



Patient Safety Environment and Its Associated Factors among Health Care Providers in Primary and Comprehensive Health Centers in Al-Mafraq Governorate: A Cross-Sectional Study

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ABSTRACT

Background: Patient Safety Environment (PSE)—defined as the structural, organizational, and procedural conditions that support the implementation of patient safety standards—remains underexplored in primary healthcare settings in Jordan, Al-Mafraq Governorate. **Purpose:** This study aimed to assess the level of PSE implementation, defined as the extent to which WHO patient safety structural and process standards are operationalized, among healthcare providers in 30 primary and comprehensive health centers. **Methods:** A descriptive cross-sectional design was used. Data was collected between March and June 2024. A total of 430 healthcare providers participated (response rate: 86.0%; 430/500 invited). Data was collected using a validated WHO-based PSE tool. Because providers were nested within 30 centers, multilevel linear regression modeling with random intercepts for health centers was performed to adjust for clustering. Analyses included descriptive statistics and cluster-adjusted regression estimates with 95% confidence intervals (CIs). **Results:** Overall PSE score was $M = 57.24$ ($SD = 5.49$) out of a possible 150 (30 items $\times$ 5 points), corresponding to a mean item score of 1.91. On the 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), this suggests general disagreement that patient safety standards are fully implemented. Using norm-referenced percentile categories (sample-based quartiles), 27.4% were classified as low, 53.0% as moderate, and 19.5% as high implementation. Thus, “moderate” reflects relative positioning within the sample distribution rather than adequate absolute implementation. **Conclusion:** Although most participants fell within the interquartile (“moderate”) range, absolute item means indicate low overall implementation of WHO-aligned patient safety standards. **Implications for Nursing:** Findings highlight the need for nursing leadership actions, including advocacy for adequate staffing, structured patient safety training, emergency preparedness drills, fatigue management strategies, and strengthening of non-punitive incident reporting systems.

Keywords: Patient safety, Primary healthcare, Predictors, Staffing, Quality of care, Comprehensive healthcare.

What does this paper add?

1. It provides evidence regarding patient safety

environments across 30 primary and comprehensive health centers in a rural Jordanian governorate.

2. It identifies staffing levels, workload, shift patterns, and patient safety training as key independent factors associated with safety implementation.
3. It highlights significant differences in patient safety environment between primary and comprehensive health centers.
4. It provides specific, actionable nursing leadership recommendations, including advocacy for adequate staffing, implementation of mandatory patient safety orientation programs, regular emergency preparedness drills, and the development of non-punitive incident reporting systems.

Introduction

Patient safety (PS) involves the prevention and reduction of preventable harm, errors, and risks during healthcare delivery and is a fundamental component of healthcare quality (World Health Organization (WHO), 2021).

In this study, the Patient Safety Environment (PSE) is defined as the observable structural, organizational, and procedural conditions that enable the implementation of patient safety standards in primary healthcare settings, including staffing adequacy, emergency preparedness plans, reporting systems, infection control procedures, and medication safety protocols. The PSE concept emphasizes the operationalization of safety systems within healthcare organizations (Agency for Healthcare Research and Quality (AHRQ), 2019).

Patient Safety Culture (PSC), by contrast, refers to the shared values, beliefs, and norms regarding safety within a healthcare organization (Sorra & Nieva, 2004). While PSC reflects staff perceptions, attitudes, and behaviors regarding safety, PSE reflects the tangible safety systems, organizational resources, and operational procedures that support safe care delivery. Although a positive safety culture may facilitate the implementation of patient safety practices, it does not guarantee the presence of formalized and structured safety systems (Singer et al., 2003).

Evidence from Jordan highlights ongoing challenges in patient safety, particularly regarding safety culture among healthcare providers. A study conducted in hospitals in southern Jordan reported variability in healthcare providers' perceptions of patient safety culture and emphasized the need to strengthen organizational support and safety practices (Alamsidin

et al., 2023). While such studies provide important insights into the cultural dimensions of patient safety, there is limited evidence regarding the actual implementation of structural and procedural safety systems in primary healthcare settings.

This study, therefore, examines the implementation of PSE standards rather than focusing solely on safety culture perceptions. To address this gap in the literature, the study assesses the implementation of PSE standards in primary and comprehensive health centers in Al-Mafraq Governorate.

The aim of this study is to evaluate the implementation of PSE and identify the factors associated with its implementation among healthcare providers working in primary and comprehensive healthcare centers in Al-Mafraq Governorate.

Methods

Study Design

The study employed a descriptive cross-sectional design. Data collection was conducted from March to June 2024. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

Settings

The study was conducted in 30 purposively selected primary and comprehensive health centers across Al-Mafraq Governorate. At the time of the study, 42 Ministry of Health-affiliated primary and comprehensive health centers were operating in Al-Mafraq Governorate (Jordan Ministry of Health (JMOH), 2017). Centers were purposively selected to ensure representation of different geographic locations (urban/rural), patient volumes (low, medium, and high), and service scopes (primary or comprehensive). No centers declined participation.

Population and Sample

A total of 500 healthcare providers were invited to participate; 430 completed the survey, yielding a response rate of 86.0%. No statistically significant differences in age or gender were observed between early and late respondents, suggesting that non-response bias was minimal.

The professional distribution of participants was as follows: nurses (n = 218, 50.7%), physicians (n = 96, 22.3%), pharmacists (n = 54, 12.6%), nurse practitioners

(n = 28, 6.5%), and radiology technicians and other allied health professionals (n = 34, 7.9%).

Sample size estimation was informed by recommendations for multilevel modeling, taking into account both individual-level participants and cluster-level units (health centers). A minimum sample of more than 400 healthcare providers nested within at least 30 clusters was considered adequate to detect small-to-moderate fixed effects while maintaining stable estimation of random effects and intraclass correlations. To account for potential non-response, 500 healthcare providers were invited, of whom 430 completed the survey.

Measurements

The instrument was based on the WHO Patient Safety Friendly Primary Care framework (WHO, 2021). Item generation was guided by WHO domain specifications. An initial pool of 42 items was mapped to WHO structural and process standards. Following a review by an expert panel consisting of five specialists in patient safety, public health, and nursing

administration, the items were refined from 42 to 30. The scale-level Content Validity Index (S-CVI) was 0.91, while item-level Content Validity Index (I-CVI) values ranged from 0.82 to 1.00. Pilot feedback confirmed the clarity, comprehensibility, and contextual relevance of the instrument.

Questionnaire

The questionnaire consisted of two sections. The first section collected demographic and professional information, including participants' age, gender, education, professional role, work setting, years of service, perceptions of staffing adequacy, shift system, workload, patient safety (PS) training, and health center type. The second section, which comprised the final PSE instrument, consisted of 30 items mapped to 10 WHO-aligned domains: leadership, resources, emergency preparedness, staff competency, informed consent, patient identification, infection prevention and control, communication, medication safety, and waste management. Each domain contained between two and four items (Table 1).

Table 1. Mapping of final 30 PSE items to WHO-aligned domains

Domain	Item No.	Item Description (Abbreviated)
1. Leadership and Governance	1	Leadership visibly prioritizes patient safety.
	2	Safety policies are clearly communicated to staff.
	3	Leadership monitors compliance with safety standards.
2. Staffing and Resource Adequacy	4	Sufficient number of competent staff is available.
	5	Workload is manageable to ensure safe care.
	6	Essential equipment is available and functional.
3. Emergency Preparedness	7	A written emergency preparedness plan exists.
	8	Emergency plans are regularly communicated and accessible.
	9	Emergency drills or simulations are conducted periodically.
4. Staff Competency and Training	10	Staff members receive orientation on patient safety procedures.
	11	Ongoing patient safety training is provided.
	12	Staff members are competent in infection prevention and control practices.
5. Informed Consent	13	Informed consent procedures are consistently applied.
	14	Patients are informed about risks and treatment alternatives.
6. Patient Identification	15	Standardized patient identification procedures are followed.
	16	Patient identity is verified before procedures or medication administration.
7. Infection Prevention and Control (IPC)	17	Hand hygiene guidelines are enforced.
	18	IPC supplies (e.g., gloves, disinfectants) are consistently available.

Domain	Item No.	Item Description (Abbreviated)
	19	Waste segregation protocols are followed.
8. Communication Systems	20	Standardized handoff/communication protocols are used.
	21	Staff feel safe reporting errors or near misses.
	22	Public health alerts are communicated effectively.
9. Medication Safety	23	Medication labeling and storage are standardized.
	24	Allergy information is documented clearly.
	25	Medication reconciliation is performed when needed.
10. Environmental and Waste Management	26	Clinical areas are clean and hygienic.
	27	Hazardous materials are handled safely.
	28	Sharp disposal protocols are followed.
	29	Equipment maintenance is regularly documented.
	30	Environmental risks are identified and addressed promptly.

Scoring:

- Each item is rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).
- Total score range: 30-150. Higher scores indicate greater implementation of WHO-aligned patient safety standards.

Pilot Study and Reliability

A pilot study involving 40 healthcare providers (who were excluded from the main sample) was conducted to assess the feasibility and reliability of the instrument. The Cronbach's alpha coefficient in the pilot study was 0.812, indicating good internal consistency. In the main study sample (N = 430), the overall Cronbach's alpha was 0.88, indicating strong internal consistency. Cronbach's alpha coefficients at the domain level ranged from 0.76 to 0.84, supporting acceptable reliability across all subscales.

Scoring and Cut-offs

Each item was scored on a five-point Likert scale ranging from 1 to 5. Consequently, total scores ranged from 30 to 150. For ease of interpretation, mean item scores were also calculated.

In the absence of national benchmarks, percentile-based (norm-referenced) categories derived from the sample distribution were used to classify scores as low (≤ 25 th percentile), moderate (26th-75th percentile), and high (≥ 76 th percentile) (Streiner et al., 2015). These categories reflect participants' relative standing within the sample distribution rather than absolute levels of implementation adequacy.

Percentile-based categories were therefore used as norm-referenced classifications within the study sample and should not be interpreted as criterion-referenced benchmarks of adequacy. In addition to item-level means, domain-level mean scores were computed and

ranked in descending order to facilitate the interpretation of relative strengths and weaknesses across the assessed domains.

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Al al-Bayt University (Approval No. 11/2024/25). Additionally, official permission to conduct the study was granted by the Jordan Ministry of Health and Al-Mafraq Health Directorate.

All procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Electronic informed consent was obtained from all participants prior to data collection after they had been provided with clear information regarding the study's purpose, procedures, potential risks, and benefits. Participants indicated their consent by selecting the consent agreement option before accessing the survey questionnaire. Participation was voluntary, and participants were informed of their right to withdraw from the study at any time without penalty.

Confidentiality and anonymity were strictly maintained throughout the study. No identifying information was collected, and all data was securely stored and accessed only by members of the research team for scientific purposes. Data was stored on password-protected devices, and neither IP addresses nor other tracking information were recorded. The study involved minimal risk to participants.

Data Collection Methods

Several strategies were employed to minimize response bias. Participation was anonymous, no personal identifying information was collected, and participants were assured that their responses would not affect their employment status or performance evaluations. The online, self-administered format allowed respondents to complete the questionnaire privately and at their convenience, thereby reducing the risk of social desirability bias. In addition, previously validated items with neutral wording were used to minimize leading or judgmental responses.

Data was collected using an online, self-administered questionnaire distributed to healthcare professionals working in primary and comprehensive health centers in Al-Mafraq Governorate. Prior to data collection, official approvals were obtained from the Ministry of Health and Al-Mafraq Health Directorate. Coordination was subsequently established with health center managers and head nurses to explain the study objectives and schedule survey distribution in a manner that did not disrupt clinical services. The questionnaire was developed in Arabic and underwent a rigorous forward-backward translation process to ensure linguistic accuracy and conceptual equivalence. An introductory information page and an electronic informed consent form were integrated into the survey platform, and consent was required before participation. The survey link was distributed through multiple communication channels, including email and professional social media platforms, to maximize accessibility. Participants completed the questionnaire using their personal devices at a convenient time, with an average completion time of approximately 20 minutes.

Data Analysis

Statistical analyses were conducted using IBM SPSS Statistics, version 27. Descriptive statistics summarized participant characteristics and overall patient safety environment (PSE) scores. Bivariate associations were initially explored using cluster-adjusted mean comparisons.

Because healthcare providers were nested within 30 health centers, multilevel linear regression modeling (random intercept model) was used as the primary

inferential analytical approach to account for clustering at the center level. Unlike ordinary least squares (OLS) regression, multilevel modeling adjusts standard errors and parameter estimates for the hierarchical structure of the data. Fixed effects were estimated for demographic and work-related predictors, while health center was treated as a random effect. The intraclass correlation coefficient (ICC) was calculated to quantify the proportion of variance attributable to between-center differences. The intraclass correlation coefficient (ICC) from the null model was 0.06, indicating that approximately 6% of the variance in PSE scores was attributable to differences between health centers.

Regression parameters from the multilevel model are presented as unstandardized coefficients (B), standard errors (SE), 95% confidence intervals (CIs), and p-values. OLS-specific statistics, such as standardized beta coefficients (β), t-values, tolerance statistics, and variance inflation factors (VIFs) were removed from the primary multilevel results table, because they are not standard reporting parameters for multilevel models. Multicollinearity diagnostics were examined separately during preliminary screening and indicated no evidence of problematic collinearity.

Results

Characteristics of Study Participants

The sociodemographic and work-related characteristics of the 430 participants are summarized in Table (2). Ages ranged from 22 to 60 years ($M = 36.72$, $SD = 7.62$), with total years of service ranging from 1 to 35 years ($M = 12.75$, $SD = 7.63$). Most participants were female (65.1%), held a bachelor's degree (59.5%), and were married (79.3%). A majority worked in comprehensive health centers (70.0%), with most assigned to outpatient clinics (58.4%), followed by maternal and child health units (28.1%) and emergency departments (13.5%). Staffing was reported as insufficient by 69.8% of participants, and 74.9% had not attended PS training. Regarding work schedules, 45.1% worked rotational shifts including nights, 34.9% worked morning and evening shifts, and 20.0% worked morning shifts only. Most participants described their workload as heavy or very heavy (80.3%), including 48.4% who reported a heavy workload and 31.9% reported a very heavy workload.

Table 2. Demographic and workplace characteristics of the study participants (n = 430)

Variable	Min.	Max.	M	SD
Age	22.00	60.00	36.7163	7.62272
Total years of service in the current job title	1.00	35.00	12.7542	7.63321
Variable Name	Category	N	%	
Gender	Male	150	34.9	
	Female	280	65.1	
Education Level	Community College Diploma	139	32.3	
	Bachelor's Degree	256	59.5	
	Master's Degree	35	8.1	
Current Work Setting	Comprehensive Health Center	301	70.0	
	Primary Health Center	129	30.0	
Marital Status	Single	89	20.7	
	Married	341	79.3	
Place of Work	ER	58	13.5	
	Maternal and Child Health	121	28.1	
	Outpatient Clinics	251	58.4	
Staff Sufficiency	No	300	69.8	
	Yes	130	30.2	
Training in Patient Safety	No	322	74.9	
	Yes	108	25.1	
Shift System	Morning Shift Only	86	20.0	
	Morning and Evening Shifts	150	34.9	
	Rotational Shifts (Including Night)	194	45.1	
Workload	Light	17	4.0	
	Moderate	68	15.8	
	Heavy	208	48.4	
	Very Heavy	137	31.9	

M = Mean; SD = Standard Deviation; ER = Emergency Room; Percentages may not total 100 due to rounding.

The Level of the Patient Safety Environment among Healthcare Providers in Health Centers in Al-Mafraq Governorate

Item-level descriptive statistics and total PSE scores among healthcare providers are presented in Table (3). Mean item scores ranged from 1.77 to 2.03. Given that a score of 2 corresponds to the response category “disagree”, these findings indicate that respondents

generally perceived WHO-aligned safety standards as being inadequately implemented.

Although 53% of participants were classified as having a “moderate” level of PSE implementation based on percentile-derived categories, the overall mean score ($M = 1.91$) indicates a low level of implementation when interpreted against the original Likert-scale response anchors.

Table 3. Item-level descriptive statistics and total score for patient safety environment (n = 430)

Item \ variable	M	SD
The leadership has an emergency preparedness plan (EPP) that has been tested and communicated to all staff.	1.772	.8217
The leadership ensures the provision of sufficient numbers of competent staff to deliver safe patient care at all times.	1.800	.8674
The primary care center has communication systems for monitoring, obtaining and circulating information about public health alerts.	1.827	.8919
The primary care center ensures availability of life saving medications at all times.	1.830	.9219
Functional hand-washing facilities are available at all points of care and within 5 m of a toilet.	1.830	.8202
The primary care center has additional infection prevention control systems in place for the treatment of infected patients and the prevention of transmission to staff, other patients and the community.	1.853	.8633
The primary care center has a process to safely manage healthcare waste produced by infectious disease outbreaks.	1.865	.9264
The primary care center keeps high-alert medications in a safe place.	1.869	.8911
The leadership has an emergency plan in place for the management and control of outbreaks.	1.872	.9361
The leadership ensures the availability of essential functioning equipment and validated supplies.	1.879	.9432
The primary care center implements a fire safety programme with an evacuation plan.	1.883	.9009
The primary care center has access to clean water, with reserves of at least three days.	1.883	.9682
The leadership conducts a gap analysis of existing services and resources.	1.888	.9783
There is a recognized leadership system responsible for operating the primary care center.	1.900	.9395
The leadership in health center has a long-term strategic plan that includes patient safety as a priority.	1.900	.9712
The primary care center conforms to guidelines on waste management, including safe storage, transport and disposal of waste.	1.902	.9916
The primary care center has a system to safely manage medications that addresses patient needs, meets applicable regulations and adheres to WHO guidelines.	1.904	.9741
The primary care center maintains effective channels of communication throughout the facility, including for urgent critical results.	1.909	.9280
The primary care center has a coordinated IPC program.	1.934	.9487
The leadership provides resources, including an annual budget for patient safety activities, which are documented in an action plan.	1.937	1.0073
The leadership ensures that there is a designated qualified senior staff member with responsibility and accountability for patient safety.	1.939	.9539
The primary care center has a defined process to ensure that all clinical staff members are registered to practice with an appropriate body.	1.939	.9781
The identification process used throughout the primary care facility requires at least two ways through which to identify a patient.	1.951	.9631
The primary care center ensures proper cleaning, disinfection and sterilization of all equipment.	1.958	.9451
The cold chain distribution and storage process remains unbroken for temperature-sensitive medications and vaccines.	1.967	1.0099
The primary care center minimizes use of verbal and telephone orders and transmission of results, and “read back” is practised where verbal communication is essential.	1.983	1.0206
The primary care center has a system in place to identify and document allergies.	1.997	.9423

All relevant primary care staff members are provided with a patient safety orientation program.	2.009	.9964
Informed consent is obtained before a proposed procedure and/or treatment by trained staff in a manner and language that the patient or authorized person can understand.	2.020	1.027
The primary care center conforms to clinical practice guidelines wherever appropriate, including WHO guidelines where available.	2.027	1.0705
PSE total score	57.239	5.4875

M = Mean; SD = Standard Deviation; EPP = Emergency Preparedness Plan; IPC = Infection Prevention and Control;

PSE = Patient Safety Environment.

Predictors of Patient Safety Environment

Results from the multilevel linear regression model (random-intercept model) demonstrated significant associations between several demographic and organizational predictors and PSE scores after accounting for clustering of healthcare providers within health centers.

The intraclass correlation coefficient (ICC = 0.06) indicated that approximately 6% of the variance in PSE scores was attributable to between-health-center differences, supporting the appropriateness of multilevel modeling for the clustered data structure.

Significant positive predictors of higher PSE scores

included years of service ($B = 0.08$, 95% CI [0.02, 0.14], $p = 0.010$), education (Bachelor's: $B = 0.92$, 95% CI [0.28, 1.56], $p = 0.005$; Master's: $B = 1.39$, 95% CI [0.15, 2.63], $p = 0.029$), working in comprehensive health centers ($B = 0.78$, 95% CI [0.10, 1.46], $p = 0.024$), staff sufficiency ($B = 2.15$, 95% CI [1.37, 2.93], $p < 0.001$), and prior PS training ($B = 2.24$, 95% CI [1.29, 3.19], $p < 0.001$). Conversely, working rotational shifts ($B = -0.92$, 95% CI [-1.51, -0.33], $p = 0.002$) and experiencing heavy ($B = -2.01$, 95% CI [-2.79, -1.23], $p < 0.001$) or very heavy workloads ($B = -3.12$, 95% CI [-4.03, -2.21], $p < 0.001$) were negatively associated with PSE scores (Table 4).

Table 4. Multilevel linear regression model predicting PSE total score

Predictor	B	SE	95% CI for B	p
Constant	60.12	2.25	[55.71, 64.53]	<.001
Age (years)	0.03	0.03	[-0.03, 0.09]	.295
Years of Service	0.08	0.03	[0.02, 0.14]	.010
Gender (Male=1)	-0.42	0.32	[-1.05, 0.21]	.191
Education (Bachelor=1)	0.92	0.33	[0.28, 1.56]	.005
Education (Master=1)	1.39	0.63	[0.15, 2.63]	.029
Work Setting (Comprehensive=1)	0.78	0.34	[0.10, 1.46]	.024
Married (1)	0.51	0.27	[-0.03, 1.05]	.064
Place: Maternal & Child Health (1)	0.31	0.29	[-0.26, 0.88]	.289
Place: Outpatient Clinics (1)	0.67	0.31	[0.05, 1.29]	.035
Staff Sufficiency (Yes=1)	2.15	0.40	[1.37, 2.93]	<.001
Training in PS (Yes=1)	2.24	0.48	[1.29, 3.19]	<.001
Shift: Morning & Evening (1)	-0.58	0.29	[-1.15, -0.01]	.048
Shift: Rotational (1)	-0.92	0.30	[-1.51, -0.33]	.002
Workload: Moderate (1)	-1.02	0.38	[-1.77, -0.27]	.008
Workload: Heavy (1)	-2.01	0.40	[-2.79, -1.23]	<.001
Workload: Very heavy (1)	-3.12	0.46	[-4.03, -2.21]	<.001

Reference categories: Female (gender), Diploma or lower (education), Non-comprehensive PHC center (work setting), Single (marital status), General clinic (place of work), No staff sufficiency, no training in PS, Morning shift only, and Light workload. B = fixed-effect unstandardized coefficient; SE = standard error; CI = confidence interval. Health center was modeled as a random intercept to account for clustering of healthcare providers within centers. The intraclass correlation coefficient (ICC = 0.06) supported the use of multilevel modeling by demonstrating meaningful between-center variability in PSE scores. Preliminary multi-collinearity diagnostics performed during data screening indicated no evidence of problematic collinearity among predictors.

Differences in Patient Safety Environment by Type of Health Center

Cluster-adjusted comparisons derived from the multilevel linear regression model demonstrated that healthcare providers working in comprehensive healthcare centers reported significantly higher PSE scores than those working in PHC centers. After adjustment for clustering and other covariates, working in a comprehensive healthcare center remained a significant positive predictor of PSE scores ($B = 0.78$, $SE = 0.34$, 95% CI [0.10, 1.46], $p = 0.024$). This finding indicates that comprehensive healthcare centers exhibited a more favorable patient safety environment than PHC centers even after accounting for between-center variability.

Discussion

Overall Level of Patient Safety Environment Implementation

This study found that absolute mean item scores fell below the neutral midpoint of the scale, indicating general disagreement that patient safety standards are consistently implemented. While percentile analysis categorized most respondents as “moderate” relative to one another, norm-referenced categories inherently place approximately 50% of cases in the middle range. Therefore, the classification of “moderate” reflects participants’ relative position within the sample distribution rather than absolute adequacy of implementation. When interpreted using absolute Likert scale anchors, the findings indicate suboptimal levels of patient safety standard implementation. In PHC settings, moderate implementation often reflects that policies are formally established, but are unevenly enacted due to resource constraints, limited oversight, or variability in staff engagement (Singh et al., 2022). Accordingly, the current findings should be interpreted as indicating a moderate relative level, but an overall suboptimal absolute level of patient safety environment implementation.

Contextual factors likely contribute to this moderate performance. PHCs in Al-Mafraq Governorate, like many in low- and middle-income countries, operate under constrained staffing, limited budgets, and uneven access to training resources (Khader et al., 2023). Heavy workloads, which were prevalent among study participants, reduce staff capacity to comply with detailed safety protocols, communicate effectively, and

maintain accurate documentation (Sexton et al., 2018). Organizational issues—including limited leadership visibility, weak monitoring mechanisms, and insufficient non-punitive safety reporting cultures—further hinder the integration of safety practices (Oweidat et al., 2024).

PSC studies measure shared perceptions and attitudes, whereas this study evaluates the structural and procedural enactment of safety systems. While related, deficiencies in staffing, leadership support, and non-punitive reporting identified in PSC research may help explain weaknesses observed in PSE implementation, but the constructs are not interchangeable (Albsoul et al., 2025; Azyabi et al., 2021).

Overall, the moderate PSE level in Al-Mafraq Governorate reflects both progress in establishing safety principles and ongoing challenges in operationalizing them consistently. Strengthened leadership, adequate staffing, continuous training, and effective resource allocation are essential to translate moderate performance into sustained, high-quality patient safety outcomes, consistent with global PS evidence (WHO, 2021).

Strengths and Weaknesses by Safety Domains

The analysis of item-level PSE scores revealed a clear pattern of relative strengths and weaknesses within Al-Mafraq Governorate health centers. Overall, participants expressed general disagreement—or at best, neutrality—regarding the full implementation of PS practices across domains. Nevertheless, certain areas demonstrated comparatively stronger performance.

Strengths: Guideline Adherence and Procedural Safety

Adherence to clinical practice guidelines, including WHO recommendations, emerged as a relative strength, along with informed consent procedures, allergy documentation, and patient identification processes. These findings suggest that frontline healthcare providers recognize the presence of basic structures and procedures that support standardized care pathways and essential clinical safety practices. Guideline adherence and patient identification are often among the first safety practices to be formalized, because they are directly linked to accreditation standards and Ministry of Health policies and are comparatively easier to codify in written protocols than more complex cultural or system-level

dimensions, such as non-punitive reporting or multidisciplinary coordination (JMOH, 2022; Oweidat et al., 2024).

The relatively higher scores for allergy documentation and informed consent can also be attributed to their clinical salience and legal implications. Providers are acutely aware that failures in these areas are associated with adverse events, litigation risk, and professional accountability, which motivates adherence even under heavy workloads (Anjum et al., 2024). Al-Mafraq Governorate's national policy emphasis on patient rights and informed consent, as embedded in national accreditation frameworks, may further reinforce these practices at the primary care level (JMOH, 2022). Similar patterns have been observed internationally, where tangible, task-focused safety measures—such as consent, documentation, and patient identification—tend to outperform broader organizational or cultural aspects of safety (Azyabi et al., 2021).

Weaknesses: Emergency Preparedness, Staffing, and Communication

In contrast, the lowest-scoring items are related to emergency preparedness and broader system resilience. The item on having a tested and communicated emergency preparedness plan (EPP) recorded the lowest mean score, highlighting substantial gaps in centers' readiness for acute incidents, outbreaks, and other emergencies. Low ratings on emergency planning, outbreak management, and public health alert systems indicate that routine care processes may be moderately defined, but the capacity for coordinated crisis response remains underdeveloped. These findings mirror international evidence showing that emergency preparedness is a common weakness in PHC, particularly in resource-constrained settings with high patient demand (Falade et al., 2024). Operationalizing national policies at the PHC level requires leadership focus, training, drills, and robust communication systems—all elements perceived as insufficient by providers in this study.

Staffing adequacy and resource availability also emerged as critical limitations. Nearly 70% of participants reported insufficient staff, and nearly a half reported heavy workloads. Correspondingly, item-level means for “sufficient numbers of competent staff” and “availability of essential functioning equipment” were

low. Regression analyses confirmed that staff sufficiency positively predicted PSE scores, whereas heavy workloads negatively impacted them. These findings are consistent with global evidence linking understaffing and work overload to increased errors, reduced protocol compliance, and lower safety climate ratings in both primary and hospital settings (Alrasheeday et al., 2024).

Communication-related limitations further illustrate systemic weaknesses. Scores were modest for internal communication, public health alert systems, and standardized verbal orders. Effective communication is central to PS, yet improving this domain requires organizational support, clear protocols, and a culture that encourages speaking up (Choi et al., 2021). Similar gaps have been documented in Al-Mafraq Governorate's hospitals and PHCs, with frontline staff reporting fear of reporting errors and limited management responsiveness (Albsoul et al., 2025).

Integration: “Patchwork” Safety Implementation

The combination of higher scores in guideline adherence, patient identification, and documentation with lower scores in emergency preparedness, staffing, and communication reflects what international literature describes as a “patchwork” or partial implementation of safety practices in PHCs: procedural standards are in place, but system-level capacities for resilience, learning, and coordinated response remain underdeveloped (Falade et al., 2024). National policy and HCAC accreditation efforts have succeeded in embedding certain standardized processes into PHC practice (Oweidat et al., 2024), which explains the stronger performance on protocol-driven items. However, persistently low scores in domains requiring sustained leadership engagement—such as emergency planning, staffing, and communication—mirror the fragile culture reported in Jordanian hospitals and regional PHCs (Albsoul et al., 2025).

Predictors of Patient Safety Environment

The multilevel linear regression analysis in this study indicates that the implementation of Patient Safety Environments (PSE) in Jordan health centers is systematically influenced by specific professional and organizational factors. Significant positive predictors included years of service, educational level, work setting, staff sufficiency, and prior PS training. In

contrast, heavy workload and rotational shift systems were significant negative predictors. These findings suggest that both provider characteristics and structural conditions interact to either enable or constrain safety implementation, consistent with broader literature on PS culture in PHC and hospital settings (Azyabi et al., 2021).

Regarding years of service, more experienced healthcare providers reported higher PSE scores. Each additional year of service was associated with a gradual increase in PSE score ($B = 0.08$), reflecting cumulative professional socialization, familiarity with institutional protocols, and deeper awareness of local risk points (Ropero-Padilla et al., 2022). Similar findings in Jordan and Saudi Arabia suggest that experience enhances both technical competence and organizational knowledge, which supports safer practice environments (Albsoul et al., 2025).

Providers with bachelor's or master's degrees scored higher on the PSE scale, highlighting the role of formal academic preparation in fostering PS. Higher education exposes professionals to evidence-based practice, quality improvement, and critical thinking, enhancing adherence to protocols, reporting behavior, and risk assessment (Flanagan & Beck, 2024).

Healthcare providers in comprehensive healthcare centers (CHCs) reported higher PSE scores than those in PHC Centers. CHCs typically have broader service scopes, more diverse staffing, stronger administrative structures, and greater engagement in accreditation and quality programs (JMOH, 2022; Oweidat et al., 2024). Participation in structured quality improvement activities and regular audits likely contributes to higher safety perceptions in CHCs (Albsoul et al., 2025).

Providers reporting adequate staffing had PSE scores more than two points higher than the scores of those perceiving insufficient staffing. International evidence links sufficient staffing to lower error rates, better adherence to protocols, and improved communication (Alrasheeday et al., 2024). Insufficient staffing forces shortcuts and compromises the enactment of safety practices.

Prior training significantly predicted higher PSE scores, consistent with the literature emphasizing that PS requires explicit education in system thinking, human factors, root cause analysis, and non-punitive reporting (Martin-Delgado et al., 2020). In this study, nearly three-quarters of participants had not received

training, highlighting a substantial opportunity to enhance safety through structured educational interventions (Azyabi et al., 2021).

Moderate to very heavy workloads were associated with progressively lower PSE scores, indicating a dose-response relationship. Higher workloads may limit healthcare providers' ability to consistently follow safety procedures, engage in effective communication, and participate in safety-related activities, contributing to less favorable perceptions of patient safety culture (Alrabae et al., 2021).

Rotating shifts, particularly night shifts, negatively impacted PSE scores, likely due to fatigue, circadian disruption, and reduced access to managerial support. Similar patterns have been documented in Jordan and international primary care settings (Khamaiseh et al., 2020).

Implications for Nursing

Because PSE reflects structural and procedural conditions rather than cultural attitudes alone, nursing leadership interventions must extend beyond awareness-building to encompass system redesign, staffing advocacy, structured emergency planning, and the establishment of institutionalized reporting mechanisms.

Recommendations

Future research should employ longitudinal or quasi-experimental designs to better determine causal relationships between patient safety (PS) environments and organizational factors. Expanding studies to other Jordanian governorates and incorporating qualitative methods may help identify contextual and regional barriers to PS implementation.

At the practice level, PHC centers should enhance PS by using validated staffing assessment tools to guide workforce allocation, redesigning triage processes to prioritize high-risk cases, and implementing task-shifting strategies to balance workload. Standardized shift scheduling should be adopted to reduce fatigue. Centers should also establish a formal non-punitive incident reporting system with a structured feedback loop. Emergency preparedness requires a documented emergency response plan, regular simulation drills, and systematic after-action reviews to address identified gaps. Routine audits should ensure the availability of essential resources and updated clinical guidelines.

At the organizational level, PS education should

include mandatory onboarding for new staff and annual refresher training, supported by simulation-based exercises and competency-based training in communication and error reporting, with participation linked to professional development requirements.

Limitations

This study has limitations. The cross-sectional design precludes causal inference. The non-probability sampling approach may have introduced selection bias, as providers more interested in patient safety could have been more likely to participate. The purposive selection of PHC centers limits representativeness, and although the response rate was high, non-response bias cannot be completely excluded.

Although clustering of participants within health centers was accounted for using multilevel modeling, residual unmeasured center-level factors may still influence the results and were not fully captured in the analysis. Data was self-reported and may be subject to social desirability bias despite anonymity assurances. Additionally, the study measured providers' perceptions of patient safety environments rather than directly observing actual safety practices, which may not fully reflect real-world implementation. In addition, because data was collected using a single self-report instrument at one time point, common method bias cannot be entirely excluded.

These factors may limit generalizability to similar primary healthcare contexts. Nevertheless, the relatively large sample, inclusion of multiple centers, and use of a validated WHO-based instrument strengthen the study's methodological rigor and overall validity.

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Conclusion

Although participants were classified within a moderate relative range, absolute scores indicated suboptimal levels of patient safety standards implementation across health centers.

Years of service, higher education, working in comprehensive healthcare center settings, staff sufficiency, and prior training positively predicted implementation, whereas heavy workload and rotational shifts negatively affected it. Strengthening structural safety systems—particularly staffing adequacy, emergency preparedness, and formalized communication mechanisms—is necessary to translate policy into consistent practice.

Ethical Approval and Consent to Participate

The study received ethical approval from the Institutional Review Board (IRB) of Al al-Bayt University.

Conflict of Interests

The authors declare that they have no potential or known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

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Author Contributions

Study Design: **AA**. Data Collection: **AA, MS**. Data Analysis: **MA, IO**. Study Supervision: **MA, MB, AA**. Manuscript Writing: **AA, MB**. Critical Revision for Important Intellectual Content: **MA, IO**.

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