews exploring participants' experiences of CPR. The present analysis focuses specifically on profession, interprofessional learning conditions, and educational implications. Integration used narrative weaving and joint-display logic [13–15]. The study was conducted at King Hussein Cancer Center, a tertiary oncology center in Amman, Jordan.

Participants

Quantitative participants were adult female healthcare providers who attended BLS training and completed CPR chest-compression assessment. The cleaned dataset included 370 participants. Professions were recoded as nurses, physicians/doctors, pharmacists, radiology technicians, laboratory technicians, and other healthcare providers. Nursing-related entries were grouped as nurse, surgical doctors as physician/doctor, and pharmacy assistants as pharmacist. The qualitative component included female healthcare providers with relevant CPR exposure who participated in semi-structured interviews about physical and emotional experiences, confidence, cultural considerations, role expectations, teamwork, and training needs.

Quantitative measures

Variables included age, body mass index (BMI), profession, number of prior BLS courses, real-practice CPR exposure, selected confidence and perception items, and objective chest-compression performance. Objective CPR-quality indicators included compression depth of at least 5 cm, compression rate of 100–120 compressions per minute, full chest recoil, correct hand positioning, and straight arms/posture. A composite core-quality indicator required simultaneous achievement of depth, rate, and full recoil.

Statistical analysis

Descriptive statistics summarized participant characteristics and CPR outcomes. Categorical quality indicators were compared across professional groups using chi-square tests. Continuous performance metrics were compared using Kruskal-Wallis tests because professional subgroups were unequal in size and not all measures were normally distributed. Mann-Whitney U tests were used for selected exploratory analyses of ordinal perception items in relation to CPR-quality outcomes. A two-sided p value < 0.05 was considered statistically significant. Because subgroup sizes were small for some professions, profession-based findings were interpreted cautiously and descriptive differences were not treated as evidence of superiority.

Secondary qualitative analysis

The parent qualitative dataset had been analyzed using NVivo-assisted thematic analysis and expert confirmation. For this manuscript, the findings were re-examined through an interprofessional education lens rather than reproducing the broader cultural and experiential themes of the parent study. The secondary analysis focused on how profession, practice exposure, hierarchy, role opportunity, teamwork, feedback, and shared female experience may shape chest-compression performance. Themes were refined using contemporary thematic analysis guidance [16, 17]. Participant quotations are de-identified using participant codes. Profession-specific attribution was avoided unless linkage to the transcript was confirmed.

Mixed-methods integration

Integration occurred after separate quantitative and qualitative analyses. Profession-based quantitative findings were compared with secondary interprofessional themes using narrative weaving and a joint display. The purpose was to explain not only whether profession was statistically associated with performance, but how educational conditions such as exposure, role allocation, feedback, rotation, and team support could shape performance across disciplines.

Use of generative AI-assisted tools

Generative AI-assisted tools were used only to support language clarity, organization, formatting, and manuscript preparation. They were not used to generate study data or perform the statistical analyses. The authors reviewed, verified, revised, and approved all content and take responsibility for the final manuscript.

Ethics approval and consent to participate

The parent study received approval from the Institutional Review Board at King Hussein Cancer Center (25 KHCC 202; 7 September 2025). Written informed consent was obtained from all participants before

participation. Quantitative results are reported in aggregate and qualitative quotations use de-identified participant codes.

Results

Participant characteristics and professional distribution

The quantitative sample included 370 female healthcare providers. Mean age was 28.41 years (SD 7.05), and participants had attended a mean of 2.18 prior BLS courses (SD 2.19). Nurses represented 72.2% of the sample, followed by physicians/doctors (10.3%), pharmacists (7.0%), radiology technicians (5.1%), laboratory technicians (3.2%), and other providers (2.2%). Real-practice CPR exposure was limited: 49.2% reported never performing CPR in real practice, 35.0% reported rare exposure, and 15.8% reported at least occasional exposure. This distribution suggests that professional title did not necessarily correspond to practical resuscitation exposure. Participant characteristics and professional distribution are presented in Table 1.

Table 1. Participant characteristics and professional distribution

Variable	Result
Age, years (n = 370)	Mean 28.41 (SD 7.05); median 26; range 21–57
BMI, kg/m ² (n = 370)	Mean 24.72 (SD 4.27); median 23.99; range 16.59–43.51
Prior BLS courses attended (n = 369)	Mean 2.18 (SD 2.19); median 2; range 0–12
Nurse	267 (72.2%)
Physician/Doctor	38 (10.3%)
Pharmacist	26 (7.0%)
Radiology Technician	19 (5.1%)
Lab Technician	12 (3.2%)
Other healthcare provider	8 (2.2%)
CPR exposure: never in real practice	180 (49.2% of valid responses)
CPR exposure: rarely, once a month or less	128 (35.0% of valid responses)
CPR exposure: at least occasionally	58 (15.8% of valid responses)

Table 1 legend. BLS, Basic Life Support; CPR, cardiopulmonary resuscitation. Profession groups were recoded as described in Methods.

Overall chest-compression quality

Participants demonstrated strong foundational technique but weaker performance on measures requiring sustained precision. Correct hand positioning was achieved by all assessed participants and straight arms/posture by 99.4%. The target compression rate was achieved by 79.3%, depth by 62.0%, and full chest recoil by 34.0%. The composite core-quality indicator was achieved by 34.0%. Overall objective CPR compression-quality performance is presented in Table 2, and continuous performance metrics are summarized in Table 3.

Table 2. Overall objective CPR compression-quality performance

Quality criterion	Valid n	Met, n (%)	Not met, n (%)
Compression depth ≥5 cm	363	225 (62.0%)	138 (38.0%)
Compression rate 100–120 cpm	363	288 (79.3%)	75 (20.7%)
Full chest recoil	362	123 (34.0%)	239 (66.0%)
Correct hand positioning	363	363 (100.0%)	0 (0.0%)
Straight arms/posture	363	361 (99.4%)	2 (0.6%)
Composite core quality: depth + rate + recoil	362	123 (34.0%)	239 (66.0%)

Table 2 legend. cpm, compressions per minute. Composite core quality required simultaneous achievement of depth, rate, and full recoil.

Table 3. Continuous objective CPR performance metrics

Metric	n	Mean (SD)	Median	Range
Depth (cm)	369	5.01 (0.67)	5.10	2.40–6.10
Rate (cpm)	370	110.58 (8.29)	110.00	80.00–140.00
Recoil (%)	370	83.26 (17.93)	89.00	13.00–108.00

Table 3 legend. cpm, compressions per minute.

Profession-based comparisons

Profession was not significantly associated with meeting the depth, rate, recoil, or composite quality criteria. Descriptive variation was present, but small subgroup sizes limited interpretation. The pattern was similar for continuous performance metrics. Categorical and continuous profession-based comparisons are presented in Tables 4 and 5, respectively.

Table 4. Interprofessional comparison of categorical CPR-quality indicators

Profession	Depth met, n (%)	Rate met, n (%)	Recoil met, n (%)	Composite met, n (%)
Nurse	164 (62.6%)	206 (78.6%)	85 (32.6%)	85 (32.6%)
Physician/Doctor	27 (71.1%)	32 (84.2%)	16 (42.1%)	16 (42.1%)
Pharmacist	15 (57.7%)	21 (80.8%)	11 (42.3%)	11 (42.3%)
Radiology Technician	12 (66.7%)	17 (94.4%)	6 (33.3%)	6 (33.3%)
Lab Technician	3 (27.3%)	7 (63.6%)	2 (18.2%)	2 (18.2%)
Other	4 (50.0%)	5 (62.5%)	3 (37.5%)	3 (37.5%)
p value (chi-square)	0.165	0.287	0.635	0.635

Table 4 legend. Chi-square tests compared met/not-met status across professional groups.

Table 5. Interprofessional comparison of continuous CPR performance metrics

Profession	n	Depth, mean (SD)	Rate, mean (SD)	Recoil, mean (SD)
Nurse	267	5.03 (0.62)	110.24 (8.32)	82.60 (18.19)
Physician/Doctor	38	5.14 (0.58)	109.84 (8.33)	89.18 (13.33)
Pharmacist	26	5.02 (0.57)	113.46 (8.03)	86.08 (17.57)
Radiology Technician	19	4.98 (0.72)	109.89 (4.45)	82.58 (16.12)
Lab Technician	12	4.11 (1.14)	113.33 (11.23)	72.33 (24.00)
Other	8	4.97 (0.93)	113.62 (9.35)	86.38 (17.39)
p value (Kruskal-Wallis)		0.093	0.332	0.103

Table 5 legend. Kruskal-Wallis tests compared continuous performance metrics across professional groups.

Selected exploratory factors associated with CPR quality

Participants who met the depth criterion reported slightly higher confidence in performing high-quality compressions than those who did not (3.76 vs 3.58, $p = 0.047$). Cultural/religious beliefs concerning male-patient contact differed by compression-rate achievement (2.90 among those meeting rate vs 3.19 among those not meeting rate, $p = 0.049$). Other exploratory associations were not statistically

significant and should be interpreted cautiously. Selected exploratory factors associated with CPR-quality indicators are presented in Table 6.

Table 6. Selected factors associated with CPR-quality indicators

Factor / measure	Outcome	Met mean (SD)	Not met mean (SD)	p value
Confidence in high-quality chest compressions	Depth met	3.76 (0.88)	3.58 (0.93)	0.047
Religious/cultural beliefs influence willingness to contact male patients	Rate met	2.90 (1.15)	3.19 (1.12)	0.049
Comfort performing CPR on female patient	Rate met	3.68 (1.03)	3.47 (1.04)	0.070
Comfort performing CPR on male patient	Recoil met	3.39 (1.01)	3.56 (1.01)	0.072
Religious/cultural beliefs influence willingness to contact male patients during CPR	Composite core quality met	2.84 (1.23)	3.01 (1.11)	0.174
Workplace accepts female providers performing CPR	Composite core quality met	3.78 (1.04)	3.80 (1.03)	0.847
Comfort performing CPR on female patient	Composite core quality met	3.71 (1.05)	3.60 (1.03)	0.308
Comfort performing CPR on male patient	Composite core quality met	3.39 (1.01)	3.56 (1.01)	0.072
Difference in comfort level between female and male patients	Composite core quality met	3.25 (1.06)	3.44 (1.05)	0.128
Confidence in high-quality chest compressions	Composite core quality met	3.66 (0.99)	3.71 (0.86)	0.788

Table 6 legend. Mann-Whitney U analyses were used for ordinal Likert measures. Findings were exploratory and were not adjusted for multiple comparisons.

Qualitative findings: secondary interprofessional explanatory themes

Five secondary themes reframed chest-compression performance as an interprofessional and educational phenomenon shaped by practice exposure, hierarchy, opportunity, physical and emotional load, and team support. Table 7 summarizes the themes.

Table 7. Secondary interprofessional themes, definitions, and educational focus

Theme	Definition and result focus	Educational subthemes
Different Badges, Same Hands: Compression Quality as a Shared Interprofessional Duty	Compression performance was described as a shared responsibility rather than a task owned by one profession.	Shared responsibility; readiness over discipline label; avoiding profession-based assumptions
It Is the Exposure, Not the Title: Confidence Grows Where CPR Is Practiced	Confidence and preparedness were linked to repeated practice, real-code exposure, simulation, feedback, and refreshers.	Real-code exposure; simulation and feedback; skill decay with limited practice
Who Steps Forward, Who Steps Back: Hierarchy Shapes Opportunity to Compress	Hierarchy, seniority, role expectations, and code leadership influenced who was given opportunities to compress or lead.	Leadership and decision-making; bedside execution; underused allied-health roles
Same Push, Different Pressures: Female Providers Share the Physical and Emotional Load	Fatigue, hand pain, stress, fear of error, and observation were experienced across disciplines.	Fatigue and stamina; fear of error; family/team observation
One Code, Many Voices: Team Rotation and Mutual Trust Sustain Quality	Sustained quality depended on role clarity, rotation, leadership support, and interprofessional trust.	Two-minute rotation; role clarification; mutual trust; supportive leadership

Table 7 legend. Themes were developed through secondary analysis using an interprofessional education lens.

Theme 1. Different Badges, Same Hands

Participants described effective CPR as dependent on readiness, practice, and willingness to act rather than professional title. One participant stated, “I proved myself through practice. Once they saw my ability to perform effective compressions, their views changed” (P06). The same participant emphasized body mechanics: “I tried to give my maximum effort and used my body weight properly rather than relying on my back” (P06).

Theme 2. It Is the Exposure, Not the Title

Participants connected confidence to repetition, feedback, and real or simulated codes. “The more training I receive, the more confident I become” (P03). Another participant explained, “Practicing on mannequins with feedback on depth has helped significantly” (P03). These accounts were consistent with the quantitative finding that most participants had limited real-practice CPR exposure.

Theme 3. Who Steps Forward, Who Steps Back

Participants described role allocation as shaped by expectations about who should perform visible physical tasks. One participant reported, “Female staff were usually assigned to documentation or

medication administration, so I felt that this role was not typically given to women” (P11). Another stated, “There is often a preference for males to perform chest compressions” (P06). The educational implication is that role allocation influences who receives repeated practice and feedback.

Theme 4. Same Push, Different Pressures

Physical and emotional demands were described across professional groups. One participant said, “Initially I felt fine physically, but after two minutes of compressions I started to feel tiredness and hand pain, therefore we have switched” (P03). Another described emotional pressure: “There are some fears and stress, but at the same time we try to perform everything correctly” (P08).

Theme 5. One Code, Many Voices

Participants emphasized that sustained performance depends on team systems rather than one individual. They highlighted two-minute rotation, role clarity, leadership support, and trust. One participant recommended: “Encourage females to take initiatives... Ensure leadership support during codes... Provide practice opportunities” (P07).

Mixed-methods integration

The quantitative and qualitative findings converged around a central educational interpretation: profession did not directly determine chest-compression quality, while the conditions that support quality—practice exposure, feedback, role clarity, rotation, leadership support, and fair opportunity—cut across professional boundaries. Table 8 presents the joint display.

Table 8. Mixed-methods joint display of interprofessional performance and educational interpretation

Secondary theme	Quantitative link	Educational interpretation
Different Badges, Same Hands	Profession was not significantly associated with depth, rate, recoil, or composite quality.	Compression quality should be taught and assessed as a shared interprofessional competency.
It Is the Exposure, Not the Title	Real-practice CPR exposure was limited; confidence was associated with depth achievement.	Repeated simulation, feedback, and refreshers may be more important than professional title for readiness.
Who Steps Forward, Who Steps Back	Measured performance did not differ significantly by profession, but opportunities may vary.	Simulation should deliberately rotate compression and leadership roles across disciplines.
Same Push, Different Pressures	Full recoil and composite quality were the weakest indicators.	Training should include fatigue recognition, rotation, body mechanics, and pressure-management strategies.
One Code, Many Voices	Composite quality was not achieved by most participants.	Team-based feedback and role clarity should be central to interprofessional resuscitation education.

Table 8 legend. Integration used narrative weaving and joint-display logic to connect objective performance with explanatory themes.

Discussion

The first key finding is that professional group was not significantly related to objective post-training quality of chest compressions in female healthcare providers. It does not mean equality among professional groups, especially when some groups were too small. However, there is no reason to believe that profession alone dictates competence in providing CPR. The educational message is that CPR quality gaps are equally distributed across professions.

The most prominent technical deficiency was a lack of full recoil, which is directly followed by composite core CPR quality. While the majority of participants demonstrated proper positioning of hands, posture, and the correct rate of chest compressions, only one-third managed to achieve full recoil and composite CPR quality index. Performing high-quality CPR involves fulfilling multiple criteria at once [1,2]. Modern simulation and feedback research indicates the value of deliberate practice and objective feedback on performance and retention [3–5,18,19].

It Is the Exposure, Not the Title – the most consistent qualitative theme in the current study, provides educational explanation for the lack of pronounced profession-related differences. Almost half of the participants reported having no real-practice exposure to CPR; and only 15.8% of participants reported at least occasional experience with CPR. The findings clearly show that low-dose, repeated practice and training across professional groups should be emphasized, rather than assuming that any certification and/or profession is sufficient to guarantee readiness to CPR.

Hierarchy and role allocation provide the other example of educational mechanism at work here. Depending on which professional is asked to perform compressions, take control, document the procedure, or administer drugs, someone gets experience, feedback, and visible competence. Interprofessional simulation provides opportunity to balance the situation and equalize role allocation among allied health professionals and female medical professionals allowing them to practice compressions and leadership skills.

The findings also emphasize importance of the team performance aspect. Fatigue, pressure, and necessity of rotation were identified in each professional group. Thus, resuscitation education should go beyond mere evaluation of psychomotor skills and develop team-based performance with such components as two-minutes rotation of roles, switching roles, communicating, establishing mutual trust, and recovery after performance decline. The oncology scenarios can involve realistic reasons of performance decline, family members' presence, and therapy-related complications without jeopardizing the essential competencies of BLS.

There are a number of limitations to the present study. First of all, it is a study in a single oncology center and its sample was heavily biased towards nursing profession. Moreover, subgroup sizes of professional groups were unequal. For smaller groups, the lack of power may influence interpretation of descriptive findings. The performance of participants was evaluated in the training setting and not in real patient care. The interprofessional qualitative analysis was a secondary analysis and, thus, profession-related quotations were provided only if reliable linkage was established.

Conclusions

Among healthcare professionals who were evaluated for the quality of chest compressions following their participation in BLS training sessions in an oncology environment, the profession played no significant role in the quality of chest compressions. The basics of technique were well executed, but compression depth, full recoil, and quality were areas that all participants shared in common. Findings indicate that factors such as exposure, feedback, hierarchy, role, opportunity, fatigue, rotation, and teamwork are more important for education than titles.

List of abbreviations

BLS: Basic Life Support

BMI: Body mass index

CPR: Cardiopulmonary resuscitation

COREQ: Consolidated Criteria for Reporting Qualitative Research

GRAMMS: Good Reporting of A Mixed Methods Study

Declarations

Ethics approval and consent to participate

The parent study received approval from the Institutional Review Board at King Hussein Cancer Center (25 KHCC 202; 7 September 2025). Written informed consent was obtained from all participants before participation. All methods were conducted in accordance with relevant institutional ethical standards and applicable regulations.

Consent for publication

Participant quotations are de-identified using participant codes. [AUTHOR CONFIRMATION REQUIRED: confirm whether the approved consent process covered publication of de-identified quotations. If no individual-level identifying data are reported and the journal permits, revise to “Not applicable.”]

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available because of participant confidentiality and institutional restrictions, but may be available from the corresponding author on reasonable request and subject to institutional and ethical approval.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SAY contributed to conceptualization, methodology, project administration, supervision, investigation, data curation, formal analysis, writing—original draft, and writing—review and editing. OS, SA, and DMA contributed to investigation, data collection, methodology, validation, and writing—review and editing. All authors read and approved the final manuscript. [AUTHOR CONFIRMATION REQUIRED before submission.]

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Authors' information

Not applicable.

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