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# Assessing the relationship between supervisor knowledge sharing and innovative behaviors among clinical nurses: the mediating role of organizational learning

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## Abstract

**Background** In today's rapidly evolving healthcare environment, nurses' innovative behaviors are crucial for improving patient care quality and organizational effectiveness. While supervisor knowledge-sharing behavior has been identified as a potential innovation driver, the mechanisms influencing nurses' innovative behaviors remain unclear.

**Objective** To investigate the mediating role of organizational learning in the relationship between supervisors' knowledge sharing behavior and nurses' innovative behaviors in clinical settings.

**Methods** A cross-sectional study was conducted among 450 nurses from university hospitals of Ardabil University of Medical Sciences, Iran, between September and November 2024. Data were collected using the Supervisor Knowledge Sharing Behavior Questionnaire (SKSBQ), Innovative Behavior Inventory (IBI), and Organizational Learning Instrument-Development Stages (OLI-DS). Structural equation modeling (SEM) analyses were performed to test the hypothesized relationships.

**Results** Findings revealed significant positive correlations between supervisor knowledge sharing behavior, organizational learning, and innovative behaviors. SEM results confirmed that organizational learning partially mediated the relationship between supervisor knowledge sharing behavior and nurses' innovative behaviors.

**Conclusion** The findings highlight the crucial role of supervisor knowledge sharing behavior in fostering nurses' innovative behaviors directly and through the mediating effect of organizational learning. Healthcare organizations should prioritize developing supervisors' knowledge sharing capabilities and establishing robust organizational learning cultures to enhance innovation among nursing staff.

**RCT code** Not applicable.

**Keywords** Knowledge sharing, Organizational learning, Innovative behaviors, Nursing leadership, Healthcare management

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## Introduction

The healthcare industry stands at a crucial intersection of traditional medical practices and emerging technological advancements [1]. As medical knowledge expands exponentially and patient care becomes increasingly sophisticated, healthcare organizations must adapt to meet evolving challenges and expectations [2]. The success of these adaptations largely depends on the active engagement and empowerment of healthcare professionals at all levels of the organization [3]. In today's dynamic and complex healthcare environment, innovation and continuous learning are critical for achieving superior patient outcomes and maintaining organizational effectiveness [4]. As frontline caregivers, nurses play a pivotal role in identifying challenges, proposing creative solutions, and contributing to organizational improvement [5]. Their unique perspective, derived from direct interaction with patients, enables them to address systemic issues and enhance the quality and safety of care [6]. However, the extent to which nurses engage in innovation and contribute to organizational learning is significantly influenced by their supervisors' behaviors and leadership styles [7].

By embracing supportive and participatory leadership approaches, nurse supervisors can cultivate an environment that encourages creativity and innovation. By empowering nurses and facilitating opportunities for skill development, supervisors not only enhance motivation and job satisfaction but also strengthen their teams' ability to adapt to the evolving demands of healthcare. This study investigates the mediating role of organizational learning in the relationship between supervisors' knowledge sharing behavior and nurses' innovative behaviors, aiming to address significant gaps in the current literature.

## Literature overview

### Supervisor knowledge sharing and nurses' innovative behaviors

In today's rapidly evolving healthcare environment, nurses' innovative behaviors are crucial for improving patient care quality and organizational effectiveness. Innovative behaviors encompass a range of actions, such as generating new ideas, refining processes, and implementing improvements, which are essential for optimizing resource use and achieving better outcomes [8, 9]. Supervisor knowledge sharing behavior plays a pivotal role in fostering innovation and can be categorized into explicit and tacit knowledge sharing [10]. Explicit knowledge sharing involves the clear and structured dissemination of information, such as protocols, guidelines, and documented best practices. In contrast, tacit knowledge sharing refers to the informal and experiential sharing of insights, skills, and personal experiences that are often more nuanced and context-dependent [10, 12].

By fostering an open environment for learning and collaborative problem-solving, supervisors create a foundation for continuous learning that encourages nurses to explore creative solutions, challenge existing practices, and implement innovative ideas [10, 11]. However, the specific mechanisms through which explicit and tacit supervisor knowledge sharing influences nurses' innovative behaviors remain unclear. Understanding these mechanisms is critical for developing strategies that enhance knowledge sharing practices and, in turn, promote a culture of innovation to improve patient care and organizational performance [12].

### Organizational learning as a driver of innovation

Organizational learning is the systematic process of acquiring, disseminating, and applying knowledge to improve organizational outcomes [13]. This process is particularly crucial in healthcare settings, where rapid advancements and complex challenges necessitate continuous adaptation and improvement. A strong organizational learning culture enables healthcare organizations to identify improvement opportunities, implement evidence-based practices, and foster innovation at all levels [13].

Engaging in organizational learning activities enhances nurses' professional skills, adaptability, and confidence, allowing them to provide high-quality care and respond effectively to emerging challenges [14]. Nurse managers can promote organizational learning and create a supportive framework that encourages team collaboration, continuous knowledge sharing, and the generation of innovative solutions [15].

### The role of supervisor knowledge sharing behaviors in organizational learning

Supervisors' knowledge sharing behavior is key to organizational learning within nursing teams. By consistently sharing knowledge, skills, and experiences, supervisors empower their subordinates to develop new competencies and engage in collaborative learning processes. This approach strengthens the team's innovation and continuous improvement capacity, creating a dynamic environment where challenges are addressed creatively and efficiently [13].

Research indicates that knowledge sharing behavior enhance individual and team performance and contributes to building a culture of trust, collaboration, and mutual support [14]. These factors are essential for fostering a learning-oriented workplace that prioritizes innovation and excellence in patient care [14].

### The mediating role of organizational learning

Organizational learning can bridge the gap between supervisors' knowledge sharing behavior and nurses'

innovative behaviors [10]. By facilitating the transfer of knowledge and fostering an environment of continuous improvement, organizational learning enables nurses to identify challenges, propose creative solutions, and implement innovations that enhance care quality and organizational effectiveness [14].

The current literature underscores the critical role of supervisors' knowledge sharing behavior, organizational learning, and innovative behaviors in fostering high-quality healthcare delivery. Despite these advancements, significant gaps remain in understanding how supervisors' active engagement in knowledge sharing directly and indirectly influences nurses' ability to innovate, particularly through organizational learning.

This study seeks to address these gaps by examining the mediating role of organizational learning in the relationship between supervisors' knowledge sharing behavior and nurses' innovative behaviors. By investigating this dynamic, we aim to uncover actionable insights into how healthcare leaders can foster a supportive and knowledge-driven culture that empowers nurses to generate, share, and implement innovative solutions. Filling this gap will not only enhance the theoretical understanding of these interconnections but also provide practical strategies for transforming healthcare organizations into innovative and adaptive learning environments capable of meeting the evolving needs of patients and society. Understanding these relationships is crucial, as fostering innovation through knowledge sharing and organizational learning can lead to improved patient outcomes, increased operational efficiency, and better staff engagement. This study's findings can guide healthcare policymakers and administrators in creating environments that support continuous learning and innovation, ultimately contributing to the delivery of high-quality, patient-centered care.

### Research hypotheses

This study investigates the intricate relationships between **organizational learning**, **supervisors' knowledge sharing behavior**, and **nurses' innovative behaviors** in clinical settings. Drawing on the theories and literature reviewed above, the following hypotheses are proposed (Fig. 1):

**Hypothesis 1** Supervisors' knowledge sharing behavior is correlated with organizational learning.

**Hypothesis 2** Organizational learning is correlated with nurses' innovative behaviors.

**Hypothesis 3** Supervisors' knowledge sharing behavior is correlated with nurses' innovative behaviors.

**Hypothesis 4** Organizational learning mediates the relationship between supervisors' knowledge sharing behavior and nurses' innovative behaviors.

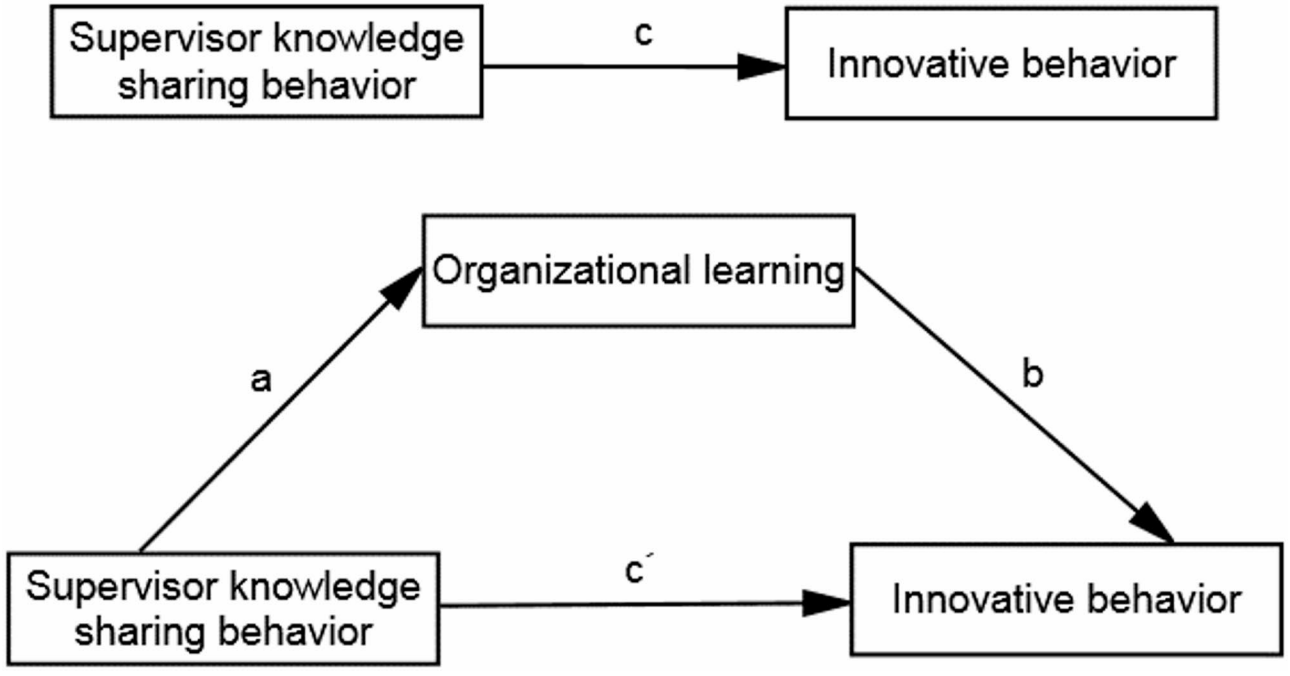


**Fig. 1** The hypothesized theoretical model

## Methods

### Design

We conducted a cross-sectional study on Iranian nurses, adhering to STROBE guidelines for observational studies [16].

### Setting and participants

The study focused on nurses at university hospitals affiliated with Ardabil University of Medical Sciences in Iran, highlighting their crucial role in healthcare delivery and education. These hospitals are well-regarded for their comprehensive training programs and research initiatives, making them ideal settings for this research. To participate, nurses were required to have at least six months of experience in their respective wards and voluntarily agree to participate in the study. This requirement ensured that participants had sufficient exposure to their work environments, potentially leading to informed and meaningful responses. Incomplete questionnaires were excluded from the analysis.

Using G*Power software, the sample size was determined based on an 80% power, a 5% significance level ($\alpha = 0.05$), an effect size of 0.04, and 9 predictor variables, resulting in a required sample size of 400. To accommodate a potential 20% dropout rate, the final sample size was increased to 480 participants.

The total nursing population across the five teaching hospitals in Ardabil was 1,920, distributed as follows: Imam Khomeini Hospital (664 nurses), Fatemi Hospital (468 nurses), Bouali Hospital (300 nurses), Alavi Hospital (256 nurses), and Imam Reza Hospital (232 nurses). Proportional sampling was employed to allocate the sample size to each hospital based on the total number of nurses. Accordingly, 166 participants were selected from Imam Khomeini Hospital, 117 from Fatemi Hospital, 75 from Bouali Hospital, 64 from Alavi Hospital, and 58 from Imam Reza Hospital. Simple random sampling was used to select participants within each hospital. A random number table was utilized to ensure that each nurse had an equal chance of being selected, thereby minimizing selection bias and enhancing the sample's representativeness. This method facilitated a fair and unbiased selection process, contributing to the overall validity of the study findings.

During data collection, 17 questionnaires were excluded due to incomplete responses, and 13 participants withdrew from the study. Consequently, the final sample consisted of 450 participants. Data collection was conducted from September 2024 to November 2024 Table 1.

**Table 1** Proportional allocation of sample size across hospitals

| Hospital name | Total nurses | Proportion of total population (%) | Sample size allocated (Including 20% dropout) |
|---|---|---|---|
| Imam Khomeini Hospital | 664 | 34.58% | 166 |
| Fatemi Hospital | 468 | 24.38% | 117 |
| Bouali Hospital | 300 | 15.63% | 75 |
| Alavi Hospital | 256 | 13.33% | 64 |
| Imam Reza Hospital | 232 | 12.08% | 58 |
| Total | 1,920 | 100% | 480 |

### Data collection

Data were collected through a structured approach utilizing several instruments, including a demographic information form, the Supervisor Knowledge Sharing Behavior Questionnaire (SKSBQ), the Innovative Behavior Inventory (IBI), and the Organizational Learning Instrument-Development Stages (OLI-DS). The questionnaires were administered in person, allowing the researchers to ensure clarity and completeness of responses. Researchers visited the hospitals to collect data directly from the nurses, facilitating a one-on-one interaction that encouraged participation and accurate data gathering.

#### *Demographic information form*

This form was developed based on relevant academic literature to gather essential demographic data. It comprises six closed-ended questions: age, working experience, gender, marital status, education level, and working ward. Including these variables allows for a comprehensive understanding of the participant demographics, which is crucial for contextualizing the study findings.

#### *Supervisor Knowledge Sharing Behavior Questionnaire (SKSBQ)*

The Supervisor Knowledge Sharing Behavior Questionnaire, developed by Ahmed Abdelwahab Ibrahim El-Sayed et al. in 2024, assesses nurses' perceptions of their supervisors' knowledge sharing behavior [10]. The instrument consists of 11 items across two subscales: explicit knowledge sharing behavior (8 items) and tacit knowledge sharing behavior (3 items). Responses are rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating greater knowledge sharing behavior by supervisors.

The original questionnaire demonstrated strong internal consistency with a Cronbach's alpha of 0.86 [10]. Following formal permission from the original designers, the English version underwent a rigorous translation process into Persian, utilizing two independent translators. To establish content validity, the translated instrument was evaluated by 12 faculty members at Ardabil University of Medical Sciences. The Content Validity Index (CVI) was assessed through three criteria: simplicity,

appropriateness, and certainty, using a four-point spectrum for each item. The final CVI calculation yielded 0.96, indicating excellent content validity. The Persian version also showed high reliability in our study, with a Cronbach's alpha of 0.92.

#### *Innovative Behavior Inventory (IBI)*

The Innovative Behavior Inventory, developed by Martin Lukes and Ute Stephan in 2017, measures employees' innovation-related activities [8]. It contains 23 items divided into six dimensions: **Idea Generation** (3 items), **Idea search** (3 items), **Idea Communication** (4 items), **Implementation starting activities** (3 items), **Involving others** (3 items), and **Overcoming obstacles** (4 items). Additionally, the questionnaire includes a separate **innovation output** dimension with 3 items to assess the results of innovative behaviors. Responses are rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate higher levels of innovative behavior. Martin Lukes and Ute Stephan reported Cronbach's alpha reliability coefficients ranging from 0.60 to 0.88 across various dimensions [8]. The psychometric properties of this inventory have also been validated in Iran, with Cronbach's alpha coefficients ranging from 0.79 to 0.96 [17, 18]. In our study, the coefficients ranged from 0.82 to 0.97.

#### *Organizational Learning Instrument-Development Stages (OLI-DS)*

The Organizational Learning Instrument-Development Stages (OLI-DS) instrument, designed by Bret Lyman and Kalene M. Ethington in 2022, assesses the readiness of hospital units for organizational learning [12]. The questionnaire includes 35 items categorized into four subscales: Identity and Ownership (13 items), Team and Respect (6 items), Accountability and Support (10 items), and Reliability and Sustainability (6 items).

Responses are scored on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating a greater readiness for organizational learning. Bret Lyman and Kalene M. Ethington determined the instrument's reliability with a Cronbach's alpha of 0.94 [12]. The psychometric properties of this questionnaire have also been evaluated in Iran, where researchers reported a Cronbach's alpha coefficient of 0.93 [19, 20]. In our study, the Cronbach's alpha was calculated at 0.97.

### Statistical analysis

Data analysis was performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA), to conduct descriptive statistical procedures, including the calculation of frequencies, percentages, means, and standard deviations. These descriptive measures provided an initial understanding of the participants' demographic characteristics and the distribution of the key study variables. To examine the interrelationships between Supervisor Knowledge Sharing Behavior, Organizational Learning, and Innovative Behaviors, Pearson correlation analysis was employed. This technique allowed for the quantification of the strength and direction of linear associations between continuous variables, thereby identifying potential relationships to inform subsequent analyses. Additionally, Structural Equation Modeling (SEM) was utilized via AMOS 24.0, incorporating the bootstrap method with 5,000 resamples to test the hypothesized model. SEM was selected due to its capacity to evaluate complex relationships among multiple variables simultaneously, offering a robust method for assessing the interactions between Supervisor Knowledge Sharing Behavior, Organizational Learning, and Innovative Behaviors within a unified framework. Model fit was assessed using established criteria, including the chi-square to degrees of freedom ratio ($\chi^2/df$), with an acceptable value of less than 3, and the Root Mean Square Error of Approximation (RMSEA), with a threshold of less than 0.08 [21]. Additional goodness-of-fit indices, such as the Goodness of Fit Index (GFI) > 0.90, Comparative Fit Index (CFI) > 0.90, and Normed Fit Index (NFI) > 0.90, were also considered [22]. Statistical significance was determined through a two-tailed test, with a p-value of less than 0.05 considered significant.

## Results

### Participants' characteristics

This study involved 450 clinical nurses and provided a comprehensive overview of their demographic profiles. The participants had an average age of 34.76 years, with a standard deviation of 8.58 years, indicating a diverse age range among the nurses. A significant majority of the participants were female, comprising 63.8% of the sample ($n = 287$), while a noteworthy portion were married individuals, representing 68.7% ($n = 309$) of the group Table 2.

### Correlation analyses

The overall mean scores for Supervisor Knowledge Sharing Behavior, Organizational Learning, and Innovative Behaviors among all participants were 39.60 ± 8.26, 96.85 ± 19.14, and 82.67 ± 11.30, respectively (Table 3).

A Pearson correlation coefficient was calculated to examine the relationships between Supervisor Knowledge Sharing Behavior, Organizational Learning, and Innovative Behaviors. The results indicated a positive relationship between Supervisor Knowledge Sharing Behavior and Organizational Learning ($r = 0.577$, $p < 0.001$). Another positive correlation was found between Supervisor Knowledge Sharing Behavior and Innovative Behaviors ($r = 0.601$, $p < 0.001$). The findings

**Table 2** Demographic characteristics of the participants ($n=450$)

| Variables | Categories | Mean ± SD | |
|---|---|---|---|
| Age (year) | | 34.76 ± 8.580 | |
| Working experience (year) | | 9.18 ± 6.207 | |
| | | **No.** | **%** |
| Gender | Male | 163 | 36.2 |
| | Female | 287 | 63.8 |
| Marital status | Single | 141 | 31.3 |
| | Married | 309 | 68.7 |
| Education level | Bachelor's degree | 408 | 90.7 |
| | Master's degree or PhD | 42 | 9.3 |
| Ward | Medical | 65 | 14.4 |
| | Surgical | 53 | 11.8 |
| | Emergency | 172 | 38.2 |
| | ICU | 60 | 13.3 |
| | OB/GYN | 33 | 7.3 |
| | Pediatric | 52 | 11.6 |
| | Other | 15 | 3.4 |

Abbreviations: ICU, Intensive care unit; OB/GYN, Obstetrics-Gynecology

**Table 3** Correlation matrix of main variables ($n=450$)

| Variables | Mean | SD | 1 | 2 | 3 |
|---|---|---|---|---|---|
| | | | *r* (*p*) | | |
| 1. SKSB | 39.60 | 8.26 | 1 | | |
| 2. OL | 96.85 | 19.14 | 0.577 ($p<0.001$) | 1 | |
| 3. IB | 82.67 | 11.30 | 0.601 ($p<0.001$) | 0.573 ($p<0.001$) | 1 |

Note. Numbers 1–3 in the title row represent the numbered variables in the first column

Abbreviations: SKSB, Supervisor Knowledge Sharing Behavior; OL, Organizational Learning; IB, Innovative Behaviors

**Table 4** Results of goodness-of-fit statistics ($n=450$)

| Indices | Acceptable value | Results |
|---|---|---|
| $\chi^2$/df | < 3 | 2.798 |
| RMSEA | < 0.08 | 0.114 |
| CFI | > 0.90 | 0.913 |
| GFI | > 0.90 | 0.915 |
| NFI | > 0.90 | 0.917 |

Abbreviations: $\chi^2$/df, Chi-Square/Degrees of Freedom Ratio; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; GFI, Goodness-of-Fit Index; NFI, Normed Fit Index

also indicated a positive relationship between Organizational Learning and Innovative Behaviors ($r=0.573$, $p<0.001$). As a result, the research findings led to the confirmation of the research hypotheses. The correlations between Supervisor Knowledge Sharing Behavior, Organizational Learning, and Innovative Behaviors are shown in the correlation matrix (Table 3).

### Structural equation modeling

A structural equation model (SEM) was developed to analyze the relationships between **supervisor knowledge sharing behavior (SKSB)**, **organizational learning (OL)**, and **innovative behaviors (IB)** among nurses. The model fit indices indicated that the conceptual framework was well-fitted to the data, with the following values: $\chi^2$/df = 2.798, RMSEA = 0.114, CFI = 0.913, GFI = 0.915, and NFI = 0.917 (Table 4). All indices met or exceeded acceptable thresholds, suggesting an adequate model fit.

Although our model yielded an RMSEA of 0.114, RMSEA is particularly sensitive to model complexity and the number of degrees of freedom. RMSEA can be upwardly biased in models with few degrees of freedom, even when the overall model fit is acceptable [19, 20]. The relatively low $\chi^2$/df and the satisfactory values obtained for CFI, GFI, and NFI suggest that the conceptual framework fits the data adequately. We thus interpret the RMSEA value with caution and emphasize that fit should be assessed using a combination of indices rather than a single criterion.

Based on the modification index (MI), a suggested covariance was added between E12 and E13, as the MI value exceeded 20%. This adjustment was made to improve the model's fit and ensure its adequacy for capturing the relationships between the constructs.

The sensitivity of the RMSEA to model complexity and sample size must also be considered. RMSEA can be more forgiving in larger samples, but a value above 0.10 typically indicates a need for further examination of the model's specifications. Therefore, while the other fit indices (CFI, GFI, NFI) suggest an adequate model fit, the elevated RMSEA warrants caution in interpretation. Future research may benefit from refining the model to improve fit, potentially by exploring additional variables or relationships that could enhance the understanding of how SKSB and OL contribute to IB among nurses.

The analysis employed a bias-corrected bootstrap method with 95% confidence intervals based on 5,000 bootstrap samples to test the mediating effect of organizational learning. The findings showed the following:

1. **Total Effect**: The total effect of supervisor knowledge sharing behavior on innovative behaviors was significant (B = 0.314, SE = 0.037, C.R. = 8.593, $p<0.001$), with a 95% CI of [0.542, 0.708].
2. **Indirect Effect**: Organizational learning significantly mediated the relationship between supervisor knowledge sharing behavior and innovative behaviors (B = 0.215, SE = 0.034, C.R. = 6.371, $p<0.001$), with a 95% CI of [0.176, 0.434].
3. **Direct Effect**: The direct effect of supervisor knowledge sharing behavior on innovative behaviors remained significant (B = 0.081, SE = 0.010, C.R. = 8.067, $p<0.001$), with a 95% CI of [0.114, 0.218].

These results indicate that organizational learning partially mediates the impact of supervisor knowledge

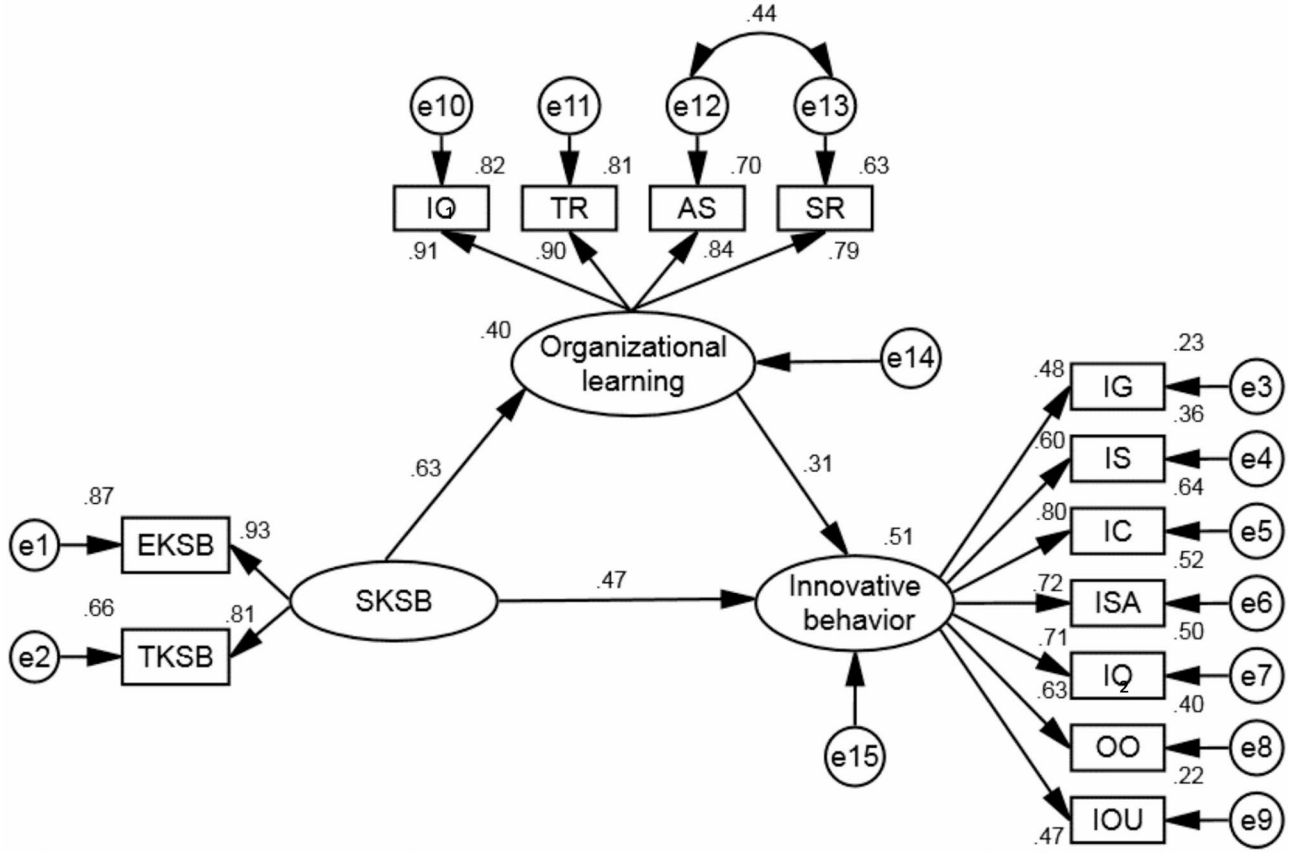


**Fig. 2** The SEM regarding the effect of supervisor knowledge sharing behavior on innovative behaviors through organizational learning. Abbreviation: SKSB, Supervisor Knowledge Sharing Behavior; EKSB, explicit knowledge sharing behavior; TKSB, tacit knowledge sharing behavior; $IO_1$, Identity and Ownership; TR, Team and Respect; AS, Accountability and Support; SR, Reliability and Sustainability; IG, Idea Generation; IS, Idea search; IC, Idea Communication; ISA, Implementation starting activities; $IO_2$, involving others; OO, Overcoming obstacles; IOU, Innovation Output

**Table 5** Results for the effects of supervisor knowledge sharing behavior on innovative behaviors with organizational learning as a mediator ($n = 450$)

| Effect | Estimated (B) | SE | C.*R.* | *p* | BC 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Total effect (SKSB → IB) | 0.314 | 0.037 | 8.593 | < 0.001 | 0.542 | 0.708 |
| Indirect effect (SKSB → OL → IB) | 0.215 | 0.034 | 6.371 | < 0.001 | 0.176 | 0.434 |
| Direct effect (SKSB → IB) | 0.0.81 | 0.010 | 8.067 | < 0.001 | 0.114 | 0.218 |

Abbreviation: SE, Standard error; C.R., Critical ratio; BC, Bias-Corrected; CI, Confidence interval; SKSB, Supervisor Knowledge Sharing Behavior; IB, Innovative Behaviors; OL, Organizational Learning

sharing behavior on nurses' innovative behaviors. Both the direct pathway (**SKSB → IB**) and the indirect pathway (**SKSB → OL → IB**) were significant, confirming that the mediating effect of organizational learning is partial.

The total variance explained by the model was substantial, demonstrating that supervisor knowledge sharing behavior and organizational learning collectively contribute significantly to fostering innovative behaviors among nurses. Table 4; Fig. 2, and Table 5 present detailed values of the total, direct, and indirect effects.

## Discussion

This study examined the relationship between supervisor knowledge sharing behavior and innovative behaviors among nurses, with organizational learning as a mediator. The findings reveal that nursing supervisors are pivotal in fostering a culture of continuous learning and innovation within healthcare organizations. Specifically, effective knowledge sharing behavior not only aids nurses in acquiring new skills and knowledge but also encourages creative thinking, leading to innovative ideas

that enhance patient care and improve organizational processes.

When compared with existing literature, these findings align with previous studies emphasizing the importance of innovative behaviors and organizational learning in delivering high-quality care [23, 24]. The evidence suggests that fostering a supportive environment for knowledge exchange among nursing staff is crucial for optimizing resource utilization, reducing medical errors and complications, and increasing overall system efficiency.

### The direct impact of supervisor knowledge sharing on innovative behaviors

Our research indicates that supervisors' knowledge sharing behaviors have a direct and positive effect on nurses' innovative behaviors. Supervisors expand their subordinates' perspectives by actively sharing information, knowledge, and experiences, fostering new ideas and creativity within the team. This is particularly crucial in healthcare, as innovation can lead to improved care procedures and enhanced patient safety outcomes [25].

Our findings demonstrated that supervisor knowledge sharing behavior directly and positively influences innovative behaviors among nurses. This aligns with the results of Ibrahim El-Sayed et al., who highlighted the importance of supervisors' explicit and tacit knowledge sharing practices in empowering nurses to think creatively and implement innovative solutions [10]. Similarly, Ming-Shun Lee et al. found that a team learning climate has a significant positive impact on innovation performance [26]. Additionally, Ahmed Abdel-Wahab Ibrahim El-Sayed et al. in another study reported that participative leadership is positively related to both productive work performance and innovative behaviors among nurses. They revealed that leadership serves as a powerful factor in fostering nurses' innovative behaviors while maintaining their productivity [27]. When supervisors share their information, knowledge, and experience with their subordinates, they broaden these subordinates' perspectives, leading to the creation of ideas and creativity within their team [28].Supervisors improve organizational performance by fostering innovation and developing creative methods [29].

The findings suggest that healthcare organizations should prioritize knowledge sharing practices among supervisors to create an environment that promotes collaboration and new ideas. This approach can enhance performance and innovation in nursing teams, thereby improving patient care and safety. Implementing training programs to boost supervisors' knowledge sharing skills can empower nurses to contribute creatively in their work environments.

### The mediating role of organizational learning

Organizational learning was found to significantly mediate the relationship between supervisor knowledge sharing behavior and innovative behaviors. This result underscores the critical role of a learning-oriented organizational culture in translating supervisors' efforts into tangible innovation among nurses. Consistent with the theoretical framework and previous research, organizational learning fosters the development of skills, knowledge, and behaviors essential for innovation [30].

Rafael Sancho-Zamora et al. demonstrated that organizational learning capability positively influences innovation capacity [31]. Additionally, Maria Ubso et al. found that knowledge generation and knowledge flow have positive effects on organizational learning as mediating factors [32]. These findings highlight the importance of creating opportunities for knowledge transfer flow from supervisor to subordinates, which establishes a learning culture in the organization. through organizational learning, the organization enhances creativity and innovation.

To fully capitalize on the benefits of supervisor knowledge sharing, healthcare organizations should establish and maintain a robust culture of continuous learning [33]. This involves not only encouraging knowledge exchange but also actively mitigating factors that impede learning, such as organizational silence, which has been found to negatively correlate with organizational learning levels among nurses [34]. Establishing such a supportive and open environment is crucial. This can be achieved through structured training and development programs that enhance nurses' innovative thinking and creative problem-solving capabilities. In today's dynamic healthcare environment, the ability to implement innovative solutions is crucial, as it directly impacts both the quality of patient care and overall organizational effectiveness [35].

### The relationship between organizational learning and innovative behaviors

The study confirmed several key findings regarding the relationship between organizational learning and innovative behaviors among nurses. Firstly, there is a strong positive relationship between organizational learning and innovative behaviors, indicating that learning organizations facilitate innovation by providing essential resources, knowledge, and support. This aligns with earlier studies that support the notion that a robust learning culture enhances innovation [23, 36].

Specifically, Oding Supriyadi et al. demonstrated a significant positive effect of organizational learning on innovation capacity [37], while Sladjana Cabrilo et al. highlighted that organizational learning practices contribute to innovation performance by enhancing knowledge and collaboration processes [38]. These findings

suggest that when organizational learning is prioritized, nurses are encouraged to share their experiences, challenge traditional practices, and experiment with novel approaches to improve care delivery [13].

Moreover, the study revealed that the knowledge sharing behavior of supervisors is positively correlated with nurses' innovative behaviors. Nurses are more likely to exhibit innovative behaviors when their supervisors actively share knowledge and experiences, emphasizing the importance of a work environment that prioritizes knowledge sharing to foster creativity and innovation. Importantly, organizational learning was shown to play a significant mediating role in the relationship between supervisors' knowledge sharing behavior and innovative behaviors [14]. Organizational learning entails the continuous acquisition, sharing, and application of knowledge to enhance performance. Creating a strong organizational learning environment is crucial for transforming knowledge into innovation among nurses.

To capitalize on these findings, healthcare organizations should develop educational programs, collaborative learning opportunities, and a supportive culture that strengthens learning and innovation within the nursing workforce. Encouraging nurses to engage in continuous learning and apply new knowledge can enhance creativity, problem-solving, and process improvements, ultimately leading to better care quality and improved patient outcomes [13].

As hypothesized, the study demonstrated that organizational learning directly and positively influences nurses' innovative behaviors. This emphasizes that organizations prioritizing learning and development can effectively nurture innovation among their employees. Innovative behaviors encompass the ability of employees to generate and implement new and useful ideas for improving organizational performance. Employees in strong learning environments are more likely to be creative, innovative, and committed to achieving both individual and organizational goals.

## Limitations

This study contributes to understanding the relationship between supervisor knowledge sharing, organizational learning, and nurses' innovative behaviors in clinical settings. A key strength is its robust methodology, utilizing a cross-sectional design with a sample of 450 participants from various university hospitals, which enhances generalizability. The use of validated data collection instruments ensures reliability and validity. The findings provide actionable insights for healthcare organizations, highlighting the need to promote knowledge sharing and continuous learning to enhance innovation among nursing staff. The study also identifies organizational learning as a crucial mediating factor, enriching the literature on translating supervisor support into practical innovations in patient care.

However, several limitations should be considered. While the study acknowledges the constraints of a cross-sectional design in establishing causal relationships, it is essential to emphasize the potential for reverse causation. For instance, innovative behaviors may influence the knowledge sharing culture within the organization, suggesting a bidirectional relationship that warrants further investigation. Additionally, the findings may not be generalizable beyond the specific cultural context of Iranian university hospitals. The reliance on self-reported questionnaires also raises concerns about potential response bias. Future research could benefit from incorporating objective measures and examining confounding variables such as organizational culture and leadership styles to provide a more comprehensive understanding.

## Conclusion

This research underscores the pivotal role of supervisors in sharing their knowledge to promote innovative practices among nurses, with organizational learning as a crucial mediating factor. A supportive, learning-oriented environment boosts nurses' innovation, which is essential for better patient care and organizational success. Supervisors who share their expertise and experiences are instrumental in cultivating a culture that fosters continuous learning, collaboration, and creativity. Furthermore, organizational learning is critical in linking knowledge sharing activities to innovative outcomes, highlighting its importance in transforming leadership behaviors into meaningful advancements.

To leverage these insights, healthcare organizations should prioritize strategies that strengthen supervisors' knowledge sharing abilities and foster organizational learning. Recommended measures include targeted training programs, leadership development initiatives, and policies that promote knowledge exchange and collaboration. Implementing these strategies can create a dynamic and innovative workforce capable of addressing the complex challenges of modern healthcare. Future research should build upon these findings by exploring additional mediators and contextual factors that may influence the relationship between leadership behaviors and innovation. Longitudinal and cross-cultural studies are encouraged to validate and generalize the results, paving the way for comprehensive strategies supporting innovation across diverse healthcare settings.

As the healthcare sector continues to evolve and face new challenges, promoting innovation among nursing staff becomes increasingly imperative. By fostering a culture that emphasizes the connections between supervisors' knowledge sharing behaviors, organizational learning, and the implementation of innovative practices,

healthcare organizations can enhance their capacity to provide high-quality patient care. This approach will also enable them to adapt effectively to the changing demands of the healthcare environment.

### Nursing implications

The findings highlight the essential role of supervisors' knowledge sharing behavior in promoting innovative practices among nurses. Healthcare institutions must foster a supportive environment encouraging explicit and tacit knowledge exchange. To optimize the impact of these results, nursing managers and policymakers should consider implementing structured knowledge sharing platforms, such as regular interdisciplinary meetings and online forums, where nurses can exchange best practices and innovative ideas. Furthermore, developing ongoing professional development programs focused on clinical skills and knowledge sharing techniques is crucial to ensure that nurses are well-equipped to engage in effective knowledge exchange.

Implementing mentorship initiatives that pair experienced nurses with newer staff can facilitate the transfer of tacit knowledge and stimulate innovative thinking. Collaborative projects can bolster organizational learning and innovation by promoting team-based learning strategies. Additionally, integrating leadership development programs for nurse managers emphasizing the significance of knowledge sharing will provide them with the necessary skills to create an open and supportive atmosphere. Revising hospital policies to incorporate knowledge sharing and innovation as core practice elements is vital, ensuring that these behaviors are acknowledged and rewarded. Establishing recognition and reward systems for innovative contributions can motivate nurses to participate in creative problem-solving. Cultivating a culture of knowledge sharing and organizational learning can enhance both the innovative behaviors among nurses and the overall quality of healthcare and patient outcomes.

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#### Author contributions

All authors contributed to the design of the study. Data collection and entry were carried out by N. G-A, and A. M, while A. H S, and S. M, were responsible for statistical analyses and interpretations. N. G-A, A. M, and A. HS, collaboratively prepared the final report and manuscript. All authors reviewed and approved the final version of the manuscript.

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#### Data availability

The data utilized in this study can be obtained from the corresponding author upon reasonable [A. H S] request.

## Declarations

#### Ethical statement

This research was approved by the Research Ethics Committee of Ardabil University of Medical Sciences (Approval ID: IR.ARUMS.REC.1403.212). Prior to participation, the clinical nurses were fully informed about the study's objectives and were made aware that their involvement was voluntary. Written informed consent was obtained from each participant, who were also assured that they could withdraw from the study at any time without any consequences. All ethical standards prescribed by the Declaration of Helsinki were strictly followed, with measures taken to protect participants' privacy and confidentiality. No identifying information will be disclosed in any publications or reports stemming from this research.

#### Competing interests

The authors declare no competing interests.

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