



Challenges of Team Interaction in the Weaning Process of Mechanically Ventilated Patients: A Qualitative Content Analysis

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Abstract

Introduction: Traumatized patients, particularly those with chest and head injuries, face unique weaning challenges due to specific physiological derangements. Multiple factors influence the complex process of weaning mechanically ventilated patients. Effective interprofessional collaboration and interaction within the health care team are essential for improving the weaning process, increasing patient safety and survival, and reducing costs and mortality. This study aimed to explain the challenges of team interaction in the weaning of trauma patients from mechanical ventilation in the intensive care units.

Method: In this qualitative study, 11 semi-structured interviews were conducted with physicians and nurses in the intensive care units of trauma hospitals in Tehran, using purposive sampling in 2023-2024. The interviews were recorded and transcribed, and a content analysis approach based on Granheim's approach was used to analyze data and extract concepts and themes.

Result: The results of the analysis of participants' experiences revealed that the main challenges of care team interactions in the weaning process of mechanically ventilated patients could be summarized into three themes: "Damage to the Interprofessional Chain of Trust," "Defective Circulation of Power in Decision-Making," and "Neglecting Interprofessional Team Care."

Conclusion : Purposeful team interaction requires mutual trust based on capabilities and values, continuous interaction, the use of problem-solving and negotiation approaches in conflict resolution, participatory management, mutual understanding of professional roles, attention to professional independence, shared team goal-setting, an information circulation pattern in the care team, interprofessional coordination, consistency in implementing care procedures, and prevention of negligence and professional errors.

Keywords: Team Interaction, Weaning from Mechanical Ventilation, Qualitative Study.

Introduction

The need for mechanical ventilation has surged in recent years due to demographic changes in the population pyramid, particularly the increasing number of elderly patients with chronic lung diseases and other comorbidities, as well as the rise in trauma-related incidents ¹⁻⁴. Current statistics indicate that approximately 86% of adult patients admitted to intensive care units (ICUs) receive invasive mechanical ventilation ^{5, 6}, with over 800,000 hospitalized patients requiring this intervention annually in countries with

robust healthcare systems, such as the United States ⁷. In Tehran, the ICU bed capacity was 3,376 in 2022, with an occupancy rate of 73.2%. The average duration of stay in the adult ICU increased from 4.2 days to 7 days for patients requiring mechanical ventilation ⁸. Despite its critical role in patient care, mechanical ventilation is associated with a range of complications that can impact patient outcomes ⁹⁻¹¹. Numerous studies have shown that patients on mechanical ventilation frequently encounter a range of challenges, including inadequate airway

management, ineffective communication among care teams, poorly managed pain, sensory deprivation, unmet nutritional needs, failed extubation efforts, unsuccessful weaning, and insufficient training, leading to further complications such as patient stress and anxiety for both patients and families.¹²⁻¹⁵

The weaning process represents the transition from full breathing support to spontaneous breathing¹⁶ and begins at the point of connection to the mechanical ventilator, continuing until successful extubation is achieved. This process is particularly intricate for patients who have been mechanically ventilated for longer than three days and requires careful management and planning¹⁷. Effective weaning depends heavily on various factors: physiological and clinical aspects of the patient, underlying and current psychological conditions, the influence of medications and sedatives, as well as the collective knowledge, experiences, skills, and interactions of the healthcare team, management and decision-making approaches, and culture of care in ICUs^{18, 19}. Unsuccessful weaning includes all cases of unsuccessful spontaneous breathing trials (SBT), unplanned extubation (accidental extubation and self-extubation), and the need for re-intubation or death within 48 hours after extubation^{20, 21}. Studies show that the weaning process varies from country to country; however, it requires effective interpersonal cooperation and interaction within the care team alongside adherence to standard protocols^{22,23}. Research indicates that successful weaning hinges on the quality of communication, participation, and interaction between care team members and patients' families^{24, 25}. This critical stage of care requires careful attention to detail, monitoring, and skilled and timely interventions by the healthcare team. Determining each person's role and responsibility within the care team, while respecting all team members' expertise and participation in patient-centered decision-making, fosters a supportive atmosphere in clinical settings and improves patient outcomes²². Tingsvik's study cited barriers to team cooperation as decision-making based on internal emotions and personal clinical experience, along with a lack of resources and facilities²⁶. In Zali's study, significant challenges faced by Iranian ICU nurses included individual challenges (lack of knowledge, non-reflective experiences, negative attitudes, and poor managerial skills), interpersonal challenges (communication avoidance, physician dominance, and

fear of violence), and organizational challenges (lack of managerial support and role ambiguity), which contributed to occupational stress and burnout among nurses²⁷. In Bouchez's study, interprofessional decision-making based on organizational inclinations, defining roles and responsibilities, professional values, continuing education, and sharing available information was deemed essential for improving patient care quality²⁸. Keykha's research identified that the high workload of nurses, underutilization of nurses' expertise, dissatisfaction with unfair salaries, appointing individuals lacking teamwork morality as ICU heads, and negative attitude from physicians regarding collaboration with nurses are major obstacles to teamwork in Iran's ICU²⁹. Ervin's study highlighted insufficient time for care, physically and emotionally challenging environments, information sharing and decision-making processes, lack of effective conflict management, multiple conflicting goals, and knowledge gaps among team members as significant challenges affecting teamwork in ICUs³⁰.

Trauma remains a leading cause of morbidity and mortality worldwide, with a substantial proportion of severely injured patients requiring invasive mechanical ventilation. Among trauma patients, those with chest injuries, including rib fractures and flail chest, often require prolonged ventilatory support due to impaired chest wall mechanics and pulmonary contusion^{31,32}. Furthermore, patients with traumatic brain injury (TBI) present distinct weaning challenges, as sedation for intracranial pressure (ICP) control frequently complicates spontaneous breathing trials, and extubation failure rates remain notably high in this population³³. Studies indicate that up to 20% of patients admitted to trauma centers with blunt chest trauma have rib fractures³⁴, and patients with severe TBI often require prolonged mechanical ventilation beyond 14 days³⁵. The complexity of trauma patient management thus necessitates not only adherence to weaning protocols but also effective interprofessional collaboration among diverse specialists.

The studies mentioned above have primarily employed a quantitative approach to determine the extent of this challenge, focusing on predefined challenges. However, few studies have identified these challenges based on the daily work experiences of the main stakeholders. It is essential to acknowledge and understand both the visible and hidden aspects of the

experiences of individuals involved in the team interactions during the weaning process. Qualitative research is an effective method for identifying and exploring these issues. In Iran, there is an urgent need to address the challenges and gaps in providing high-quality care for trauma patients undergoing mechanical ventilation weaning. A better understanding of these participatory challenges may reveal new strategies to align ICU practices with patient goals and priorities. Given the high prevalence of mechanical ventilation among traumatized patients in ICUs and the lack of studies focusing on team interaction challenges in this specific population, the present study aimed to achieve a comprehensive knowledge and qualitatively assess the experiences of nurses and physicians (who were responsible for the care and treatment of mechanically ventilated trauma patients) regarding team interaction challenges during the weaning process, providing a deeper understanding of the phenomenon. By gaining a deeper understanding of this concept and sharing our findings with stakeholders and policymakers, we can take measures to ensure improved team interactions in this complex process.

Methods

Study Design/Participant

This study was conducted from 2023 to 2024 using a conventional qualitative content analysis approach. Qualitative research methods examine how participants' experiences shape their understanding and how that evolves. Content analysis can provide reliable results, generate insights, and guide organizational activities based on textual data [36]. The study involved 11 nurses and physicians who were members of the care team for mechanically ventilated patients in dedicated trauma ICUs across Tehran hospitals. Purposeful sampling was employed to select participants with rich and firsthand experiences relevant to the study. The inclusion criteria were: having at least one year of experience treating and caring for mechanically ventilated patients, participating in their weaning process, willingness to participate in the study, and being able to provide information about their own experiences regarding the phenomenon. The characteristics of the participants are presented in Table 1.

Data collection

Data collection was conducted through in-depth, face-to-face, and individual semi-structured interviews by the first researcher. Participants chose the interview location to ensure comfort. Interviews lasted between 40 and 80 minutes, and sampling continued until data saturation and conceptual clarity were achieved. The interview process followed four stages ³⁶: (1) Orientation Phase: the researcher introduced herself along with the research title, general and detailed objectives, potential interview duration, and obtained recording permission. (2) Main question phase: Participants were asked main questions related to their experiences during patient weaning: "Can you describe your overall experience of collaborating and interacting with other team members in this process? What are the main challenges of team interactions in the process of weaning patients from mechanical ventilation that you experienced in your ICU? What actions did you take when these team interaction challenges arose?" (3) Probing phase: based on participants' responses, enlightening and exploration questions such as "Explain more about this, and what do you mean by this?" were asked. (4) Terminal question stage: at the end of each interview, the participant was informed that the researcher's questions and topics were over. If you have any other points or questions, please state them. Interviews continued until data saturation was reached; two additional interviews were conducted after saturation to confirm that no new findings emerged. Supplementary File 1: Interview Guide and Questions.

Data Analysis

The Granheim and Landman analysis method was used to analyze the data ³⁷. Recorded interviews were transcribed verbatim and reviewed several times for accuracy. Semantic units were identified through a line-by-line reading process. Max QDA software version 2022 facilitated organization and coding during content analysis. The first author conducted the analysis primarily, with continuous supervision by the other authors. After identifying semantic units, sentences were coded based on their essence; similar codes were merged into subcategories named according to their themes. The codes given to the text were agreed upon between the first, second, and third authors. The classifications extracted from the interviews were then repeatedly compared with similar groups until subcategories and categories emerged. In coding the interview transcript, the researcher noted their own experiences and assumptions (reflexive memos) to consider how these might influence their interpretation. One observer analyzed parts of the data alongside the first author, and interpretations were continuously discussed with all authors at each stage,

including coding, grouping of codes, and interpretive levels of the themes, to ensure trustworthiness. This qualitative study is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) 32-item checklist [38]. All relevant items have been addressed in the manuscript. The completed COREQ checklist is provided as Supplementary File 2.

Trustworthiness

To ensure data trustworthiness, we applied four criteria proposed by Lincoln and Guba³⁶. The study aimed to enhance data accuracy through the following methods: conducting in-depth interviews at various times/locations, as well as ensuring maximum diversity among participants (Table 1). Credibility was established through prolonged engagement with the data, iterative immersion in participants' narratives, and triangulation via member checking and expert peer debriefing. Peer debriefing involved three academic experts, each possessing substantial expertise in qualitative research, who critically evaluated the coding framework, interpretative decisions, and emerging thematic structure. The coded text was shared with four participants to accurately verify the codes and ensure that the interpretations realistically reflected their lived experiences. Any discrepancies were addressed and investigated.

Additionally, the research team, including the supervisor and advisor, conducted a final review. An external observer performed a research audit to ensure confirmability. Dependability was enhanced through comprehensive documentation of research activities during data collection/analysis. Audio recordings and verbatim transcripts were retained to ensure procedural traceability. Finally, transferability was supported by rich and accurate findings accompanied by appropriate quotations.

Results

A total of seven nurses and four anesthesiologists (including two ICU fellows) participated (Table 1). All participants confirmed that the majority of mechanically ventilated patients under their care had sustained traumatic injuries, primarily resulting from motor vehicle collisions and falls, with diagnoses including traumatic brain injury (TBI), multiple rib fractures, flail chest, and multiple trauma. A total of 657 primary codes were generated; following content analysis, including the deletion/merging of duplicate

codes, twelve subcategories emerged under three main themes: "Damage to the Interprofessional Chain of Trust", "Defective Circulation of Power in Decision-Making," and "Neglecting Interprofessional Team Care". These themes reflect participants' experiences with the challenges they faced during team interactions throughout the weaning process for mechanically ventilated traumatized patients (Table 2).

Category 1: Disruption in the Chain of Interprofessional Trust

Trust refers to the belief in the capabilities and integrity of others and the positive anticipation of their behavior, which is established based on three components: positive relationships, competence and expertise, and consistency in words and actions. Interprofessional trust is described as a process in which various healthcare professionals have mutual trust in each other, enabling them to engage in more purposeful professional collaboration through establishing trust-based interactions. Effective mutual trust is essential for ensuring all team members are aligned regarding the expected therapeutic goals. According to the findings of this study, participants indicated that the interprofessional trust chain is compromised by weaknesses in scientific and practical competencies, a lack of attention to ethical and professional values, and deficiencies in continuous interaction.

1-1: Lack of Trust Based on the Weakness in Scientific and Practical Capabilities

The inadequate and ineffective scientific and practical capabilities and skills of the healthcare team members during the weaning process of mechanically ventilated traumatized patients contribute to the disruption of mutual trust and interprofessional interaction.

One participant stated: "... Another aspect of these relationships is the role that the nurse shows her/his scientific and practical skills and abilities to the physician, and this relationship is formed; the physician does not trust a nurse who lacks these skills, and this chain is broken...". (P3)

Another participant expressed: "... Regarding other staff, the physician assesses their quality of work; that is, when they see that this nurse is not knowledgeable and does not have enough practical skills to work with the patient on a ventilator, they do not trust her...". (P9)

The next participant stated: "... I do not trust Dr. ... at all, because a physician must be knowledgeable and experienced, meaning he should possess scientific and practical skills for me to trust him, but he is very inexperienced...". (P2)

1-2: Lack of Trust Based on Lack of Attention to Ethical and Professional Values

Insufficient attention to ethical and professional values leads to the breakdown of trust among care team members during this weaning process. One participant stated: "... So when we are in contact with this physician who is consistently present, ethical, responsible, adheres to scientific principles and stays updated, has adequate scientific and practical skills, and is diligent in the treatment process and assessing the patient's condition, we trust this person. However, when I see a lack of adherence to these professional principles, I lose my trust in the physician, and I become more cautious in executing his orders so that the patient does not suffer any harm..." (P9)

Another participant pointed out: "... Well, when I notice this negligence and care errors from the nurse, and this issue arises several times, I lose my trust. In fact, repeated occurrences of carelessness, lack of attention to patient safety, and work principles lead to the erosion of my trust in my nursing colleagues..." (P1)

1-3: Lack of Trust Due to Insufficient Continuous Interaction

Continuous interaction among care team member's fosters effective communication, enabling the exchange of information, ideas, and opinions among team members with diverse backgrounds, experiences, and skill levels. The lack of continuous interaction between the care team during this weaning process erodes mutual trust and weakens team interaction among members. A participant remarked: "...What I have experienced as a nurse or seen among my colleagues is that we often trust more readily the physician we see more frequently; in other words, our trust in a physician who is not present in the ward every day and only comes once a week does not develop properly..." (P4)

Category 2: Defective Circulation of Power in Decision-making

The process of weaning and the decision to wean is a team-based and interprofessional approach rather than an individual choice made by the physician. The weaning process will succeed when it relies on the

interaction and shared decision-making of a multidisciplinary specialized team. The rotation of power in decision-making involves the participation of various individuals based on their professional roles, knowledge, and skills in patient-centered shared decision-making, coupled with trust and mutual understanding. Defective circulation of power in decision-making encompasses interprofessional conflict resolution approaches, authoritarian management styles, the professional and organizational superiority of physicians, and restrictions on nurses' functional independence, which result in increased healthcare costs.

2-1: Interprofessional Conflict Resolution Approach

Conflict arises when an individual or individuals attempt to obstruct others from achieving their desires or interests in response to an event, leading to challenges. Unresolved conflicts heighten the likelihood of problems, hinder the proper exchange of information, and reduce the quality of care. Conflicts within the care team are inevitable due to diverse communication styles and expectations among members, high workload, stressful environments, and disagreements over complex treatment methods, among other factors. Team leaders employ various strategies to resolve conflicts: avoidance, acceptance and submission, aggressive behavior, compromise, and surrender. Resolving conflict among care team members is crucial for the success of the weaning process in mechanically ventilated patients. One participant stated: "... In the next shift, I saw that the nurse responsible for that patient was not in the ward. I inquired and learned that her head nurse had penalized her and given her a day off. I was shocked that there was an attempt to sweep the issue under the rug without investigating the cause ..." (P10)

Another participant mentioned: "... Now, when a physician, due to laziness or negligence, disrupts this weaning process, leading to increased morbidity or mortality of patients, there definitely should be a confrontation. What I did was report it to the hierarchy..." (P8)

2-2: Authoritarian Management Style

The lack of interest from managers and officials in solving problems and forcing staff to obey orders unconditionally leads to disillusionment and undermines their role in patient-centered decision-making. Hierarchical communication structures may

hinder young employees from actively participating in processes or reporting issues and mistakes. One participant remarked: "... After 10-15 years of proposing solutions to problems and improving workflows, I no longer make any suggestions. Because it seems futile. When you propose that your voice is heard and action is taken. What is the point when the managers do nothing and disregard your opinions? Now, I keep silent when I notice an issue in the patient weaning process ...". (P6)

2-3: Professional and Organizational Superiority of Physicians

Attention to the role and professional responsibility of each individual in the healthcare team is essential for the success of this process. In Iranian hospitals, physicians are sometimes reluctant to consult and collaborate with other team members in making decisions about patient weaning, because they are legally responsible for the patient and often rely solely on their personal experience. Physicians' lack of trust in the expertise and knowledge of nursing colleagues and poor communication diminishes nurses' motivation to engage actively in decision-making. Nurses have observed that some physicians adopt a top-down approach, disregarding nurses' opinions and exhibiting inappropriate behavior. One participant stated: "... The novice says I am an ICU sub-specialist. From a scientific perspective, he holds the position. We argue, based on our experience, that it is not advisable to wean now, but he proceeded, and then 10 hours later the patient was re-intubated. We cannot do anything, and we have no role in this decision-making; we just have to follow his orders ...". (P5)

Another participant said: "... The physician altered the weaning plan without consulting the other team members. This abrupt change resulted in an aggressive attempt at early weaning, which ultimately caused the patient's discomfort and the need for re-intubation...". (P2)

2-4: Restrictions on Nurses' Functional Independence

Collaboration among physicians and other care team members results in effective treatment decisions, enhanced efficiency of care and treatment procedures, reduced length of stay, and lower treatment costs. The constraints on nurses' professional independence and their limited involvement in patient-centered decision-making in this process were evident in the participants' remarks: "...Now we can reduce the FiO₂ from 100 to

60 or 45 because we have that much authority because oxygen poisoning occurs and the physician has it set at 70, we can bring it down from 70 to 45; however, we lack the authority to spontaneously wean the patient even if all the objective and subjective conditions are favorable and he could tolerate it ...". (P4)

Category 3: Neglect of Interprofessional Team Care

Neglect in interprofessional care refers to the disregard and carelessness in professional care and failure to provide the standard of care expected of a healthcare professional that, according to many participants' statements, plays a role in the formation of the team interaction process during the weaning of mechanically ventilated traumatized patients, and harming patients, which was characterized by weaknesses in patient-based team targeting, information circulation pattern in the care team, interdisciplinary and interprofessional misalignment, ambiguity and confusion in care practice, as well as negligence and professional errors. Negligence in professional care during the weaning process of these patients from the ventilator in the ICU is a critical issue that requires special attention. This process is complex and delicate and requires precise monitoring and skilled intervention. When negligence occurs in this process, it can lead to serious consequences, including long-term ventilator dependence, increased risk of complications, and even mortality for the patient.

3-1: Weakness in Patient-based Team Targeting

Shared goal setting among team members in this process plays a crucial role in organizing specialized teams and enhancing the quality of care delivery in healthcare systems. Weakness in team goal setting disrupts interprofessional care. A participant mentioned: "... When there was no shared goal among team members and the step-by-step process leading to weaning was not defined, this interaction was not formed properly and ethically, and the team's movement was not synchronized with that shared goal, resulting in not achieving the care outcome that is safe and rapid weaning for the patient..." (P11).

3-2: Information Circulation Pattern in the Care Team

The pattern of information circulation within the team refers to reporting patterns between nurses and physicians, among different physicians, and between nursing staff to share knowledge and collaborate in providing comprehensive care. In some instances, critical information regarding a patient's condition,

progress, or response to weaning protocols is not effectively shared among team members, resulting in neglect of care and potential harm to the patient. One participant said: "... Our night Anesthesiologist does not even engage in this cycle, which is a flaw in our department because we never see the night physicians; we do not have notes from these night shifts, nor do they hand over patients. I have informed Dr... multiple times that it is a Ministry of Health rule that the night anesthetist must leave notes, but unfortunately, there is no supervision of their work, and they manage their shifts however they want. This lack of reporting causes our team care process to encounter challenges; because our shifts are 12 hours long, the night staff continue the patient weaning process as they did in the morning, meaning our plan is 24 hours a day...". (P7)

Another participant stated: "... Each morning shift nurse only takes over her patients and does not participate in the overall rounds, leaving only the head nurse and the staff nurse aware of all the patients. So, when a patient has a problem due to our lack of knowledge about the exact conditions and history of the patient, our care process gets disrupted, and we cannot actively and purposefully engage in teamwork...". (P1)

3-3: Interdisciplinary and Interprofessional Misalignment

With the increasing complexity of patients' health and medical needs, the necessity for collaboration among the healthcare team members to manage the trauma patient care process during weaning is increasingly felt. The lack of coordination and indirect interaction among different patient care team members results in disruptions in the team care process. One participant mentioned: "... During our shift, we only contact the treating physician in emergencies or when we need to transfer the patient. Of course, this communication also occurs through the ICU nurses, and in most cases, there is no direct communication between us...". (P10)

Another participant noted: "... for example, I write physiotherapy prescriptions for a patient. I am not in direct contact with the physiotherapists and do not even

see them. It is the ICU nurse who explains the patient's condition and the ventilator's settings to them and assists the patient get through the weaning process and be liberated from the ventilator more easily by strengthening his respiratory muscles...". (P11)

3-4: Ambiguity and Confusion in Care Practice

The care team's lack of attention to the ongoing weaning process leads to disorganization and prolonged team processes, ultimately delaying patient outcomes. One participant expressed: "... sometimes you arrive at the hospital at 7 a.m., and you have 15-20 patients as an anesthesiologist, and you do not know the patients, and these patients are only managed by the nursing team, with nurses changing every 12 hours, so the weaning process for these patients takes a long time. This is what is happening right now. A patient who has been on a ventilator for an extended period, and you cannot determine the reason for that. The weaning process of these patients is completely disrupted. Due to the lack of continuity, coordination, and confusion among the treatment team members, we diminish the chances of success for this process...". (P7)

3-5: Negligence and Professional Errors

Negligence in providing team care for these trauma patients can lead to the occurrence of various errors by different members of the healthcare team during the weaning process. Poor communication among healthcare team members and individual factors such as fatigue, stress, and burnout among healthcare professionals can contribute to confusion regarding the patient's weaning plan and increase the likelihood of errors in care delivery. One participant stated: "... When someone consistently exhibits this kind of behavior and disregard for the process, it indicates an unwillingness to follow the established team path, and this could jeopardize the entire team's efforts and challenge the process we have all undergone for some time to wean the patient from the ventilator. Well, the ongoing occurrence of these individual and clinical errors adversely impacts the overall outcome and well-being of the patient. ...". (P10)

Table 1: Demographic information of the participants

Number	Age (year)	Sex	Job	Education	Professional Experience (years)
1	54	Male	Nurse	Master's Degree	20
2	35	Female	Nurse Of Education	Bachelor's Degree	8
3	35	Male	Night Shift Nurse	Bachelor's Degree	10
4	38	Male	Head Nurse	Master's Degree	10
5	45	Male	Night Shift Nurse	Master's Degree	15
6	46	Female	Nurse In Charge of EN Shift	Bachelor's Degree	22
7	55	Male	ICU Fellows	Fellowship	25
8	59	Male	Anesthesiologist	Specialist	29
9	40	Female	Nurse	Bachelor's Degree	16
10	42	Female	Anesthesiologist	Specialist	11
11	50	Female	ICU Fellows	Fellowship	22

Table 2- Categories and Subcategories

Category	Sub Category
Disruption in the Chain of Interprofessional Trust	Lack of Trust Based on the Weakness in Scientific and Practical Capabilities
	Lack of Trust Based on Lack of Attention to Ethical and Professional Values
	Lack of Trust Due to Insufficient Continuous Interaction
Defective Circulation of Power in Decision-Making	Interprofessional Conflict Resolution Approach
	Authoritarian Management Style
	Professional and Organizational Superiority of Physicians
	Restrictions on Nurses' Functional Independence
Neglect of Interprofessional Team Care	Weakness in Patient-Based Team Targeting
	Information Circulation Pattern in the Care Team
	Interdisciplinary and Interprofessional Misalignment
	Ambiguity and Confusion in Care Practice
	Negligence and Professional Errors

Discussion

The present study aimed to investigate the experiences of ICU nurses and physicians regarding the challenges of team interaction in the process of weaning trauma patients off mechanical ventilation. It identified three main themes that the participants expressed as concerns about team interaction in the context of trauma ICUs due to patient-specific factors: "disruption in the chain of interprofessional trust," "defective circulation of power in decision-making", and "neglect of interprofessional team care." Each theme has subcategories, and a thorough examination of these subcategories could enhance understanding of their dimensions and inform planning to address related

concerns.

The "disruption in the chain of interprofessional trust" was recognized as a significant concern among participants regarding team interaction in this weaning process. Participants emphasized that trust is the most crucial link in fostering purposeful communication among healthcare team members. When mutual trust is compromised, overall team interaction and achievement of the ultimate goal are affected. In a study aimed at further investigating healthcare professionals' perceptions of team trust and performance, it was found that trust and team performance were closely related. Additionally, trust, the duration of continuous and ongoing communication, work history and experience,

and the number of team members were key predictors of effective team performance in healthcare delivery, aligning with our study³⁹. In another study, dishonesty, limited interpersonal skills, and differences in ethical and cultural values were identified as barriers to building trust within the healthcare team⁴⁰. The most significant opportunity to enhance trust among team members is through a focus on scientific knowledge and communication skills. Another study demonstrated that establishing team trust requires honest, continuous, compassionate communication based on scientific and ethical principles, and that neglecting these values can lead to distrust among ICU team members⁴¹. In another study, 90% of nurses and 55% of physicians acknowledged that the physicians they work with trust the nurses' performance skills and clinical decisions⁴². When team members are consistently interacting and share a common team perspective, they trust each other more readily. However, if this ongoing communication between physicians and nurses is not maintained, weak team interaction can delay the desired patient outcomes, which aligns with our study⁴³. In a qualitative study of interdisciplinary trauma teams, it was found that trust was frequently undermined when team members had no prior working relationships and had to make rapid decisions under time pressure, a common scenario in trauma weaning⁴⁴. Similarly, another study reported that nurse-physician collaboration scores in ICUs were significantly lower when physicians perceived nurses as lacking trauma-specific competencies (e.g., ventilator weaning protocols for chest trauma)⁴⁵. Therefore, disruptions in the development of competence-based trust, ethical and professional values, and continuous interaction should be prioritized as significant challenges in team collaboration during the weaning process in trauma ICUs.

According to the researchers of this study, an in-depth analysis of the theme of defective circulation of power in decision-making, which is a major concern for healthcare team members involved in weaning trauma patients from mechanical ventilation, reveals that the lack of participation from other care team members in the decision-making process during patient weaning, combined with organizational superiority and complete reliance on individual physician's decisions, biased approaches to conflict resolution, and authoritative management, can negatively impact team interaction. In trauma ICUs, this defective power circulation is

magnified by hierarchical structures that prioritize neurosurgical or trauma surgery opinions over nursing input. In patients with traumatic brain injury, weaning decisions are often made unilaterally by neurointensivists without consulting bedside nurses, leading to premature extubation or unnecessarily prolonged ventilation³³. The continuous rotation of team members can yield both positive and negative effects on the interactive performance of the ICU team during this complex process. A new team member may bring a fresh perspective or greater credibility, thus helping resolve team conflicts and participate more in decision-making²⁵. The care team leader can play a crucial role in enhancing teamwork by involving members in collaborative efforts and restructuring the organization to address the needs of patients and caregivers better⁴³. Nurses are primary caregivers in the ICU, dedicating most of their time to caring for mechanically ventilated patients needing continuous care monitoring. This highlights the nurses' significant role in the decision-making process concerning patient weaning⁴⁶. Although many studies indicate that the quality of care provided by nurses often surpasses that of other team members, a study reported that physicians are the leaders and final decision-makers in most cases of teamwork, which inevitably results in a certain degree of interprofessional conflict during complex processes, consistent with our study⁴². The lack of managers' understanding of nurses' professional roles can exacerbate this existing disagreement. If managers limit resource access for certain team members while favoring it for others, overvalue one role compared to others, and show little willingness to resolve issues with support from team members, this inequality and biased expectations regarding compliance adversely affect team dynamics and relationships among team members⁴⁷. Given that each profession possesses distinct tools and opportunities to gather information from patients and families, this collective knowledge becomes dispersed among various team members. If an individual has not participated in decision-making, this dispersed knowledge is not shared as an intact resource. This limitation of professional roles and functional independence creates challenges in the ICU team, which aligns with our study²⁵. One study reported that 97% of nurses and 85% of physicians acknowledged that nurses should operate fully and independently in their specialized training in teamwork.

Meanwhile, 75% of nurses and 8% of physicians stated that the physicians they worked with supported restrictions on nurses' scope of practice in the ICU ⁴². Another study also indicates that nurses' independence and enhanced leadership roles improve teamwork. Policies and organizational changes should focus on promoting professional independence and improving nurses' leadership roles in teamwork, thereby enhancing patient care and outcomes. Numerous studies have shown that incorporating individual autonomy in team designs is an effective approach to creating successful teams. Researchers have found that nurses' autonomy does not undermine teamwork between nurses and physicians; rather, it enhances it ⁴³. However, a recent review reported persistent physician-dominant cultures in European trauma ICUs, suggesting that our findings on professional and organizational superiority of physicians are not unique to Iran but represent a global challenge in trauma care ⁴⁸. So, the participation of all team members in patient-centered decision-making can enhance team interactions effectively.

Another influential dimension of interactions in this team process is the neglect of interprofessional team care. A study showed that all healthcare team members played specialized professional roles in the ICU team, aligned with the care goals established for weaning patients. Different professions engage in various clinical activities in the ICU, providing unique access and interaction with patients and their families. If these activities are not aligned with a shared team goal, it can lead to increased neglect in team care among members ⁴⁹. In multiple trauma patients, misalignment of shared goals is a major source of interprofessional neglect. Trauma teams often have conflicting priorities (e.g., early extubation vs. airway protection in chest trauma), and without a patient-centered team target, the weaning process becomes fragmented ⁵⁰. Ineffective teamwork among care team members, inadequate medical staff, and miscommunication were identified as risk factors for medical errors and negligence in professional care, which aligns with our findings ⁵¹. A study demonstrated that non-standardized sign-outs among trauma team members reduce critical data sharing by up to 50%, leading to incomplete mental models and prolonged ventilation ⁵². Interactions within the ICU represent a complex and dynamic process characterized by high stress, and the lack of coordination and proper communication between ICU physicians and other team

members, especially nurses, serves as a source of increased interpersonal conflicts.

Interdisciplinary and interprofessional conflicts among ICU team members can frequently be reduced through regular team meetings, understanding individuals' limitations and expectations, and encouraging individuals to improve their communication skills ⁵³. Team coordination involves a challenging process concerning how team members share, access, and utilize shared knowledge. Different professions have various opportunities to gather knowledge about patient goals and priorities, leading to a dispersion of this knowledge among team members. To share and use this dispersed knowledge effectively, ICU teams need a coordinated approach. Professional role boundaries can hinder knowledge sharing in ICU teams ⁵⁴. Clinical teams work diligently to wean patients off mechanical ventilation as quickly as possible based on accepted protocols, to reduce the negative effects of prolonged ventilation. Studies show that these protocols often fail to account for the countless complexities of real-world healthcare, where care must fit specific contexts and available resources. Factors including lack of time and staff, heavy workloads, unfamiliarity with guidelines, resistance to protocols, and disorganization among clinical roles contribute to confusion in implementing treatment protocols. Researchers also report that guidelines often overlook the complexities of the ICU environment and can be perceived as hierarchical approaches that ignore the expertise and skills of care providers involved in this intricate weaning process. This oversight can lead to various errors in the functioning of healthcare teams ¹⁹. Another study found that trauma providers recognize multiple sources of potential harm to future patients, but systemic, communication, and human-related barriers persist. The study highlights the need for a preventive approach and learning from past errors to improve trauma care safety ⁵⁵. In this context, it is estimated that 70-80% of clinical professional errors are attributed to human factors related to interpersonal interactions among team members; therefore, weaknesses in teamwork such as incomplete communication and failure to leverage diverse expertise towards a shared goal, cannot be underestimated, especially since these issues increase the risk of medical errors due to their critical impact on patient safety and wellbeing. According to our study's results, errors arising from poor teamwork can be

detrimental to patient safety and may delay the weaning process⁵¹.

Strengths, Limitations, and Recommendations:

This study mainly focused on the multifaceted challenges of interaction between physicians and nurses in this complex process. One of the major strengths of this study is that we included participants who could provide an in-depth and comprehensive view of their experience. It is recommended that similar studies be conducted in other hospitals across the country, involving additional healthcare personnel members of the ICU care team. This approach would allow for the identification of perspectives and concerns of other members responsible for the care and treatment of these patients, thereby laying the groundwork for developing necessary measures to manage these challenges effectively.

Conclusion

Based on the results of this research, disruption in the chain of interprofessional trust, defective circulation of power in decision-making, and neglect of interprofessional team care are among the main challenges of team interaction in weaning mechanically ventilated trauma patients. Purposeful team interaction requires mutual trust based on scientific and practical capabilities, adherence to ethical and professional values, and continuous interaction of healthcare team members. Utilizing problem-solving and negotiation strategies to resolve conflicts, collaboratively managing care, respecting the roles and expertise of all individuals, and encouraging their active participation in patient-centered decision-making create an empathetic environment within the trauma ICU patient care team. Shared patient-centered team goal setting, enhancing information circulation patterns within the care team, fostering interprofessional coordination and interaction, ensuring stability and clarity in implementing care protocols, and preventing negligence and professional errors promote safe care. Adhering to interprofessional care standards, identifying gaps between recommended guidelines and actual clinical practice, organizing regular team meetings,

and providing ongoing education can help healthcare providers and health policymakers enhance the quality of healthcare services, accelerate weaning, increase safety, and improve patient satisfaction.

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Conflict of Interest Disclosures

The authors declare that there are no competing interests related to this study.

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Authors' Contributions

HSN: Interview with participants, Transcribing the interviews, Data curation, Data analysis, Conceptualization, Methodology, and Writing–Original Draft, Writing–Review and Editing.

AE: Project administration, Data curation, Interpretation and Conceptualization, Visualization, Methodology, Writing–Review and Editing.

HM: Writing–Review and Editing, Conceptualization, Methodology, Implementation, and analysis plan.

EM: Writing–Review and Editing, Conceptualization, Methodology, and Supervision.

ZV: Project administration, Designing the research process, Data curation, Methodology, Writing–Review, and Critical Editing.

All authors meet the authorship criteria and have read and approved the final version of the manuscript.

Ethical Statement

The present study was approved by the Ethics

Committee of Baqiyatallah University of Medical Sciences, under code IR.BMSU.BAQ.REC.1401.073. Interviews were conducted after participants were informed about the study's purpose, obtained written informed consent, and assured of their right to withdraw from further participation. They were assured that their data would remain confidential and that the researcher would conduct the analysis confidentially.

Declaration of Generative AI and AI-assisted technologies

Not applicable.

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