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RESEARCH ARTICLE

# Impact of Basic Life Support Training on Knowledge and Skills Among Community Pharmacists: A Pre-post Study

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**ABSTRACT**

**Objective:** Early intervention is crucial for out-of-hospital cardiac arrest cases. As healthcare facilities that are in regular contact with the public, pharmacies are potential environments where emergencies may occur. The aim of this study is to evaluate the impact of Basic Life Support (BLS) training on the knowledge and skills of pharmacists and pharmacy assistants in the province of Ankara.

**Materials and Methods:** This pre-post descriptive study was conducted from May to August 2025 with ethics approval. A total of 258 pharmacists received 16-hour BLS training based on the 2020 AHA guidelines. A 20-question test and a practical skills exam were administered before and after training. Data were analyzed using the Wilcoxon signed-rank test, Kruskal–Wallis test, and Spearman correlation.

**Results:** 93% of participants were pharmacists, and 7% were other personnel. The 79.7±8.4 average score of the pre-test rose to 95.7±4.1 for the post-test, and this rise was found to be statistically significant ($p<0.001$). The mean score for the practical exam was 97.7±1.8. 99.6% of all participants were successful. It was determined that there was a negative correlation between the number of working years and both pre-test ($r=-0.184$, $p<0.05$) and post-test ($r=-0.286$, $p<0.05$) scores. The lowest scores were observed in the group with 20 years or more of experience.

**Conclusion:** BLS training significantly improved the knowledge level of pharmacists and pharmacy assistants. The decline in test performance as professional experience increases highlights the necessity of regular refresher training, particularly for senior professionals.

**Keywords:** Basic life support, cardiopulmonary resuscitation, health professional, pharmacist, training

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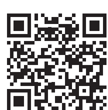
## INTRODUCTION

Cardiac arrest is one of the leading causes of death worldwide and causes millions of people to lose their lives each year.[1] Survival in out-of-hospital cardiac arrest cases is directly associated with early recognition and Basic Life Support (BLS) practices.[1,2] Initiation of cardiopulmonary resuscitation (CPR) in the first minutes can reduce the risk of neurological damage and significantly increase the chance of survival.[1,2] The 2020 American Heart Association (AHA) Guidelines for CPR and Emergency Cardiovascular Care highlight that high-quality CPR is one of the most critical links in the survival chain.[1] It also emphasizes that, to achieve high-quality CPR, the compression rate should be between 100–120, and the depth of compressions should be 5–6 cm.[2]

The BLS knowledge and skills of healthcare professionals are critical factors that affect patient outcomes in emergency sit-



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uations. A study examining the effect CPR training for nurses has on patient mortality has shown that spontaneous return of circulation increased from 19.7% to 30.1% after training, and discharge rates increased from 27.5% to 52.9%.[3] These findings demonstrate that structured training programs can provide significant improvements in clinical outcomes.[4] Pharmacies are healthcare facilities that have frequent contact with and easy access to the population. As one of the first points of contact for patients seeking advice on medication, health screenings, and minor health issues, pharmacies should be considered environments where emergencies may occur. In recent years, areas where pharmacists provide services have increased, particularly in emergency departments.[5] Additionally, it has been determined that compliance with guidelines increases from 31.9% in CPR cases where a pharmacist is not present to 59.3% in CPR cases where a pharmacist is present.[6] In the literature review study in which Oliveira et al.[7] examined the knowledge, skill, and approach of pharmacists and pharmacy students in emergency situations, 31 studies were reviewed, and it was determined that there were significant knowledge and skill gaps in the studies focusing on cardiac emergencies. It has also been reported that, following CPR training, pharmacists' performance was rated as perfect or very good in 99% of cases and that the time for providing shock was significantly shorter after training on using automatic external defibrillators; however, theoretical knowledge decreased after four months.[8,9]

The effectiveness of BLS training in health professionals is evaluated with study designs that have pre- and post-tests. Studies have demonstrated that training provided to health professionals caused the pre-test scores, ranging between 52.2% and 75.1%, to rise to the 85.6–97.3% range for post-tests; additionally, simulation-based CPR training significantly increased knowledge and performance scores.[10–13] However, a 20-year review documented that nurses' knowledge and skill retention following CPR training is low and highlighted that regular refresher training is required.[14] These findings demonstrate that periodic refresher training is necessary, even for health professionals. Due to the importance of standardization of BLS training and refresher training, international standards have been established.[15,16]

The aim of this study is to evaluate the effectiveness of Basic Life Support training provided to pharmacists and pharmacy assistants in the province of Ankara on knowledge and skill levels. Additionally, the relation between experience and training performance and the correlation between theoretical knowledge levels and practical skill gains have been studied.

## MATERIALS and METHODS

### Study Design and Participants

Our study was conducted with the approval of the Ankara Provincial Health Directorate Ethics Committee (Ethics Committee No: 2025-09-01). The study was designed as a pre- and post-test descriptive cross-sectional study and was conducted with pharmacists and pharmacy assistants in the province of Ankara. The study population was 1,250 pharmacists and pharmacy assistants practicing in the province of Ankara. Of this population, 282 volunteer pharmacists and pharmacy assistants agreed to take the Basic Life Support training between 01.05.2025 and 31.07.2025. However, 24 participants were excluded from the final analysis due to incomplete pre- or post-test data, and the analyses were therefore conducted on a total of 258 participants. Informed consent was obtained from all participants, and all participants filled out an information document before the study.

The volunteers who agreed to take part in the study were divided into 21-person groups, and a 20-question pre-test was administered to all participants to measure their BLS knowledge level before the Basic Life Support training. Participants were given 16 hours of training by trainers who are experts in the field of BLS: 8 hours of theoretical training using a computer and a projector and 8 hours of practical training using first aid mannequins. Theoretical sessions were based on the 2020 American Heart Association (AHA) guidelines. After training, a 20-question post-test was administered in order to measure BLS knowledge. Participants were divided into groups as pharmacists and others and also as successful or not.

### Statistical Analysis

Data analysis was performed using the SPSS 25.0 (Armonk, NY: IBM Corp.) software package. Descriptive statistics for categorical variables were presented as numbers and percentages and quantitative variables as mean, median, minimum, and maximum values. The Kolmogorov-Smirnov test statistic was used to test for normality. For continuous variables showing a normal distribution, the Kruskal-Wallis test was used to test for differences between more than two groups. Dunnett's multiple comparison analysis was performed to identify the differing groups. To determine the relationship between continuous variables, Spearman's correlation coefficient was calculated. $p<0.05$ was accepted as the statistical significance level in all analyses.

## RESULTS

Most of the participants were female (n=173, 67.1%), and 32.9% (n=85) were male. The ages of the pharmacists ranged between 30 and 60, and the median age was 43. The mean age of participants was 43.6±7.4. The largest age group was the 40–49 years group (n=106, 41.1%). This group was followed by the 30–39 years group (n=93, 36.0%) and the older than 50 years group (n=59, 22.9%), respectively. Ninety-three percent (n=240) of participants were pharmacists, and 7% (n=18) had other titles. Most of the participants (99.6%) were successful in the post-test. The demographic data of the participants are shown in Table 1.

Participants demonstrated a significant improvement in knowledge scores following the training, with higher post-test scores compared to pre-test results ($p<0.001$). The detailed descriptive statistics are presented in Table 2. The mean duration of professional experience indicated that a substantial proportion of participants had long-standing experience in their field.

No statistically significant differences were observed between male and female participants in pre-test, post-test, or practical examination scores ($p>0.05$ for all comparisons). Detailed gender-based comparisons are presented in Table 3.

While age was not associated with pre-test scores or practical examination performance, post-test results differed significantly across age groups ($p=0.002$). Participants aged 30–39 years achieved higher post-training knowledge scores compared to older age groups (Table 4).

There was a positive and significant association ($r=0.355$, $p<0.05$) between pre- and post-test results; this finding suggests that individuals with high knowledge levels before training also performed better after training. There was a weak negative correlation between years of experience and both pre-test ($r=-0.184$, $p<0.05$) and post-test ($r=-0.286$, $p<0.05$) results; this finding suggests that there may be a slight decrease in test performance as work experience increases (Table 5).

A statistically significant difference was observed between experience groups in terms of pre-test scores ($p=0.040$). However, no significant differences were found between groups regarding post-test scores or practical examination performance ($p>0.05$). Detailed comparisons according to years of professional experience are presented in Table 6.

**Table 1. Demographic data**

| | n | % |
|---|---|---|
| Gender | | |
| Male | 85 | 32.9 |
| Female | 173 | 67.1 |
| Age | | |
| Min-Max (Median) | 30–60 (43) | |
| Mean±SD | 43.55±7.37 | |
| Age groups | | |
| 30–39 years of age | 93 | 36.0 |
| 40–49 years of age | 106 | 41.1 |
| 50 years or older | 59 | 22.9 |
| Title | | |
| Pharmacist | 240 | 93.0 |
| Other | 18 | 7.0 |
| Post-test result | | |
| Successful | 257 | 99.6 |
| Failed | 1 | 0.4 |
| Month in which training is conducted | | |
| May | 15 | 5.8 |
| June | 66 | 25.6 |
| July | 99 | 38.4 |
| August | 78 | 30.2 |
| Year of experience | | |
| No experience (0 years) | 16 | 6.2 |
| 1–5 years | 49 | 19.0 |
| 6–10 years | 41 | 15.9 |
| 11–15 years | 29 | 11.2 |
| 16–20 years | 39 | 15.1 |
| Over 20 years | 84 | 32.6 |
| Total | 258 | |

SD: Standard deviation

## DISCUSSION

BLS administrations are of critical importance in preserving public health and are accepted as a factor that directly affects survival rates in out-of-hospital cardiac arrest cases.[1,5] As healthcare facilities that are in regular contact with the public, the capabilities of pharmacists and pharmacy assistants in providing BLS are of great importance. For this reason, we evaluated the effectiveness of 16 hours of BLS training given to 258 pharmacists and pharmacy assistants in the province of Ankara. To our knowledge, this is the first study to evaluate the effectiveness of BLS training provided to pharmacists and pharmacy assistants working in the periphery. In our study, we found that there was a significant

**Table 2. Pre-test, post-test and practical exam scores and mean year of experience**

| | Min-Max (Median) | Mean±SD | p | Statistical analysis |
|---|---|---|---|---|
| Pre-test | 48–100 (80) | 79.65±8.35 | <0.001* | Z=-13.823<br>p<0.001** |
| Post-test | 73–100 (97) | 95.69±4.14 | <0.001* | |
| Practical exam | 96–100 (96) | 97.60±1.79 | <0.001* | |
| Year of experience | 0–52 (15) | 16.23±12.54 | <0.001* | |

*: Kolmogorov Smirnov Normality test; **: Wilcoxon Sign test, $p<0.05$ statistically significant. SD: Standard deviation

**Table 3. Comparison of pre-test, post-test and practical exam scores based on gender**

| Gender | Pre-test (min–max, median) | p (Pre-test) | Post-test (min–max, median) | p (Post-test) | Practical exam (Min–max, median) | p (Practical) |
|---|---|---|---|---|---|---|
| Male | 79.22±7.31 (80.00) | | 95.22±4.31 (95.00) | | 97.69±1.75 (98.00) | |
| Female | 79.85±8.83 (80.00) | | 95.92±4.05 (97.50) | | 97.55±1.81 (96.00) | |
| p | | 0.290 | | 0.225 | | 0.476 |

*: Mann-Whitney U test, $p<0.05$ statistically significant

**Table 4. Comparison of pre-test, post-test and practical exam scores based on age groups**

| Age groups | Pre-test (min-max, median) | p (Pre-test) | Post-test (min-max, median) | p (Post-test) | Practical exam (min-max, median) | p (Practical) |
|---|---|---|---|---|---|---|
| 30–39 years | 80.56±7.43 (80.00) | | 96.90±3.07 (98.00) | | 97.81±1.86 (98.00) | |
| 40–49 years | 79.97±7.82 (80.00) | | 95.38±4.03 (96.00) | | 97.45±1.72 (96.00) | |
| ≥50 years | 77.63±10.24 (80.00) | | 94.34±5.21 (95.00) | | 97.53±1.79 (96.00) | |
| p | | 0.326 | | 0.002* | | 0.410 |

Kruskal Wallis test, $p< 0.05$ statistically significant, Dunnet's multiple comparison analysis

increase in knowledge levels post-training and that post-test success increases with years of experience.

In our study, we observed that while the mean score for the pre-test was 79.7±8.4, for the post-test it was 95.7±4.1, and this improvement was statistically significant ($p<0.001$). This finding is consistent with others in the literature. Sok et al.,[10] in their study examining the effects of simulation-based CPR in nurses, reported significant improvement in knowledge scores ($t=4.664$, $p<0.001$). Similarly, the pilot study performed on nurses by Toubasi et al.[17] reported that the mean score of 4.6 in the pre-test improved to 7.5 in the post-test. Fahajan et al.[11] conducted a large-scale study with nurses, and in this study pre-test scores ranging from 52.2% to 75.1% improved to post-test scores ranging from 85.6% to 97.3% ($p<0.001$). Goddard et al.'s[8] study evaluating BLS training provided to pharmacy students and members of the public reported that 99% of participants described the training as perfect or good. Similarly, in the study by Zamami et al.,[18] in which life-saving skills training provided to pharmacy students was evaluated, significant improvement was reported in the comparison between pre- and post-test scores. In our study, the 79.7±8.4 mean score of the pre-test performed before the BLS training given to pharmacists and pharmacy assistants improved to 95.7±4.1 in the post-test, and this difference was statistically significant ($p<0.001$). Our findings are similar to those found in the literature and prove the efficacy of our training.

**Table 5. Analysis of correlation between variables**

| | Pre-test | Post-test | Practical exam | Year of experience |
|---|---|---|---|---|
| Pre-test | 1 | | | |
| Post-test | 0.355* | 1 | | |
| Practical exam | 0.013 | 0.029 | 1 | |
| Year of experience | -0.184* | -0.286* | -0.035 | 1 |

*: Spearman Rho correlation coefficient, $p<0.05$ statistically significant

In our study, the mean score for the practical exam was 97.7±1.8, and this score proves that participants gained a

Table 6. Comparison of pre-test, post-test and practical exam scores based on year of experience

| Year of experience | Pre-test (Mean±SD, Median) | p (Pre-test) | Post-test (Mean±SD, Median) | p (Post-test) | Practical exam (Mean±SD, Median) | p (Practical) |
|---|---|---|---|---|---|---|
| No experience (0 year) (a) | 80.63±8.18 (80) | | 96.19±3.41 (96.50) | | 97.50±1.71 (97) | |
| 1–5 years (b) | 81.10±8.25 (80) | | 97.00±3.05 (98) | | 97.67±1.93 (96) | |
| 6–10 years (c) | 80.39±5.79 (80) | | 97.17±3.12 (98) | | 98.10±1.78 (98) | |
| 11–15 years (d) | 82.41±8.08 (83) | | 96.10±3.50 (97) | | 97.10±1.65 (96) | |
| 16–20 years (e) | 80.45±7.15 (83) | | 96.18±3.20 (97.50) | | 97.44±1.71 (96) | |
| Over 20 years (f) | 76.93±9.52 (78) | | 93.74±5.07 (95) | | 97.57±1.78 (96) | |
| p | | 0.040* | | <0.001* | | 0.310 |

*: Kruskal Wallis test, p<0.05 statistically significant, Dunnet's multiple comparison analysis. SD: Standard deviation

high level of practical skills. In the study by Tobase et al.,[17] in which the effects of online BLS courses provided to nursing students were researched, in the CPR simulation, success rates for opening the chest were 98%, for breathing control 97%, for hand position 97%, for depth of compression 89%, and for placement of the pad 100%.[19] After the training by Kopacek et al.[9] given to pharmacy students on the use of external defibrillators, the time for shocking decreased to 50±17 seconds from 74±25 seconds, and this decrease was found to be statistically significant (p<0.001). The 97.6% success rate in the practical exam part of our study demonstrated that structured training programs can provide high success rates in obtaining practical skills.

Studying the relationship between the need for CPR training and clinical experience, the highest scores in BLS knowledge belonged to the group with 6–15 years of experience, and the lowest scores belonged to the groups with 5 years or less of experience and the group with over 21 years of experience.[20] Howell et al.[13] assessed the CPR knowledge of physicians and found a negative correlation between knowledge levels and seniority (p<0.01). The negative correlation established in our study between pre-test (r=-0.184, p<0.05) and post-test (r=-0.286, p<0.05) scores is similar to the results found in the literature. This finding demonstrates that BLS knowledge levels decrease as work experience increases.

In our study, the lowest pre-test (76.9±9.5) and post-test (93.7±5.07) scores were found in the group with 20 years or more of experience. The literature review by Hamilton evaluating knowledge and skills retention following CPR training demonstrated low retention over 20 years and highlighted the importance of regular refresher training.[14] Cheng et al.[4] performed a systematic review of studies assessing knowledge and skills retention of advanced life support in adults and reported loss of knowledge and skills between 6 weeks and 2 years in all 11 studies. Mokhtari Nori et al.[20] examined the frequency of CPR training in nurses and found that following a 4-hour training, the mean score increased from 10.67 to 17.81; however, it went back down to 12.86 after 2 years. Assessing the effectiveness of video-supported CPR training in a randomized controlled trial, Saidu et al.[21] reported that retention was preserved at 1- and 3-month follow-up. These findings demonstrate that regular refresher training is essential, even for experienced health professionals.

The strengths of our study are the large sample size (n=258), standardized training protocol, compliance with 2020 AHA guidelines, performance of both theoretical and practical evaluation, and inclusion of participants with different levels of experience. However, our study has some limitations as well. The first is the exclusion of participants with previous BLS training, and the second is the lack of long-term follow-up of BLS knowledge retention and the lack of real-life application of BLS training. In addition, participation in the training was voluntary, which may have introduced selection bias, as individuals who were more motivated or interested in Basic Life Support may have been more likely to participate. Furthermore, participants were aware that their knowledge and skills were being assessed, which may have increased their level of attention during the evaluations and potentially influenced test performance.

## CONCLUSION

In conclusion, our study demonstrates that BLS training provided to pharmacists and pharmacy assistants in the province of Ankara significantly increased knowledge and skill levels. The 20% increase observed in the comparison of pre-

and post-test scores and the 99.6% success rate support the effectiveness of this training program. The negative correlation identified between years of experience and test scores highlights the need for regular refresher training, particularly for senior personnel. As the health professional group that is in most frequent contact with the public, increasing the BLS competency of pharmacists will contribute to the improvement of out-of-hospital cardiac arrest survival rates. Our suggestions for future studies include the evaluation of long-term knowledge and skill retention after training, identification of optimal refresher training intervals, and the study of cardiac arrest cases that occur in pharmacies.

## Disclosures

**Ethics Committee Approval:** The study was approved by the Ankara Provincial Health Directorate Ethics Committee (No: 2025-09-01, Date: 23/09/2025).

**Informed Consent:** Informed consent was obtained from all participants, and all participants filled out an information document before the study.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

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