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Review article

SUTURING COMPETENCE IN UNDERGRADUATE MEDICAL EDUCATION: CURRENT EVIDENCE, EDUCATIONAL STRATEGIES AND FUTURE DIRECTIONS

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Abstract: Suturing is a fundamental clinical skill, yet many medical students graduate without consistent technical competence or confidence in basic wound closure. This structured narrative review synthesizes contemporary evidence on undergraduate suturing competence and educational strategies to improve technical performance, retention, and clinical readiness. Relevant literature was identified through structured searches of PubMed/MEDLINE, Scopus, and Google Scholar using predefined eligibility criteria and synthesized thematically.

The evidence demonstrates substantial variation in suturing competence and frequent discrepancies between self-reported confidence and objectively assessed performance. Simulation-based training, particularly when combined with deliberate practice, feedback, and objective assessment, consistently improves short-term technical performance. Video-based and other digital approaches may improve accessibility and cognitive preparation but appear most effective when integrated with hands-on practice. Remote and technology-enhanced instruction is promising, although evidence remains heterogeneous in study design, learner populations, training duration, and outcome measures.

Many studies focus on immediate post-intervention outcomes, limiting conclusions regarding long-term retention and transfer to clinical practice. Overall, undergraduate suturing education should prioritize objectively assessed competence over confidence alone. The available evidence supports structured, longitudinal training integrating simulation, deliberate practice, feedback, and validated assessment to prepare students for safe supervised clinical practice. Further studies using standardized competency outcomes and longer follow-up are needed to establish the durability and clinical relevance of educational gains.

Keywords: suturing skills, undergraduate medical education, surgical education, simulation-based education, surgical competence, wound closure, objective structured assessment of technical skills.

INTRODUCTION

Suturing and basic wound closure are fundamental procedural skills in medical practice, and undergraduate medical education plays an important role in preparing students for supervised clinical responsibilities. However, the provision of formal suturing training varies across medical schools, and studies have reported gaps in both students' technical proficiency and confidence (1, 2, 3). Competence in wound closure requires more than theoretical knowledge; it involves appropriate instrument handling, tissue handling, accurate suture placement, and secure knot tying.

Traditionally, surgical skills have been acquired through clinical observation and apprenticeship-based learning. However, opportunities for students to gain hands-on experience have become increasingly limited by patient-safety considerations, medico-legal concerns, reduced clinical exposure, and the demands of crowded medical curricula. These challenges have encouraged the use of structured educational approaches that allow students to acquire and practice technical skills in a controlled setting before applying them in clinical environments (4).

Simulation-based education has therefore become an important component of undergraduate surgical skills training. Other approaches, including video-supported learning, technology-enhanced instruction, remote teaching, structured feedback, and peer-supported learning, have also been explored. These strategies may increase access to training and provide opportunities for repeated practice. Nevertheless, the availa-

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ble literature is heterogeneous, with substantial variation in learner populations, educational interventions, training duration, and outcome measures.

An important concern is the discrepancy between perceived confidence and objectively assessed technical competence, as improved confidence does not necessarily indicate adequate procedural performance. Moreover, many studies emphasize immediate post-intervention outcomes, while evidence on long-term retention and transfer to clinical practice remains limited. Differences in the definition and assessment of competence further complicate comparisons between interventions.

The importance of effective suturing education extends beyond technical skill acquisition. Adequate preparation may improve students' readiness to participate in supervised procedural care, while inadequate preparation may leave important gaps that require additional training and supervision. For medical educators, identifying effective and practical approaches to suturing instruction is particularly relevant in settings with limited curriculum time and variable access to clinical learning opportunities.

Although previous studies and reviews have examined surgical skills education, evidence specifically relevant to undergraduate suturing training continues to evolve. A critical synthesis is needed to examine not only the reported benefits of different educational approaches but also the methodological differences and limitations that influence the interpretation of their findings.

Accordingly, this structured narrative review synthesizes evidence on suturing education and competence among undergraduate medical students. It examines current competence, educational strategies to improve technical performance and retention, and approaches to skills assessment. The review addresses the following questions:

i. What is the current level of suturing competence among undergraduate medical students?

ii. Which educational strategies are associated with improvements in technical performance, confidence, and skill retention?

iii. How is suturing competence assessed, and what methodological strengths and limitations characterize the available evidence?

iv. Finally, what evidence-informed principles may support the development of competency-based undergraduate suturing education?

MATERIAL AND METHODS

Review Design

This study was conducted as a structured narrative review to synthesize evidence on suturing competence and educational approaches among undergraduate medical students. A narrative approach was considered appropriate because the available literature includes diverse educational interventions, study designs, learner populations, and outcome measures, limiting direct comparison across studies.

The review was developed with attention to the key domains assessed by the Scale for the Assessment of Narrative Review Articles (SANRA), including the importance of the review, clear aims, description of the literature search, appropriate referencing, scientific reasoning, and presentation of relevant evidence. The review was guided by the research questions presented in the Introduction.

Literature Search and Study Selection

A structured literature search was conducted between April and May 2026 using PubMed/MEDLINE, Scopus, and Google Scholar. Boolean operators were used to combine the terms "suturing skills," "undergraduate medical students," "surgical simulation," and "Objective Structured Assessment of Technical Skills (OSATS)."

The search identified 66 articles. After duplicate removal, 59 articles remained for screening. Titles, abstracts, and relevant full texts were assessed against predefined eligibility criteria, resulting in the inclusion of 44 articles for thematic synthesis. The study selection process is presented in Figure 1.

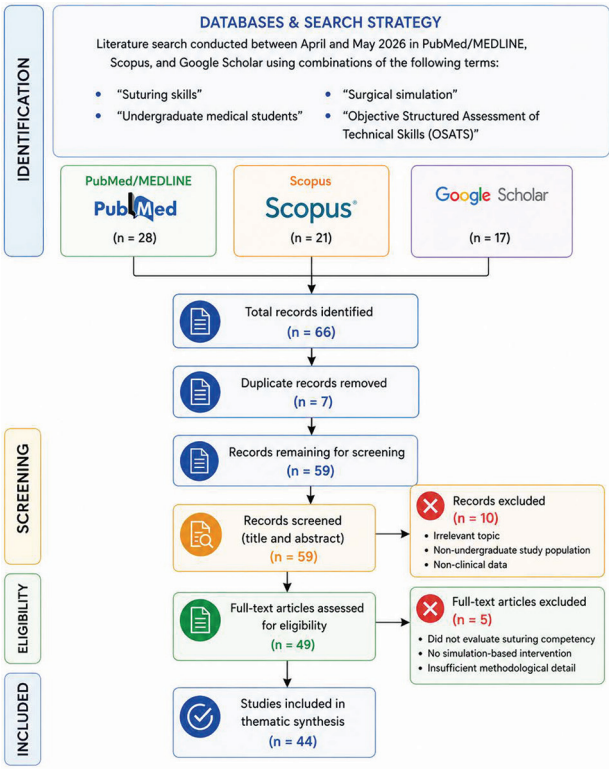


Figure 1. *Study selection process for the structured narrative review*

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The search was intended to identify relevant evidence for a structured narrative synthesis rather than to achieve the exhaustive identification of studies required for a systematic review.

Eligibility Criteria

Studies were included if they involved MBBS or equivalent undergraduate medical students and addressed basic wound closure, knot-tying, or related suturing skills. Studies evaluating educational interventions, including simulation-based, digital, or other structured approaches to surgical skills training, were considered eligible.

Studies were excluded if they were published in languages other than English, focused exclusively on postgraduate surgical trainees or non-medical practitioners, or did not provide sufficient information regarding the educational intervention or outcomes relevant to the objectives of this review.

Data Synthesis and Critical Interpretation

Included studies were synthesized narratively according to themes relevant to the research questions, including suturing competence, educational strategies, assessment, training challenges, and skill retention.

Evidence was interpreted considering differences in study design, learner populations, settings, interventions, and outcome measures. Particular attention was given to distinctions between subjective outcomes, such as confidence and satisfaction, and objective measures of technical performance, as well as differences in follow-up and long-term skill retention.

No formal risk-of-bias assessment was performed. Findings should therefore be interpreted within the narrative design and methodological heterogeneity of the included studies. This review provides a critical thematic synthesis rather than a quantitative estimate of the comparative effectiveness of educational interventions.

EVIDENCE SYNTHESIS

Current proficiency levels in suturing among undergraduate medical students

The available evidence suggests considerable variation in the provision of undergraduate suturing training and in students' levels of technical competence. Historically, suturing has been taught largely through clinical observation and apprenticeship-based learning; however, exposure to clinical procedures alone may not provide sufficient opportunities for students

Evidence from the United Kingdom illustrates gaps in formal curricular provision. Davis et al. reported that only 24.7% of medical schools formally incorporated suturing into their curricula (1). Similarly, Emmanuel et al. highlighted limitations in the provision of basic surgical skills training, which may lead students to seek additional extracurricular instruction (5). In a survey of 705 undergraduate medical students, Rufai et al. found that although 86% had attended scheduled training, only 13.5% considered this training adequate, while objective competence measures remained below the expected standards reported in the study (6).

Comparable concerns have been reported in Canada. Cleversey et al. found that 79% of students achieved objective competency following targeted workshops, although confidence did not always correspond with technical performance (7). Similarly, Walser et al. found no significant difference in suturing ability between students with and without relevant surgical or procedural rotations, suggesting that clinical rotations alone may not ensure technical proficiency (8).

Evidence from low- and middle-income settings also indicates gaps in hands-on experience and objectively assessed competence. In a 2024 Nigerian cross-sectional study of 144 final-year medical students, Mato et al. found that only 34.7% were competent in basic suturing despite completing surgical rotations, with discrepancies between perceived knowledge and objective performance (9). Aderounmu et al. reported that more than 60% of students lacked previous hands-on experience, while subsequent low-cost skills training improved objective performance (10). Similarly, Ijah et al. found substantial support for incorporating surgical skills laboratories into undergraduate education (11).

Focused educational interventions may also improve performance in specific areas of suturing. Sultan et al. evaluated a plastic surgery–based workshop using didactic instruction and hands-on practice with silicone models. Only 1.4% of participants met the predefined competency threshold before training, compared with 80% after the intervention (12). However, the assessment was limited to immediate post-training performance, and long-term retention and transfer to clinical practice were not evaluated.

Taken together, these studies indicate that undergraduate exposure to suturing is variable and that clinical observation or rotation-based experience alone may not reliably produce demonstrable technical competence. At the same time, comparisons across studies should be interpreted cautiously because definitions of competence, assessment instruments, learner populations, and training contexts differ substantially. The evidence nevertheless highlights a recurring concern:

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Table 1. *Comparative summary of selected studies on undergraduate suturing training and competency outcomes*

Series	Region	Study Design	Focus	Primary Metric	Key Finding
Davis et al. (1)	UK	Audit	Curricular provision	Schools with formal training	24.7% formally included suturing training
Rufai et al. (6)	UK	National survey	Undergraduate training	Perceived adequacy	Only 13.5% considered training adequate
Cleversey et al. (7)	Canada	Cohort	Suturing curriculum	OSATS / competence	79% achieved competency; confidence and performance differed
Walser et al. (8)	Canada	Cohort	Clinical rotations	Suturing ability	Clinical rotations alone did not ensure better suturing performance
Mato et al. (9)	Nigeria	Cross-sectional	Preparedness for practice	Self-reported preparedness	Identified gaps in preparedness and suturing skills
Aderounmu et al. (10)	Nigeria	Intervention	Undergraduate skills training	Skills assessment	Targeted training improved suturing performance
Ijah et al. (11)	Nigeria	Survey	Surgical skills laboratory	Student opinion	Strong support for undergraduate skills laboratories
Sultan et al. (12)	China	Intervention	Structured suturing workshop	Competency score	Competency increased from 1.4% to 80%

self-reported confidence should not be regarded as a substitute for objective assessment of suturing performance.

The characteristics and key findings of selected studies included in this review are summarized in Table 1.

Educational Strategies for Suturing Skill Acquisition

A range of educational approaches has been used to teach suturing and related procedural skills to undergraduate medical students. Simulation-based medical education provides a controlled setting in which learners can practice repeatedly and receive feedback before participating in clinical procedures. The simulation models described in the literature range from low-fidelity materials and synthetic pads to animal-tissue, cadaveric, and virtual platforms (13–17). Both dry and wet models have been used for basic skill acquisition, although differences in model characteristics, educational design, and outcome measures make direct comparisons difficult.

Simulation and Video-Based Learning

Several studies have compared hands-on simulation with video-based instruction. Alshaalan found that both improved students' confidence in dermatological suturing, although gains were greater with supervised hands-on training (18). Similarly, Sakamoto et al. reported superior technical performance with hands-on simulation compared with video-based instruction for microsurgical training (19). A systematic review by Ahmet et al. concluded that video-based education can improve knowledge, confidence, and procedural understanding, particularly when combined with practical training (20).

Overall, video-based resources may support the introduction and reinforcement of procedural concepts, whereas hands-on practice remains important for psychomotor skill development. Given differences in procedures, learners, and outcomes, video instruction should not be considered a direct substitute for practical training when demonstrable technical competence is the objective.

Peer-Assisted Learning

Peer-assisted learning (PAL) has been explored as a strategy for expanding access to undergraduate surgical skills training. Preece et al. reported improvements in technical performance and confidence following peer-led suturing workshops (21), while Bennett et al. found that a structured PAL programme improved learners' confidence across multiple procedural domains (22). Randomized studies by Ong et al. and Vijayan et al. reported technical outcomes comparable to those achieved with faculty-led instruction in their respective settings (23, 24).

Other studies have explored factors that may influence the effectiveness of peer-led training. Manolopoulos et al. reported an association between learner anxiety and objective performance during peer-led suturing training, while Major et al. found improvements

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in both confidence and technical competence following a near-peer suturing curriculum (25, 26).

Overall, the available evidence suggests that PAL can provide a practical and resource-efficient means of delivering basic skills training. Nevertheless, differences in tutor preparation, instructional structure, and assessment methods should be considered when interpreting the findings. PAL may be particularly useful in settings with limited faculty availability, provided that teaching is appropriately structured and learner performance is objectively assessed.

Telementoring and Remote Instruction

Telementoring and teleproctoring may increase access to procedural instruction when direct supervision is limited. Feeley et al. reported comparable technical performance between senior medical students receiving live remote instruction and conventional face-to-face teaching (27), while Elrod et al. found no significant differences in OSATS scores between telementored and directly supervised groups during suturing and knot-tying training (28).

Systematic reviews by Bilgic et al. and Erridge et al. reported generally comparable outcomes between telementored and on-site mentoring across surgical settings (29, 30). Fernandes et al. also reported improvements across several educational outcomes, including procedural competence and workplace-based performance (31).

Remote instruction may therefore be useful in selected circumstances. However, much of the evidence involves advanced procedures or practicing surgeons; its applicability to all undergraduate suturing contexts should be interpreted cautiously.

Holography-Augmented Instruction

Emerging mixed-reality technologies have been explored as adjuncts to procedural skills training. Lemke et al. compared faculty-led, peer tutor-led, and holography-augmented guidance for proficiency-based suturing among medical students (32). All groups achieved predefined proficiency benchmarks, with no significant differences in technical performance or time to competency. However, holography involved higher equipment costs and lower learner preference.

These findings suggest that holography is feasible, although cost and acceptability may limit routine use. Further research is needed to determine whether its benefits justify the additional resources required.

Overall, no single educational modality appears universally superior. Simulation supports repeated hands-on practice, while digital resources may improve preparation and accessibility. PAL and remote instruction may address limitations in faculty availability, whereas emerging technologies require consideration of cost and practicality. Given the heterogeneity of available studies, approaches should be selected according to learning objectives, resources, opportunities for feedback and deliberate practice, and objective assessment of technical performance rather than confidence alone.

Assessment Tools and Objective Metrics

Objective assessment is essential when evaluating suturing competence, as self-reported confidence does not necessarily reflect technical performance. The Objective Structured Assessment of Technical Skills (OSATS) is widely used in surgical skills assessment and typically combines a Global Rating Scale (GRS) with task-specific checklists. These tools assess domains such as instrument handling, tissue respect, suture placement, knot security, and overall procedural performance (33, 34).

The development and validation of simulation-based assessment frameworks have reinforced the importance of structured evaluation in technical skills training (35). Shaharan and Neary similarly emphasized the need for robust and objective assessment methods to support competence-based progression in surgical education (36). Several complementary instruments have also been developed for procedure-specific assessment, including the Automated Laparoscopic Assessment Platform–Mini (A-LAP Mini), the Intracorporeal Suturing Assessment Tool (ISAT), and motion-analysis systems such as the Imperial College Surgical Assessment Device (ICSAD), which evaluate aspects of technical performance and instrument efficiency (37).

In addition to standardized rating scales, studies have used a range of objective outcome measures, including the time required to complete a suturing task, Objective Structured Clinical Examination (OSCE) performance, Final Product Analysis of suture quality and knot integrity, and absolute symmetry error as a measure of precision (37, 38). However, the use of different assessment instruments and definitions of competence limits direct comparison across studies.

Subjective outcomes, including learner confidence, perceived competence, and satisfaction with an instructional approach, are also frequently reported and may provide useful information about the educational experience (39). Nevertheless, these outcomes should complement rather than replace objective measures of technical performance. The frequent variation in assessment approaches across studies remains an important limitation of the current evidence base and makes it difficult to establish a uniform threshold for suturing competence.

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Interprofessional and Collaborative Workshops

Interprofessional education has been incorporated into simulation-based procedural skills training. Yang et al. evaluated a gynecology surgical skills workshop involving undergraduate medical and nursing students in Australia (40). The workshop included suturing, gowning and gloving, intrauterine device insertion, and urethral catheterization. Participants reported improved self-reported confidence and interprofessional behaviors.

Although not limited to suturing, the study suggests that collaborative workshops may combine procedural and interprofessional learning. However, as outcomes were primarily self-reported and involved multiple procedures, the specific effect on objectively assessed suturing competence cannot be determined.

Educational Impact Beyond Technical Skills

The potential impact of surgical skills training may extend beyond technical performance. Onishi et al. reported that objective assessment of suturing skills within a hands-on training course was associated with increased interest among medical students in pursuing a surgical career (41).

This finding suggests a possible relationship between early exposure to structured surgical skills training and learners' engagement with surgical career pathways. However, this association should not be interpreted as evidence that suturing training directly determines specialty choice. Further research is needed to clarify the broader educational and career-related effects of undergraduate procedural skills training.

Challenges and Solutions in Acquiring Suturing Competence

Several barriers may limit the acquisition and maintenance of suturing competence during undergraduate training. Limited curriculum time is a major challenge; evidence from the United Kingdom indicates that only 24.7% of medical schools formally incorporate suturing into undergraduate programmes (1, 5). Integrating surgical skills into existing activities, such as anatomy laboratory sessions, may reduce the need for additional curriculum time (39).

Limited hands-on practice and supervised clinical opportunities may further restrict skill acquisition because of patient-safety considerations and faculty constraints. Near-peer teaching and structured independent practice may help expand access. Jensen et al. reported that students could achieve basic proficiency through structured independent practice, suggesting that continuous faculty supervision may not be necessary throughout skill acquisition (42).

Remote instruction may also be useful where direct supervision is limited. Feeley et al. found comparable technical performance with live-streamed teleproctoring and conventional face-to-face supervision (27). However, its applicability may depend on the educational context, available technology, and procedural complexity.

Skill retention is another challenge. Bekele et al. reported declining competence without regular clinical or simulation-based reinforcement (43), while Routt et al. found declines in OSATS scores and knot-tying speed following initial proficiency after a suturing workshop (44). The discrepancy between self-reported confidence and objective performance further supports continued objective assessment.

These findings support distributed practice and spaced repetition rather than reliance on single training sessions. Low-cost portable suture kits may facilitate repeated self-directed practice (18). However, the optimal frequency and duration of refresher training remain insufficiently defined.

Proposed Curriculum Blueprint for Undergraduate Suturing Proficiency

Based on the findings of this review, an evidence-informed longitudinal framework for undergraduate suturing education is proposed (Figure 2). This conceptual model has not been prospectively validated and should be adapted to institutional resources, curriculum structures, and local educational needs.

Phase 1: Foundation and Cognitive Acquisition

During the pre-clinical years, students may learn basic principles of instrument and tissue handling, knot-tying, and simple interrupted suturing through digital resources and self-directed practice. Low-cost portable suture kits may facilitate repeated practice outside formal sessions. The initial emphasis should be on understanding procedural principles before advancing technical complexity.

Phase 2: Supervised Simulation-Based Training

During the early clinical years, structured workshops using dry or wet simulation models may support supervised practice. Faculty or appropriately prepared

practice, feedback, and repeated performance. Formative assessment using tools such as OSATS may mon-

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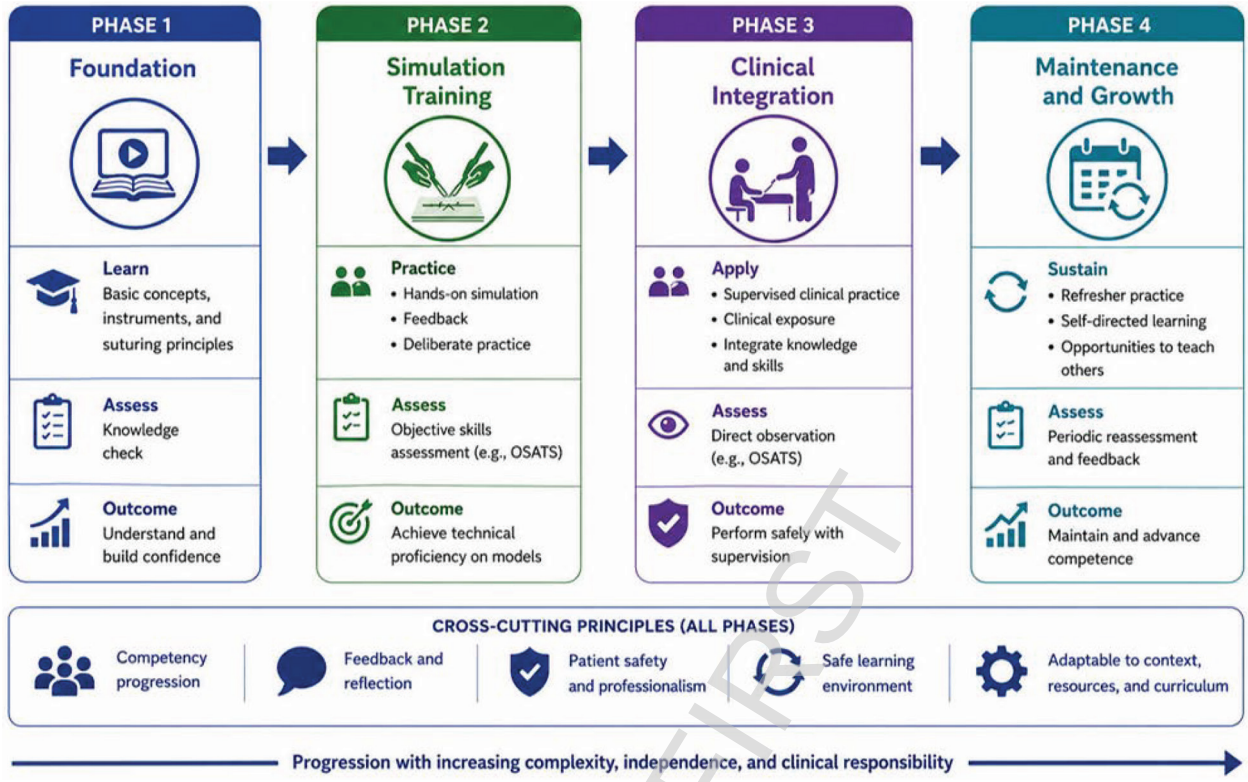


Figure 2. *Proposed longitudinal, competency-based framework for undergraduate suturing and wound-closure training*

itor progression. Training can include techniques such as simple interrupted and mattress sutures.

Phase 3: Clinical Integration

In later undergraduate training, students may progressively apply simulation-acquired skills in supervised clinical settings. Remote instruction or teleproctoring may offer additional options where direct supervision is limited. The focus should be on integrating technical performance with clinical judgement and safe patient care.

Phase 4: Maintenance and Continued Practice

Continued practice is important for skill retention. Distributed practice, refresher sessions, and self-directed resources may support maintenance, while periodic objective assessment can identify learners requiring additional practice. The frequency of refresher training and proficiency thresholds should be determined according to local requirements and available evidence.

LIMITATIONS

Several limitations should be considered when interpreting these findings:

• **Narrative Design:** As a structured narrative review, this study does not follow the protocol-driven methodology of a systematic review or meta-analysis. Selection and interpretation of evidence may therefore be influenced by authors' judgement.

• **Study Heterogeneity:** Included studies varied considerably in sample size, setting, learner populations, instructional approaches, and training duration, limiting direct comparisons between interventions.

• **Variable Definitions of Competence:** No universally accepted definition of undergraduate suturing competence exists. Studies use different benchmarks, including task completion and predetermined scores on tools such as OSATS.

• **Reliance on Subjective Outcomes:** Many studies report confidence and satisfaction alongside, or instead of, objective measures. Perceived readiness may not reflect objectively assessed ability.

• **Short-Term Follow-Up:** Evidence largely focuses on immediate outcomes, with limited data on long-term retention, optimal refresher frequency, and transfer of simulated skills to clinical practice.

• **Geographical Distribution:** Although evidence from low- and middle-income settings was included, much of the literature originates from high-income academic institutions, potentially limiting generalizability to resource-constrained settings.

• **Evolving Technology:** Virtual, mixed-reality, and teleproctoring technologies are rapidly evolving; findings regarding specific platforms may become out-

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dated, particularly where long-term effectiveness remains uncertain.

CONCLUSION

Undergraduate medical education does not consistently provide sufficient opportunities to acquire and maintain demonstrable suturing competence. Structured interventions incorporating hands-on simulation, repeated practice, feedback, and objective assessment can improve technical performance. However, heterogeneity in teaching, assessment, and definitions of competence prevents identification of a universally superior educational model.

Video-based, peer-assisted, and remote approaches may complement hands-on training and address limitations in faculty availability and access. However, self-reported confidence should not be equated with objectively assessed competence.

A longitudinal, competency-based approach may support progressive skill development, adapted to local resources and incorporating repeated practice and objective assessment. Further longitudinal research should establish competency thresholds, evaluate skill retention, and determine whether simulation-based learning translates into safe clinical performance.

Abbreviations

GRS - Global Rating Scale;
OSATS - Objective Structured Assessment of Technical Skills;
A-LAP mini - Automated Laparoscopic Assessment Platform – Mini;
ISAT - Intracorporeal Suturing Assessment Tool;
PAL - Peer-assisted learning;
SBME - Simulation-based medical education.

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Sažetak

OSPOSOBLJENOST ZA HIRURŠKO ŠIVENJE U DODIPLOMSKOJ NASTAVI MEDICINE: SAVREMENI DOKAZI, OBRAZOVNE STRATEGIJE I BUDUĆI PRAVCI RAZVOJA

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Ušivanje rana je jedna od osnovnih kliničkih veština, ali mnogi studenti medicine završavaju studije bez dovoljno razvijenih tehničkih veština i sigurnosti potrebnih za osnovne postupke zatvaranja rana. Ovaj strukturisan narativni pregled razmatra savremene dokaze o kompetentnosti studenata medicine za ušivanje, kao i obrazovne strategije usmerene na unapređenje tehničkih veština, njihovo zadržavanje i pripremu studenata za klinički rad. Relevantna literatura pretražena je u bazama PubMed/MEDLINE, Scopus i Google Scholar, prema unapred definisanim kriterijumima, a rezultati su analizirani prema tematskim celinama.

Dokazi ukazuju na značajne razlike u kompetentnosti za ušivanje, kao i na česta neslaganja između procene sopstvene sigurnosti i objektivno procenjenog nivoa veština. Obuka zasnovana na simulaciji, naročito kada uključuje ciljano vežbanje, povratne informacije i objektivnu procenu, dosledno doprinosi poboljšanju tehničkih veština u kratkoročnom periodu. Obrazovni pristupi zasnovani na video-materijalima i drugim digi-

talnim tehnologijama mogu doprineti većoj dostupnosti obuke i boljoj pripremi za izvođenje postupaka, ali se čini da su najefikasniji kada se kombinuju sa praktičnim radom. Nastava na daljinu i primena savremenih tehnologija u nastavi pokazuju potencijal, iako su dosadašnji dokazi heterogeni u pogledu dizajna studija, karakteristika ispitanika, trajanja obuke i načina procene ishoda.

Mnoge studije prate ishode neposredno nakon sprovedene obuke, što ograničava mogućnost donošenja zaključaka o dugoročnom zadržavanju stečenih veština i njihovoj primeni u kliničkoj praksi. Sveukupno, obrazovanje studenata u oblasti ušivanja treba da daje prednost objektivno procenjenoj kompetentnosti, a ne da se oslanja samo na njihovu subjektivnu procenu sigurnosti. Dostupni dokazi podržavaju strukturisanu, kontinuiranu obuku koja objedinjuje simulaciju, ciljano vežbanje, povratne informacije i validirane metode procene, kako bi se studenti pripremili za bezbedno obavljanje kliničkih postupaka pod nadzorom. Potrebna su dalja istraživanja koja koriste standardizovane kriterijume za procenu kompetentnosti i duže periode praćenja kako bi se utvrdili trajnost i klinički značaj postignutih obrazovnih rezultata.

Ključne reči: veštine ušivanja, dodiplomsko medicinsko obrazovanje, hirurško obrazovanje, obrazovanje zasnovano na simulaciji, hirurška kompetentnost, zatvaranje rana, objektivna strukturisana procena tehničkih veština.

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