

## Comparison of the Four-step Basic Life Support Approach with Non-Standardised Training Approach in Achieving Basic Life Support Proficiency among the Healthcare Workers

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### ABSTRACT

**Objective:** To quantify the effectiveness of non-structured training versus a structured 4-step approach for basic life support (BLS) knowledge and skills using quantitative assessment tools.

**Study Design:** Quasi-experimental study.

**Place and Duration of Study:** Department of Medicine, Combined Military Hospital, Peshawar Pakistan from Oct 2022 to Mar 2023.

**Methodology:** Two hundred (n=200) healthcare workers from all Hospital Departments were included in the study through convenient sampling. They were divided into "Group-A" and "Group-B" of equal size. Group-A received BLS training through a four-step approach, whereas Group-B received non-structured teacher-based training. Pre and post-training MCQs judged the knowledge gained, and a checklist was used to assess the effectiveness of the BLS skills.

**Results:** Both the groups had similar scores in the Pre-training test ( $p$  0.692). Both groups improved their scores after their respective training ( $p$ <0.001 for both groups). However, Group-A got a better score (mean score =70.50±11.22) than Group-B (mean score =59.60±11.88) with a highly significant difference ( $p$ -value<0.001). There was also a significant improvement ( $p$ <0.001) in BLS skills performance as per the checklist in Group-A (mean 7.69±1.47) versus Group-B (mean 6.18±1.34) out of a maximum score of 10.

**Conclusion:** The 4-step program is significantly better than non-standardised training in achieving BLS learning outcomes.

**Keywords:** BLS, non-standardised training, Checklist, Four-step BLS training,

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### INTRODUCTION

Cardiac arrest from any underlying cause is a critical situation which needs to be addressed immediately to save a life. BLS is one of the essential courses required for all healthcare workers in a hospital to be qualified. In addition, as many laypersons as possible should be trained in this life-saving procedure to improve the outcome of out-of-hospital cardiac arrest.<sup>1</sup> Many variations of BLS are available, but the crux of the techniques is very similar.<sup>2</sup> The BLS course, designed by the American Heart Association (AHA), is widely accepted worldwide.<sup>3</sup>

Traditionally, skills requiring repeated practice to gain proficiency relied on an apprenticeship model. Teaching and learning have evolved over the years, and student-based learning is becoming more widely accepted as the preferred method in medical teaching.<sup>3</sup> There is also a move to standardise the teaching and assessment techniques to gain across-the-board acceptability for successful candidates and ensure safe

health care for the patients.<sup>4</sup> Various models are used to ensure successful learning of practical skills, including the Knowledge, Skill and Simulation (KSS) model and Peyton's four-step approach, etc.<sup>5,6</sup> Peyton's four-step approach tackles the quagmire of ensuring effective delivery of the skill set taught to the learner. It ensures that the student is actively involved in learning and acquiring the requisite skills. These four steps are: 1) demonstration, 2) deconstruction, 3) comprehension, 4) performance.<sup>6,7</sup>

An important aspect of any educational activity is to ensure the effectiveness of the teaching, and that involves feedback in the form of formal student assessment. The assessment of three key areas of learning, i.e., knowledge, attitude and skills, requires selecting appropriate assessment tools. For instance, essays, MCQs, SEQs, etc., are appropriate for assessing knowledge, and mini-CEX, DOPS checklists, etc., for assessing psychomotor skills and affective learning objectives.<sup>8,9</sup> In our study, we have endeavoured to quantify the effectiveness of non-structured training versus a structured 4-step approach for BLS knowledge and skills using quantitative assessment methods.

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**METHODOLOGY**

The quasi-experimental study was conducted at the Department of Medicine Combined Military Hospital, Peshawar Pakistan, from October 2022 to March 2023 after Hospital Ethics Review Committee approval (letter No. 00240/23). The sample size was calculated using the WHO sample size calculator, 87 for each group (total 174), keeping the anticipated percentage frequency of 5% in a population based on a study conducted by Razzak *et al.* in Karachi.<sup>10</sup> Therefore, the final data was collected from about 200 people. A convenient sampling technique was used for individual selection for the study.

**Inclusion Criteria:** Registrars, house officers, and nursing and paramedic staff from all hospital departments were included.

**Exclusion Criteria:** Those doctors and paramedics who had attended BLS workshops over the past two years were excluded.

The study population was divided into two groups, "Group-A" and "Group-B" by lottery method (Figure).

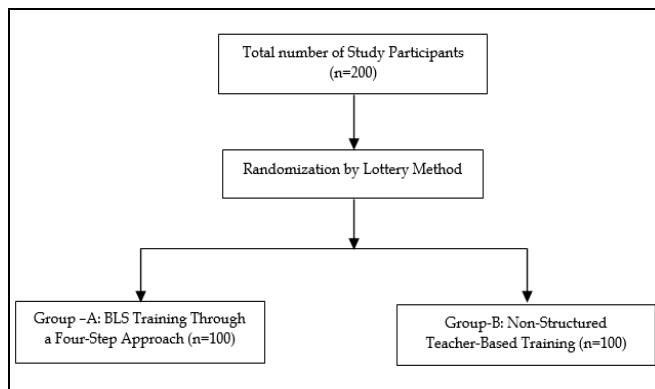


Figure: Patient Flow Diagram (n=200)

Both groups had equal sample sizes (n=100), and training was conducted by BLS and ACLS-qualified facilitators. The BLS workshop was conducted according to AHA guidelines for Group A using the four-step BLS training approach. A non-structured training approach was adopted for Group-B, comprising a teacher-oriented theoretical PowerPoint lecture followed by a short video clip of BLS delivery. Both the groups took the pre and post-training tests comprising MCQs prepared by the trainers to assess the cognitive domain of BLS training. We used van Dawen *et al.* checklist for the psychomotor domain of BLS performance on standard mannequins, which rated the students on a continuous scale from 0 to 10.<sup>8</sup>

Data was analysed using Statistical Package for the Social Sciences (SPSS) version 23.00. Mean±SD was calculated for continuous variables. Frequency and percentage were calculated for categorical variables. Independent sample t-test and paired sample t-test were used inferential statistics. The *p*-value of ≤0.05 was considered significant.

**RESULTS**

Two hundred (n=200) participants were divided into two equal sample size groups comprising "Group-A" and "Group-B", with mean age in years being 28.06±3.21. The demographic details of both groups are shown in Table-I.

Table-I: Demographic Characteristics (n=200)

| Parameters        | Group-A (n=100) | Group-B (n=100) |
|-------------------|-----------------|-----------------|
| <b>Gender</b>     |                 |                 |
| Male              | 52              | 59              |
| Female            | 48              | 41              |
| Mean Age in years | 28.06±3.21      | 28.06±3.21      |

The mean score of pre and post-test in Group-A was 56.40±17.66 and 70.50±11.22 respectively, and the mean score of pre and post-test in Group -B was 55.50±14.24 and 59.60±11.88, respectively. There was a highly significant difference between pre and post-test in both Group A (*p*-value<0.001) and Group B (*p*-value< 0.001) Table-II.

Table-II: Comparison of Pre and Post Test Results (n=200)

| Study Groups    | Pre Test (Mean±SD) |                     | <i>p</i> -value |
|-----------------|--------------------|---------------------|-----------------|
|                 | Pre Test (Mean±SD) | Post Test (Mean±SD) |                 |
| Group-A (n=100) | 56.40±17.66        | 70.50±11.22         | <0.001          |
| Group-B (n=100) | 55.50±14.24        | 59.60±11.88         | <0.001          |

Table-III: Comparison of Pre-Test, Post-Test, Difference and Checklist among the Groups (n=200)

| Parameters      | Study Groups              |                           | <i>p</i> -value |
|-----------------|---------------------------|---------------------------|-----------------|
|                 | Group-A (n=100) (Mean±SD) | Group-B (n=100) (Mean±SD) |                 |
| Pre-Test        | 56.40±17.66               | 55.50±14.20               | 0.692           |
| Post-Test       | 70.50±11.22               | 59.60±11.88               | <0.001          |
| Difference      | 14.10±12.39               | 4.90±9.04                 | <0.001          |
| Checklist score | 7.69±1.47                 | 6.18±1.34                 | <0.001          |

The average score of the pre-training test in Group=A was 56.40±17.66, and in Group B was 55.50±14.20 was statistically insignificant (*p*-value=0.692). However, the Post-training test performance in the two groups was significantly different. Group-A scored higher (mean=70.50±11.22) than Group-B (mean

score=59.60±11.88) with a highly significant difference ( $p$ -value<0.001). Similarly, the performance of Group-A (7.69±1.47) as compared to Group-B (6.18±1.34) as assessed by the checklist was found statistically significant- ( $p$ -value <0.001) (Table-III).

### DISCUSSION

Educational methodologies have been under constant review in the medical and non-medical fields since the early pioneers in this subject, the most notable being the PBL system used in the McMaster University Medical School.<sup>11</sup> We have seen a lot of work and changes in medical education in the last decade. It is a fact that BLS training improves the students' knowledge and skills.<sup>12</sup> By comparing two groups of trainees, we conducted our study to ascertain the impact of modern teaching methodologies versus teacher-centred learning on one specific skill set, i.e., the life-saving BLS training. As devised by Peyton, Group A was facilitated using a 4-step training approach, and Group B was facilitated using non-standardised conventional training as previously described. We compared the training outcome in these two groups by objectively measuring pre and post-training responses to MCQs (for knowledge gained). We used a checklist to gauge the practical skills attained due to the training. In our study, both the groups had similar pre-training MCQ scores (56.40±17.66 for Group-A and 55.50±14.20 for Group-B), which meant that both groups were similar in their general characteristics. In the post-test performance, we found significant improvement in Group-A compared to Group-B ( $p$ <0.001). In addition, we found a significant difference in the performance of the BLS as quantified by the checklist we used in this assessment. We found that the group trained through Peyton's 4-step approach performed the BLS skills much better than those trained through a non-standardised approach. Our findings align with studies on this same question internationally, but they are unique in that such a study has not been conducted locally in the past.<sup>13</sup>

We conducted our research as a part of our Institution's policy to change training methodologies to incorporate the newer educational tools in the teaching/learning milieu. Combining classical cognitive teaching (through lectures and presentations) with communication skills workshops, problem-based learning, attitude building, case-based learning, and role modelling effectively delivers the psychomotor and affective learning outcomes to the target

audience.<sup>14-16</sup> In this aspect, providing feedback during training sessions has been established to enhance the retention of the learners.<sup>17,18</sup> Peyton's 4-step approach enhances the learners' understanding of the skills being taught and reinforces retention and performance, and in this study, we have validated its effectiveness in skill training.

### CONCLUSION

The 4-step training program has shown a significant improvement in achieving the learning outcomes compared to non-standardised conventional training for BLS. Based on this evidence, we recommend revisiting training programs at post-graduate training institutes and incorporating newer student-based learning techniques as much as possible to achieve better training standards.

**Conflict of Interest:** None.

### Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FAS & WA: Conception, data acquisition, critical review, approval of the final version to be published.

BS & MH: Data analysis, data interpretation, critical review, approval of the final version to be published.

NA & JSK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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