The relationship between teamwork and the workload of nurses with missed nursing care in intensive care units in Iran: a cross-sectional study

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Abstract

Background Missed nursing care (MNC) is a major challenge faced by nurses working in intensive care units (ICU). Workplace characteristics, including teamwork and workload, can affect the extent of missed nursing care. Examining the relationship between these variables can help create strategies to enhance care. Thus, this study aimed to explore the connection between teamwork, workload, and missed nursing care in the intensive care units of hospitals in Iran.

Methods This descriptive cross-sectional study was conducted from August to November 2023 on 219 nurses working in the intensive care units of teaching hospitals affiliated with Hamadan University of Medical Sciences. Participants were selected through multi-stage sampling after meeting the inclusion criteria. Data were collected using the General Characteristics questionnaire, the Team-STEPPS® Teamwork Perception Questionnaire (T-TPQ), the National Aeronautics and Space Administration Task Load Index (NASA-TLX), and the MISSCARE survey. Data analysis was performed using Stata software version 14.

Results Out of 219 returned questionnaires (92.79% response rate), 194 valid responses were analyzed. Missed nursing care showed a significant negative correlation with overall teamwork ($r = -0.538$, $P < 0.001$) and its subcomponents, including team structure ($r = -0.472$), leadership ($r = -0.303$), situation assessment ($r = -0.486$), mutual support ($r = -0.325$), and communications ($r = -0.517$). Tenure was also significantly related to missed nursing care ($p = 0.040$), with nurses having less than 2 years of experience reporting the lowest missed care scores. No significant relationships were found between workload scores and demographic variables.

Conclusion The relationship between teamwork, nurse workload, and missed nursing care is complex. The findings of this study emphasize the importance of effective teamwork and manageable workloads in reducing missed nursing care. However, contextual differences in nurses' work environments are of great importance in different countries.

Keywords Missed nursing care, Teamwork, Workload, Intensive care units, Iran

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Summary statement

Why is this research or review needed?

- Missed nursing care is a prevalent problem observed internationally, serving as a key indicator of the safety and quality of nursing care.
- Teamwork plays an effective role in providing quality and safe care to patients.
- Nurses in intensive care units have a heavier workload than those in other hospital departments.
- The characteristics of the work environment vary widely across different countries. On the other hand, the relationship between missed nursing care, workload, and teamwork in developing countries is unknown.

What does this paper contribute to the broader global community?

- Missed nursing care has an inverse and significant correlation with teamwork.
- There is a significant relationship between missed nursing care and tenure in the hospital.

Introduction

Missed nursing care has become a focus of attention for nursing managers and policymakers due to its direct impact on patient clinical outcomes [1]. Over the past 15 years, this global phenomenon has been extensively studied by researchers worldwide [2]. The concept of missed nursing care was first identified and introduced in a study by Kalisch and colleagues in 2006 [3], encompassing aspects of patient care that are either completely omitted or delayed [4]. The rate of missed nursing care in Iranian healthcare centers has been reported to be higher than the global average [5]. A previous study in Iran indicated that 72.1% of nurses missed at least one essential component of nursing care in surgical inpatient units [6]. Essential components such as vital sign monitoring, oral care, patient education, emotional support, and discharge planning are frequently overlooked or neglected [7].

Missed nursing care is associated with complications such as hospital-acquired infections, medication errors, pressure ulcers, and readmissions [1]. Additionally, this phenomenon has adverse effects on healthcare organizations [7]. Identifying effective strategies to reduce missed nursing care is crucial, as it is a key indicator of patient safety and the quality of nursing care [8]. The characteristics of the workplace heavily impact the occurrence of missed nursing care [8]. The mismatch between patients' needs and the available time and resources creates stress for nurses, negatively impacting the quality of care and resulting in missed nursing care [9]. Collaboration among team members is crucial in alleviating stress for nurses

and ensuring the delivery of high-quality and safe nursing care [10]. Teamwork is also associated with higher job satisfaction and performance among nurses [11]. A nursing team typically consists of two or more nurses who assist each other in delivering patient care. This teamwork ensures high-quality and safe care, particularly in intensive care units [10].

Intensive care units (ICUs) are specialized sections equipped with human resources and advanced technology to provide high-standard care, focusing on delivering safe services at a reasonable cost [12]. Nurses in ICUs spend most of their time providing direct care to patients in critical and severe conditions, resulting in a higher workload compared to nurses in other departments. Evidence suggests a correlation between high nurse workloads and missed nursing care [10]. The study by Tubbs-Cooley et al. reported a significant statistical relationship between nurse workload and the likelihood of missed care for infants [13].

In the study conducted by Cho et al., a direct relationship was observed between unfavourable work schedules, such as long working hours, missed nursing care, and organizational commitment among Korean nurses [14]. Given the adverse outcomes of missed nursing care on nurses, patients, and organizations [15] and the lack of identification of all factors influencing missed nursing care in healthcare settings, it is crucial to identify other contributing factors.

Although the significance of teamwork in providing high-quality and safe care is well-known [12], the relationship between missed nursing care, workload, and teamwork in various healthcare settings, such as intensive care units, is still unknown. Most previous studies on factors influencing missed nursing care have been conducted in developed countries [8], and there is a notable lack of research in developing countries. The work environments in developing countries, such as Iran, differ significantly from those in developed nations, necessitating studies that address these specific contexts [6]. Moreover, research indicates that missed nursing care is a significant issue in Iran's healthcare system [4, 15]. Therefore, this study examined the relationship between nurse workload, teamwork, and missed nursing care in intensive care units of educational and medical centers in Iran.

Methods

Study design & settings

This prospective, multicentric, cross-sectional study was conducted at three teaching hospitals, Shahid Beheshti, Besat, and Sina in Hamadan (Western Iran), from August to November 2023. These teaching hospitals housed various inpatient and outpatient departments where healthcare teams, including nursing and medical staff, performed numerous modern medical and surgical

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interventions. All of these hospitals were associated with Hamadan University of Medical Sciences. This study was designed according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies.

Participants
Participant selection for the study was performed using a multi-stage sampling method from nurses working in intensive care units. Initially, the hospitals were selected using a convenience sampling method; subsequently, study participants were chosen in proportion to the number of nurses employed in each hospital through stratified random sampling. Participants who met the inclusion criteria participated voluntarily in the study. The inclusion criteria for nurses were: (1) clinical nurses (2), having worked at least one year full-time in the intensive care units of the research hospitals (3), being employed full-time (4), holding a bachelor's or master's degree in nursing (5), signing informed consent, and (6) willingness to participate in the study. Nurses on leave during the study period or were part-time employees were excluded from the study. Additionally, nurses who did not provide direct patient care were also excluded.

The sample size for this study was calculated based on a similar study [16]. with a Type I error rate of 0.05, a power of 80%, and a correlation coefficient ($r = 0.19$), 215 intensive care nurses. Considering potential data loss and a non-response rate, an additional 10% was added to the sample size, estimating an appropriate sample size of 236 nurses.

Measurements
General characteristics
General characteristics included assessments of gender, age, education, marital status, work history, overtime duration, and shift type, which were collected using a self-report questionnaire. When completing the survey, nurses were asked to consider the characteristics of their typical work schedule over the past six months.

Teamwork
The teamwork of nurses was assessed using the TeamSTEPPS® Teamwork Perception Questionnaire (T-TPQ). This questionnaire measured individuals' perceptions and attitudes toward knowledge, skills, and teamwork behaviours at the group or unit level [11]. The questionnaire consists of 35 items structured into five dimensions: "Mutual Support," "Communication," "Situation Monitoring," "Leadership," and "Team Structure," each dimension comprising 7 items. Participants were asked to show their level of agreement with each item on a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). This tool has been utilized in numerous international studies [11, 17–20]. Kakemam et al. evaluated the validity and reliability of this tool in the Iranian population. Cronbach's alpha coefficients for the subscales varied from 0.84 to 0.92, while the overall questionnaire reliability coefficient was $\alpha = 0.96$ [21].

Workload
In this study, the mental workload of the participating nurses was measured using the National Aeronautics and Space Administration Task Load Index (NASA-TLX). This tool has been used in various studies to assess the workload of healthcare providers [22, 23]. It assesses workload in six subcategories: mental demand, temporal demand, physical demand, performance, effort, and frustration [24]. The NASA-TLX method for assessing mental workload consists of three steps. First, the weight of each of the six scales is determined to establish their relative importance. During this step, staff members evaluate and select all scales in pairs across 15 different scenarios, assigning each workload dimension a score between 0 and 1. In the second step, each of the six scales is rated to gauge the impact of each dimension on mental workload. Participants rate these dimensions from 0 to 100 based on their specific working conditions. In the final step, the total workload is calculated on a scale of 0 to 100 using the formula: Total workload = (rating × weight) / 15 [25]. The validity and reliability of this index were confirmed by Mazloumi et al., with the questionnaire's Cronbach's alpha determined to be 0.862 in this study [26]. Additionally, Mohammadi et al. evaluated the validity and reliability of this tool in Persian for nurses working in intensive care units and found the results acceptable [27].

Missed nursing care
The MISSCARE survey, developed in 2009 by Kalisch and Williams, was used to evaluate instances of missed nursing care [28]. Various Iranian studies have confirmed this scale's validity and reliability [29, 30]. The Persian version of this tool assesses the frequency and types of missed nursing care, along with the underlying reasons for these occurrences. Part A consists of 24 items focused on identifying the frequency and types of missed nursing care, while Part B consists of 17 items aimed at understanding the reasons behind missed or delayed nursing care. In the present study, the first part of the tool was utilized. In this section, participants were asked to rate the reasons for missed nursing care on a four-point Likert scale: "1 = no cause for not doing it, 2 = trivial cause, 3 = moderate cause, and 4 = major cause." The reasons for missed nursing care are classified into three categories: human resources, material resources, and communication. The range of scores is between 17-68. Higher scores indicate more significant reasons for missed nursing care activities in this scale. The test-retest reliability coefficients in

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the Kalisch and Williams study were 0.87 for part A and 0.86 for part B of the main scale [28].

In Iran, Mehrabian et al. confirmed the validity and reliability of the tool used in their study. The reliability was assessed by calculating Cronbach's alpha coefficient, which was found to be 0.85 for the first part and 0.73 for the second part of the questionnaire [29]. In the present study, only the initial section of the tool was utilized, resulting in a Cronbach's alpha coefficient of 0.8.

Data analysis
Data analysis was conducted using Stata software, version 14. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe the data. Data normality was assessed, and inferential statistics were performed using Pearson correlation, independent t-test, and ANOVA. The significance level was set at 0.05.

Results
Demographic characteristics of the nurses
Out of 236 distributed questionnaires, 219 were returned, resulting in an overall response rate of 92.79%. Responses with repetitive answers or incomplete questionnaires

Table 1 Participant characteristics ($N = 219$)

	n	%
Gender		
Male	25	11.42
Female	194	88.58
Marital status		
Single	137	62.56
Marid	82	37.44
Education		
Bachelor	201	91.78
Master	18	8.22
Hospital		
Sina	37	16.89
Besat	110	50.23
Beheshti	72	32.88
Work schedule		
Rotating shifts	174	79.45
Only daytime	45	20.55
Age (R:23–52; M:33.22; SD:6.48)		
≤30 years	89	40.64
≥31 years	130	59.36
Tenure in hospital (R:1–25; M:7.54; SD:5.30)		
< 2 years	9	4.11
2–4 years	79	36.07
5–9 years	57	26.03
≥ 10 years	74	33.79
Overtime (R:4–125; M:66.46; SD:34.10)		
≤ 40 h	64	29.22
≥ 41 h	155	70.78

R range, *M* mean, *SD* standard deviation, *n* frequency, % percentage

were excluded. Among the 194 participants (88.58%), the majority were women with an average age of 33.22 ± 6.48 years. Eighteen participants held a master's degree, while the rest had a bachelor's degree. Most participants (79.45%) worked rotating shifts, and 20.55% had only daytime work schedules. The average tenure in the hospital was 7.54 ± 5.30 years, with 33.79% having ten or more years of experience. Additionally, 29.22% of nurses worked overtime for 40 h or less, while 70.78% worked overtime for 41 h or more (Table 1).

The occurrence and the reporting of missed nursing care
The average nursing care score was 42.41 ± 10.32. No significant differences were found between gender, marital status, education, or age regarding missed nursing care scores ($p > 0.05$). However, a significant relationship was found between tenure in the hospital and missed nursing care ($p = 0.040$), indicating that individuals with less than 2 years of experience had the lowest scores of missed nursing care (Table 2).

Levels of teamwork
The average teamwork score was 129.61 ± 12.53. Significant differences were found between age ($p = 0.020$), hospital ($p = 0.029$), tenure ($p = 0.016$), and overtime ($p = 0.024$) with teamwork scores. Other demographic variables did not show significant relationships with teamwork scores ($p > 0.05$) (Table 2).

Levels of workload
The average workload score was 61.75 ± 8.03. No significant relationships were found between workload and any demographic variables ($p > 0.05$) (Table 2).

Comparison of the scores of teamwork and its subscales by missed nursing care occurrence and reporting
Table 3 shows the relationships between missed nursing care, workload, teamwork, and its subcomponents. A significant negative correlation was found between missed nursing care and overall teamwork ($r = -0.538$, $P < 0.001$). The correlations between missed nursing care and the subcomponents of teamwork were as follows: Team structure ($r = -0.472$, $P < 0.001$), Team leadership ($r = -0.303$, $P < 0.001$), Situation assessment ($r = -0.486$, $P < 0.001$), Mutual support ($r = -0.325$, $P < 0.001$), and Communications ($r = -0.517$, $P < 0.001$).

Comparison of the scores of workloads by missed nursing care occurrence and reporting
There was a positive but non-significant relationship between workload and missed nursing care ($r = 0.159$, $P = 0.081$) (Table 3).

Table 2 Relationship between teamwork, workload, and missed nursing care with general characteristics study participants

	Missed nursing care		Teamwork		Workload	
	mean (SD)	*P* values	mean (SD)	*P* values	mean (SD)	*P* values
Gender						
Male	44.4 (13.53)	0.308	128.12 (9.65)	0.834	59.11 (6.68)	0.081
Female	42.15 (9.85)		128.68 (12.88)		62.09 (8.14)	
Marital status						
Single	42.51 (10.70)	0.860	128.30 (11.89)	0.637	61.14 (7.86)	0.148
Marid	42.25 (9.72)		129.13 (13.60)		62.76 (8.26)	
Education						
Bachelor	42.40 (10.24)	0.971	128.66 (11.77)	0.843	61.67 (7.90)	0.617
Master	42.5 (11.54)		128.05 (19.62)		62.66 (9.64)	
Hospital						
Sina	41.05 (8.41)	0.559	132.02 (7.81)	0.029	60.44 (9.39)	0.483
Besat	43.08 (12.20)		126.47 (13.73)		61.76 (7.54)	
Beheshti	42.09 (7.82)		130.13 (12.11)		62.41 (8.05)	
Work schedule						
Rotating shifts	42.16 (10.24)	0.474	128.38 (13.12)	0.592	61.49 (7.79)	0.343
Only daytime	43.4 (10.70)		129.51 (10.01)		62.76 (8.94)	
Age						
≤30 years	43.74 (12.50)	0.143	126.24 (12.17)	0.020	61.46 (7.0)	0.648
≥31 years	41.50 (8.45)		130.23 (12.56)		61.95 (8.69)	
Tenure in hospital						
< 2 years	37.22 (3.92)	0.040*	127.66 (10.5)		62.22 (6.65)	0.652
2–4 years	44.86 (12.89)		126.15 (12.48)	0.016	61.00 (7.12)	
5–9 years	40.08 (4.57)		132.98 (7.04)		62.78 (9.16)	
≥ 10 years	42.22 (10.42)		128 (15.19)		61.69 (8.23)	
Overtime						
≤ 40 h	41.14 (8.98)	0.206	131.57 (8.69)	0.024	62.50 (8.49)	0.373
≥ 41 h	42.94 (10.81)		127.39 (13.65)		61.44 (7.84)	

*Kruskal Wallis

Table 3 Correlation between missed nursing care, teamwork, workload, and work experience

	Missed nursing care	Workload	Team structure	Team leadership	Situation assessment	Mutual support	Communications
Missed nursing care	1.00						
Workload	r=0.159 P=0.081	1.00					
Team structure	r = −0.472 P < 0.001	r=0.004 P=0.943	1.00				
Team leadership	r = −0.303 P < 0.001	r=0.029 P=0.663	r=0.473 P<0.001	1.00			
Situation assessment	r = −0.486 P < 0.001	r = −0.048 P=0.474	r=0.527 P<0.001	r=0.560 P<0.001	1.00		
Mutual support	r = −0.325 P < 0.001	r=0.102 P=0.131	r=0.377 P<0.001	r=0.689 P<0.001	r=0.526 P<0.001	1.00	
Communications	r = −0.517 P < 0.001	r=0.022 P=0.741	r=0.490 P<0.001	r=0.412 P<0.001	r=0.565 P<0.001	r=0.571 P<0.001	1.00

Discussion

Intensive care units' complex and variable conditions, which impose significant pressure on nursing staff, often lead to the loss of nursing care [31]. This study investigated the relationship between missed nursing care, workload, and teamwork.

In our study, the average team performance score was medium to high. According to the results of one study, nurses' perception of teamwork was evaluated as moderate to high, with 91% of respondents scoring 3 or higher [21]. Soliman et al.'s study showed that less than half of the nurses had a moderate level of teamwork, and about one-quarter had low teamwork levels [10]. In our study,

the average teamwork score was higher in individuals aged 31 and over. This may be attributed to the fact that experienced nurses can prevent harm more effectively than less experienced staff due to their advanced knowledge and professional skills [24]. We also found that nurses working 40 or fewer overtime hours reported higher teamwork scores, which could be due to less work pressure.

The findings of this study indicated that better teamwork is associated with fewer missed nursing care activities. Consistent with this finding, Nobahar et al. also demonstrated in a similar study in Iran that a higher level of teamwork is associated with increased ethical sensitivity and reduced missed nursing care among intensive care unit nurses [31]. According to the results of another study in this field, there is a significant and inverse relationship between missed nursing care and average teamwork among nurses. Torka Beydokhti et al. also examined the relationship between teamwork and patient safety among nurses, showing that teamwork and patient safety are directly related, with increased teamwork leading to fewer nursing errors [6]. Given that inadequate teamwork is associated with missed nursing care, it is recommended that policies and procedures be adopted to improve teamwork in healthcare organizations [32]. Pourmovahed et al. showed that teamwork training for nurses can reduce missed nursing care [33]. Based on this, strategies to enhance teamwork, including holding interactive workshops and communication training, are recommended.

Our study reported a correlation between workload and missed nursing care; however, this relationship was not statistically significant. Nonetheless, it aligns with international research trends demonstrating the detrimental effects of excessive workload on care quality. Tubbs-Cooley et al., in a similar study, reported a statistically significant correlation between nurse workload and the likelihood of missed nursing care for infants [13]. Lake et al. also showed that a higher nurse workload and an unfavourable work environment are associated with increased missed nursing care [34]. Chapman et al. conducted a study to explore how teamwork influences instances of missed care in four Australian hospitals, and findings revealed that care requiring teamwork was more likely to be missed [32]. However, another study's results indicated that the workload intensity due to patient transfer was not a predictor of missed nursing care [35]. In Utomo et al.'s study, no statistically significant relationship was found between overall workload and the frequency of missed nursing care [36]. The differences between the results of these studies and our study can be attributed to differences in healthcare systems and economic conditions. Additionally, differences in nurse workload across various studies could be due to different frameworks and staffing organizations, variations in the types of patients admitted to intensive care units, and technical and practical differences.

The relationship between teamwork and workload is intricate, with each factor potentially impacting the other. Research findings suggest that teamwork within neonatal intensive care units can enhance patient safety and decrease infant treatment errors [36]. When teamwork is present, team members prioritize the team over any individual staff member, embracing the mindset that "work is for us" rather than for any specific employee. This leads to increased awareness of others' workloads and subsequently supporting each other in providing care [37]. One study also indicated that improving teamwork and communication between different nursing staff levels is essential to prevent missed nursing care [38]. Therefore, improving intra-team communication is recommended to enhance the quality of nursing care and reduce missed nursing care.

Limitations

This study has several limitations. Firstly, it only included nurses working in the intensive care units of three teaching hospitals, which may challenge the generalizability of the findings. The study used self-report questionnaires to measure missed nursing care, which may have been influenced by recall bias or fear of repercussions. Therefore, longitudinal studies using objective measures are recommended to gain a deeper understanding of the relationships between workload, teamwork, and missed nursing care in clinical settings.

Conclusions

This study elucidates the critical role of teamwork in mitigating missed nursing care in ICU settings. The significant negative correlations between missed nursing care and various teamwork components, such as team structure, leadership, situation assessment, mutual support, and communication, highlight the necessity of cultivating a collaborative work environment. These insights provide a foundation for developing targeted interventions to improve nursing care quality in intensive care units, ultimately contributing to better patient outcomes and more efficient healthcare delivery.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-025-12583-2.

Supplementary Material 1.

and Sina Hospitals staff, and the study participants who generously answered questionnaire questions.

Data availability
On demand, from corresponding author.

Declarations

Ethics approval and consent to participate
This study received approval from the Ethics Committee of Hamadan University of Medical Sciences, with the ethics code IR.UMSHA.REC.1402.174. Before the study commenced, researchers explained the study's objectives and methodology to the participants. They were also informed that their information would be kept confidential and reported anonymously. Nurses were informed that their participation was voluntary and that they could withdraw from the study at any time if they wished. Informed consent to participate was obtained from all of the participants.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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