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A Study on Learning and Assessment of Basic Surgical Skills in Interns During Surgical Posting

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Abstract
Certifiable competencies in Basic Surgical Skills (BSS) are essential for medical graduates. However traditional methods of learning lack formal assessment leading to inconsistent skill levels and potential patient harm. This study aimed to assess the effectiveness of a BSS course in enhancing the technical performance and confidence of medical interns during surgical postings. It sought to evaluate interns cognitive and psychomotor skills before and after the course compare outcomes between batches with and without prior conventional training and assess participants perception of the course. Twenty-two interns in Batch A and eighteen in Batch B participated providing informed consent. A three-day BSS course covering cognitive and psychomotor skills was administered followed by pre- and post-course assessments using a 22-point checklist, 25 multiple-choice questions and a Likert scale. Statistical analysis like paired t-test and ANOVA was conducted using SPSS software. Interns showed significant improvements in performance and confidence in BSS after the course ($p<0.05$) except for safe suture removal. Batch B after conventional training performed better in certain skills but failed to improve suturing and overall performance. Feedback on the course was positive, indicating its effectiveness and demand for additional training. The BSS course particularly with simulated practice significantly enhanced interns psychomotor skills and confidence levels. It highlights the need for structured training programs in surgical education to improve patient care and safety advocating for the integration of simulation-based training into medical curricula.

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Key Words
Basic surgical skills (BSS), medical interns, surgical education, simulation-based training, skill enhancement

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INTRODUCTION

In contemporary medical education the imperative for medical graduates to possess certifiable competencies in Basic Surgical Skills (BSS) is widely acknowledged. The pivotal role of BSS in ensuring patient safety and optimizing clinical outcomes is underscored by research findings[4]. revealed that house officers (HOs) in rural Ghana often face limited exposure to essential surgical conditions leading to low confidence levels. This lack of exposure not only affects the interns confidence but also impacts their ability to effectively manage surgical emergencies and deliver quality care to patients. Similarly[3] identified work fatigue, poor mentor ship and inadequate training programs as major hindrances to surgery interns in Southeast Nigeria. These challenges highlight the need for structured training programs to equip interns with the necessary skills and confidence to handle surgical procedures effectively.

Traditionally interns embark on their surgical journey through a blend of observation and hands-on practice often directly on patients within the clinical setting. However this conventional approach while valuable in providing experiential learning may lack structured assessment and certification mechanisms[6,1]. This leaves interns skill levels unstandardized and their competencies uncertified. Without standardized training and assessment mechanisms interns may struggle to acquire essential surgical skills and may not reach the proficiency level necessary to ensure patient safety and optimal clinical outcomes. Recognizing this gap[7,2] emphasized the importance of peer-led basic surgical skills workshops in boosting interns confidence levels and addressing gaps in surgical training. These workshops provide interns with the opportunity to practice and refine their surgical skills under the guidance of their peers allowing for valuable feedback and support.

To address this imperative for proficiency in BSS the provision of a dedicated BSS course emerges as a strategic intervention. Various studies have highlighted the effectiveness of such courses in enhancing technical performance and instilling confidence among interns[9,5]. demonstrated improvement in interns competency and confidence post-BSS training while[8] found significant improvements in both cognitive and procedural skills post-course. By implementing a structured BSS course interns are provided with a comprehensive and standardized curriculum that covers essential surgical skills such as suturing, knot-tying and tissue handling. This structured approach ensures that interns receive consistent training and assessment leading to improved skill acquisition and confidence levels. The study seeks to build upon existing research by delineating the cognitive and psychomotor skill progression of interns at the onset and culmination of their surgical posting. The purpose of this study is to evaluate the effectiveness of a structured Basic Surgical Skills (BSS) course in enhancing technical performance and confidence among medical interns during surgical postings. It aims to delineate the cognitive and psychomotor skill progression of interns before and after the course as well as capture their perceptions of the training. The study seeks to inform evidence-based educational strategies to better equip future healthcare practitioners for safe and effective patient care.

Aim of the Study: To study this the study aimed to determine.

- Describe interns cognitive and psychomotor skills at the start of surgical postings.
- Assess interns skills after one month of conventional training.
- Evaluate the impact of a Basic Surgical Skills (BSS) course on interns technical proficiency.
- Measure changes in interns confidence levels following the BSS course.
- Gather feedback from interns to understand their perception of the BSS course.

MATERIALS AND METHODS

Materials: Twenty-two interns from Batch A and eighteen from Batch B were recruited to participate in the study. These interns were at various stages of their medical education and had varying levels of exposure to basic surgical skills (BSS) who participated with informed consent and following approval from the Institutional Ethical Committee (IEC).

The study introduced a comprehensive three-day course was designed to provide interns with both cognitive and psychomotor training in basic surgical skills. The course content was developed by experienced surgical educators and included a combination of didactic lectures, interactive sessions, video presentations and hands-on practical training through Demonstration Observation Assist and Perform (DOAP) in a simulated skill lab environment. The assessment tools used in the study included,

Psychomotor Skills Checklist: A detailed 22-point checklist was created to systematically evaluate interns proficiency in various psychomotor skills related to surgical procedures. This checklist covered aspects such as instrument handling, suturing techniques and tissue manipulation.

Cognitive Assessment: A set of twenty-five multiple-choice questions was prepared to assess interns theoretical knowledge and understanding of

basic surgical principles and techniques. These questions were designed to cover a broad range of topics relevant to BSS.

Confidence Evaluation: Interns confidence levels were assessed using a 5-point Likert scale questionnaire administered before and after the course. This questionnaire measured interns self-perceived confidence in performing surgical tasks and procedures.

A dedicated skill lab was set up to provide interns with a simulated surgical environment for hands-on practice. It was equipped with surgical instruments, suturing materials, anatomical models and simulators to simulate realistic surgical scenarios. Interns had the opportunity to practice and refine their surgical skills under the guidance of experienced surgical faculty members.

The Variables Included in the Questionnaire Such As:

- Put on mask and CAP
- Wash hands with soap for 3 minutes approx
- Movement with hand raised position
- Proper donning of gown
- Open and don sterile gloves
- Selection of right instruments for suturing
- Safe removal of suture from packet
- Appropriate mounting and orientation of needle in jaws
- Needle is grasped at 50 to 60% back from tip
- Needle is grasped 1-2 mm from tip of needle holder
- Hold the tooth forceps with non-dominant hand
- Counter traction on tissue by forceps
- Appropriate trajectory of needle through tissue
- Suture material drawn through the skin leaving 2-3 cm from skin surface
- Appropriate formation of loop for each throw of knot
- Appropriate crossing of hands with each throw
- Appropriate number of throws for suture material used
- Correct suture tension:
- Suture material is cut with scissor 1-2 cm from knot
- Correct distance of between sutures
- Correct stitch removal techniques

The Questionnaire used for Assessing Interns Confidence levels Included variables Such As:

- Confidence in donning personal protective equipment (mask, gown, gloves).
- Confidence in performing hand hygiene techniques (handwashing).
- Confidence in handling surgical instruments correctly.
- Confidence in executing various suturing techniques.
- Confidence in conducting surgical procedures with precision.
- Confidence in overall surgical skill proficiency.

These variables were measured using a 5-point Likert scale with interns rating their confidence levels from Strongly Disagree to Strongly Agree both before and after the structured BSS course.

The Proposed System:

Pre-Test Assessment: Before the commencement of the BSS course interns from both Batch A and Batch B underwent a comprehensive pre-test assessment. The assessment included were.

Psychomotor Skills Checklist: Each interns proficiency in various surgical tasks such as instrument handling, suturing techniques and tissue manipulation was evaluated using a 22-point checklist.

Cognitive Assessment: Interns theoretical knowledge and understanding of basic surgical principles and techniques were assessed through a set of 25 multiple-choice questions.

Confidence Evaluation: Interns rated their confidence levels in performing surgical tasks using a 5-point Likert scale questionnaire.

Interns participated in a structured three-day BSS course designed to enhance both cognitive understanding and psychomotor skills. The course curriculum such as

Didactic Lectures: Experienced surgical educators delivered lectures covering essential theoretical concepts and practical aspects of basic surgical skills.

Video Presentations: Educational videos demonstrating surgical techniques and procedures were shown to enhance interns understanding.

Hands-on Practice: Interns engaged in hands-on practice sessions conducted in a skill lab equipped with surgical instruments, anatomical models and simulators. They practiced various surgical tasks under the guidance of experienced faculty members.

Post-Test Assessment: Following the completion of the BSS course interns underwent a post-test assessment to evaluate the effectiveness of the training program. The same assessment tools used in the pre-test were employed to measure any improvements in interns

skills and confidence levels. Statistical analysis of the data collected was performed using (SPSS) software. SPSS was used to analyze the pre-test and post-test results including paired t-tests and ANOVA to determine the effectiveness of the structured BSS course in improving interns skills and confidence levels. Paired t-tests were performed to compare interns performance and confidence levels before and after the course. Additionally ANOVA was conducted to compare the pre-test results between Batch A and Batch B assessing any differences in baseline skills.

Interns were encouraged to provide feedback on the BSS course using a structured course evaluation tool. The feedback collected helped assess the overall effectiveness of the course and identify areas for improvement.

RESULTS AND DISCUSSIONS

The results of the study revealed significant improvements in both the performance and confidence of interns in Basic Surgical Skills (BSS) following the structured BSS course. Interns demonstrated enhanced proficiency in various surgical tasks as evidenced by the significant differences in pre-test and post-test scores.

The paired t-test was conducted to compare interns performance and confidence levels before and after the Basic Surgical Skills (BSS) course. The results indicate significant improvements in both performance and confidence following the course as highlighted in Table 1 and Table 2. The paired t-test results demonstrate statistically significant improvements in both performance and confidence levels across various surgical tasks after the completion of the BSS course.

(Table 3) demonstrates the ANOVA results for batch comparison. The ANOVA analysis was conducted to compare the pre-test results between Batch A and Batch B, assessing any differences in baseline skills. The ANOVA results indicate statistically significant differences between Batch A and Batch B interns in certain surgical skills such as putting on masks and caps, washing hands properly and selecting appropriate instruments for suturing.

In addition to paired t-test and ANOVA analysis the results of the chi-square test are summarized in Table 4. This test was conducted to assess the association between interns prior surgical experience and their performance in the BSS course. The chi-square test revealed a statistically significant association between interns prior surgical experience and their performance improvement in the BSS course with interns having prior experience showing higher performance improvement.

The Regression Analysis Results was summarized for factors influencing confidence levels in Table 5. Regression analysis was conducted to identify factors influencing interns confidence levels after the BSS course. The regression analysis identified several significant predictors of interns confidence levels after the BSS course including prior surgical experience, duration of the BSS course, batch allocation and interns age.

Correlation analysis was conducted to examine the relationship between interns pre-test scores and their confidence levels before the BSS course. The correlation coefficient (r) and p-value were calculated indicating the strength and significance of the relationship. The correlation analysis with the correlation coefficient (r) is 0.632 with the $p<0.001$ revealed a strong positive correlation between interns pre-test scores and their confidence levels before the BSS course indicating that interns with higher pre-test scores tended to have higher confidence levels. The analyses provide valuable insights into the effectiveness of the BSS course in improving interns surgical skills and confidence levels as well as highlighting differences in baseline skills between batches.

Performance Improvement: Interns showed marked improvement in tasks such as putting on masks and caps, washing hands properly, selecting appropriate instruments for suturing and holding tooth forceps correctly.

Batch B interns who underwent conventional training before the BSS course performed better in certain skills compared to Batch A interns particularly in tasks related to personal protective equipment (PPE) donning, hand hygiene and instrument selection. This suggests that prior exposure to clinical settings may have contributed to their initial proficiency in these areas. However Batch B interns showed no significant improvement in suturing skills and overall performance compared to Batch A interns indicating the limitations of conventional training methods in addressing specific surgical skills deficiencies.

The feedback from interns regarding the BSS course was overwhelmingly positive highlighting its effectiveness in enhancing technical skills and confidence levels. Interns expressed a desire for additional training opportunities and emphasized the importance of structured educational programs in surgical skill development.

Confidence Enhancement: Interns reported a notable increase in confidence levels across various surgical tasks after completing the BSS course. This improvement was particularly evident in tasks requiring precise instrument handling, suturing techniques and tissue manipulation. The structured nature of the BSS course which included didactic lectures, hands-on practice sessions and real-time

Table 1: Paired t-test for Performance Improvement

Surgical Skill	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Paired t-value	p-value
Put on mask and cap	17(42.5)	35(87.5)	-0.450	<0.001
Wash hand with soap for 3 minutes	23(57.5)	36(90)	-0.325	<0.001
Movement with hand raised position	28(70)	36(90)	-0.200	0.015
Proper donning of gown	22(55)	29(72.5)	-0.175	0.045
Open and don sterile glove	16(40)	32(80)	-0.425	<0.001
Selection of right instrument for suturing	21(52.5)	35(87.5)	-0.350	<0.001
Safe removal of suture from packet	28(70)	33(82.5)	-0.125	0.100

Table 2: Paired t-test for Confidence Enhancement

Surgical Task	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Paired t-value	p-value
Confidence in scrubbing on Likert scale	-1.325	-0.982	-0.169	<0.001
Confidence in gloving on Likert scale	-1.000	-0.668	-0.164	<0.001
Confidence in Gowning on Likert scale	-1.425	-1.064	-0.179	<0.001
Confidence in suturing on Likert scale	-1.425	-1.057	-0.182	<0.001
Confidence in dressing on Likert scale	-1.075	-0.717	-0.177	<0.001

Table 3: ANOVA Results for Batch Comparison

Surgical Skill	F-value	p-value
Put on mask and cap	9.236	0.004
Wash hand with soap for 3 minutes	4.985	0.032
Movement with hand raised position	0.165	0.687
Proper donning of gown	1.453	0.235
Open and don sterile glove	1.297	0.262
Selection of right instrument for suturing	5.559	0.024
Safe removal of suture from packet	0.073	0.788

Table 4: Chi-square Test Results for Prior Surgical Experience

Prior Surgical Experience	Performance Improvement (Yes)	Performance Improvement (No)	Chi-square value	p-value
Yes	18	4	5.267	0.022
No	8	10		

Table 5: Regression Analysis Results for Factors Influencing Confidence Levels

Variables	Beta Coefficient	Standard Error	t-value	p-value
Prior Surgical Experience	0.357	0.092	3.879	<0.001
Duration of BSS Course	0.215	0.067	3.209	0.002
Batch (A or B)	0.128	0.045	2.845	0.006
Age (years)	-0.076	0.032	-2.371	0.019

feedback contributed to interns confidence-building process. The simulated surgical environment provided a safe and supportive learning environment where interns could practice and refine their skills under expert supervision. The positive correlation between improved technical performance and increased confidence levels underscores the effectiveness of the BSS course in addressing interns skills deficiencies and instilling confidence in their abilities to perform surgical tasks competently.

The findings of the study highlight the critical role of structured BSS courses in enhancing the technical proficiency and confidence of medical interns during surgical postings. The integration of simulation-based training methodologies and real-time feedback mechanisms proved instrumental in bridging the gap between theoretical knowledge and practical skill application. The implementation of similar educational interventions is recommended to ensure that interns receive standardized training and assessment in essential surgical skills ultimately improving patient care and safety in clinical settings.

CONCLUSION

The study underscores the vital role of structured Basic Surgical Skills (BSS) courses in bolstering the technical proficiency and confidence of medical interns during their surgical postings. Through a dedicated BSS course significant enhancements in both performance and confidence levels were observed across various surgical tasks. While prior conventional training contributed to initial proficiency in certain areas it fell short in addressing specific skills deficiencies. The positive feedback from interns underscores the efficacy of structured educational programs in surgical skill development. The integration of simulation-based training and real-time feedback mechanisms is paramount to ensure standardized training and assessment, ultimately enhancing patient care and safety in clinical settings.

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