

WILL MEDICAL SIMULATION EDUCATION BE A SUPERIOR ALTERNATIVE TO TRADITIONAL EDUCATION

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Abstract:

Medical simulation education is a vital component of modern medical training, offering a safe environment for skill enhancement. This study evaluates simulation-based training at Vydehi Advanced Simulation Academy (VASA), analysing data from 1000 participants over three years. The findings indicate significant improvements in clinical skills, suggesting simulation education as a superior alternative to traditional methods.

Keywords: Medical simulation, Simulation-based education, Traditional education, Clinical skills, Patient safety, Basic Life Support, Advanced Cardiac Life Support, Trauma Emergency Management, Vydehi Advanced Simulation Academy

INTRODUCTION:

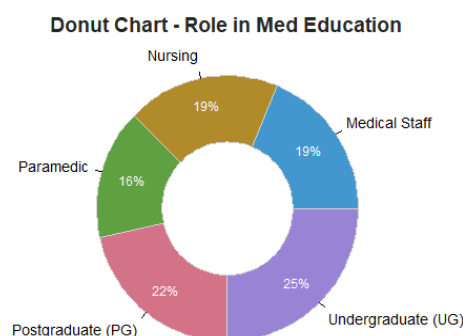
Simulation-based education provides a controlled environment for practicing clinical skills, especially in emergency and critical care. It bridges the gap between theoretical knowledge and practical application, reduces medical errors, and enhances patient safety. Despite challenges like cost and the need for trained personnel, its advantages make it a promising alternative to traditional education.

METHODOLOGY:

This retrospective cohort study analysed feedback and pre-test/post-test results from 1000 participants, including interns, undergraduates, postgraduates, nursing students, and paramedics. Training covered Basic Life Support (BLS), Advanced Cardiac Life Support (ACLS), and Trauma Emergency Management over three days. Statistical comparisons and qualitative feedback were used to assess effectiveness.

RESULTS

The study included a total of 1,020 participants from various roles in medical education. Among them, 174 participants (18.83%) were medical staff, and another 174 (18.83%) were from nursing. The paramedic group comprised 146 participants (15.80%). Postgraduate (PG) participants numbered 199 (21.54%), while undergraduate (UG) participants were the largest group with 231 participants (25.00%). There were also 96 participants whose roles were unknown.



Measure the improvement in clinical skills:

Day 1- Basic Life Support Workshop

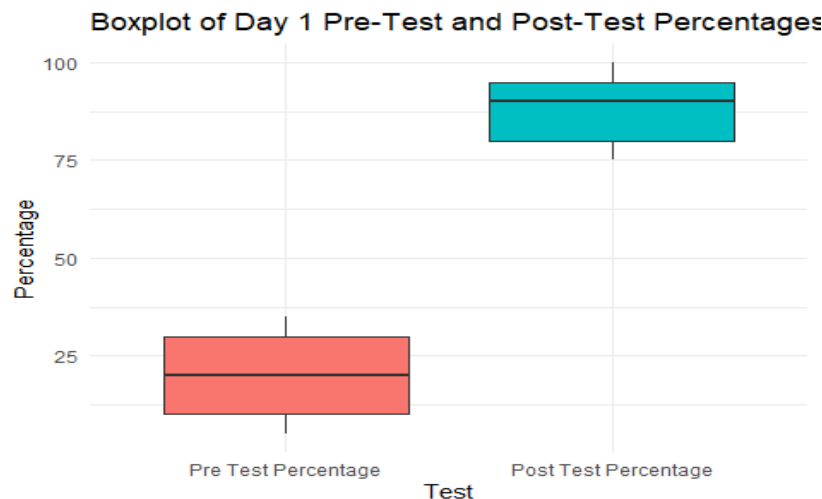
Variable	N	Range	Mean SD	Improvement	T Value ¹	P Value
Pre-Test	924	1,7	3.92±2.05	13.59	-155.099	<0.001 * (T)

Variable	N	Range	Mean SD	Improvement	T Value ¹	P Value
Post-Test	924	15,20	17.51±1.73			

¹(T):Paired T Test

Variable	N	Range	Mean SD	Improvement	T Value ¹	P Value
Pre-Test Percentage	924	5,35	19.62±10.23	67.95	-155.099	<0.001 * (T)
Post-Test Percentage	924	75,100	87.57±8.64			

¹(T):Paired T Test



The analysis of Day 1's pre-test and post-test scores for 924 participants reveals significant improvements in basic life support skills following the simulation training. The pre-test scores ranged from 1 to 7, with a mean of 3.92 ± 2.05 . In contrast, the post-test scores ranged from 15 to 20, with a mean of 17.51 ± 1.73 . This substantial improvement, with a mean difference of 13.59, was statistically significant ($T = -155.0999$, $P < 0.001$), as determined by the paired T-test.

Expressing these results as percentages, the pre-test scores ranged from 5% to 35%, with a mean of $19.62 \pm 10.23\%$, while the post-test scores ranged from 75% to 100%, with a mean of $87.57 \pm 8.64\%$. This representation highlights a mean improvement of 67.95%, which was statistically significant ($T = -155.0999$, $P < 0.001$). These percentage scores provide a clearer picture of the extent of improvement in participants' basic life support skills, further emphasizing the effectiveness of the simulation training on Day 1.

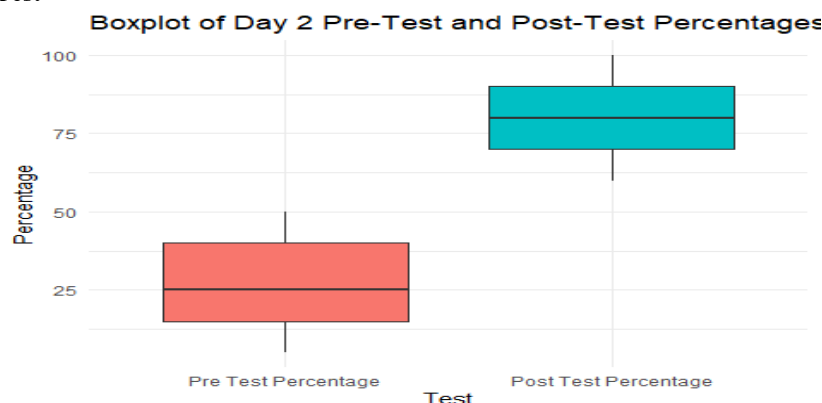
Day 2 - Advanced Cardiac Life Support

Variable	N	Range	Mean.SD	Improvement	T Value ¹	P Value
Pre.Test	924	1,10	5.49±2.78	10.55	-82.9547	<0.001 * (T)
Post.Test	924	12,20	16.04±2.59			

¹(T):Paired T Test

Variable	N	Range	Mean.SD	Improvement	T Value ¹	P Value
Pre-Test Percentage	924	5,50	27.47±13.91	52.74	-82.9547	<0.001 * (T)
Post-Test Percentage	924	60,100	80.22±12.97			

¹(T):Paired T Test



The analysis of Day 2's pre-test and post-test scores for 924 participants demonstrates significant improvements in advanced cardiac life support skills following the simulation training. The pre-test scores ranged from 1 to 10, with a mean of 5.49 ± 2.78 . In contrast, the post-test scores ranged from 12 to 20, with a mean of 16.04 ± 2.59 . This notable improvement, with a mean difference of 10.55, was statistically significant ($T = -82.9547$, $P < 0.001$), as determined by a paired T-test.

Expressing these results as percentages, the pre-test scores ranged from 5% to 50%, with a mean of $27.47 \pm 13.91\%$, while the post-test scores ranged from 60% to 100%, with a mean of $80.22 \pm 12.97\%$. This percentage representation highlights a mean improvement of 52.74%, which was statistically significant ($T = -82.9547$, $P < 0.001$). These percentage scores provide a clear illustration of the extent of improvement in participants' advanced cardiac life support skills, further emphasizing the effectiveness of the simulation training on Day 2.

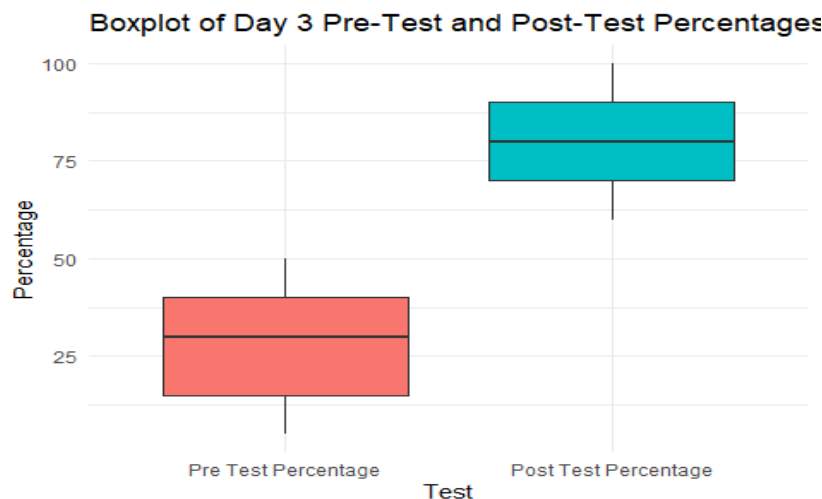
Day 3 - Trauma Emergency Management

Variable	N	Range	Mean.SD	Improvement	T Value ¹	P Value
Pre.Test	924	1,10	5.52±2.86	10.53	-83.1242	<0.001 * (T)
Post.Test	924	12,20	16.05±2.57			

¹(T):Paired T Test

Variable	N	Range	Mean.SD	Improvement	T Value ¹	P Value
Pre-Test Percentage	924	5,50	27.62±14.28	52.64	-83.1242	<0.001 * (T)
Post-Test Percentage	924	60,100	80.25±12.85			

¹(T):Paired T Test



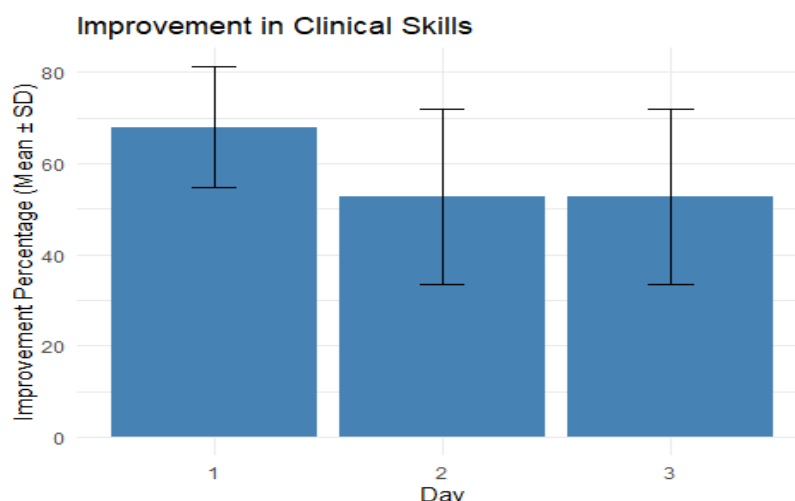
The analysis of Day 3's pre-test and post-test scores for 924 participants reveals significant improvements in trauma emergency management following the simulation training. The pre-test scores ranged from 1 to 10, with a mean of 5.52 ± 2.86 . In contrast, the post-test scores ranged from 12 to 20, with a mean of 16.05 ± 2.57 . This substantial improvement, with a mean difference of 10.53, was statistically significant ($T = -83.1242$, $P < 0.001$), as determined by a paired T-test.

Expressing these results as percentages, the pre-test scores ranged from 5% to 50%, with a mean of $27.62 \pm 14.28\%$, while the post-test scores ranged from 60% to 100%, with a mean of $80.25 \pm 12.85\%$. This percentage representation highlights a mean improvement of 52.64%, which was statistically significant ($T = -83.1242$, $P < 0.001$). These percentage scores provide a clear illustration of the extent of improvement in participants' trauma emergency management skills, further emphasizing the effectiveness of the simulation training on Day 3.

Descriptives

Summary Statistics - Improvement in Clinical Skills

	N	Range	Mean±SD
Day 1 Improvement Percentage	924	40,95	67.95±13.32
Day 2 Improvement Percentage	924	10,95	52.74±19.33
Day 3 Improvement Percentage	924	10,95	52.64±19.25



The summary statistics for the improvement in clinical skills across three days of simulation training reveal substantial gains for the 924 participants. On Day 1, the improvement in clinical skills ranged from 40% to 95%, with a mean improvement of $67.95 \pm 13.32\%$. For Day 2, the improvement ranged from 10% to 95%, with a mean improvement of $52.74 \pm 19.33\%$. Similarly, Day 3 showed an improvement range of 10% to 95%, with a mean improvement of $52.64 \pm 19.25\%$. These results highlight the effectiveness of the simulation training program, demonstrating significant gains in clinical skills among the participants over the three days.

Percentage improvement by role

Characteristic	Medical Staff, N = 174 ¹	Nursing, N = 174 ¹	Paramedic, N = 146 ¹	Postgraduate (PG), N = 199 ¹	Undergraduate (UG), N = 231 ¹	p-value ²
Day 1 Improvement Percentage	66 (13)	68 (13)	69 (15)	67 (13)	69 (13)	0.2
Day 2 Improvement Percentage	53 (20)	54 (18)	54 (18)	53 (20)	50 (20)	0.2
Day 3 Improvement Percentage	53 (19)	51 (19)	55 (20)	53 (19)	53 (19)	0.4
¹ Mean (SD)						
² One-way ANOVA						

The analysis of percentage improvement by role in medical education reveals the following findings. On Day 1, the mean improvement percentages were $66 \pm 13\%$ for Medical Staff, $68 \pm 13\%$ for Nursing, $69 \pm 15\%$ for Paramedics, $67 \pm 13\%$ for Postgraduates (PG), and $69 \pm 13\%$ for Undergraduates (UG). The differences in improvement percentages across these roles were not statistically significant ($p = 0.2$) as determined by one-way ANOVA.

On Day 2, the mean improvement percentages were $53 \pm 20\%$ for Medical Staff, $54 \pm 18\%$ for Nursing, $54 \pm 18\%$ for Paramedics, $53 \pm 20\%$ for Postgraduates, and $50 \pm 20\%$ for Undergraduates. Again, the differences in improvement percentages were not statistically significant ($p = 0.2$).

On Day 3, the mean improvement percentages were $53 \pm 19\%$ for Medical Staff, $51 \pm 19\%$ for Nursing, $55 \pm 20\%$ for Paramedics, $53 \pm 19\%$ for Postgraduates, and $53 \pm 19\%$ for Undergraduates. The differences in improvement percentages on Day 3 were also not statistically significant ($p = 0.4$).

Overall, the percentage improvements in clinical skills were consistent across the different roles in medical education, with no significant differences observed among the groups on any of the days.

Analysis of Feedback Forms

The feedback on various aspects of the course revealed positive evaluations from the participants. Regarding the information received to participate in the course, 264 participants (29%) rated it as excellent, while 660 participants (71%) rated it as good. The organization of the course was rated excellent by 264 participants (29%), good by 528 participants (57%), and satisfying by 132 participants (14%).

The relevance of the topics treated was rated excellent by 264 participants (29%), good by 594 participants (64%), and satisfying by 66 participants (7.1%). Similarly, the quality of the course contents received excellent ratings from 264 participants (29%), good ratings from 594 participants (64%), and satisfying ratings from 66 participants (7.1%).

The quality of didactic methods and presentation was rated as excellent by 462 participants (50%), good by 396 participants (43%), and satisfying by 66 participants (7.1%). The use of the simulator in improving psychomotor

skills was rated excellent by 264 participants (29%), good by 594 participants (64%), and satisfying by 66 participants (7.1%).

Regarding the quality of the course in reference to punctuality, 198 participants (21%) rated it as excellent, 594 participants (64%) rated it as good, and 132 participants (14%) rated it as satisfying. Lastly, the efficacy of the course for continuing education was rated excellent by 330 participants (36%), good by 528 participants (57%), and satisfying by 66 participants (7.1%).

Overall, the feedback indicates a strong positive reception of the course across all assessed dimensions, with majority of the participants rating each aspect as good or excellent.

Based on the detailed frequency table provided, the analysis reveals several key insights and suggestions from the participants

Continuing the Course: The majority of the participants expressed a strong preference for continuing the course, with 42 86% rating it a perfect 10. Additionally, 35 71% gave a rating of 7, indicating overall positive feedback towards the course's continuation.

Day 1: Basic Life Support Workshop: Feedback for Day 1 was diverse, with each suggestion category receiving equal attention. Participants consistently emphasized the need for more practical skills and longer practice sessions, along with reducing lecture time and increasing the number of simulations.

Day 2: Advanced Cardiac Life Support Workshop: The feedback for Day 2 focused on incorporating more scenarios and allowing more practice time. Participants also highlighted the importance of effective time management during the workshop.

Day 3: Trauma Emergency Management Workshop: Suggestions for Day 3 were varied but consistently mentioned the need for more practice sessions with the simulator and more simulation activities to enhance skill development.

Future Training Preferences: Participants expressed interest in a wide range of future training programs, including ACLS, ALS, trauma training, and ambulance simulations. This indicates a desire for diverse and comprehensive training opportunities.

Overall Feedback for VASA: General feedback for VASA included requests to reduce fees and increase the number of simulations. Participants also praised the instructors for their patience and effective teaching methods, highlighting the positive learning experience.

Overall, the feedback indicates a strong endorsement of the course's current structure, along with constructive suggestions for enhancing specific areas to better meet participants' needs and expectations. The diverse suggestions and high ratings reflect a positive reception and a desire for continuous improvement in the training programs offered by VASA.

The qualitative analysis of the feedback reveals several key themes that highlight the strengths of the course and areas for improvement. Participants expressed a strong preference for continuing the course, with the majority rating it highly. A recurring theme was the need for increased practical training and simulations, which was consistently mentioned across all workshop days. Effective time management was highlighted as an important factor for the Advanced Cardiac Life Support Workshop.

Participants also showed interest in a diverse range of future training programs, indicating a desire for comprehensive training opportunities. Cost considerations were noted, with requests to reduce fees, and the effectiveness of instructors was positively highlighted. Overall, the feedback indicates a strong endorsement of the course's current structure, along with constructive suggestions for enhancing specific areas to better meet participants' needs and expectations.



Thematic Analysis

Positive Reception and Continuation:

Theme: High endorsement for course continuation

Details: The majority of participants (42.86%) rated the course continuation a perfect 10, with additional strong support indicated by a rating of 7 from 35.71% of participants. This suggests a high level of satisfaction and a desire for ongoing training.

Need for Practical Skills and Simulations:

Theme: Demand for increased practical training and simulations

Details: Feedback across all workshop days consistently emphasized the need for more practical skills training, longer practice sessions, and additional simulations. This was a common theme for Day 1 (Basic Life Support), Day 2 (Advanced Cardiac Life Support), and Day 3 (Trauma Emergency Management).

Time Management:

Theme: Importance of effective time management

Details: For the Advanced Cardiac Life Support Workshop (Day 2), participants highlighted the need for better time management, indicating that efficient use of time could enhance the training experience.

Future Training Preferences:

Theme: Interest in diverse and comprehensive training programs

Details: Participants expressed interest in various future training programs, including ACLS, ALS, trauma training, and ambulance simulations. This indicates a desire for a broad range of training opportunities to cover different aspects of medical emergencies.

Cost Considerations:

Theme: Concerns about training costs

Details: Feedback included requests to reduce fees, suggesting that cost is a significant factor for participants and could impact their ability to attend future training sessions.

Instructor Effectiveness:

Theme: Positive feedback on instructor performance

Details: Participants praised the instructors for their patience and effective teaching methods, highlighting the positive impact of skilled instructors on the learning experience.

DISCUSSION

The analysis reveals significant improvements in clinical skills across all three days of training, with the highest gains observed in the Basic Life Support workshop feedback from participants indicates a strong endorsement of the course structure and content, with suggestions for more practical training and simulations. The positive reception of the course highlights the effectiveness of simulation-based training in enhancing clinical skills among healthcare professionals and students.

Conclusion and Recommendations

The simulation-based training programs at Vydehi Advanced Simulation Academy (VASA) have proven to be effective in significantly improving clinical skills across various roles in medical education. The feedback from participants underscores the importance of practical training and simulations in medical education, providing valuable insights for further enhancing the training programs. The findings support the integration of simulation-based training as a superior alternative to traditional education methods in medical curricula. It is recommended to expand the use of simulation training in medical education to better prepare students for real-world clinical practice, improve patient care, and support the development of clinical skills in a risk-free environment.

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