



# The Association of Transformational Leadership on Safety Practices Among Nurses: The Mediating Role of Patient Safety Culture

Mahmoud Hamdan<sup>1,2</sup>, Amar Hisham Jaaffar<sup>3,4</sup>, Omar Khraisat<sup>5</sup>, Marwan Rasmi Issa <sup>6</sup>, Mu'taman Jarrar <sup>7,8</sup>

<sup>1</sup>Quality Management and Patient Safety Administration, King Saud Medical City, Riyadh, Saudi Arabia; <sup>2</sup>College of Graduate Studies (COGS), Universiti Tenaga Nasional (UNITEN), Putrajaya Campus, Kajang, Selangor, 4300, Malaysia; <sup>3</sup>Institute of Energy Policy and Research (Iepre), Universiti Tenaga Nasional (UNITEN), Putrajaya Campus, Kajang, Selangor, 4300, Malaysia; <sup>4</sup>College of Business Management and Accounting (COBA), Universiti Tenaga Nasional (UNITEN), Putrajaya Campus, Kajang, Selangor, 43000, Malaysia; <sup>5</sup>Faculty of Nursing, Al-Ahliyya Amman University, Amman, Jordan; <sup>6</sup>Skills Development Training Center, King Saud Medical City, Riyadh, 12746, Saudi Arabia; <sup>7</sup>Medical Education Department, King Fahd Hospital of the University, Al-Khobar, Saudi Arabia; <sup>8</sup>Vice Deanship for Development and Community Partnership, College of Medicine, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

Correspondence: Mahmoud Hamdan, College of Graduate Studies (COGS), Universiti Tenaga Nasional (UNITEN), Putrajaya Campus, Jalan IKRAM-UNITEN, Kajang, Selangor, 4300, Malaysia, Tel +966580405515, Email Mahmoud\_hamdan84@yahoo.com

**Background:** To ensure best possible patient outcomes, patient safety is a major component of healthcare delivery system that needs to be prioritized. Safety practices among nurses are essential to maintain patient safety, especially the practices of medication administration, handover, patient falls and unplanned extubations prevention.

**Purpose:** To investigate the mediating effect of patient safety culture between the relationship of transformational leadership and safety practices among nurses.

**Methods:** The data in this cross-sectional study were gathered from a survey targeted clinical nurses using a random sampling technique. The study was conducted in a medical city in Saudi Arabia, and two hundred nurses were surveyed. The Multifactor Leadership, Hospital Survey on Patient Safety Culture, and Nursing Safety Practice questionnaires were used in the study.

**Results:** The results revealed significant positive associations between transformational leadership, patient safety culture, and nursing safety practices. Moreover, patient safety culture mediates the association between transformational leadership and safety practices among nurses.

**Conclusion:** Enhancing transformational leadership capabilities among nurse managers should be considered in order to improve nursing safety practices. Additionally, patient safety culture should be measured and improved periodically to ensure better nursing safety practices.

**Keywords:** nurses, safety practices, transformational leadership, patient safety, culture

## Introduction

Patient safety is a paramount concern in healthcare systems worldwide. In an increasingly complex and dynamic healthcare environment, the effective implementation of safety practices is essential to ensure the well-being of patients and to uphold the integrity of the healthcare profession. Patient safety has gotten plenty of attention among policymakers, healthcare leaders, and governments; with an emphasis on risk reduction including minimizing the risks that could harm patients.<sup>1,2</sup> Preventable adverse events have been estimated to be the cause of up to 400,000 deaths annually in US hospitals,<sup>3</sup> and medical errors were considered the third leading cause of death.<sup>4,5</sup> Furthermore, in 2016, the Canadian Institute for Health Information reported one in every 18 patients suffered from preventable harm. In Saudi Arabia, 91.6% of the sentinel events occurred between 2012 and 2015 were considered as preventable.<sup>6</sup> The majority of these errors worldwide can be prevented by implementing various published strategies.<sup>7</sup> Therefore, healthcare professionals focused on improving patient safety by implementing training programs that address human factors, applying

standardized procedural guidelines, and enhancing organizational learning to ensure best practices and outcomes.<sup>8–10</sup> These collective endeavors, coupled with enhancements to the patient safety culture and leadership capabilities, have had a positive impact on safety outcomes.<sup>7,11</sup>

Nurses, as the primary caregivers in most healthcare settings, play an essential role in safeguarding patient safety.<sup>12</sup> Frontline nurses afford a considerable responsibility for ensuring patient safety and mitigating risks and errors through safe practices.<sup>12</sup> Nurses' safety practices are those practices performed by nurses to maintain safety in clinical aspects related to patients such as medication administration, prevention of falls and unplanned extubations, and handover safety.<sup>13</sup> However, nurses' commitment to safety practices is influenced by various factors such as effective communication, availability of supportive structures and processes, and transformational leadership within healthcare organization.

Transformational leadership is defined as leaders who

broaden and elevate the interests of their employees, generate awareness and acceptance of the purposes and mission of the group, and stir their employees to look beyond their own self-interest for the good of the group.<sup>14</sup>

It is characterized by its emphasis on inspirational motivational, intellectual, and individualized attention and influence, and has been associated with improved safety outcomes in healthcare settings.<sup>15</sup> These leadership behaviors performed by nurse leaders at different levels especially those directly managing frontline nurses can foster a culture of safety, influence the safety-related attitudes and behaviors of healthcare professionals, and ultimately impact patient safety.

However, the associations between transformational leadership and safety practices may not be direct.<sup>16</sup> Organizational culture, specifically the patient safety culture, which is influenced by transformational leadership and affects safety behaviours and outcomes, is a potential mediator in these relationships.<sup>16–18</sup> This is underpinned by the theory of self-efficacy which argues that transformational leaders foster safety knowledge and motivation among nurses which enhances nurses' safety practices.<sup>17</sup> The best practices of patient safety culture encourage healthcare professionals to report errors, learn from adverse events, and engage in practices that enhance patient safety.

Saudi Arabia has been witnessing a remarkable transformation in its healthcare sector over the past decades. While potential improvements have been made, concerns regarding patient safety persist nationally and internationally.<sup>19</sup> The link between leadership behaviors and safety practices in the Saudi healthcare context remains relatively underexplored. Understanding the interplay between transformational leadership, patient safety culture, and safety practices among Saudi nurses is crucial for enhancing patient safety and the quality of healthcare services in the country. By examining these associations, this research can help to the broader understanding of how leadership and culture impact patient safety, potentially informing healthcare practices in other regions with similar healthcare challenges.

## What This Study Adds to National and International Concerns

Saudi Arabia: has been actively working to enhance the quality of healthcare services in the country. According to the Saudi Patient Safety Center, there were 352,842 patient safety incidents reported in 2020. These incidents underline the pressing need to improve patient safety practices in the country. Understanding the role of leadership and patient safety culture in this context is crucial for developing effective interventions.

International Concerns: Globally, patient safety remains a significant concern. The World Health Organization (WHO) estimates that millions of patients suffer harm every year due to unsafe healthcare. Research from various countries highlights the vital role of leadership and safety culture in mitigating these concerns, making this study's findings relevant on an international scale.

## Background

### Transformational Leadership and Patient Safety Practices

Transformational leadership is a style that has gained considerable attention in healthcare management due to its potential to influence the behavior of healthcare professionals and improve patient outcomes. A transformational leader inspires and motivates his followers, stimulates his intellectual curiosity, shows individualized consideration, and embodies idealized influence which create a positive work environment.<sup>15</sup> Numerous studies in international healthcare settings

have found a positive association between transformational leadership and safety practices. For example, a study conducted by Wong and Cummings (2007) in Canadian healthcare organizations revealed that transformational leadership behaviors were significantly correlated with safety climate and patient safety practices.<sup>20</sup> Similarly, Aveling et al (2013) found in their research in the UK that transformational leadership positively influenced staff engagement in safety practices.<sup>21</sup> Therefore, the following hypothesis needs to be explored:

H1: Transformational leadership has a positive association on nursing safety practices.

## Transformational Leadership and Patient Safety Culture

Leadership style is an indicator of patient safety culture, nurse-related patient practices and outcomes.<sup>22</sup> Transformational leadership has been considered as an effective style among nurses and healthcare professionals.<sup>12,22–24</sup> Transformational leaders are those characterized by having the capability to transform their organizations through the effective empowerment for subordinates.<sup>25</sup> (Asif et al, 2019; Astuti et al, 2023; Boamah et al, 2017; Labrague & Obeidat, 2022; Lappalainen et al, 2020; Mistry et al, 2020; Syabanasyah et al, 2023)<sup>26–29</sup> Moreover, patient safety culture includes manager actions to promote safety, learning, collegial relations and communications, feedback and sharing potential errors, non-punitive acts to error, staffing, management commitment to patient safety, teamwork, hospital handoffs and staff rotations.<sup>30</sup> Therefore, the following hypothesis needs to be explored:

H2: Transformational leadership has a positive association with patient safety culture.

## Patient Safety Culture and Nurse Safety Practices

Patient safety culture is the collective values, beliefs, and attitudes that shape an organization's commitment to safety.<sup>31</sup> An organization with a strong patient safety culture encourages open communication, learning from errors, and a shared commitment to patient safety.

Studies have consistently demonstrated that a healthy patient safety culture is associated with favourable patient safety outcomes. For instance, a systematic review by da Silva et al indicated that organizations with a healthy safety culture had lower rates of adverse events and better patient outcomes.<sup>32</sup> This underscores the importance of promoting and maintaining a strong patient safety culture within healthcare organizations.

Studies on nurse safety practices focusing on medication administration, unplanned extubation prevention, fall prevention, and handover are still limited. Therefore, the factors of transformational leadership and patient safety culture that influence safety practices among nurses need to be further explored. The National Academy of Medicine (NAM) report stated that safety culture of reporting errors enhances constructive, open, and voluntary attitudes among healthcare professionals toward safety engagement.<sup>33</sup> The issue of underreporting errors is still a concern among nurses.<sup>5,13,34,35</sup> In addition, because nurses provide direct patient care, their perceptions of safety culture and error reporting are directly reflected in patient outcomes.<sup>36</sup> Therefore, the following hypothesis needs to be explored:

H3: Patient safety culture has a positive association with nursing safety practices.

The importance of transformational leadership, patient safety culture, and nursing safety practices rests in their combined capacity to improve patient outcomes, lower medical errors, raise the standard of care overall, and foster a culture of safety inside healthcare institutions.<sup>5</sup> Nurses are more equipped to provide safe, compassionate, and patient-centered care when these factors are successfully integrated and prioritized.<sup>36,37</sup> It is worth examining these perceptions' influence on nurses' practices when providing patient care. However, the association between transformational leadership and safety practices may not be direct, and patient safety culture can play a pivotal mediating role.<sup>16</sup> While transformational leadership behaviors can promote safety practices, they may do so through the influence they exert on the organization's safety culture. However, there is a dearth of research specifically examining this mediation effect, particularly in Saudi Arabia. By investigating the mediating effect of patient safety culture between the association of transformational leadership and safety practices among nurses in Saudi Arabia, this study contributes to the existing

literature and provide insights into improving patient safety within the Saudi healthcare system and, by extension, worldwide. Therefore, this study aims to examine the mediation effect of patient safety culture between the relationship transformational leadership and nursing safety practices among nurses in Saudi governmental hospitals. Therefore, the following hypothesis needs to be explored:

H4: Patient safety culture mediates the relationship between transformational leadership and nursing safety practices.

Figure 1 is the conceptual framework that illustrates research variables and hypotheses:

## Methods

### Study Design and Setting

In this cross-sectional descriptive study, data were gathered using a questionnaire completed by clinical nurses. The study took place in a medical city in Riyadh, Saudi Arabia which includes three hospitals and two specialized centers with 1250 total bed capacity. The population size in this study was 2206 clinical nurses; 1052 nurses work in general hospital, 504 in pediatric hospital, 391 in maternity hospital, 142 in kidney center, and in 117 dental center.

### Inclusion and Exclusion Criteria

The inclusion criteria included licensed clinical nurses who work in hospital settings in Riyadh region and have work experience of three months at least in the current working unit.

### Ethical Considerations

The study followed the Declaration of Helsinki. The study was approved by the institutional review board (IRB: KACST, KSA: H-01-R-053). The hospital directors and the heads of nursing departments approved the study conduction. The study respondents received a cover letter that explained the aim, significance, content, study measurement tools instructions, and the duration to complete the survey. Each respondent signed a written informed consent of agreement to voluntary participate in the study after reading the cover letter.

### Sample Size Determination and Procedure

G\*Power analysis was used for sample size determination. This approach is widely used for Partial Least Squares (PLS) sample size determination, according to Cohen (1988) and Hair, Hult et al, (2016).<sup>38,39</sup> The estimated sample size was 140 when three predictors, a power of 0.80, and a medium effect size (0.15) were used.

In order to increase understanding and reduce participant attrition, oversampling was used. Systematic random sampling was used to obtain a sample representativeness from the different nursing specialties. Microsoft Excel

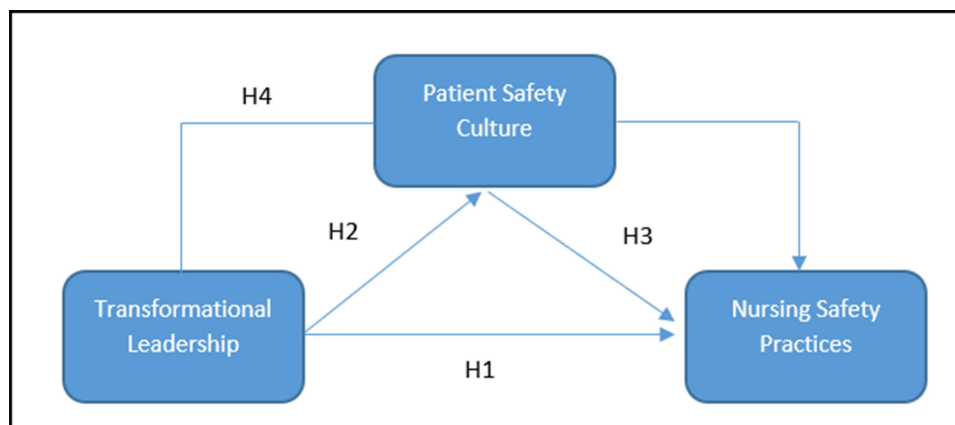


Figure 1 Conceptual framework and hypotheses.

randomization was used for choosing every tenth nurse from the nursing list, resulting in an achievable sample size of 220. The data were collected from September 2022 to January 2023 from all the hospitals and centers inside the medical city. The researchers invited the selected clinical nurses to participate in the study in coordination with the related nurse managers. The researchers provided nurse participants with information about the study. Before the data collection, researchers met the respondents and received informed consent from each participant after explaining the purpose of the study in private room. The researchers explained the importance of the study for the nurse participants and promised to share the results with them once the study completed. The researchers also explained that they were able to quit at any time without penalty.

## Measurement Tools

Self-reported anonymous questionnaires were used in the study. The questionnaire is divided into four sections. The first section includes demographic characteristics including age, marital status, length of service in career of nursing, and current unit, highest educational qualification, and working unit. The second section includes the Multifactor Leadership Questionnaire (MLQ) for assessing the transformational leadership behaviours of nurse leaders from the perspective of clinical nurses. MLQ Form 5X (MLQ-5X) was developed by Bass and Avolio in 2000 based on Bass's leadership conceptualization.<sup>40</sup> The rate form was used in this study because frontline nurses were approached to assess leadership behaviors among their managers. Based on the tool, a transformational leader is characterized by being able to inspire subordinates toward a shared vision and increase their level of awareness.<sup>40</sup> The tool is a five-point Likert scale from “not at all” to “frequently, if not always” and it consists of 20 items.

The third section is the Hospital Survey on Patient Safety Culture (HSOPSC) which was released by the Agency for Healthcare Research and Quality (AHRQ) in 2004 to measure patient safety culture among nurses. The HSOPSC consists of three main parts in which all the items are rated using a five-point Likert scale based on agreement (“strongly disagree” to “strongly agree”) or based on frequency (“never” to “always”). The first is seven-dimensions and 24 items, and it emphasizes on patient safety issues at the unit level. While the second subscale consists of three dimensions and 11 items, and it assesses patient safety culture at the hospital level. The last part includes nine items which form four outcome variables. These variables include the frequency of reporting adverse events and the number of events reported, overall perception of patient safety, and patient safety grade.<sup>41</sup>

The last section is the Nursing Safety Practices Scale (NSPS). Nursing safety practices and the frequency of implementing safety practices were measured using the NSPS which was developed by Chiang, Hsiao, and Lee (2016).<sup>13</sup> It is a five-point Likert scale tool that ranges from 1 which is “a little of the time” to 5 “all the time”. The NSPS measures the frequency of implementing safety practices through three factors: medication administration safety, falls prevention, handover safety and unplanned extubation. The Medication safety administration factor includes seven items, while the factors of prevention of falls and unplanned extubations, and handover safety include four items for each. The total number of items in this instrument is 15. Higher scores reflect the more safety practices.<sup>13</sup>

Convergent validity was utilized to assess construct validity. According to Garver & Mentzer (1999), Average Variance Extracted (AVE) higher than 0.5, factor loading of survey items higher than 0.7, and composite reliability greater than 0.7 are prerequisites for convergent validity.<sup>42</sup>

The survey was in English because it is the official language of communication in the participating hospitals. A pilot test on 20 respondents was conducted to evaluate the reliability of the study scales. The results revealed that the questionnaires had high internal consistency for transformational leadership, patient safety culture, and nursing safety practices with a Cronbach's alpha of 0.898, 0.980, and 0.950, respectively. In addition, the measurement tools used in this study are not long, easily understood by the participants, and cover the exact object of the inquiry.

## Data Analysis

We conducted data analyses using SPSS 25.0 and SmartPLS software. These are mostly used in studies about management and related fields.<sup>43</sup> SPSS Descriptive statistics used to present the demographic characteristics of the study participants. Structural equation modelling (SEM) was used to test the hypotheses of the study which present in the research framework. The framework depicts transformational leadership as an independent variable, patient safety culture

as a mediator, and nursing safety practices as a dependent variable. SmartPLS (SEM) is suitable for simultaneously predicting a group of equations for the study model and examine the relationship between variables.<sup>44</sup> The study data analysis adheres to the STROBE checklist.

## Results

A total of 220 questionnaires were distributed among the nurse participants. Four nurses withdrew from the study, and 16 participants were excluded because they partially answered the study questionnaire. A total of 200 complete responses were considered in the data analysis (90% response rate).

## Descriptive Statistics

The majority of participants 43% were in the age of 31–40 years. The majorities were female (81%) and married (68.5%). Also, a 43.5% had careers spanning six to ten years. However, the majority of service histories in the current unit (38%) fall between 1 and 5 years. A 78.5% of the sample had a bachelor's degree in nursing. Almost equally many nurses participated in the study, regardless of whether they worked in a critical or non-critical unit (See Table 1).

Descriptive statistics of study constructs as shown in Table 2 indicate positive correlations between study variables (transformational leadership, patient safety culture, and safety practices), with mean values over 4.

**Table 1** Demographic Characteristics of Nurses (N=200)

Variables	Frequency (n=200)	Percentage (%)
Age		
21–30	51	25.5
31–40	86	43.0
41–50	45	22.5
51–60	18	9.0
Gender		
Male	38	19
Female	162	81
Highest Educational Qualification		
Diploma	18	9.0
BSN	157	78.5
Master	25	12.5
Marital Status		
Single	50	25.0
Married	137	68.5
Divorced	7	3.5
Widowed	6	3.0
Unit		
Critical Care	101	50.4
Non-Critical Care	99	49.5
Length of Service in Nursing Career		
1–5	19	9.5
6–10	87	43.5
11–15	24	12.0
>15	70	35.0
Length of Service in the Current Working Unit		
1–5	76	38.0
6–10	61	30.5
11–15	38	19.0
>15	25	12.5



**Table 2** Descriptive Statistics and Correlations

n = 200	Mean	SD	Correlations		
			1	2	3
Transformational leadership	4.062	0.637	–		
Patient Safety Culture	4.023	0.542	0.757**	–	
Safety Practices	4.194	0.613	0.724*	0.828**	–

Notes: \*p < 0.05. \*\*p < 0.01.

## Evaluation of the Outer Measurement Model

According to Table 3, Cronbach's alpha ( $\alpha$ ) values ranged from 0.878 to 0.937 and composite reliability (CR) values ranged from 0.912 to 0.947 and were within the recommended range.<sup>45–47</sup> Each of the factors had values of “Standardized Factor Loading” (SFL) for the study dimensions were greater than 0.70. Convergent validity was evaluated using the Average Variance Extracted (AVE) values which were higher than 0.5.<sup>42</sup> All of these results indicate acceptable validity and reliability.

Additionally, two main criteria were employed to ensure the scale has adequate discriminant validity.<sup>48</sup> These criteria included the “Fornell-Larcker criterion method” and the “heterotrait-monotrait method” ratio (HTMT). As can be seen in Table 4, the bolded diagonal AVE values are greater than the inter-variable correlation coefficient, which is indicative of high discriminant validity.<sup>49</sup> In addition, as stated by Leguina,<sup>49</sup> HTMT values should be under 0.90. Study HTMT levels were significantly lower than the reference value. Taken together, the previous results confirm and support the scale reliability, discriminant, and convergent validity as approved in the study measurement outer model. Accordingly, we can move forward with the structural outer model to test the study hypothesis.

**Table 3** Measurement Model

Construct	1st Order Construct	Loading	Cronbach's alpha	Composite Reliability	Average Variance Extracted
Transformational Leadership (TFL)	Attributed Behavior Motivation Stimulation Consideration	0.881 0.803 0.834 0.849 0.732	0.878	0.912	0.675
Patient Safety Culture (PSC)	Manager Expectations Organizational Learning Teamwork within Units Communication Openness Feedback and Communication about Error Non-punitive Response to Error Staffing Hospital Management Support for Patient Safety (HMS) Teamwork Across Hospital Units Hospital Handoffs and Transitions	0.845 0.754 0.861 0.829 0.823 0.765 0.762 0.744 0.835 0.778	0.937	0.947	0.641
Nursing Safety Practice (NSP)	Medication Administration Safety Prevention of Falls and Unplanned Extubating Handover Safety	0.839 0.833 0.749	0.902	0.924	0.671

**Table 4** Inter-Construct Correlations, the Square Root of AVE, and Heterotrait–Monotrait Ratio (HTMT) Results

	Fornell-Larcker Criterion			HTMT Results		
	TL	PSC	NSP	TL	PSC	NSP
TL	0.821					
PSC	0.687	0.801		0.757		
NSP	0.646	0.760	0.819	0.724	0.828	

## Assessment of the Structural Inner Model

A structural equation investigation was employed to test the study proposed hypothesis. Specifically, the main aim is to examine the model's aptitude to explain and predict the variation in the endogenous variables caused by the exogenous variable.<sup>50</sup> Furthermore, an  $R^2$  value of at least 0.10 to ensure a satisfactory model fit.<sup>51</sup> Accordingly, the endogenous variable "patient safety culture" has an  $R^2$  value of 0.583, similarity, "nursing safety practices" has an  $R^2$  value of 0.609, both  $R^2$  values exceeded the recommended threshold score and designating that the study model sufficiently represents the collected data (Table 5). Likewise, the Stone-Geisser  $Q^2$  calculation displayed a value of (0.531) for patient safety culture and 0.548 for nursing safety practices, both values are more than zero (Table 5), indicating a satisfactory predictive power of the structure model.<sup>52</sup> Finally, the SRMR value should be less than 0.08 and the GoF value should be higher than the minimum cut-off of 0.1 to guarantee a good model fit to data,<sup>51</sup> as shown in Table 5 the SRMR value is 0.072 and the GoF value is 0.625 exceeding the recommended threshold value and approving a goodness-of-fit (GoF).

In the end, a bootstrapping method was implemented in smart PLS4 to determine the path coefficient and its associated t-value for both the direct and mediating relationships. The smart PLS results showed that all the direct relationships are positive and significant; transformational leadership on nursing safety practices ( $\beta = 0.216$ , t-value = 3.850,  $p < 0.001$ ), patient safety culture on nursing safety practices ( $\beta = 0.631$ , t-value = 9.268,  $p < 0.001$ ), and transformational leadership on patient safety culture ( $\beta = 0.666$ , t-value = 10.128,  $p < 0.001$ ). Consequently, direct relationships were supported (see Table 6).

The results also give data about the specific indirect effect to test the mediation effects of patient safety culture in the relationship between transformational leadership and nursing safety practices (Table 7). The statistics behind mediation are correlated. Mathieu & Taylor (2006) suggested a decision tree framework to test the covariance relationships among three variables: an independent variable (IV), a potential mediating variable (M), and a dependent variable (DV).<sup>53</sup> The result showed

**Table 5** Coefficient of Determination ( $R^2$ ) and ( $Q^2$ ) and Model Fit

Construct	$R^2$	$Q^2$	SRMR	GoF
PSC	0.583	0.531	0.072	0.625
NSP	0.609	0.548		

**Abbreviations:**  $R^2$ , Determination of coefficient;  $Q^2$ , predictive relevance; SRMR, standardized root mean square.

**Table 6** Examining Results of Direct Effects of the Constructs

Relationship	$f^2$	VIF	Beta ( $\beta$ )	t-value	p-value	Hypothesis Result
TL→NSP	0.057	2.069	0.216***	3.850	0.000	Supported
PSC→NSP	0.424	2.399	0.631***	9.268	0.000	Supported
TL→PSC	1.061	1.004	0.666***	10.128	0.000	Supported

**Note:** \*\*\* $p < 0.001$ .

**Abbreviations:**  $f^2$ , Effect size; VIF, Variance inflation factor.



**Table 7** Results of Examining Mediation Effect of Safety Culture

	Path	Path Coefficient ( $\beta$ )	Standard Error	T-value	P-value	Hypothesis Result
H	TL→PSC→NSP					
	Total Effect of IV on DV without M (path a)	0.636***	0.073	8.737	0.000	Supported (Partial Mediation)
	Direct Effect of IV on DV with M (path a')	0.216***	0.056	3.850	0.000	
	Indirect Effect of IV on DV through M (path bc)	0.420***	0.073	5.787	0.000	
	Effect of IV on M (path b)	0.666***	0.066	10.128	0.000	
	Effect of M on DV (path c)	0.631***	0.068	9.268	0.000	

Note: \*\*\*p < 0.001.

that the total effect of Transformational Leadership (TL) as IV on Nursing Safety Practices (NSP) as DV (path a) without the inclusion of Patient Safety Culture (PSC) as M was statistically significant at 0.001 level;  $\beta = 0.636$ , T-value = 8.737,  $p < 0.001$ . The direct effect of Transformational Leadership (TL) as IV on Nursing Safety Practices (NSP) as DV (path a') with the inclusion of Patient Safety Culture (PSC) as M was statistically significant at 0.001 level;  $\beta = 0.216$ , T-value = 3.850,  $p < 0.001$ . As depicted in Table 7, the association of Transformational Leadership (TL) as IV on Patient Safety Culture (PSC) as M (path b) was statistically significant at 0.001 level;  $\beta = 0.666$ , T-value = 10.128,  $p < 0.001$ . Further, the association of Patient Safety Culture (PSC) as M on Nursing Safety Practices (NSP) as DV (path c) was also statistically significant at 0.001 level;  $\beta = 0.631$ , T-value = 9.268,  $p < 0.001$ . These results indicated that Patient Safety Culture (PSC) mediates the relationship between Transformational Leadership (TL) and Nursing Safety Practices (NSP). The degree of mediation was partial since the paths a, a', b and c were all statistically significant. The phenomenon supported the study hypothesis. Further, the result revealed that Transformational Leadership (TL) had a significant indirect positive association on Nursing Safety Practices (NSP) through Patient Safety Culture (PSC);  $\beta = 0.420$ , T-value = 5.787,  $p < 0.001$  (Figure 2) is the PLS model with standardized coefficients.

## Discussion

This study aimed to examine the associations of transformational leadership and patient safety culture on nurses' safety practices. Previous studies showed that transformational leadership has a significant impact on patient safety culture and the perceived level of patient safety.<sup>37,54,55</sup> Moreover, many studies declared that patient safety culture has a positive impact on patient safety perceptions and outcomes.<sup>8,11,56</sup> The current study revealed that transformational leadership and patient safety culture has also significant association with nurses' practices related to patient safety.

This study examined the mediating association of patient safety culture on the relationship between transformational leadership and safety practices among nurses. The findings indicate a significant mediating association of patient safety culture on the relationship between transformational leadership and safety practices. This result aligns with the existing body of research in healthcare leadership, which suggests that leadership behaviors influence safety outcomes, and the safety culture plays a key role in mediating this relationship.<sup>7</sup> Our study expands on this literature by demonstrating that in the specific context of Saudi Arabia, transformational leadership is positively associated with patient safety culture, which, in turn, affects safety practices among nurses. The path from transformational leadership to patient safety culture and then to safety practices highlights the importance of fostering a culture of safety within healthcare organizations.

This mediation results suggest that healthcare leaders should focus not only on directly influencing safety practices but also on cultivating a patient safety culture within their organizations. This can be achieved through leadership training and development programs that emphasize transformational leadership behaviors and their impact on organizational culture.

Moreover, the attributes of transformational leaders make them ready to better improve patient safety culture among the bedside nurses. When integrated together, transformational leadership style and enhanced patient safety culture achieve more effect and, consequently, improve safety practices among nurses.<sup>53,57</sup> In line with the results obtained from the present study, the enhancement of safety practices entails instituting a patient safety culture in the hospital which would be a conduit through which effective transformational leadership can be better utilized to sustain enhanced nursing practices.

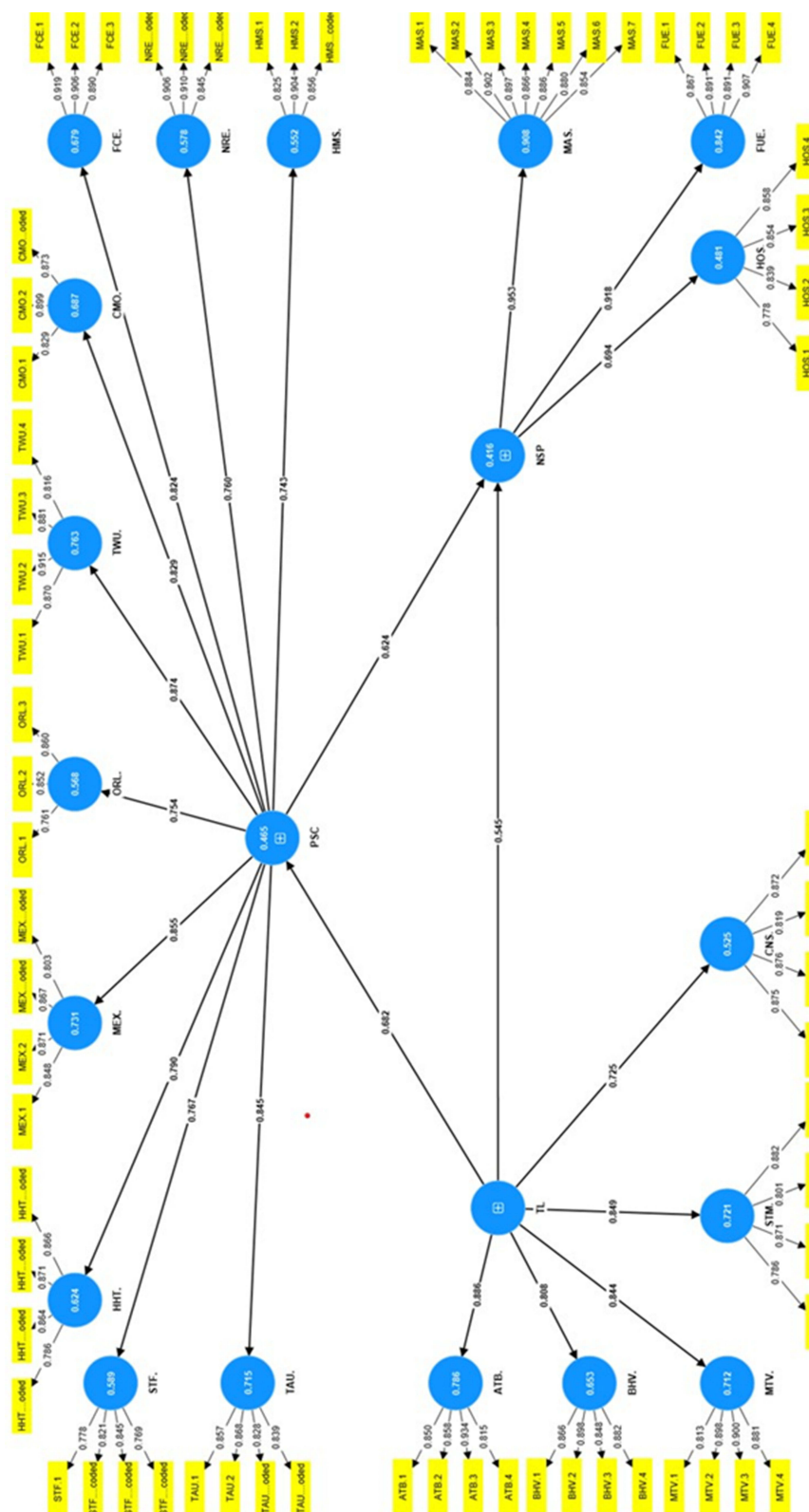


Figure 2 PLS model with standardized coefficients.

The result is also supported by Olsen & Jensen (2017) who conducted a study among healthcare professionals in Norway and used structural equation modelling to test a model in which patient safety culture mediates the relationship between safety leadership and the perceived patient safety levels.<sup>58</sup> Results revealed that certain patient safety culture dimensions mediate the relationship between safety leadership and safety practices and outcomes of nurses. In line with this study, a study was conducted in the United States by Farag et al (2019) to test a model explaining the mechanism by which organizational and social factors influence nurses' safety motivation.<sup>35</sup>

A systematic review supported the findings of this study and assessed the mediating role of nursing work environment on the relationships between transformational leadership and patient outcomes through a proposed model.<sup>59</sup> Results supported the model and showed significant relationships between the variables. Patient outcomes included medication errors and patient falls.<sup>59</sup> Previous studies showed that nurses with higher patient safety culture scores reported fewer patient falls, medication errors, pressure injuries, healthcare-associated infections, mortality, physical restraints, and vascular access device reactions.<sup>8</sup> As patient safety culture mediated the relationship between transformational leadership and safety practices among nurses. This indicates that the culture of patient safety has the power to alter the impact of transformational leadership on nurse safety practices. The findings of our study show that transformational leadership and patient safety culture do not only affect nurses' perceptions of patient safety, but also their safety practices. This indicates the importance of building effective transformational leadership skills and patient safety culture among nurses especially that they provide the majority of direct care to patients. Studying the variables affecting nursing safety practices is an original addition by this study.

## Implications

Identifying the mediating role of patient safety culture can help healthcare organizations in design interventions that leverage transformational leadership to promote a culture of safety and improve safety practices among nurses. Insights from this study can inform leadership development programs in the Saudi healthcare system, helping leaders to adopt behaviors that positively influence patient safety culture and, subsequently, safety practices among their nursing staff. Therefore, efforts to improve patient safety culture can be an integral part of organizational strategies. Promoting open communication, reporting of errors, and learning from mistakes can help create a culture that supports and encourages safety practices among nurses. Thus, training and education initiatives should be designed to enhance the patient safety knowledge and practices of nurses. Empowering nurses with the necessary skills and knowledge is vital for improving patient safety.

As part of the theoretical implications, it contributes to the literature on nursing safety practices. Previous studies focused on perceptions of patient safety,<sup>60,61</sup> but this study focused on certain safety practices related to nursing; medication administration, handover, fall prevention, and unplanned extubation. In addition, it extends to the literature related to patient safety culture by revealing its association on nursing safety practices. Previous study focused mainly on the impact of patient safety culture on patient safety outcomes.<sup>8,62,63</sup> Moreover, it adds to the literature related to transformational leadership by showing its association on patient safety culture and nursing safety behaviors. The previous study examined the association of transformational leadership on work environment and patients' outcomes.<sup>64,65</sup> Future research could explore the mechanisms and boundary conditions how and when transformational leadership and patient safety culture affect nursing practices. Moreover, explore other factors that may influence safety behaviors among nurses such as individual and organizational characteristics.

## Limitations

The cross-sectional design of the study limits our ability to draw causal conclusions. Longitudinal studies would be beneficial in establishing the temporal sequence of the relationships investigated. The study's sample size and focus on single governmental hospital in Saudi Arabia may limit the generalizability of the findings to other settings and populations. Future research should replicate this study in diverse healthcare contexts.

The study examined transformational leadership as an independent variable as well as the mediating role of patient safety culture. However, it did not examine the role of other variables such as work engagement, staffing level, resource availability, workload, collegial relations and work environment, and leadership styles, which could be critical for better understanding the relationships between leadership, culture, and safety practices. Future research opportunities could be to examine the moderating or mediation role of these variables on the link between transformational leadership and

nursing safety practices. Comparative studies can compare the mediating role of patient safety culture in the relationship between different leadership styles (eg, transactional, laissez-faire, and authentic leadership) and safety practices among nurses. This can help identify which leadership styles are most effective in promoting patient safety. Further research opportunities could also include undertaking a qualitative research approach using focus groups interviews and observation methods, as qualitative research can provide insights into the nuances of leadership behaviors and their impact on safety culture. The reliance on self-reported data from nurses may introduce response bias and common-method variance. Combining self-report data with objective measures could improve the validity of the findings. There is a need to include the perspectives of patients in future research. Investigate how transformational leadership and safety culture influence patient experiences, satisfaction, and perceptions of safety.

## Conclusions

Patient safety is a global concern, and the role of leadership in promoting safety practices is of paramount importance. This study has contributed to our understanding of the mediating role of patient safety culture in the relationship between transformational leadership and safety practices among nurses in Saudi Arabia. The conclusions drawn from the findings are that transformational leadership and patient safety culture have direct, positive, and significant associations on nursing safety practices. Moreover, these variables can be directly manipulated and catalysed to achieve enhanced nursing safety practices. It was observed that the most important determinant of nursing safety practices was patient safety culture, followed by transformational leadership; and transformational leadership was found as a significant determinant of patient safety culture. To enhance patient safety and the quality of healthcare services, healthcare organizations in Saudi Arabia should prioritize leadership development, patient safety culture enhancement, and ongoing staff training. By doing so, they can create a safer environment for both patients and healthcare professionals, ultimately improving the overall healthcare system. Further research in this field is encouraged to explore these relationships in greater detail and in diverse healthcare settings. Understanding the nuances of leadership, culture, and safety practices can lead to the development of more effective strategies to ensure patient safety and the provision of high-quality healthcare.

## Disclosure

The authors report no conflicts of interest in this work.

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