

# The Impact of a One-Day Multidisciplinary Workshop on Medical Students' Self-Assessed Confidence, Knowledge, and Teamwork Skills: A Pre-Post Study

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**Background and Objectives:** Medical workshops serve as interactive learning sessions that allow medical students to apply their extensive theoretical knowledge in a structured, low-stress environment. This study aimed to evaluate the impact of a self-developed multidisciplinary workshop on participants' self-reported confidence, teamwork, leadership skills, and theoretical knowledge acquisition.

**Methods:** The present study gathered data from 100 participants. Two surveys, each comprising three sections, were administered: a multiple-choice questionnaire (MCQ), with distinct versions for pre- and post-workshop assessment; a self-confidence questionnaire; and a non-technical skills questionnaire structured using a Likert-scale format.

**Results:** Regarding self-assessed confidence, significant increases were observed across all workshop stations ( $p < 0.001$ , Wilcoxon signed-rank test), with all effect sizes classified as large (Cohen's  $d > 0.8$ ). In terms of theoretical knowledge, students demonstrated substantial improvement, with the median score increasing from 5.92 to 8.2, and no significant differences identified between study years ( $p = 0.895$ ). Non-technical skills, including teamwork and leadership, were assessed using two questions each, revealing a statistically significant improvement in pre- and post-intervention ( $p < 0.001$ ) with large effect sizes.

**Conclusion:** This study demonstrated that the one-day multidisciplinary workshop increases medical students' confidence by refining their communication skills, broadening their understanding of different roles in healthcare, and improving their ability to collaborate effectively.

**Keywords:** self-confidence, medical leadership, medical education, medical workshop, medical students, teamwork

## Introduction

Medical education has continuously evolved, especially in the last decades, to ensure that students acquire not only theoretical knowledge but also the practical skills necessary for high-quality patient care.<sup>1</sup> Traditional learning methods often focus on information retention, yet students frequently struggle with applying their knowledge in real-world clinical settings.<sup>2</sup> Additionally, self-confidence and essential non-technical skills—such as communication, teamwork, and decision-making—are critical for future medical professionals but are not always adequately addressed in conventional curricula.<sup>3</sup>

As medicine and medical practices continue to evolve, medical education must adapt accordingly<sup>4</sup> to ensure that students acquire comprehensive theoretical knowledge and the practical skills essential for their future medical careers. Traditional

learning methods often fall short in fostering hands-on competencies, as an exclusive emphasis on information retention may leave students inadequately prepared to apply their knowledge effectively in real-world clinical settings.

Medical workshops have emerged as an effective tool to bridge the gap between traditional learning and real-life medical skills by providing hands-on experiences in a controlled learning environment. Furthermore, these interactive sessions allow students to put into practice clinical procedures, engage in problem-solving scenarios, and develop professional skills in a low-risk setting.<sup>5</sup>

An effective method for students to gain practical experience is simulation. Simulation-based practice can be realized using workshops. Ji Hie Yu et al confirmed that medical students need repetitive simulation experience to improve their clinical knowledge. Furthermore, this survey confirms that students have a lower level of anxiety and a higher level of confidence after simulations.<sup>6</sup>

Despite the growing recognition of the benefits of medical workshops in enhancing students' practical skills<sup>7,8</sup> and non-technical competencies, there remains a significant gap in the scientific literature regarding their long-term impact and optimal implementation strategies.<sup>9</sup> While existing studies highlight improvements in knowledge, self-confidence, and teamwork, comprehensive research on standardized structure, effectiveness across different medical disciplines, and retention of acquired skills over time is still limited.<sup>10</sup> Additionally, there is a lack of large-scale, controlled studies evaluating the integration of these workshops into formal medical curricula. Addressing these gaps is essential to developing evidence-based guidelines that maximize the educational value of medical workshops and ensure their sustainability in medical training programs.

Self-confidence refers to people's certainty in handling something.<sup>11</sup> It is a pivotal element in motivating students to learn. Recently, during the COVID-19 pandemic, students lacked practice, motivation, and self-confidence, which decreased medical students' psychological and professional development, resulting in a low perception of self-confidence.<sup>12–14</sup> Increasing confidence and offering extrinsic motivational sources for medical students as one-day multidisciplinary workshops improve academic performance.<sup>15</sup>

The main goal of medicine is treating patients. Leadership is the art of motivating a group of people to achieve a common goal: saving and helping others.<sup>16</sup> As in any field, leadership is indispensable for effective teamwork. In medicine, teamwork and interdisciplinary collaboration are essential keys to success. Besides organization and management, medical leadership provides knowledge for the efficiency of medical acts and improves communication between medical team members. As Chen TY States, medical leadership is a required competency that all students should acquire.<sup>17</sup> A method for gaining experience about leadership and teamwork is hands-on workshops.

This article explores the role of medical workshops in enhancing students' knowledge, self-confidence, and non-technical skills such as leadership and teamwork. Our survey addresses the challenge of motivating individuals to organize such workshops by demonstrating their significant impact. Although developing a one-day multidisciplinary workshop requires substantial effort, it provides participants with valuable theoretical and practical insights that enhance their academic understanding, motivation, and self-confidence. To assess these benefits, we conducted a pre-course and post-course survey among 4th- to 6th-year medical students to evaluate the impact of hands-on medical workshops.

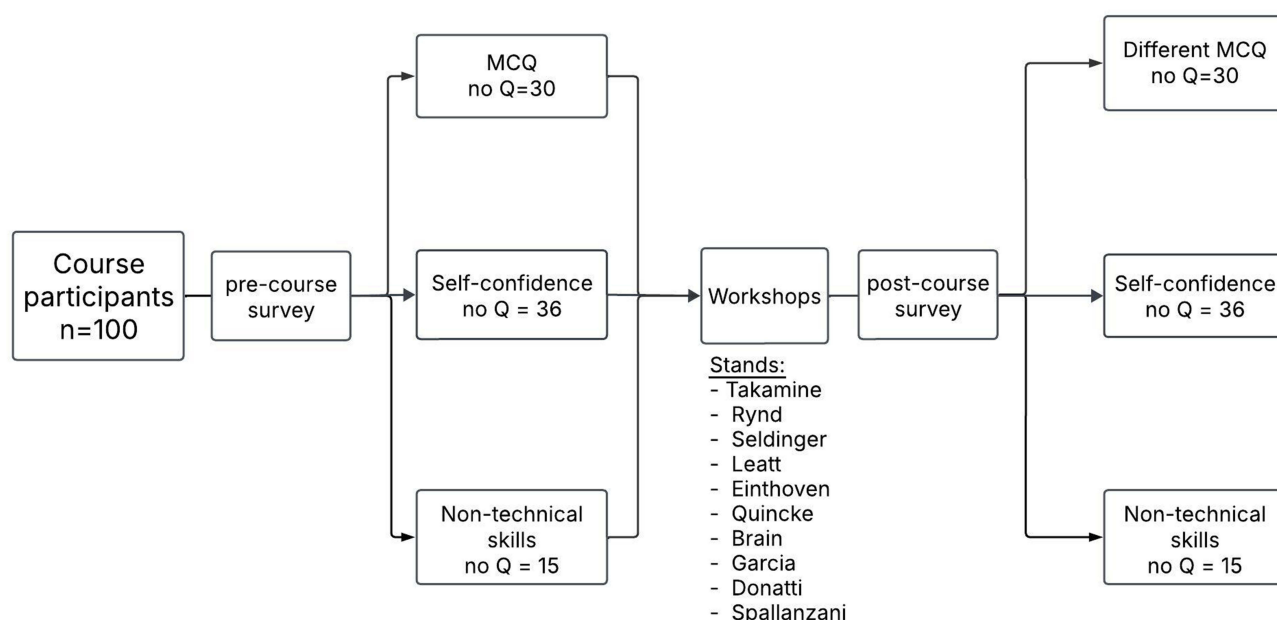
The primary objective of this study was to demonstrate that active participation in hands-on activities significantly enhances self-confidence among medical students. The secondary outcome was the self-assessed improvement in teamwork skills, leadership, and medical knowledge. By analyzing these effects, we seek to emphasize the importance of integrating such training sessions into medical education to better prepare students for clinical practice.

## Materials and Methods

### Study Design, Participant Selection, and Informed Consent

This quasi-experimental study collected data before and after a one-day multidisciplinary workshop held in Galati as part of a National Medical Congress. The study flowchart is showcased in [Figure 1](#).

Galati, a city in eastern Romania with a population of approximately 625,000, hosted the workshop in November 2023, which included 100 participants—all general medicine students in their fourth to sixth years of study. Specifically, 37 students were in their fourth year, 47 in their fifth year, and 22 in their sixth year. This one-day



**Figure 1** Study flowchart.

multidisciplinary workshop was held six times; however, the questionnaire for this survey was used only during the abovementioned session.

The inclusion criteria were consented to complete the survey and being a medical student in the 4th, 5th, or 6th year of training. The exclusion criteria encompassed students from other medical specialties, including dental medicine, pharmacology, and nursing, and those in the pre-clinical years of the general medicine program (first to third year). Notably, respondents' denial to participate in this survey was another exclusion criterion. All 100 participants agreed to participate in the study for the first time without other participation in similar workshops.

Informed consent was obtained from all participants before data collection. Before the workshop began, participants provided their consent with the understanding that they would not be exposed to any hazardous situations, harmful experiments, or adverse experiences.

## Workshop Structure

The concept of this study involved implementing a new workshop designed for 4th, 5th, and 6th-year medical students, aimed at developing practical skills based on the theoretical knowledge acquired during the early years of medical school. This workshop follows an intensive, fast-paced structure, allowing 100 students to participate in a single day. They are divided into 10 pre-formed, permanent teams of 10 students each, rotating through ten one-hour practical stations.

These stations focus on enhancing various skills related to emergency medicine, surgery, ICU, and cardiology, using a team-based learning approach. Each station has a unique name and focuses on specific medical skills: Takamine covers CPR, Rynd focuses on vascular access, and Seldinger involves arterial blood gas analysis (ABG). Leatt is dedicated to fracture immobilization, while Spallanzani covers ultrasound (FAST). Einthoven focuses on ECG interpretation, Quincke on spinal anesthesia, and Brain on supraglottic airway devices. Garcia teaches orotracheal intubation, and Donati focuses on knot tying and suturing techniques.

The university program in Romania includes emergency medicine, cardiology, and general surgery rotations in the 4th year, and anesthesia and intensive care in the 6th year. The expectations were higher for 6th-year students who had already completed these rotations. For the others, the expected knowledge base consisted of first aid training (from first year), practical skills (from second year), as well as medical and surgical semiology (from third year). Therefore, the strategy involved mixing students from different years into permanent groups to facilitate peer evaluation, critical thinking, and team development within the team-based learning (TBL) framework.<sup>18</sup>

This workshop involves performing procedures that most medical students do not typically get to practice during their training years, only during residency—due to their complexity, the specific nature of chosen specialties, or anxiety related to associated risks. Thus, its goal extends beyond merely reinforcing theoretical knowledge through practical learning methods (such as the three- or four-step method, learning through feedback, and debriefing). Instead, it aims to place students in the role of physicians within a safe simulation environment, fostering increased self-confidence.

Therefore, by leading a resuscitation team or just playing a role in it at the end of the workshop, the expected outcomes were implementing both practical and non-technical skills learned throughout the day, strengthening team unity, and reinforcing a sense of responsibility. Thus, excluding familiarity with test questions.

## Questionnaire Design

We selected a self-developed questionnaire, as no validated survey in Romanian currently assesses self-confidence and non-technical skills in these areas. Future research will focus on validating this questionnaire. The survey, originally in Romanian, is provided in English translation in [Supplementary Material M1](#).

This form included three parts: PART I – theoretical part with 30 MCQ’s (which evaluated the theoretical knowledge that was going to be presented in the practical workshops), PART II – Evaluation the level of SELF-CONFIDENCE (when it comes to applying the theoretical knowledge in clinical practice, this part included 36 questions) and PART III – Evaluation of knowledge about medical leadership and teamwork (which evaluates the non-technical skills as communication, assigning tasks to the members of the medical team – 17 questions). For the questions in PART II and PART III of the pre-course form, we used a 1 to 5 Likert-type scale for responses, where one means “not sure at all” and five means “very sure.” We designed this scale to quantify participants’ self-confidence, leadership, and teamwork perceptions.

For the questions in PART II and PART III of the pre-course form, we used the same Likert-type scale for responses. We designed this scale to quantify participants’ perceptions of confidence, leadership, and teamwork.

To preserve the participant’s anonymity, we assigned each participant an original code based on the first stand they attended (a letter corresponding to the first letter of the stand’s name and a number from 1 to 10).

The workshop’s last step was performed after the participants’ practical experience at the end of the day. We designed a post-course questionnaire that included three parts like the pre-course questions (PART I – 30 more theoretical MCQs, PART II –36 questions about self-confidence, and PART III –17 questions about leadership and teamwork).

## Statistical Analysis

The statistical analysis for this study was conducted using JASP, Excel, and R (version 4.4.1; package: dplyr, effsize, flextable, ggplot2, officer, purrr, tidyverse). Descriptive statistics are reported as medians and interquartile ranges (IQRs). Differences in repeated measurements of the same parameter were assessed using the Wilcoxon signed-rank test, while comparisons between groups were performed using the Kruskal–Wallis test. Cohen’s D was the preferred measure to determine the effect size.

Corrected values are sometimes presented to account for variations in the number of items across sections, which would otherwise result in differing total score ranges. The correction was applied straightforwardly: the total score was divided by the number of questions.

A difference was considered statistically significant when the p-value was below 0.05. Effect sizes were classified as large when their values exceeded 0.8.

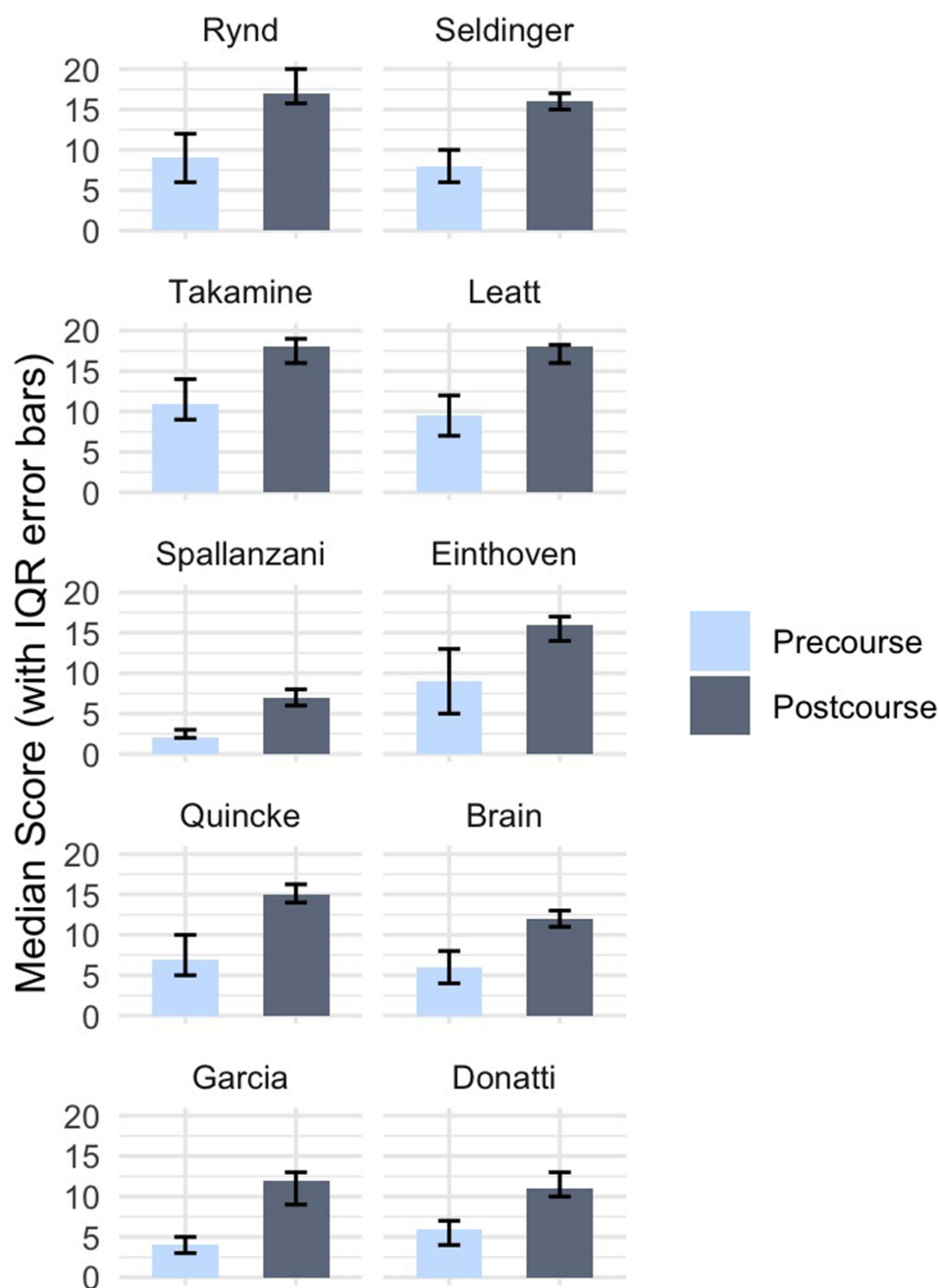
## Results

### PART I – Theoretical Knowledge Evaluation

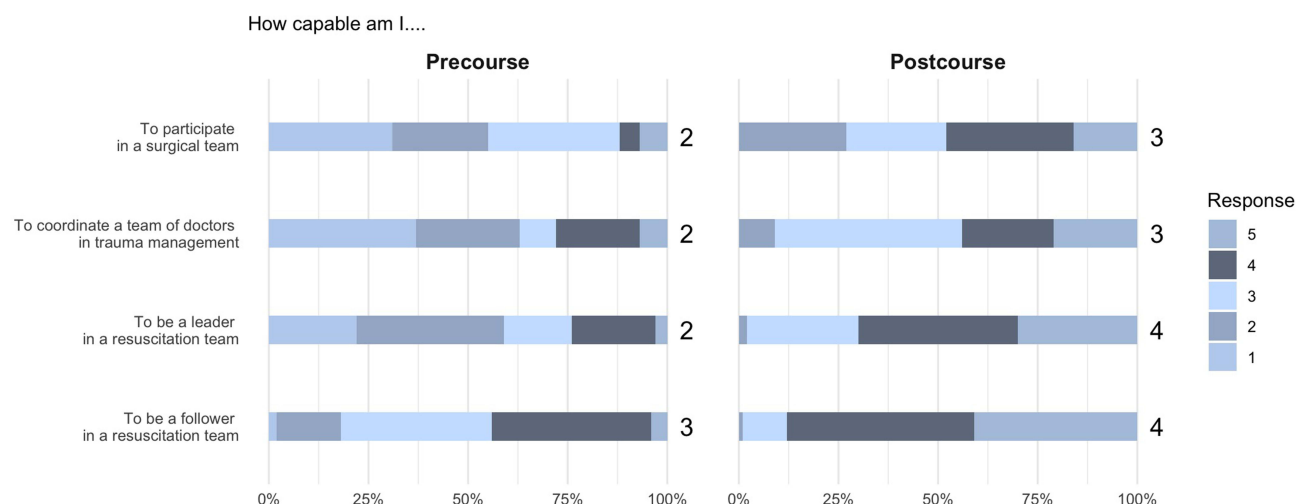
Regarding theoretical knowledge, students had a median pre-course grade of 5.92 (IQR: 4.77–6.88), which increased to 8.2 (IQR: 7.86–8.53) following the course. Pre-course grades did not significantly differ by study year ( $p = 0.895$ ). However, post-course grade distribution varied significantly ( $p = 0.02$ ), with median scores of 8.4 (IQR: 8.01–8.6) for sixth-year students, 8.26 (7.99–8.53) for fifth-year students, and 7.99 (7.66–8.33) for fourth-year students.

## PART II – Self-Perception Regarding Self-Confidence

Self-assessed confidence for each stand was evaluated by summing the points assigned by the respondent to each item. The medians and interquartile ranges (IQRs) for all survey items are detailed in [Supplementary Table S1](#). Figure 2 illustrates the enhancement in respondents' self-confidence following participation in each stand. The Wilcoxon signed-rank test yielded p-values below 0.001 for all stands, indicating statistically significant improvements. Before the course, respondents exhibited the lowest self-assessed confidence in the Spallanzani stand, with a corrected median of 1 point, followed closely by the Garcia stand with 1.3 points. Conversely, students reported the highest pre-course confidence in the skills covered at the Takamine (2.75) and Leatt (2.38) stands. Following the completion of the workshop, the lowest levels of post-course confidence were observed in the Spallanzani (3.5) and Donatti (3.67) stands. In contrast, the highest confidence levels were reported for the Takamine and Leatt stands, with a median of 4.5 for each. Additionally, Cohen's



**Figure 2** Bar charts for participants' median self-reported self-confidence before and after the course for each specific stand.



**Figure 3** Stacked bar chart illustrating self-perceived teamwork and leadership skills, with corresponding median values for each category.

D (95% CI) was calculated separately for each stand, demonstrating the following increases: Rynd 1.97 (1.54–2.39), Seldinger 2.31 (1.89–2.73), Takamine 1.74 (1.41–2.06), Leatt 1.96 (1.58–2.33), Spallanzani 2.56 (2.08–3.04), Einthoven 1.38 (1.1–1.66), Quinke 2.2 (1.79–2.62), Brain 2.33 (1.92–2.74), Garcia 2.51 (2.03–2.99), Donatti 1.82 (1.49–2.16). [Supplementary Table S2](#) presents a more detailed course of participants' self-confidence divided by each study year.

### PART III – Self-Perception Regarding Non-Technical Skills (Teamwork and Leadership)

Regarding their teamwork and leadership skills, participants were asked to answer 15 questions. Most of them had the purpose of evaluating their self-assessed capacity of performing certain procedures while part of a team, while 4 of them were specific. Their results are depicted in [Figure 3](#). All the results regarding their responses are presented in [Supplementary Table S3](#). The difference between the answers given before and after the course was statistically significant for all the questions ( $p < 0.001$ ). No statistically significant differences were observed when comparing the results across respondents' study years. Cohen's D estimates were: "[...] to be a follower in a resuscitation team" 1.28 (0.93–1.64); "[...] to be a leader in a resuscitation team" 1.52 (1.15–1.9); "[...] to coordinate a team of doctors in trauma management" 1.04 (0.73–1.34); "[...] to participate in a surgical team" 0.93 (0.62–1.24).

## Discussion

The findings of this study show that a one-day multidisciplinary workshop significantly enhances medical students' confidence, knowledge, and teamwork abilities. While many studies in literature discuss one-day workshops and their effectiveness in producing noticeable advancements in different medical fields<sup>19–21</sup> our research stands out as it uniquely incorporates medical students and adopts a multidisciplinary approach. This distinctive perspective sets our study apart from others in the existing literature.

Moreover, the current study has several strengths. The workshop outcomes analyzed are aligned with the general learning outcomes of the medical workshops, including the assessment methods, which include a continuous clinical assessment with MCQs, a self-perception regarding self-confidence, and a self-perception regarding non-technical skills (teamwork and leadership).<sup>22,23</sup> This is the first to propose a short-term (one-day) multidisciplinary medical education strategy for medical students that has been shown to be effective and measurable using a self-developed questionnaire design. The short-term nature of the workshop was also an advantage, as it minimized external factors that could have influenced internal validity and did not facilitate replication and expansion, or knowledge of the questions. Other health education interventions have also found short-term strategies to be an effective way to increase knowledge.<sup>24</sup>

In evaluating the theoretical knowledge acquisition of our medical students, the median score before the course was recorded at 5.92 (IQR: 4.77–6.88), which rose to 8.2 (IQR: 7.86–8.53) following just one day of multidisciplinary



workshop. Another study that focused on one-day workshop designed to enhance knowledge regarding the prescription of physical activity, also without a control group, revealed that pre- and post-test assessments indicated an average increase in test scores analyzing theoretical knowledge from 67% to 82% after the workshop ( $p < 0.001$ ). The overall mean individual relative gain was 29% (CI: 26 to 32%).<sup>21</sup> Also, post-course grade distribution varied significantly ( $p = 0.02$ ), with median scores of 8.4 (IQR: 8.01–8.6) for sixth-year students, 8.26 (7.99–8.53) for fifth-year students, and 7.99 (7.66–8.33) for fourth-year students.

Our one-day multidisciplinary workshop features stand aimed at enhancing skills in emergency medicine, surgery, intensive care, and cardiology through a collaborative learning model. We evaluated self-rate confidence for each standby totaling the points assigned by respondents to each item. The Wilcoxon signed-rank test we employed produced  $p$ -values under 0.001 for all stands, demonstrating statistically significant improvements. Only a recent study by Desouky et al, published in 2024, mirrors our design but spans five days, involving 80 final-year medical students who rotated through nine stations simulating typical on-call scenarios. Each station required students to tackle urgent medical situations, such as managing patients with acute conditions and electrolyte imbalances and making referrals while navigating realistic interruptions via a “bleep” system. They also distributed pre- and post-workshops questionnaires comprising 25 items on a Likert scale to assess student feedback and self-reported confidence in skills like communication, clinical decision-making, and task prioritization. Out of the 80 participants, 70 filled out the pre-event questionnaire, and 72 completed the post-event questionnaire. The analysis of statistical data indicated a noteworthy rise in students’ self-reported confidence across all 25 items on the Likert scale, highlighting significant advancements in task prioritization ( $r_s = 0.74$ ,  $p < 0.001$ ), the management of acutely ill patients ( $r_s = 0.60$ ,  $p < 0.001$ ), and escalation skills ( $r_s = 0.49$ ,  $p < 0.001$ ). Upon reviewing these findings, the researchers determined that their workshop format offered a realistic, valuable, and supportive setting for final-year medical students to hone their on-call responsibilities, thereby boosting their self-confidence.<sup>25</sup>

Analyzing the third section of the questionnaire, which focused on self-assessment of non-technical skills such as teamwork and leadership, shows a statistically significant difference in pre- and post-course responses for all questions, with a  $p$ -value below 0.001. This indicates consistent evidence of a substantial change after the course. In addition, when comparing the results between different undergraduate years of medical students, no statistically significant differences were found, suggesting that the impact of the course remained uniform regardless of the academic year of the participants.

In terms of effect size, as measured by Cohen’s  $D$ , the alterations in responses indicate differing levels of impact: a considerable effect size observed in the question about being a follower within a resuscitation team (Q1), high Cohen’s  $D$  emerged from the question concerning leadership in a resuscitation team (Q2), signifying a meaningful transformation in attitudes toward leadership positions among respondents. The effect size for managing a team of doctors in trauma situations (Q9) was moderate (Cohen’s  $D = 1.04$ ), indicating a significant, yet not overwhelmingly large, change. Involvement in a surgical team (Q15) demonstrated the least effect size (Cohen’s  $D = 0.93$ ), suggesting a notable change. Interestingly, the largest increases in self-confidence were seen in areas where students felt relatively less confident prior to the session, such as “How confident do I feel in coordinating a resuscitation team as a leader?” (Q2) and integrating into a resuscitation team as a follower (Q1). Q2 improved by 1.52 (1.15–1.9) and Q1 increased by 1.28 (0.93–1.64). This suggests that our one-day multidisciplinary workshop may have the greatest impact on skills in which students initially feel less prepared. The same findings have been observed, but by improving the transition from student to junior doctor using simulation so that students can actively participate in realistic tasks and experience real-time scenarios, as Teagle et al analyzed in a workshop on a new “practice readiness” course for final-year medical students.<sup>26</sup>

Like our results, Joan Carles Trullàs et al highlighted the fact that improving social and communication skills, succinct and applied presentation of theoretical notions, and self-learning skills through problem-based learning (PBL), which could be associated with the principle of our workshops, led to a high level of satisfaction and the efficient, practical application of all the acquired knowledge.<sup>27</sup>

Thus, effectively structuring a workshop that respects the principle of modern pedagogical philosophy is also validated as the source of the major research areas in student learning and pedagogical innovation in health sciences education. Working without pressure and having unlimited access to guidance, information, advice, and approved feedback, in addition to fixing theoretical notions thanks to the relaxed environment and practical applicability, this

context is favorable for the development and support of the participants' self-esteem which is, at the same time, the key towards success and progress.<sup>28</sup>

Overall, students generally expressed a marked increase in confidence and a greater sense of preparedness for starting their clinical practice. This underscores the possible benefits of utilizing structured simulations alongside practical experiences to bridge foundational knowledge with real-world clinical application. Such findings align with existing literature that support the incorporation of simulation into medical education to enhance readiness for clinical roles.<sup>29</sup>

Even one-day workshops encompassing multidisciplinary can significantly enhance confidence and skills acquisition, especially in crucial areas such as task prioritization and managing acutely ill patients. These programs equip students with technical expertise and strengthen their mental preparedness for the challenges of early clinical practice, aiding in a more seamless transition into foundational roles.<sup>30</sup> Additionally, we noted that final-year students exhibited more extraordinary perceptiveness and demonstrated more substantial improvement compared to those in years 4 or 5.

While these workshops may not entirely mimic the unpredictability and responsibilities of real clinical settings, this one-day multidisciplinary workshop is a valuable complement. It offers opportunities for repeated practice and reflection in essential areas, which can help alleviate initial stress during medical duties, boost self-confidence in medical students, and enhance their skills in prioritization, self-assessment, teamwork, leadership, and medical knowledge.

## Study Limitations

A few limitations in this study must be considered when analyzing the findings. Firstly, the study's design offered merely a momentary view of student knowledge, self-confidence, and self-assessed non-technical skills at one moment. Depending on self-reported data could introduce social desirability bias. Furthermore, self-evaluations may not accurately represent actual competence, as they might be swayed by personal perception, overestimating or underestimating abilities, or a lack of insight into one's actual skill level.

## Conclusion

This study demonstrated that the one-day multidisciplinary workshop increases medical students' confidence by refining their communication skills, broadening their understanding of different roles in healthcare, and improving their ability to collaborate effectively. In addition, it enriches their knowledge by exposing them to diverse perspectives and promotes essential teamwork skills crucial for achievement in the medical profession. Such design workshops are vital steps in the development of well-trained health professionals capable of contributing significantly to interdisciplinary teams.

## Institutional Review Board Statement

Ethical review and approval were waived for this study due to the anonymized data collection for this non-interventional study.

## Data Sharing Statement

Data and materials can be provided at reasonable requests to the corresponding author.

## Informed Consent

Informed consent was obtained from all participants involved in this study.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.



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## Disclosure

The authors declare no conflicts of interest in this work.

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