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Research Paper

The Effect of Journaling on the Clinical Reasoning of Surgical Technologist Students: An Interventional Quasi-Experimental Study

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ABSTRACT

Aims Clinical reasoning (CR) is considered one of the most important abilities required in medical sciences. The development of CR and decision-making skills requires innovative and comprehensive educational strategies. One proposed method in this field is journaling. This study aimed to investigate the impact of journaling on clinical education on the CR of surgical technology students.

Materials & Methods In this interventional study, 27 surgical technology students participated after providing informed consent. All internship students were included using a census method and randomly allocated to intervention and control groups. The control group underwent standard clinical training, while the intervention group received training based on journaling. The Self-Assessment of Clinical Reflection and Reasoning CR self-assessment questionnaire was employed to assess CR before and after the intervention. Data were analyzed using SPSS software (version 19). A paired t-test was used to compare CR scores before and after the intervention. An independent t-test was used to compare the groups.

Findings The students' age mean ± SD was 21.55 ± 1.64. Most participants (70.4%) were female, and 88.8% were single non-residents. The results indicated a statistically significant difference after the intervention ($P = 0.0001$). The journaling group exhibited a higher mean CR level. Initially, CR levels were unfavorable in both groups. After the intervention, improvements were observed in groups, with 92.9% of the control group and 76.9% of the journaling group demonstrating average and favorable reasoning, respectively.

Conclusion Journaling significantly improved CR scores in the intervention group compared to those in the control group ($P < 0.001$); 76.9% of participants in the intervention group achieved favorable levels, compared to an average of 92.9% in the control group. This clinically meaningful enhancement demonstrates that reflective journaling during clinical internships—beyond technical skill acquisition—strengthens error analysis, logical reasoning, and preparedness for high-stakes operating room challenges.

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Introduction

Recent advances in educational technology have transformed teaching and learning in medical sciences. For example, mobile learning can enhance students' academic performance and self-regulation [1]. The most important and fundamental part of medical science training programs is clinical training, and a significant amount of time is devoted to it [2]. In many medical science programs, one-third to half of undergraduate training is devoted to clinical education. During clinical placements, students gain bedside experience and learn to solve patients' problems using experience and logical reasoning. Clinical education is often described as the 'heart' of professional training because it shapes students' professional identity [2, 3].

Paying attention to clinical education in medical sciences is particularly crucial. Due to environmental and work conditions, clinical instructors face new challenges in designing educational strategies to actively involve learners in learning experiences. Unstable clinical conditions require staff with the ability to make appropriate decisions and high-level thinking and reasoning skills. Acquiring critical thinking and clinical reasoning (CR) skills leads to positive outcomes such as patient-centered and effective care, creativity, evidence-based practice, and staff professionalism, and operating room technologists are no exception [3]. CR is a core component of clinical competence and is regarded as one of the most essential abilities in medical education [3]. Reasoning is a thinking process in which primary conditions are transformed into secondary or desired conditions by processors [4]. It guides the person from the signs and symptoms of the patient to the correct diagnosis, treatment, and care of patients with wise and purposeful decisions [4]. Despite its importance, few curricula emphasize CR development [5, 6]. Failure to solve clinical problems correctly leads to diagnostic and treatment errors, which are often irreparable and lead to the death of the patient. Therefore, teaching CR and improving it are vital [7].

Despite its importance, promoting CR faces many challenges. Current curricula often lack structured programs to teach and strengthen this skill, and there is no widely accepted 'gold standard' approach to its development among medical educators [4, 7]. Universities implement CR only for medical students and student Olympiads, and it has not yet been discussed in the fields of nursing or the operating room [8].

Although medical school curricula increasingly emphasize modern educational methods, traditional lecture-based approaches still dominate in many medical universities [9, 10]. Traditional teaching methods mainly focus on delivering large amounts of theoretical information. However, graduates may still struggle to solve practical problems in real clinical settings. These methods rarely help students analyze, prioritize, and organize new knowledge. Such skills are essential for higher-order thinking, clinical reasoning, and effective learning [11]. It is necessary to adopt new inclusive educational methods to advance CR and enhance medical students' decision-making power. One proposed method in this field is journaling [12]. Journaling, a structured reflective writing practice, involves students documenting clinical experiences at shift end, analyzing performance (strengths/errors), expressing emotions, and developing action plans for future improvement [12]. It is believed that writing about one's clinical experiences and revisiting these events can strengthen reasoning and decision-making in similar future situations [13]. Through event recording, students learn that writing helps organize ideas, and non-critical feedback deepens students' understanding. Although experience alone does not always lead to learning, the integration of experience and thinking turns it into learning and knowledge [11, 12]. Journaling is an experience during which people regain their experience, think about it, and analyze and evaluate it [12, 14]. Sharing experiences improves knowledge, and people skills enhance performance quality and can improve the effectiveness of clinical training. In sharing experiences, one evaluates one's performance, and there is optional reporting of errors. Therefore, this work prevents future errors and increases the security of care performance [13].

Given the special conditions of the operating room and the impossibility of experiencing all surgical procedures during the student period, this method may help improve students' skills and CR. Considering the importance of thoughtful event recording, sharing experiences, and clinical care situations, no studies were conducted in this field. Therefore, the present study was designed to determine the impact of journaling on the CR of surgical technology students.

Materials and Methods

The present study was of the interventional (quasi-experimental) type. The statistical population consisted of 27 students in the eighth semester of operating room technology at Gonabad University of Medical Sciences, Gonabad, Iran, in the second semester of 2022-2023. Census sampling was employed, and participants were randomly assigned to intervention (n = 13) and control (n = 14) groups. After obtaining the code of ethics, IR.GMU.REC.1400.194, the study started. The ethical principles used in this research were the right to choose to participate and withdraw from the study, informed consent to enter and continue the study, and confidentiality of information. The inclusion criteria were that the undergraduate students in the operating room must be studying in the eighth semester, have a desire to enter the study, have not yet been trained in these two methods, or have not participated in a workshop in this field. The exclusion criteria included the absence of more than two internship sessions and unwillingness to continue studying.

The research tool was the Self-Assessment of Clinical Reflection and Reasoning (SACRR) questionnaire. This questionnaire is a validated tool for self-assessing clinical reflection and reasoning skills, developed by Royeen, Mu, Barrett, and Luebben in 2001. It has 26 items rated on a 5-point Likert scale from 5 (completely agree), 4 (agree), 3 (undecided), 2 (disagree), to 1 (completely disagree). The maximum score was 130, and the minimum score was 26. Questionnaire scores between 26 and 60 were considered unfavorable CR, 61 and 95 as medium, and 96 and 130 as favorable. This tool has been examined in various studies, and its validity has been confirmed. The internal reliability of the tool has been confirmed with Cronbach's alpha of 0.92 [5, 15]. Researchers translated this tool, and its validity was again confirmed with content and face validity. In this way, the translated questionnaire was provided to 8 relevant academic staff members, and the proposed revision was made. Cronbach's alpha was employed to assess the tool's reliability ($\alpha = 0.76$).

At the start of the semester, a meeting was conducted to explain the research objectives to the students. With their consent, the SACRR questionnaire was administered. The students were randomly assigned to two internship groups: intervention (journaling) and control groups. The intervention group underwent journaling-based training during the internship, while the control group received traditional training. The journaling group received guidance on presenting journaling and sharing experiences at the bedside during a session. The journaling process involved six stages: description of the situation, expression of feelings, analysis of the incident, conclusion, action plan, and final learning [16]. At the end of each internship shift and after surgery completion, the student was required to document their experience, detailing the tasks performed as a scrub or circulating nurse, noting any errors, and expressing their emotions. They were then expected to analyze the events, assess their performance, outline ways to enhance their skills in similar scenarios, and submit this information to the instructor. After the internship, during the final 30 minutes, students, under the instructor's guidance, recounted the situation and events, detailing their roles and sharing their individual experiences. A narrative approach was used to share experiences; each student expressed their experiences and discussed them with peers and the instructor. Subsequently, oral assessments were conducted to evaluate the student's comprehension. Notably, the journaling-based training comprised two rotations for each student - one in a scrub position and the other in a circular position. A total of 54 journaling sessions were conducted for this group, with meetings held in the operating room at the shift's end and lasting 30-45 minutes. Following the semester and the final internship session, students were presented with the SACRR questionnaire again. The training groups were overseen by a single instructor, with strict instructions for each group to maintain confidentiality and not share information or notes with the other group. To ensure educational justice, all journaling group information and techniques were later shared with the control group after the research.

The control group received standard clinical training, which involved attending operating room internships, observing and performing duties as scrub and circulating nurses, and receiving routine guidance from the instructor without using structured reflective methods. This educational approach was implemented based on the standard curriculum of Gonabad University of Medical Sciences and included two internship rotations (one for scrub and one for circulating nurses) for each student, without written documentation of experiences or reflective group discussions at the end of each shift. The instructor of the control group was the same as the instructor of the intervention group to control for teaching variables, and journaling information was provided to this group after the study to promote educational equity.

SPSS software (version 19) was used for data analysis. Descriptive statistics, including frequency distribution, mean, and standard deviation, were used to describe the research units. The Shapiro-Wilk test was used to determine the normality of quantitative variables and CR scores. A paired t-test was used to compare the average CR scores before and after the intervention in each group. An independent t-test was used to compare the groups (intervention and control groups). The significance level was set at $P < 0.05$.

Results

The study population comprised all 27 eighth-semester operating room students. The mean and standard deviation of the students' ages were 21.55 ± 1.64 (minimum 19, maximum 26). The majority of research units (70.4%) were female, 88.8% were non-resident and single. None of the students was excluded from the study. According to the Shapiro-Wilk test, except for age, the other quantitative variables in the study did not follow a normal distribution ($P < 0.05$). The two groups were homogeneous in terms of age, sex, and marital status ($P > 0.05$). According to the findings of this study, the mean and standard deviation of the CR score before the intervention in all students were 58.25 ± 4.02, while after the intervention, it increased to 87.74 ± 20.29.

As shown in Table 1, the Wilcoxon test indicated a significant difference in CR between the journaling group before and after the intervention ($P = 0.001$). In other words, the mean and standard deviation of CR increased significantly after the intervention compared to before. Also, the results showed that the CR in the control group differed significantly before and after the intervention ($P = 0.001$). In other words, the mean and standard deviation of reasoning increased significantly after the intervention compared to before. In the between-group comparison, the Mann-Whitney test indicated no significant difference in CR between the two groups before the intervention ($P = 0.903$). Reasoning after the intervention showed a significant difference between the two groups ($P = 0.001$). In other words, CR in the journaling group had higher means and standard deviations. No significant relationship was found between CR and demographic variables ($P > 0.05$).

Table 1. Comparison of the Average Clinical Reasoning (CR) Scores Before and After the Intervention Within the Group and Between the Two Groups

Variable	Control Group	Journaling Group	Mann-Whitney Test Result
CR before the intervention	58.35 ± 4.16	85.15 ± 4.03	Mann-Whitney U = 88.50 Z = -0.12 *P* value = 0.903
CR after the intervention	69.14 ± 4.34	107.76 ± 5.83	Mann-Whitney U = 00 Z = -4.42 *P* value = 0.001
Wilcoxon test result	Z = -3.306 *P* value = 0.001	Z = -3.181 *P* value = 0.001	

A. Within-Group Comparisons (Wilcoxon Signed-Rank Test)

Group	Pre (Mean± SD)	Post (Mean± SD)	Z	*P*-value
Journaling (n = 13)	85.15 ± 4.03	107.76 ± 5.83	-3.181	< 0.001
Control (n = 14)	58.35 ± 4.16	69.14 ± 4.34	-3.306	< 0.001

B. Between-Group Comparisons (Mann-Whitney U Test)

Time Point	Journaling	Control	U	Z	*P*-value
Pre-intervention	58.35 ± 4.16	58.35 ± 4.16	88.50	-0.12	0.903
Post-intervention	107.76 ± 5.83	69.14 ± 4.34	0	-4.42	<0.001

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The CR level of the majority of the research units in both groups before the intervention was unfavorable, and none of the students had a favorable CR. While the students' CR level improved in both groups after the intervention, in the control group, 92.9% of students had average reasoning, and only one person (7.1%) had unfavorable reasoning. In the journaling group, after the intervention, 10 people (76.9%) had favorable reasoning, and three people were at an average level. In this group, there was no unfavorable reasoning after the intervention (Table 2).

Table 2. Distribution of the Absolute and Relative Frequency of Research Units (27) in Two Groups According to the Level of Clinical Reasoning (CR) Before and After the Intervention

	Level of CR* Before the Intervention (No. [%])	
	Control Group	**Journaling Group**
Favorable	0	0
Medium	4 (28.6)	2 (15.4)
Unfavorable	10 (71.4)	11 (84.6)
	Level of CR* After the Intervention (No. [%])	
Favorable	0	10 (76.9)
Medium	13 (92.9)	3 (23.1)
Unfavorable	1 (7.1)	0
Total	14	13

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Discussion

The data analysis results indicated that the CR of most surgical technology students before the intervention was at an unfavorable and average level, and none of the students had a favorable CR. This finding is consistent with the results of the study by Sohrabi et al. [17], Akhoundzadeh et al. [18], and the study by Hasanpour et al. [19], who also reported that students' CR was at an unfavorable level before the intervention. The low total CR score in the present study and in some other studies requires a deeper investigation of the causes and related factors. The main goal of all medical science jobs is to provide the highest quality services to patients in all biological, psychological, and social areas. Therefore, poor CR can affect the decision-making of surgical technology students in critical situations and lead to unfavorable services. Yousefichaijan et al. discovered that a short-term workshop on improving CR is effective in enhancing medical students' problem-solving skills [6]. Also, Delavari et al. showed that theory-driven educational strategies have an impact on developing CR in medical students and interns [20].

The data analysis of the present study indicated the positive impact of journaling on CR. In this way, CR increased significantly at the end of the semester, after the intervention, compared to before the intervention. In the control group, CR increased after the end of the semester, indicating a positive effect of clinical training, but none of the students achieved a high, favorable level of CR.

Also, the results showed a statistically significant difference between the two groups in CR improvement. This finding is consistent with Sindhu's [13] and Smith's [14] research. In their studies, they investigated the consequences of journaling on students' clinical judgment and decision-making. The results showed that journaling can promote and cultivate clinical judgment, improve instructor-student communication, and strengthen students' critical thinking [13]. Klitgaard's study found that journaling and writing experiences, including recounting and reflecting on them, improve students' self-awareness, decision-making, and professionalism [21]. Elven et al. also concluded in their grounded theory study that journaling can improve the CR of midwifery students [22]. Also, Sindhu et al. confirmed the effect of journaling on nursing students' critical thinking during the internship

[13]. Oluwatoyin showed that reflective performance and rethinking lead to learning from experience, thereby improving the stability of learning [23].

Notably, the control group also demonstrated significant improvement in CR post-intervention, with 92.9% achieving average reasoning levels, compared to unfavorable pre-intervention scores. This improvement likely reflects the inherent benefits of clinical internship experience, in which operating room students gain hands-on exposure to real surgical procedures, patient interactions, and supervised decision-making opportunities. Even traditional training provides essential experiential learning through bedside practice, which naturally enhances CR over time. However, the journaling group achieved superior outcomes (76.9% favorable reasoning), demonstrating the added value of structured reflection beyond routine clinical exposure. This clarifies that while clinical experience alone improves CR, reflective journaling provides additional, statistically superior enhancement.

Unfortunately, in the medical sciences, due to the increasing number of required course materials, less importance is given to training in clinical thinking, reasoning, and decision-making, and even less attention is paid to evaluation. Most students perform their clinical tasks routinely and without thinking. The progress and growth of medical knowledge, along with the different, new, and unexperienced situations that the treatment staff may encounter at any moment, require personnel with strong reasoning, judgment, and decision-making skills. Students can use these skills to deal correctly with new situations to reduce the possibility of errors. The operating room is full of conditions that have not been experienced. Something new and unexpected may occur during surgery, creating a challenge for therapeutic care. Therefore, CR is particularly crucial for operating room personnel.

According to this study's findings, journaling appears to handle this task well and improve the strength and skills of CR students. In journaling, "experience after experience" is obtained. Following the clinical work and care performance, the student has an opportunity to reflect on their performance, identify their strengths and weaknesses, and seek to eliminate deficiencies. The point to consider is that the development of CR is a process that unfolds over time and requires conscious involvement in thinking and rethinking in practice. This process is not linear and short-term. Therefore, it should be considered by professors during the undergraduate course. Targeted use of strategies to promote CR guides individual learning and facilitates permanence and continuity of learning. In general, to improve the CR of students, the following can be helpful: the use of active and comprehensive methods in theory teaching, emphasis on rethinking after completing the internship and reviewing the activities performed, guiding the student, and helping self-control in clinical education, the use of different thinking strategies in the hospital, such as journaling, and combining journaling with other effective methods, such as journal clubs. In the present study, due to the low number of surgical technology students, it was not possible to study on a larger sample. Therefore, it is suggested that the mentioned teaching methods be investigated in future studies with a larger sample size and across several academic semesters.

Conclusion

This study demonstrates that structured reflective journaling significantly improves CR among operating room students during clinical internships. The intervention group achieved higher CR scores compared to the control group. Enhanced CR through deliberate reflection on errors, emotions, and action planning directly translates to fewer intraoperative decision-making errors, improved patient safety, and better crisis management in dynamic operating room environments. Journaling is a low-cost, scalable intervention requiring minimal resources. Operating room curricula should incorporate regular reflective practice alongside technical skill training to maximize both competence and patient safety outcomes. These findings advocate for reflective journaling as an essential component of perioperative education, bridging the gap between routine clinical exposure and expert-level clinical reasoning proficiency.

Ethical Considerations

Compliance with ethical guidelines

This article is part of an approved research project (number: 837) of Gonabad University of Medical Sciences, Gonabad, Iran, under the code of ethics IR.GMU.REC.1400.194. The study purpose and importance were explained to participants. Participants were also assured that their data would remain confidential and that they could withdraw from the study at any time.

Authors' contributions

All authors contributed equally to the work.

Conflicts of interest

The authors declared no conflicts of interest.

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References

1. Ahmady S, Khajeali N, Kohan N, Zarei A, Biswas B, Barzegar M, et al. Medical students' perception of mobile learning during COVID-19 in Iran: a national study. PLoS One. 2024;19(10):e0308248. [DOI: 10.1371/journal.pone.0308248] [PMID] [PMCID]

2. Zohar DN, Robinzon V, Loebenstein R, Levy Y, Shapira S, Maggio N, et al. Increasing medical students clinical training capacity through the establishment of dedicated academic out-patients clinics: the case of NAC—neurology academic clinic in a tertiary medical center. J Med Educ Curric Dev. 2025;12:23821205251335134. [DOI: 10.1177/23821205251335134] [PMID] [PMCID]
3. Araújo B, Gomes SF, Ribeiro L. Critical thinking pedagogical practices in medical education: a systematic review. Front Med (Lausanne). 2024;11:1358444. [DOI: 10.3389/fmed.2024.1358444] [PMID] [PMCID]
4. Durning SJ, Jung E, Kim DH, Lee YM. Teaching clinical reasoning: principles from the literature to help improve instruction from the classroom to the bedside. Korean J Med Educ. 2024;36(2):145-55. [DOI: 10.3946/kjme.2024.292] [PMID] [PMCID]
5. Yazdani S, Mardani S, Hosseini Abardeh M, Habibi A. The effect of Bayesian reasoning training on the results of clinical reasoning tests of interns. Res Med Educ. 2021;13(4):25-34. [Link]
6. Ishizuka K, Shikino K, Takada N, Sakai Y, Ototake Y, Kobayashi T, et al. Enhancing clinical reasoning skills in medical students through team-based learning: a mixed-methods study. BMC Med Educ. 2025;25(1):221. [DOI: 10.1186/s12909-025-06784-w]
7. Putman HP 3rd. Clinical reasoning, medical error, and treatment failure. Curr Res Psychiatry. 2025;5(1):9-16. [DOI: 10.46439/Psychiatry.5.036]
8. Leal P, Poeira A, Mendes DA, Batalha N, Franco H, Nunes L, et al. Teaching and learning clinical reasoning in nursing education: a student training course. Healthcare (Basel). 2024;12(12):1219. [DOI: 10.3390/healthcare12121219] [PMID] [PMCID]
9. Khedmatizare M, Aghabarary M, Norouzinia R, Moosavipour M. Clinical education status and factors affecting effective clinical education from the viewpoints of nursing students in Alborz University of Medical Sciences in the year 2020. J Nurs Educ (Tehran). 2020;9(5):20-32. [Link]
10. Karkera S, Devendra N, Lakhani B, Manahan K, Geisler J. A review on modern teaching and learning techniques in medical education. EIKI J Eff Teach Methods. 2024;2(1). [DOI: 10.59652/jetm.v2i1.128]
11. Falasi M. Innovative pedagogies: a comparative analysis of traditional and modern teaching methods. Acad Educ Leadersh J. 2024;28 Suppl 1:1-2. [Link]
12. Lama A. Reflective teaching journals as an effective embedded formative assessment process of teaching skill development confidence in a longitudinal medical student-as-teacher elective. Med Sci Educ. 2023;33(6):1493-503. [DOI: 10.1007/s40670-023-01938-1] [PMID] [PMCID]
13. Sindhu R. Effectiveness of reflective journaling on clinical decision-making skills among nursing students. Int J Adv Res Nurs. 2025;8(1):299-302. [DOI: 10.33545/nursing.2025.v8.i1.D.474]
14. Smith T. Guided reflective writing as a teaching strategy to develop nursing student clinical judgment. Nurs Forum. 2021;56(2):241-8. [DOI: 10.1111/nuf.12528] [PMID]
15. Kameli S, Aliyari S, Habibi H, Pishgooie S. The effect of teaching clinical reasoning on critical thinking of undergraduate nursing students taking the course of emergency nursing in disasters and events: a preliminary study. Mil Caring Sci J. 2019;6(3):207-14. [DOI: 10.29252/mcs.6.3.6]
16. Dhollande S, Shepheard J, Barnard C. Reflective models used in undergraduate health programs: a scoping review. Teach Learn Nurs. 2026;21(1):e313-e320. [DOI: 10.1016/j.teln.2025.08.011]
17. Sohrabi Z, Ramezanpour E, Rashidi N, Nouri KZ, Nosrati S, Barry A, et al. Improving scrub and circulating skills in operating room students: a quasi-experimental study on the influence of reflective education. J Med Educ Dev. 2024;17(54):21-30. [DOI: 10.61186/edcj.17.54.21]
18. Akhoundzadeh K, Ahmari Tehran H, Salehi S, Abedini Z. Critical thinking in nursing education in Iran. Iran J Med Educ. 2011;11(3):210-21. [Link]
19. Hasanpour M, Hasanzadeh A, Ghaedi Heidari F, Bagheri M. Critical thinking skills of nursing students. Iran J Nurs. 2015;28(93):22-31. [DOI: 10.29252/ijn.28.93.94.22]
20. Cahyaningrum YD, Suhoyo Y, Rahayu GR. Facilitating clinical reasoning for medical students in clinical settings: a scoping review. Korean J Med Educ. 2025;37(2):163-186. [DOI: 10.3946/kjme.2025.333] [PMID] [PMCID]
21. Klitgaard TL, Guldberg TL, Kristensen JK. Exploring medical students' reflections and well-being during clinical training: a qualitative study of peer reflecting teams. BMC Med Educ. 2025;25(1):1456. [DOI: 10.1186/s12909-025-07905-1] [PMID] [PMCID]
22. Elvén M, Welin E, Wiegleb Edström D, Petreski T, Szopa M, Durning SJ, et al. Clinical reasoning curricula in health professions education: a scoping review. J Med Educ Curric Dev. 2023;10:23821205231209093. [DOI: 10.1177/23821205231209093] [PMID] [PMCID]
23. Yang Q, Zou W. The impact of reflective practice on the development of nursing undergraduate students. BMC Med Educ. 2025;25(1):880. [DOI: 10.1186/s12909-025-07490-3] [PMID] [PMCID]