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Developing a Clinical Leadership Competency Framework for Surgical Residents: A Qualitative Study

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Abstract

Background: Competency-based medical education reflects an approach that prepares students according to defined competencies necessary to meet specific needs. Leadership, described as a fundamental competency and a process of influence, underpins being a "good physician" and is essential for a system that supports high-quality health and healthcare. Given the importance of clinical leadership, this study aimed to develop a framework of clinical leadership competencies specifically tailored for surgical residents.

Methods: This qualitative study employed a conventional content analysis approach. Participants included surgical specialists from the Iran University of Medical Sciences, who were purposively sampled. Data were collected through semi-structured interviews and analyzed using the inductive content analysis method as described by Graneheim and Lundman.

Results: A total of 15 participants were included in the study. Codes were extracted from meaning units and classified into subcategories based on shared themes or concepts. Analysis of the interview data yielded 121 codes, 26 subcategories, 10 categories, and 3 overarching domains (themes). Among the identified categories, "Technical and Non-Technical Skills," "Leadership and Management of Interprofessional Teams," and "Organizational Optimization and Transformation" carried the most significant weight. Based on these three main domains, a clinical leadership competency framework was developed for surgical residents.

Conclusion: The framework developed in this study provides a structured approach to integrating clinical leadership training into surgical residency curricula, which is crucial for enhancing healthcare performance and improving patient care outcomes.

Keywords: Clinical Leadership, Competency, Surgery, Surgeon, Surgical Residents, Medical Education

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Introduction

As pivotal institutions in healthcare systems, hospitals exhibit unparalleled organizational complexity (1). In the current era, advancing patient safety and care standards requires health practitioners to acquire specialized skills, mandating innovative leadership strategies to navigate this paradigm shift (2). Notably, the Royal College of Physicians and Surgeons of Canada restructured its CanMEDS competency framework, redefining the traditional 'Manager' role as 'Leader.' This modification highlights the criticality of cultivating leadership expertise in medical training, signaling an adaptive response to modern healthcare demands by embedding leadership into physicians' core professional identity (3). This heightened focus reflects the shifting paradigm of clinical practice, where expanding

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↑What is "already known" in this topic:
International frameworks, such as the NHS (UK), CanMEDS (Canada), and Health LEADS (Australia), have guided leadership training in medical education to enhance healthcare quality. In Iran, studies—primarily based on these models—have explored clinical leadership skills, challenges, and improvement strategies, highlighting its vital role in hospital and health system performance.

→What this article adds:
This study presents an innovative, locally adapted competency framework for clinical leadership in surgical residents, highlighting individual competencies, interprofessional team leadership, and strategic management of the operating room. The framework provides a structured approach for developing both technical and non-technical skills, enhancing team performance and patient care.

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roles and diversified responsibilities necessitate a broader repertoire of competencies among healthcare practitioners. Contemporary definitions position clinical leadership as a composite skill set encompassing effective team coordination, adaptive communication across varied clinical settings, exemplary professional conduct, and well-developed emotional intelligence - all now regarded as indispensable attributes for modern physicians (4) .The critical importance of clinical leadership becomes particularly evident in operating room environments, where multidisciplinary teams comprising surgeons, surgical residents, anesthesiologists, anesthesia technicians, surgical technologists, and nurses must collaborate seamlessly to ensure successful surgical outcomes and optimal patient care (5). Effective leadership in these settings serves as a cornerstone for both delivering high-quality patient care and maintaining a safe, efficient clinical workspace (6).

Paradoxically, studies show that while healthcare professionals attain considerable clinical expertise, most demonstrate limited proficiency in clinical leadership competencies (7). This gap persists essentially because leadership development receives insufficient attention throughout medical education and residency training programs (8). For example, Jardine et al. reported in their study that Surgical residents frequently assume leadership responsibilities in patient care management, yet their formal training rarely includes systematic instruction on team leadership principles, nor does their evaluation typically assess these crucial skills (9). Supporting this concern, a 2015 study revealed significant gaps in new graduates' readiness to undertake clinical leadership roles (10).

Compounding this issue, scholarly evidence indicates that the selection and implementation of optimal leadership training methodologies encounter significant obstacles when attempted without the foundation of established supportive frameworks and validated assessment mechanisms (11). A review of the literature indicates that Many countries now have national clinical leadership frameworks for physicians, such as the UK Clinical Leadership Competencies Framework (CLCF) (12), Canada's CanMEDS (13), and Australia's Health Leads Framework (14). Such frameworks are valuable as a starting point for leadership training and professional development (15) and provide the necessary changes to address future challenges, as well as to develop the leadership competencies required for physicians to engage more actively in the planning, delivery, and transformation of healthcare services (16).

In Iran, most research in the field of clinical leadership has focused on identifying managerial skills, challenges, improvement strategies, and the relationship between clinical leadership and hospital performance indicators, primarily based on frameworks developed in other countries, such as the UK National Health System (NHS) (17-19).

Existing studies indicate that unfamiliarity with management concepts and their limited application in clinical processes are among the factors contributing to challenges and a sense of gaps in professional performance (18). Furthermore, the necessity of strengthening leadership components within medical residency program curricula has been emphasized (20). While the official medical education curriculum in Iran may not yet fully equip students with the managerial and leadership skills required in clinical settings, the development of leadership curricula and a focus on enhancing leadership competencies in medical education and healthcare systems are considered essential (19). Accordingly, the identified gap in formal residency training and the lack of a localized framework tailored to Iran's medical education system underscore the need to design a comprehensive and structured framework to cultivate clinical leadership competencies. In response to this educational need, the present study was developed to create a clinical leadership competency framework specifically for surgical residents at Iran University of Medical Sciences. This initiative aims to address both educational and practical surgical needs, while simultaneously bridging the critical gap in medical education.

Methods

This was a qualitative study of a conventional content analysis type conducted in 2024 at Iran University of Medical Sciences .The participants in this study, including surgeons, were selected through purposive sampling, taking into account the diversity in the surgical field. Qualitative methodologies were specifically chosen for their capacity to generate an in-depth understanding of complex phenomena and uncover latent conceptual patterns, making them particularly valuable for framework development in medical education research (21). Data analysis was conducted using conventional content analysis and the Graneheim and Lundman approach. This method consists of 5 steps as follows: (1) Writing down the entire interview immediately after each interview; (2) Reading text as the whole to achieve a general understanding of its content; (3) Determining semantic units and primary codes; (4) Categorizing similar primary codes into more comprehensive categories; and (5) Determining the content hidden in the data and extracting the central theme (22).

Before the interviews began, participants were provided with a research information sheet. This sheet included a summary of research information, such as the study topic and objectives. Interview questions were designed to be open-ended and aligned with the study's goals and the findings of the literature review. Interviews were conducted individually, with the participants' consent, and recorded. In cases where participants refused to be audio-recorded, their responses were recorded. Participation in the study was voluntary, and all participants had the right to withdraw from the study at any stage of the research process. Interviews were conducted with surgical specialists at their workplace in the hospital and in the break room, in a quiet and appropriate environment to minimize interference with patient care and the data collection process. Data saturation occurs when no new information emerges during data collection, and the researchers only encounter cases that confirm and validate previous findings while collecting and updating the extracted data. Based on this principle, the researchers reached data saturation after interviewing 13 participants, but continued interviews with two more participants to ensure data saturation.

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The interview process began with carefully structured guiding questions designed to explore participants' experiences with clinical leadership. Key questions included: "What have been your experiences working with clinical leaders in your practice environment?" and "How would you describe the roles that clinical leaders play in your workplace?" Additionally, participants were asked: "Based on your professional experience, either serving as a clinical leader or working with those in such roles, what specific characteristics and competencies have you observed in effective clinical leaders?" Throughout the interviews, follow-up probing questions were used to clarify and expand upon responses. These included requests such as "Could you please elaborate on that point?" and "Would you be able to provide a concrete example?" These techniques helped ensure a comprehensive understanding and rich discussion of all relevant concepts.

Following data collection, a systematic approach was employed for data processing and analysis. All interview responses were carefully documented, transcribed verbatim, and then coded before being organized into meaningful thematic categories. The research team followed a structured protocol: one primary researcher (ER) conducted all individual interviews, while three investigators (E.R., Z.S., and L.S.) participated in the subsequent transcription process, thorough review of materials, coding procedures, and comprehensive analysis. The research team brought valuable multidisciplinary perspectives to the study, with backgrounds in healthcare education, nursing, and clinical medicine, as well as significant experience in qualitative research methodologies. Importantly, all team members confirmed they had no potential conflicts of interest or preconceived biases regarding the research topic. These precautions served to protect participant privacy while minimizing any potential external influences on responses, thereby creating optimal conditions for open, honest discussion and ensuring the highest standards of research ethics were maintained throughout the study.

Data Credibility

In this study, 4 criteria proposed by Guba and Lincoln (23) credibility, dependability, confirmability, and transferability were employed to enhance the validity and precision of the data. To ensure methodological rigor, the researchers engaged in prolonged immersion during the interview process, actively collaborating with participants to collect authentic data and subsequently validating the findings with them. To bolster credibility, the researchers immersed themselves in the data through iterative review of interview transcripts and sustained interaction with participants. Member checking was utilized to validate the data further, ensuring alignment between participants' perspectives and the interpreted results. For dependability, a peer review process was implemented during the data analysis phase, incorporating feedback from domain experts to scrutinize methodological consistency. Additionally, interview transcripts and emergent data were used to ensure methodological rigor. The research findings underwent independent verification by 2 qualitative research experts who audited the analytical procedures and validated the results. Confirmability was further reinforced through systematic integration of feedback from faculty members, incorporating their critical assessments throughout the research process. Finally, to optimize the study's transferability, a detailed account of the methodological framework was meticulously documented, allowing for a thorough evaluation of the findings and their potential applicability to comparable settings.

Results

The study participants consisted of 15 surgeons practicing at teaching hospitals affiliated with the Iran University of Medical Sciences. The cohort consisted of 10 males (66.7%) and 5 females (33.3%). Additional demographic characteristics of the participants are presented in Table 1.

Through rigorous content analysis of interview data, researchers systematically identified 1443 initial codes, which were subsequently consolidated through constant comparative analysis. This iterative refinement process involved merging analogous codes, ultimately yielding 121 distinct codes. Through careful examination of conceptual relationships, these codes were organized into 26 coherent subcategories. Further analytical synthesis of these subcategories revealed 10 broader categories, from which three core thematic domains emerged as the study's principal findings. The complete coding structure, including subcategories, categories, and emergent themes, is presented in Table 2. Additionally, Figure 1 illustrates the derived "Clinical Leadership Competencies Framework for Surgical

Table 1. Demographic Characteristics of Participants

Participant ID	Sex	Academic Rank	Specialty	Clinical Experience
P1	Male	Assistant Professor	Orthopedic surgery	6 years
P2	Male	Assistant Professor	Neurosurgery	9 years
P3	Male	Associate Professor	General surgery	22 years
P4	Female	Assistant Professor	Gynecological surgery	11 years
P5	Male	Associate Professor	Cardiovascular Surgery	15 years
P6	Male	Professor	Neurosurgery	20 years
P7	Female	Assistant Professor	Ophthalmic Surgery	9 years
P8	Male	Assistant Professor	Plastic & Reconstructive Surgery	12 years
P9	Female	Associate Professor	Otorhinolaryngology Surgery	10 years
P10	Female	Professor	General surgery	18 years
P11	Male	Assistant Professor	Orthopedic surgery	8 years
P12	Female	Assistant Professor	Gynecological surgery	13 years
P13	Male	Associate Professor	General surgery	15 years
P14	Male	Assistant Professor	Ophthalmic Surgery	7 years
P15	Male	Assistant Professor	Cardiovascular Surgery	10 years

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Table 2. Subcategories, Categories, and Themes

Sub-category	Category	Themes
Scientific and practical expertise		
Evidence-based medicine		
The leader's professional and technical superiority over colleagues		
Development of clinical and surgical strategies		
treatment based on a comprehensive understanding of the patient	Technical and Non-Technical Skills	
specialized capabilities of the leader in surgical emergencies		
Continuous Learning and Self-Empowerment	Personal and Professional Growth and Development	
Personal Growth and Character Development		
Psychological and Personality Traits	Individual Dimensions in Leadership	Individual competencies of clinical leadership
Individual Behaviors and Capabilities		
Structuring and Managing Team Performance	Leader's Abilities in Organizing and Managing Teamwork	
Management of Surgical Team Operations in Emergency Settings		
Empowerment and Development of Team Members	Ethical and Professional Competencies	
Professional Ethics		Intra and Interprofessional Networking in the Operating Room
The Leader's Mentoring Role in Experiential Learning and Team Feedback	Educational Leadership in the Operating Room	
Creating Teaching-Learning Opportunities in the Operating Room		
Clinical Strategies in Interprofessional Leadership	Leadership and Management of Interprofessional Teams	
Interprofessional Leadership Capabilities		
Intra-team communication	Communication Skills	
organizational and inter-organizational communication		
communication with patients and their companions		
facilitating change and transformation	Organizational Optimization and Transformation	Intelligent Leadership of the Operating Room Toward Excellence
continuous improvement of human resources services		
organizational leadership	Leadership Strategies for Equipment Management and Team Interactions	
in the operating room		
Resource and Equipment Management		
Conflict Management		

Residents," which encapsulates the study's key theoretical contributions.

Data Description

Based on the analysis of the interview data, three main themes were extracted as follows:

- Individual competencies of clinical leadership
- Networking of intra- and interprofessional teams
- Intelligently guiding the operating room toward excellence

Individual Competencies of Clinical Leadership

The first key area identified in this study was individual competencies of clinical leadership. This area consisted of three main categories and ten subcategories.

Category 1: Technical and Nontechnical Skills

Technical skills refer to task-specific abilities that require specialized knowledge and psychomotor proficiency to achieve clinical objectives. Nontechnical skills complement technical skills and include concepts such as decision-making, problem-solving, and leadership.

In the present study, after analyzing the obtained codes, we reached six subcategories including the scientific and practical expertise of the leader in the field of surgery, evidence-based medicine, the leader's professional and technical superiority over colleagues, structured patient assessment during, and after surgery, development of clinical and surgical strategies, treatment based on a comprehensive understanding of the patient, and specialized capabilities of the leader in surgical emergencies. As shown in Figure 1, technical and nontechnical skills have the highest weight, accounting for 53% of the competencies in this area. From the participants' perspective, the subcategory of scientific and practical expertise was one of the most critical capabilities expected of clinical leaders. They argued that a clinical leader in the field of surgery should have high functional skills and sufficient scientific literacy. For example, one participant admitted:

If a surgeon lacks proper expertise in their work and isn't even familiar with the surgical process, how can they organize and manage their team's tasks? We had a surgeon whose theoretical knowledge was strong, but their skills were so lacking that they prolonged a procedure to the point where they could no longer be considered the team leader (P13).

Additionally, participants believed that the clinical leader of a surgical team must be capable of making decisions based on current research and evidence. In this regard, one participant stated:

"*I always remind my students that something new is added to our field every day—a new method, a new paper. We must adopt updated techniques whenever conditions allow*" (P14).

Most participants emphasized the "specialized capabilities of a clinical leader in critical situations" during surgery. They considered anticipating difficult and critical surgical situations, planning and determining steps before a crisis occurs in surgery, clinical problem-solving ability, time management, and sound clinical decision-making as essential components of clinical leadership. Participants also mentioned the training required to develop these competencies.

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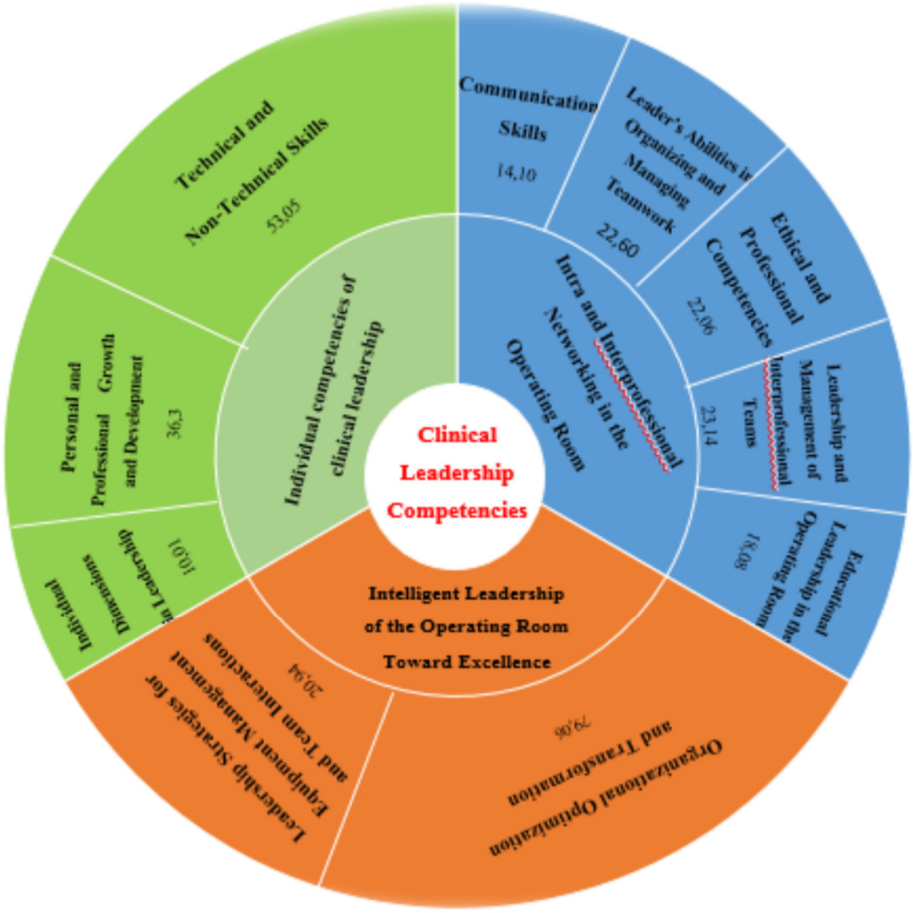

Figure 1. Clinical Leadership Competencies Framework for Surgical Residents

You must have thought about the surgical process in advance and have a plan. Even for postoperative care. Go ahead according to the plan and consider alternative techniques as a Plan B. That is, you cannot request a specific device for the patient during surgery without prior planning. You must have a strategic plan for each surgery in advance. These are the things that I must teach my residents if I am to develop them into clinical leaders, in addition to surgeons (P9).

Category 2: Personal and Professional Growth and Development

The narratives of all participants were filled with numerous experiences in which clinical leaders had taken steps to update their knowledge and skills in novel surgical approaches, foster personal growth, develop character, and enhance individual empowerment. They also emphasized the importance of a leader's ability to recognize their weaknesses, strive for improvement, and engage in continuous learning. Participant number 12 stated the following regarding this matter:

"*For a surgeon, as the team leader, surgical expertise is a priority; however, in my opinion, if a leader's knowledge remains confined to what they studied several years ago, they will inevitably be unaware of new methods or technologies. Consequently, they will fall behind, and others will hesitate to follow their lead. I try to stay informed about new methods by keeping up with relevant articles and guidelines. Additionally, I encourage assistants to study and familiarize themselves with emerging approaches*.

Category 3: Individual Dimensions in Leadership

This category includes the Psychological and Personality Traits such as maintaining calmness, managing individual stress, ability to control anger, high self-confidence, openness to criticism, charisma, and high responsibility, which, from the participants' perspectives, lead to timely actions in various surgical situations, especially in critical surgical conditions.

"*The first and most important characteristic of a clinical leader, in my opinion, is stress control and maintaining calmness. Being calm does not mean working slowly during surgery. It means that in emergency situations, you do not lose your composure, use your thinking and scientific knowledge, and perform the correct action that saves the patient's life*" (P11).

Some participants emphasized the importance of training these characteristics in surgical assistants. For example,

[DOI: 10.47176/mjiri.39.144]

Participant Number Five stated:

"In my opinion, if we train residents who indeed have practical skills but cannot manage challenges and sometimes routine surgical conditions, such as bleeding, due to their own anxiety, then we have not provided proper training. Because leadership complements surgical expertise."

From the perspective of these participants, team stress management to improve performance, the role model of specialized performance and professional ethics of the leader in the surgical team, calming leadership, motivating and inspiring the team, and providing opportunities for team suggestions were among the aspects emphasized under the category of the individual behaviors and capabilities.

Intra- and Interprofessional Networking in the Operating Room

Another domain identified in this study was intra- and interprofessional networking in the operating room, which relates to the leadership of others. We identified 49 codes within this domain and categorized them into five categories. Among the obtained categories, as shown in Figure 1, leadership and management of interprofessional teams accounted for the highest proportion (23.14%).

Category 1: Leader's Abilities in Organizing and Managing Teamwork

According to the participants' statements, a clinical leader must be able to select surgical team members based on their scientific and practical potential and have the ability to form an optimal and efficient team. They must properly assign team duties and also assume leadership of the team in both routine and emergencies. One participant stated:

"*My experience has shown that if a good surgery is to be performed, I arrange the team members based on the type of surgery. Moreover, everyone must have specific duties, and I clearly communicate the job descriptions and expectations to them*" (P10).

Most participants argued that leadership of teamwork in patient emergencies, division of team members' duties during crises, timely repositioning of team members in emergencies, and employing capable and experienced individuals in surgical emergencies are among the essential competencies of clinical leaders.

Category 2: Ethical and Professional Competencies

This category included narratives from participants, through which we identified fourteen codes and two subcategories. Participants' emphasis on enhancing the knowledge and skills of team members, creating opportunities for experience acquisition, and promoting continuous team learning indicated that efforts toward developing team members are essential components of clinical leadership. Participant number five stated:

"*Since we are talking about a team, in my opinion, part of the leader's focus should be on improving the team so that they do not fall behind current methods. Team members must not only possess high skills but also advance their theoretical knowledge. I conduct periodic sessions with the team. For example, we review fracture images together, then during procedures like plating and screwing, I ask the scrub nurse or assistant to interpret the images*."

Participants in this study emphasized that clinical leaders must be committed to the patient's life and health and earn patients' trust through honesty in behavior and performance. They also stressed the importance of respect for the patient, empathy, and understanding. One participant said:

"*What I have experienced with others and strongly emphasize myself is the importance of the medical oath. It is essential to me to prioritize the patient's health under any circumstances*."

Moreover, the majority of participants repeatedly referred to clinical leadership from admission to discharge, acknowledging that failure to perform correctly at any stage creates gaps in the overall treatment process. For example, participant number 15 stated:

"*The clinical leadership process begins when the patient is admitted to the clinic or hospital and continues until discharge. All individuals are connected like links in a chain, and if any of these links do not perform their duties properly, it can cause the chain to break*."

Category 3: Educational Leadership in the Operating Room

This category refers to the competencies of a clinical leader in the field of education and mentoring. According to the participants' narratives, clinical education for team members, providing learning opportunities through peers, the facilitative role in training, and timely, constructive feedback on members' performance by the team leader appear essential. Participants stated that education by the clinical leader of the surgical team should be timely and principled, based on needs assessment, learning potential, and the level of their duties, and that opportunities for teaching and learning in the operating room should be provided. Participant number 4 stated:

"*I believe that under normal conditions, my own knowledge is sufficient to perform a good surgery; however, in emergency surgeries, I definitely need timely actions from team members who must have the literacy and skills to participate in the operation. For this reason, I organize educational programs for the operating room for the growth of the team members, based on the weaknesses observed during work*" (P4).

On the other hand, the interviewees also emphasized the importance of professional ethics education for team members. One participant stated:

"*We have the responsibility to teach certain ethical principles as well. For example, the fact that the patient is primarily a human being whose dignity must be preserved. Training specialists alone is not sufficient to meet patients' needs, and it is necessary to clearly explain the concept of the medical oath to them from the beginning*" (P12).

Category 4: Leadership and Management of Interprofessional Teams

Overall, considering that patient safety and quality of care largely depend on the interprofessional performance of individuals from various healthcare disciplines—and given

[DOI: 10.47176/mjiri.39.144]

that the presence and care of surgical patients are not limited to the operating room but also require pre- and post-operative care—analysis of the codes within this category led to the identification of two key subcategories: Interprofessional Leadership Capabilities and Clinical Strategies in Interprofessional Leadership. According to the majority of participants, the most frequently mentioned codes in the first subcategory were interprofessional communication skills and maintaining composure among team members. For instance, one participant stated the following regarding this matter:

In the treatment process, there is no "I," but several teams exist, and interprofessional relationships are essential. For example, when requesting blood from the laboratory, intergroup communications are so effective that they call the laboratory, and the laboratory staff responds, "No problem. Intergroup relationships have a significant influence on the patient's treatment process (P10).

Furthermore, through an analysis of the participants' narratives, the subcategory of Clinical Strategies in Interprofessional Leadership emerged, encompassing a set of practical methods and approaches that clinical leaders employ to guide and manage interprofessional teams effectively in clinical settings. These strategies include task organization, work division, time management, clinical decision-making, performance evaluation of team members, and fostering a consultative environment among members of interprofessional teams before, during, and after surgery. Some of the participants' statements regarding this matter were as follows:

For example, in brain aneurysm surgery with bleeding, in that situation I told myself that if something bad is not to happen, I must be able to maintain the team's calm so we can make decisions for the patient. I asked anesthesia to administer the antidote and coordinate platelet and blood reservation. And all teams should bring experienced staff so we can control the bleeding (P8).

Category 5: Communication Skills

This category encompasses codes derived from the analysis, which led to three subcategories: intrateam communication, organizational and inter-organizational communication, as well as communication with patients and their companions. Participants considered team communication and structured communication necessary. Some participants stated in this regard:

The relationships are friendly ,but I am not very supportive of excessively friendly relationships; *there should be a specific boundary between the supervisor and subordinate. This distance is, to some extent, an invisible line that preserves boundaries while simultaneously preventing disrespect, which depends on professional training* (P10).

Additionally, according to the narratives of most participants, effective communication with the patient both before and after surgery, as well as communication skills with the patient's companion, were also considered essential. Some participant statements are as follows: The patient wants information from you. You must be able to provide this information in a way that the patient understands, without alteration, and to the necessary extent, so that the patient can be convinced about the treatment method (P12).

Intelligent Leadership of the Operating Room Toward Excellence

Nowadays, achieving a high level of productivity and organizational excellence in complex and multifunctional organizations, such as hospitals, is not possible without a scientific approach and an emphasis on leadership capabilities. In this regard, by analyzing the participants' experiences, we identified two categories, with the category of organizational optimization and transformation accounting for the highest weight (79%) in this domain.

Category 1: Organizational Optimization and Transformation

The effort to create conditions for change, improve service quality, and consider the organization's goals and vision were among the issues frequently repeated in the majority of participants' statements, which led to the emergence of subcategories including facilitating change and transformation, continuous improvement of human resource services, and organizational leadership. For example, most participants considered planning and efforts to reduce resistance to the implementation of change programs as necessities of leadership. Participant number 4 said in this regard:

Having rules and regulations for surgeries increases work efficiency. However, implementing it is not easy, especially if the team is already accustomed to something else. For example, to eliminate the previous routine and establish wearing gloves using the closed method. I also collected statistics on patient infections to have justification when convincing the staff.

Regarding the continuous improvement of services, most participants expected that the individual in the clinical leadership role would take steps through continuous efforts to assess functional skills, identify the strengths and weaknesses of team members, and plan educational programs accordingly. Participant number five stated in this regard:

"*Another essential matter is to identify what the team members do not know well and where they perform better. Then, focus on those areas. Follow-up checks should be conducted subsequently. You must pursue their shortcomings sufficiently until they reach the required level of skill*."

Category 2: Leadership Strategies for Equipment Management and Team Interactions

The majority of participants in this category referred to team conflict management and the management of consumable resources in the operating room. From their perspective, a clinical leader must monitor consumable resources throughout all stages of surgery and operate based on resource limitations and existing conditions. Additionally, the leader should strive to resolve conflicts among team members and be capable of employing effective conflict management techniques to address disagreements. One participant stated in this regard:

"*I prefer to intervene in the problems between my team*

[DOI: 10.47176/mjiri.39.144]

members, let them express their views, and be a good listener so that I can resolve their conflicts. You see, it is a principle that if the members of a group are not aligned, teamwork cannot be performed well" (P3).

Discussion

This study was conducted to design a clinical leadership competency framework for surgical residents. Following data analysis, 3 main themes were identified: individual clinical leadership competencies, networking of intra- and interprofessional teams in the operating room, and intelligent guidance of the operating room towards excellence.

Consistent with the present study concerning individual competencies in clinical leadership, Panagiotis Trevallas' findings demonstrated that the competencies of healthcare managers encompass various components, which include, in order, individual competencies such as responsibility, honesty, and commitment, self-esteem, development of self-awareness, self-management, continuous personal development, and work experience (24). From the participants' perspective in this study, technical and non-technical skills, efforts toward personal growth, and personality and individual characteristics are among the essential competencies of clinical leadership. Similarly, Riaz A. Agha (2015) demonstrated that the traditional focus on acquiring technical skills and other competencies for performing safe surgery is insufficient. They found that modern surgery requires the following: technical and non-technical skills, evidence-based performance, emphasis on lifelong learning, and the establishment of an institutional and healthcare services framework which, ultimately, must be integrated with several personal and professional values, including honesty, accountability, professionalism, and patient-centeredness (25). In this study, based on the classification of psychological and personality traits, we concluded that clinical leaders who lead their teams by maintaining calmness, self-confidence, and emotional control are more successful. In this regard, Kyriakidou's findings indicated that although having appropriate professional expertise is considered a necessary criterion for clinical leadership, personality traits also play a role in evaluating a specialist's potential for a leadership role (26). Additionally, the participants of the present study emphasized the leader's ability to control both their stress and that of others. Consistent with this finding, participants in the survey by Aspasia and colleagues also acknowledged that maintaining calmness and composure, as one of the essential skills for clinical leaders, is the key to "professional thinking," and maintaining composure prevents stress from overwhelming oneself and other team members. Moreover, similar to the results of our study regarding professional ethical competencies, such as empathy, respect, and building patient trust, this study also emphasized the importance of adhering to professional ethics (16). In the context of networking intra- and interprofessional teams in the operating room, participants emphasized the leader's competencies in organizing and teamwork, communication skills, and team development. Correspondingly, the UK Clinical Leadership Competency Framework includes components such as teamwork, network development, establishing and maintaining relationships, and encouraging participation, which align with the findings of the present study (27).

From the perspective of participants in the current study, communication skills with patients, patients' families, and team members are key competencies of successful clinical leaders. This finding aligns with the results of Niki's study (2021), which reported that, through interviews with surgeons, clinical leaders have emphasized the importance of effective communication with colleagues, patients, and families. According to all participants, establishing effective communication and listening to others are considered essential competencies for leaders, as these help them evaluate situations more effectively (16). Additionally, this finding is consistent with Nosrati et al.'s 2025 study, which found that leadership and communication competencies appear critical for surgical residents (28).

The statements of participants in this study demonstrated that when a clinical leader selects individuals with higher competency levels and forms an efficient and optimal clinical team accordingly, the team's effectiveness is significantly improved. Morgeson's study (29). also reported that selecting individuals who are competent both academically and practically will enhance team performance. Aligned with the findings of the present study in the category of leadership and management of interprofessional teams, Alexandra Sopu et al (2021) found that since surgeons collaborate with interdisciplinary teams, only 45% of complications arising during treatment are rarely due to an individual's failure. However, in more than 80% of cases, they result from poor planning or failures in teamwork among interdisciplinary members. Therefore, teamwork fundamentally requires leadership to ensure that the team's objectives are understood and accepted, all members are encouraged to share their ideas, and decisions are made through consensus (30). Our study demonstrated that the leader's competency in recognizing team problems, listening to members' disagreements, and utilizing conflict management techniques is a key component of clinical leadership. In line with our research, Mumghamba showed that a leader must learn the art of conflict resolution, strive to understand every differing viewpoint, and be a reliable and attentive listener who can provide consultation when necessary (31). In this research, facilitating change and transformation is regarded as one of the subcategories of the intelligent guidance of the operating room toward excellence. Consistent with our study, Riikka Hofmann stated that change management leads to the expansion of physicians' knowledge horizons in establishing a clinical leadership culture (32). Our study demonstrated that resource management in surgery is one of the strategic leadership approaches. In this regard, the Royal College of Surgeons of England also considers resource management as one of the competencies within the clinical leadership framework (27). Furthermore, Parker's study showed that resource management is one of the eight core components of leadership in surgeons (33).

This study led to the identification of three main domains and ten categories in the field of clinical leadership. Among the obtained categories, 3 categories —technical and non-

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technical skills, leadership and management of interprofessional teams, and organizational optimization and transformation —were assigned the highest weight. These results indicate that although technical skills such as surgical proficiency are fundamental for residency training, it cannot be denied that non-technical skills are a perfect complement for safe and successful surgery. Furthermore, considering the variety of human resources in the operating room across different disciplines, including surgeons, anesthesiologists, surgical technologists, anesthesia technicians, and nurses, this study highlighted the necessity of interprofessional team leadership training for surgical residents. Organizational optimization and transformation was another category that received the highest frequency within the domain of intelligent guidance of the operating room towards excellence, underscoring the growing importance of advancing leadership competencies at the level of complex and multifunctional organizations, such as hospitals.

Limitations of the Study

Several methodological constraints should be acknowledged in this study. First, despite persistent efforts to engage hospital administrators and clinical departments, some institutions were unable to provide adequate research support. Second, participant recruitment faced challenges due to surgeons' demanding operative schedules, limiting data collection opportunities. Additionally, the generalizability of this study's findings may be constrained by its single-center design at an Iranian medical university. Variations in healthcare infrastructure, cultural norms, and institutional protocols across different settings could potentially impact the applicability of these results to other clinical environments or national healthcare systems.

Conclusion

This study developed a comprehensive competency framework for clinical leadership among surgical residents, encompassing three primary domains: individual clinical leadership competencies, networking of intra- and interprofessional teams within the operating room, and the intelligent guidance of the operating room towards excellence. The findings indicate that clinical leadership is an essential competency for surgeons that must be systematically taught during residency. Purposeful development of these competencies can enhance team interactions and improve patient care outcomes.

Integrating clinical leadership competency training into both the formal and hidden curricula of surgical residency programs can play a pivotal role in elevating the quality of healthcare services. This framework offers educational policymakers and residency program directors a practical tool for curriculum design and revision. Moreover, the proposed framework can serve as a structured model for designing and implementing diverse educational interventions, such as professional empowerment workshops and short-term skill-based courses, across various levels of medical education. This versatility facilitates broader adaptation and application of the framework in both formal and informal educational settings.

Future research is recommended to evaluate the effectiveness of the identified framework across diverse clinical environments and specialties. Additionally, designing and implementing educational interventions based on this framework and assessing their impact on enhancing leadership competencies, team performance, and patient health outcomes could pave the way for further development and generalizability of this model within medical education.

Authors' Contributions

E.R. and Z.S Conceptualization, L. S. and E. R. Writing Original draft, All authors reviewed the manuscript.

Ethical Considerations

Ethical approval and informed consent for participation in this study were obtained from the Ethics Committee of the School of Medicine at Iran University of Medical Sciences (IR.IUMS.FMD.REC.1401.538). Throughout the research process, the university's ethical policies, which follow the principles of the Helsinki Declaration, including obtaining informed consent and ensuring the confidentiality of participants' information, were strictly observed. Participants were free to withdraw from the study at any time.

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Conflict of Interests

The authors declare that they have no competing interests.

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