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Associations between safety outcomes and communication practices among pediatric nurses in the United States

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ABSTRACT

Purpose: To gain a deeper understanding of RNs communication related to patient safety.
Research aims: To determine: (1) the associations between the communication of registered nurses (RNs) within their health care teams and the frequency that they reported safety events; (2) the associations between RNs' communication within their health care teams and their perceptions of safety within the hospital unit; and (3) whether RNs' communication had improved from 2016 to 2018.
Theoretical framework and methods: We used the United Kingdom's Safety Culture model as the theoretical framework for this study. Our secondary data analysis from the Agency for Healthcare Research and Quality's Hospital Survey on Patient Safety Culture included 2016 ($n = 5298$) and 2018 ($n = 3476$) using multiple regression models to determine associations between responses for Communication Openness and Feedback & Communication About Error, and outcome responses for Frequency of Events Reported and Overall Perceptions of Safety.
Results: Our findings were: 1). In both 2016 and 2018 datasets, Feedback About Error had a greater impact on Reporting Frequency than Open Communication; 2). Feedback About Error had a greater impact on Safety Perceptions than Open Communication; 3). Open Communication and Feedback About Error and their associations with Reporting Frequency and Safety Perceptions showed little change; and, 4). The proportion of variance was low, indicating factors other than Open Communication and Feedback About Error were involved with Reporting Frequency and Safety Perceptions.
Conclusion: Pediatric RNs' communication, reporting, and perceptions of patient safety have not improved. (245 words).

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Introduction

In the United States, children account for over 5 million hospital admissions annually (Healthcare Cost and Utilization Project (HCUP), 2021). The longer children are hospitalized, the greater their chance of experiencing a safety incident (Kirkendall et al., 2012). With an estimated 36.7% of hospitalized children experiencing a safety incident during their hospital stay (Kirkendall et al., 2012), up to 1,835,000 children may experience safety incidents annually, with many of these events leading to permanent injury or death.

A patient safety incident is any unintended or unexpected event that may result in patient harm (National Patient Safety Agency, 2003). Safety incidents include near misses, adverse events, and medical errors (National Patient Safety Agency, 2003). An adverse event is an injury caused by medical care. Adverse events do not imply error, negligence, or poor quality of care, but rather that an undesirable clinical outcome occurred as a result of some aspect of diagnosis or therapy and was not due to an underlying disease process (National Patient Safety Foundation, 2015). A medical error is an act of commission (doing something wrong) or omission (failing to do the right thing) that

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leads to or has the potential for an undesirable outcome (National Patient Safety Foundation, 2015). Over 400,000 hospitalized individuals die each year from medical errors (James, 2013; Makary & Daniel, 2016).

Higher risks of untoward events in pediatric care

Pediatric health care providers work in complex settings where there are many opportunities to cause unintended harm (Mueller et al., 2019). Children are at higher risk than adults for safety incidents due to maturational differences related to their anatomy, physiology, and medical conditions (Ahuja et al., 2012; Gampetro et al., 2021; Leonard, 2010; Peterson et al., 2012; Rosenthal et al., 2017; Walsh et al., 2014). Examples of such incidents include infiltration of an intravenous infusion that causes cellulitis and necrosis of surrounding tissue, post-operative infection, or ventilator-associated pneumonia (Unbeck et al., 2014). Equipment and medications used in pediatric care can contribute to harm, such as drugs, biologic agents, and medical devices that have not been specifically tested for use in pediatric care (Clancy et al., 2013). Thus, it is difficult to ensure that these therapeutics and devices have the same safety profile in children as in adults (Clancy et al., 2013; Gonzales, 2010).

Medication errors are of particular concern in pediatric care due to the small size of children and the need for individualized dosing through weight-based calculations (Gampetro et al., 2021; Leonard, 2010; Peterson et al., 2012; The Joint Commission, 2021a; Unbeck et al., 2014; Walsh et al., 2014). Medication errors from a miscalculated dose are three times higher among children than adults, placing children at risk of serious or lethal injury (Brennan-Bourdon et al., 2020; Kaushal et al., 2001).

Effective communication prevents patient harm

Safety incidents occur when there are deficits or unclear exchanges in the understanding of verbal or written information that is transmitted between individuals or teams. Communication is a reciprocal process of sending and receiving information that forms and reforms a group or team's attitudes, behaviors, and thoughts (Gregory et al., 2021; Salas et al., 2018). Effective communication occurs when there are understandable exchanges of information, thoughts, and feelings among individuals through verbal speech, written reports, and other exchanges (Kourkouta & Papathanasiou, 2014; Ratna, 2019). Communication errors between health care providers may contribute to unanticipated risks, serious injuries, and deaths (Rosenthal et al., 2017; Starmer et al., 2017).

Effective team communication is critically important, between providers and a child's adult caregivers. For example, poor communication regarding a child's pain management can result in the administration of too little or too much medication. Lapses in effective communication have been found to increase the occurrence of patient safety incidents, driving up the duration and cost of hospital admissions (Rosenstein, 2011). The lack of effective communication increases family caregivers' anxieties about their child's care, and decreases their overall satisfaction (Cox et al., 2013; Khan et al., 2016; Tarini et al., 2009; Woods et al., 2008). Effective communications within the health care team regarding safety incidents are essential to creating system changes that prevent further harm (Gampetro et al., 2021; Kaushal et al., 2001; The Joint Commission, 2021 b).

Safety cultures support reporting

A safety culture is defined as "the product of individual and group values, attitudes, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety programs" (Cooper, 2000, p. 114; National Patient Safety Foundation, 2015, p. xii; Health and Safety Executive, 2005, p. 4). An organization displaying a positive safety culture characteristically ensures that communications are founded on mutual trust and shared perceptions of the importance of safety. There is a group confidence in the efficacy of the preventive measures found within the organization (Health and Safety Executive, 2005).

Organizations with positive safety cultures support the communications of near misses and errors within just cultures (Reason, 1998). Just cultures reinforce the trust that reporting of safety incidents will be supported within the health care organization, and not met with punitive responses from management (Reason, 1998). Such reporting cultures occur in environments that prime employees to report safety lapses and potential safety hazards (Reason, 2000). Following reports, the health care system needs to collect, analyze, and disseminate the knowledge gained from the reported incidents in rapid, useful, and intelligent ways. Health care systems with just cultures value these reports and welcome the learning that occurs that will improve the organization's ability to function safely (Reason, 1998).

United States hospital systems indirectly discourage reporting of safety incidents (Burlison et al., 2020; Gampetro et al., 2021; Mitchell et al., 2016). Studies have found that health care providers do not speak up when they confront a safety incident because such reporting was perceived negatively by their team and unit managers (Ahlberg et al., 2020; Burlison et al., 2020; Gampetro et al., 2021). Since the publication of *To Err is Human* (1999), quality improvement initiatives in the United States have targeted hospital-acquired safety incidents that increase patient morbidity, mortality, and length of hospital stay. However, there is a gap in the patient safety literature that focuses on the institution and promotion of sustainable system changes for the prevention of these incidents (Kohn et al., 1999; Patterson et al., 2013; Schneider et al., 2021; The Joint Commission, 2018, 2021a). For instance, medication errors in neonatal care remain common, along with unsafe transfers of children between hospital units and specialties (Gampetro et al., 2021; Mueller et al., 2019).

Perceptions of safety in pediatric care vary among managers and providers

Previous research has analyzed data on pediatric care extracted from the Agency for Healthcare Research and Quality's (AHRQ's) 2016 Hospital Survey on Patient Safety Culture (HSOPSC) dataset (Gampetro et al., 2021). This research determined that pediatric administrators and managers reported a more positive safety culture than pediatric frontline providers such RNs, physicians, nurse practitioners, and physician assistants ($p < .001$). Frontline health care providers did not perceive their settings as open to communicating safety events, nor did hospital administrators and managers ($p < .001$). This demonstrates a gap in perceptions about how safety events are identified and communicated within hospital units (Gampetro et al., 2021).

Purpose of this study

This follow-up study looks deeper into the communication gap uncovered within the pediatric care setting regarding patient safety incidents and reporting. This study explored differences in how pediatric RNs perceived and conceptualized team communication regarding safety incidents that could cause children harm. We analyzed pediatric RNs' responses from datasets from the national HSOPSC survey, from two separate cohorts at two points in time (2016, 2018), to determine communication regarding safety incidents. The communication dimensions in the survey examined the perceptions of reporting safety incidents from the perspective of RNs (see Table 1).

We chose a population of RNs because RNs are the largest group of health care providers in the workforce (Smiley et al., 2018). Our primary objective in this study was to gain a deeper understanding of RNs' perception of communication within the pediatric hospital setting. In addition, we wanted to establish whether the previously identified gap in

Table 1
Four Dimensions of the Hospital Survey on Patient Safety Culture with Items or Questions.

Communication dimensions		Abbreviated dimension names	Cronbach's alpha	Survey items or questions
	Communication Openness	Open Communication	0.72	Staff will freely speak up if they see something that may negatively affect patient care. Staff feel free to question the decisions or actions of those with more authority. Staff are afraid to ask questions when something does not seem right. (negatively worded)
	Feedback & Communication About Error	Feedback About Error	0.78	We are given feedback about changes put into place based on event reports. We are informed about errors that happen in this unit. In this unit, we discuss ways to prevent errors from happening again.
Outcome dimensions				
	Frequency of Events Reported	Reporting Frequency	0.84	When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported? When a mistake is made, but has no potential to harm the patient, how often is this reported? When a mistake is made that could harm the patient, but does not, how often is this reported?
	Overall Perceptions of Safety	Safety Perceptions	0.74	Patient safety is never sacrificed to get more work done. Our procedures and systems are good at preventing errors from happening. It is just by chance that more serious mistakes don't happen around here. (negatively worded) We have patient safety problems in this unit. (negatively worded)

Note. Survey dimension names and items drawn from Sorra & Dyer, 2010.

communication and in the reporting of safety incidents persists (Gampetro et al., 2021).

Our study aims were to: (1) determine the associations between RNs' communication within their health care teams and the frequency that they reported safety events; (2) determine the associations between RNs' communication within their health care teams and their perceptions of safety within their hospital units; and (3) determine whether RNs' communication differed in the 2016 and 2018 datasets. We hypothesized that given the attention to quality improvement initiatives over the past decade, hospitals would develop safety cultures that would support reporting cultures and quality improvement.

Methods

Design, sample, and procedure

This study used a descriptive design to analyze secondary data from the HSOPSC of individual RN responses. We analyzed data drawn from the 2016 (June 2013 through July 2015) and 2018 (August 2015 through July 2018) surveys. From these two datasets, we extracted pediatric RNs' survey responses, creating two pediatric subsets as the basis of our analysis. The 2016 HSOPSC dataset, with 447,584 participants from 680 hospitals, included 5298 pediatric RNs. The 2018 dataset, with 382,834 participants from 630 hospitals, included 3476 pediatric RNs.

All hospitals participating in the HSOPSC submitted individual-level data. Hospital leadership chose the population that would voluntarily participate in the surveys. Blinded surveys were administered on paper, electronically, or through a combination of the two. Completed surveys were cleaned by each hospital and submitted to a central location managed by Westat (Baltimore, MD), where a second cleaning took place and datasets were created. Hospitals that participated in the national comparative database signed a data use agreement that is maintained at Westat (Rockville, MD).

We obtained the 2016 and 2018 national datasets from Westat and downloaded them onto a protected server maintained by our university, with the data available only to our research team. Demographic data for hospitals included the bed size, academic status, and region in the United States where the facility was located. Hospital characteristics in both datasets were fairly consistent with the distribution of hospitals registered with the American Hospital Association (Famolaro et al., 2018). Demographic data on the individual RNs included their tenure with their current hospital site and their work area or unit; we included only RNs working in pediatric settings. Although human subjects were involved in the data collection, hospital and individual data were already deidentified when we received the data set. This study was approved by our university's Human Subjects Review Board.

Measures

The HSOPSC used a Likert scale with data treated as interval levels (1 = Strongly Disagree, 2 = Disagree, 3 = Neither, 4 = Agree, 5 = Strongly Agree; 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Most of the time, 5 = Always) (Sorra & Dyer, 2010). All negatively worded items were reverse scored before analysis (Sorra & Dyer, 2010).

We examined the effects of two communication dimensions (Open Communication, Feedback About Error) on two outcome dimensions (Reporting Frequency, Safety Perceptions). Table 1 lists these four survey dimensions and their associated items and questions. (In this manuscript, we abbreviated the names of the original survey dimensions to improve readability). The three to four items or questions per dimension operationalize the tool (Sorra & Dyer, 2010). The HSOPSC's psychometric properties for these dimensions have acceptable reliability (Cronbach's alpha of 0.72 to 0.84) and content and construct validity determined through exploratory and confirmatory factor analysis (Sorra & Dyer, 2010).

Data analysis

Multiple linear regression analyses were performed with SPSS version 27 (IBM, Chicago, IL). We calculated 95% confidence intervals for the model parameters; tests for statistical significance were determined with $\alpha < 0.05$. Missing data for any variables was excluded from the analysis.

We fit our first multiple linear regression model to test for any associations between Open Communication or Feedback About Error and Reporting Frequency in the 2016 and 2018 surveys. The second multiple linear regression model was fit to test for associations between Open Communication or Feedback About Error and Safety Perceptions in

2016 and 2018. All multiple regression models were assessed for normality, linearity, collinearity, homoscedasticity, and fit.

Findings

Descriptive analysis

The characteristics for both samples are displayed in Table 2. Data on repeat participation of hospitals from 2016 to 2018 was not available to this research team as the datasets were restricted to individual RN responses. The 2016 dataset included 680 participating hospitals, of which 7% were children's hospitals (Famolaro et al., 2016). In 2018, there were 630 participating hospitals (a 7% decline in hospital participation), and the percentage of children's hospitals was not provided (Famolaro et al., 2018). Between 2016 and 2018, the number of pediatric RNs participating in the survey decreased by 1822 (34.4%). Although the reason for this drop in participation is unknown, it could be due to time constraints, survey fatigue, and lack of follow-up from previous incident reporting (Chen et al., 2018; O'Reilly-Shah, 2017; The Joint Commission, 2018).

Table 2
Demographics of United States hospital staff and pediatric RN survey respondents, 2016 and 2018.

	2016 survey				2018 survey			
	All participating hospital staff[a]		Pediatric RNs[b]		All participating hospital staff[c]		Pediatric RNs[b]	
	n	%	*n*	%	*n*	%	*n*	%
Hospital bed size								
6–49	17,210	4	182	3	15,918	4	31	1
50–99	30,600	7	384	7	23,967	6	409	12
100–199	71,570	16	765	14	79,082	21	381	11
200–299	79,566	18	1013	19	75,910	20	714	20
300–399	66,995	15	449	8	50,639	13	415	12
400+	133,795	41	2505	47	137,318	36	1526	44
Total	447,584	100	5298	100	382,834	100	3476	100
Hospital teaching status								
Nonteaching	174,039	39	1031	20	166,533	44	838	24
Teaching	273,545	61	4267	80	216,301	56	2638	76
Total	447,584	100	5298	100	382,834	100	3476	100
Region								
Northeast[d]	111,325	25	1130	21	70,870	19	720	21
South Atlantic[e]	114,462	26	1395	26	107,584	28	883	25
East Central[f]	98,387	22	1139	23	101,984	27	997	29
West Central[g]	58,171	13	777	15	64,091	17	436	13
West[h]	65,239	15	857	16	38,305	10	440	13
Total	447,584	100	5298	100	382,834	100	3476	100
Pediatric RN tenure at current hospital site								
< 1 year	48,751	12	447	9	43,180	14	303	12
1–5 years	129,992	32	1552	32	105,747	34	895	35
6–10 years	88,337	21	1099	22	54,684	18	441	17
11–15 years	55,413	13	678	14	38,600	12	384	15
16–20 years	31,578	8	396	8	26,367	8	236	9
21+ years	57,531	14	750	15	43,451	14	316	12
Subtotal	411,602	100	4922	100	312,020	100	2575	100
Other missing	35,982		346		70,805		901	
Total	447,584		5268		382,834		3476	
Pediatric RN tenure at work area or unit								
< 1 year			683	13			430	16
1–5 years			1869	36			1081	40
6–10 years			1113	21			471	17
11–15 years			612	12			343	13
16–20 years			345	7			173	6
21+ years			573	11			223	8
Subtotal			5195	100			2721	100
Other missing			103				755	
Total			5298				3476	

Note. Percentages may not add to 100 due to rounding.
[a] Data from Famolaro et al., 2016.
[b] Data from Gampetro et al., 2021.
[c] Data from Famolaro et al., 2018.
[d] CT, MA, ME, NH, RI, VT, NJ, NY, PA.
[e] DC, DE, FL, GA, MD, NC, SC, VA, WV, Puerto Rico, Virgin Islands.
[f] IL, IN, MI, OH, WI, AL, KY, MS, TN.
[g] IA, KS, MN, MO, ND, NE, SD, AR, LA, OK, TX.
[h] AZ, CO, ID, MT, NM, NV, UT, WY, AK, CA, HI, OR, WA, American Samoa, Guam, Marshall Islands, Northern Mariana Islands.

Although the decline in pediatric RN participation is striking, hospitals with less than 400 beds increased their participation by 51% between 2016 and 2018; this may represent a growing interest in patient safety. The participating pediatric RNs predominantly worked in teaching hospitals (80% in 2017, 76% in 2018) with over 400 beds (47% in 2016, 44% in 2018). In 2016, the largest number of participating pediatric RNs were employed in the South Atlantic region (26%), whereas in 2018, the largest number was found in the East Central region (29%). The greatest percentage of pediatric RNs had worked at their hospital for 1 to 5 years (32% in 2016, 35% in 2018) and within the pediatric specialty also for 1 to 5 years (36% in 2016, 40% in 2018).

Our statistical analyses determined whether pediatric RNs' communication (Open Communication and/or Feedback About Error) predicted outcomes (Reporting Frequency and/or Safety Perceptions). We compared data from the 2016 and 2018 surveys; time was not considered to be continuous.

Descriptive findings for the communication and outcome dimensions in the 2016 and 2018 datasets are found in Table 3. The means for Reporting Frequency and the two predictors, Open Communication and Feedback About Error, remained basically the same in the 2016 and 2018 datasets. The means for Safety Perceptions and the two predictors, Open Communication and Feedback About Error, were also basically the same in the 2016 and 2018 datasets.

The regression coefficients for Open Communication and Feedback About Error and their associations with Reporting Frequency and Safety Perceptions were basically the same in the 2016 and 2018 datasets (see Table 4). There was no difference in the openness of communication between the two datasets. This may indicate that RNs were not free to speak up or question those in authority (see Table 1). When analyzing the same two datasets, RNs were not informed of ways to prevent patient harm, report safety events, or improve overall safety (see Table 1).

In both the 2016 and 2018 datasets, Feedback About Error had a greater impact than Open Communication on predicting Reporting Frequency and Safety Perceptions. While the regression models showed statistical significance *within* each survey year of data, they did not demonstrate statistical significance *between* the years.

Discussion

There were four important new findings in this study: 1). Feedback About Error had a greater impact on Reporting Frequency than Open Communication in both the 2016 and 2018 datasets; 2). Feedback About Error had a greater impact on Safety Perceptions than Open Communication in both the 2016 and 2018 datasets; 3). Open Communication and Feedback About Error and their associations with Reporting Frequency and Safety Perceptions showed little difference in both the 2016 and 2018 datasets; and 4). The R^2 (proportion of variance) was low, indicating factors other than Open Communication and Feedback About Error were involved with Reporting Frequency and Safety Perceptions. However, our data did not determine what other factors influenced RNs' participation in safety reporting or their perception of safety within their hospital units.

RNs' frequency of reporting and perceptions of safety

Our study found that United States pediatric RNs' general perception of hospital safety did not differ between the 2016 and 2018 datasets. RNs perceived the safety culture within their hospital settings as unsupportive when they communicated that something negatively affected patient care (see Table 1). This lack of support created a

Table 3
Descriptive findings for communication and outcome dimensions, 2016 and 2018.

	United States Pediatric RNs' Perceptions of Communication when associated to Reporting Frequency				United States Pediatric RNs' Perceptions of Communication when associated to Safety Perceptions			
	2016 (n = 4783)		2018 (n = 3128)		2016 (n = 4874)		2018 (n = 3221)	
Safety Culture Dimensions	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Feedback About Error	3.76	0.812	3.80	0.778	3.75	0.813	3.81	0.781
Open Communication	3.20	0.456	3.22	0.443	3.20	0.457	3.22	0.444

psychologically unsafe setting, inhibiting improvements in patient care, and hindering communication (Edmondson, 1999; Lyman et al., 2020). Over the several years between 2016 and 2018 and following many initiatives to improve the safety of pediatric care, RNs have continued to not report safety incidents that may have caused patient harm. In addition, RNs' safety perceptions within their own pediatric units were basically the same in the 2016 and 2018 datasets. We believe this may be due to the longstanding tradition in healthcare of viewing unsafe acts caused by medical errors or procedural breaches as personal failures, meaning the RNs internalized the source of the error and blamed themselves, rather than others or the hospital system. RNs perceived the origin of error stemmed from "forgetfulness, inattention, poor motivation, carelessness, negligence, and recklessness" rather than from system failures (Reason, 2000, p. 768). This view remains common in United States hospital settings and to this day places the blame for unsafe acts on frontline providers, such as RNs.

Table 4
Associations between outcome dimensions (Event Frequency, Safety Perceptions) and communication dimensions (Open Communication, Feedback About Error) in 2016 and 2018.

2016 Reporting Frequency	B	95% CI for B		*SE* B	β	R^2	ΔR^2	p
		LL	*UL*					
Model						0.226	0.226	
Constant	1.721	1.574	1.868	0.075				
Open Communication	0.143	0.092	0.194	0.026	0.080			
Feedback About Error	0.432	0.403	0.460	0.015	0.431			<0.05
2018 Reporting Frequency	**B**	**95% CI for B**		***SE* B**	**β**	**R^2**	**ΔR^2**	
		LL	*UL*					
Model						0.197	0.197	
Constant	1.834	1.640	2.027	0.099				
Open Communication	0.106	0.040	0.172	0.034	0.057			
Feedback About Error	0.436	0.398	0.474	0.019	0.414			<0.05
2016 Safety Perceptions	**B**	**95% CI for B**		***SE* B**	**β**	**R^2**	**ΔR^2**	
		LL	*UL*					
Model						0.135	0.135	
Constant	2.515	2.432	2.598	0.042				
Open Communication	0.096	0.067	0.125	0.015	0.100			
Feedback About Error	0.167	0.403	0.184	0.008	0.309			<0.05
2018 Safety Perceptions	**B**	**95% CI for B**		***SE* B**	**β**	**R^2**	**ΔR^2**	
		LL	*UL*					
Model						0.120	0.120	
Constant	2.540	2.431	2.650	0.056				
Open Communication	0.089	0.052	0.127	0.019	0.088			
Feedback About Error	0.171	0.150	0.192	0.011	0.431			<0.05

Note. Model = Enter method in SPSS Statistics (version 27); B = unstandardized regression coefficient; CI = confidence interval; *LL* = lower limit; *UL* upper limit; *SE* B = standard error of the coefficient; β = standardized coefficient; R^2 = coefficient of determination; ΔR^2 = adjusted R^2.

Human error

Reported attributes of health care organizations enhance the collective understanding of patient safety in a variety of ways. Namely, multiple levels of a work system (e.g., individual, team, organizational) are known to explain the occurrences of human error and thereby can be used to understand ways to safeguard against any safety events resulting from said error (Reason, 2000). Active failures, as shown in Fig. 1, are the errors associated with frontline workers, such as administering the wrong medication, and are often more noticeable forms of failure as they often lead to immediate negative effects (Dekker, 2011; Reason, 2000). Latent failures, however, are errors stemming from decisions or actions that may have lain dormant for a period, such as an old policy regarding adequate staffing, or an outdated order set. When multiple latent failures are triggered, active failures result (Dekker, 2011; Reason, 2000). Addressing safety culture concerns preemptively can help prevent an active failure from reaching the patient bedside (Chartered Institute of Ergonomics and Human Factors, 2016; McLeod & Bowie, 2018). It is incumbent upon hospital administrators and managers to familiarize themselves with the uniqueness of pediatric care practices so that policies and regulations support a safety culture for children.

Effective communication is imperative

In the United States, pediatric RNs' general perception of hospital safety has not improved over time. Pediatric RNs perceive the safety culture within their hospital settings as unsupportive and psychologically unsafe, which prevents them from reporting medical errors, adverse events, or other safety concerns.

The United States health care system was built on siloed care where physicians developed diagnostic treatments that were patient and disease specific (Zeidel, 2011). Today's health care model has moved away from this siloed approach to patient-centered models, where integrating standardized communication protocols such as SBAR (situation, background, assessment, recommendation) and TeamSTEPPS have improved interprofessional functions (Beckett & Kipnis, 2009; Gregory et al., 2021; Mayer et al., 2011). TeamSTEPPS was based on 20 years of research that was conducted in the military, aviation, and health care industries that focuses on the optimization of interprofessional communication to improve patient outcomes (Gregory et al., 2021; Mayer et al., 2011; Salas et al., 2018). Hospital leadership must recognize the need for improvement and strengthen communication skills by integrating these or similar programs within their health care teams.

Psychological safety affects incident reporting

Although the frequency of reporting patient safety incidents was basically the same in both the 2016 and 2018 datasets, we found that RNs will report safety concerns if their reports are addressed by hospital leadership in a timely and nonpunitive manner. RNs do not currently perceive that they work in a psychological safe work setting where they can provide feedback about patient care practices, take

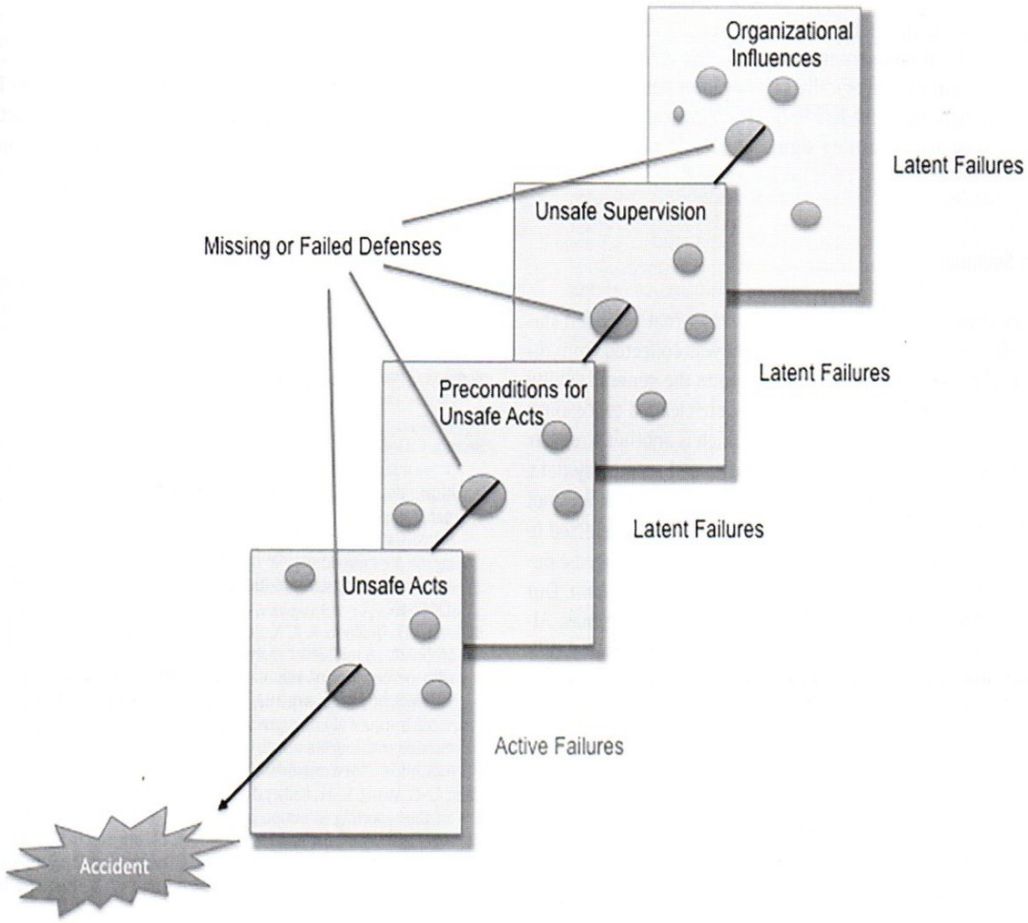

Fig. 1. Human Factor or "Swiss Cheese" Model depicting active and latent failures.
Note. This figure adapts Reason's (2000) Human Factor Model to provide a visual depiction of the relationships between latent and active human failures that contribute to accidents. Latent failures have their primary systemic origins in the imperfect decisions made by organizational leadership. The effects of these decisions may pass through the system throughout the workday and lead to unsafe acts, or active failures. (figure reprinted with permission).

interpersonal risks within the team, and speak up about safety incidents without the fear of retaliation, (Edmondson, 1999; Gampetro et al., 2021; Lyman et al., 2020).

Psychological safety is a shared belief among team members that it is safe to take interpersonal risks within the team (Edmondson, 1999). Team members who feel psychologically safe are comfortable sharing innovative ideas, providing feedback and speaking up about problems —without fear of repercussions.

Hospitals that participate in the Medicare and Medicaid programs are required to track and analyze instances of patient harm. Incident reporting systems have been engineered to support positive reporting cultures, where system flaws that contribute to patient harm are identified, evaluated, and addressed (The Joint Commission, 2018, 2021b). Although incident reporting systems now exist in most hospital settings, as few as 14% of unsafe incidents are reported (Office of Inspector General, 2012). Although incident reporting systems claim to be anonymous, hospital leadership may access the systems to uncover the names of those who initiated the reports. This possible lack of anonymity, and the potential for the administrators and unit managers to punish well-meaning RNs, hinders open communication about safety concerns. Managers have been known to inappropriately use incident reports to justify unfair evaluations and even employment terminations (Chen et al., 2018; Smith et al., 2014; Williams et al., 2017).

Anonymous incident reporting has been adopted by high-reliability organizations (HROs) such as the aeronautic, petrochemical, steel, and nuclear energy industries. Kurapati et al., (2020) found incident reporting increased when the system was anonymous. HROs are systems that operate in hazardous conditions and overall have few adverse events. These systems have an intrinsic "safety health" that can withstand operational dangers while still achieving their intent (Reason, 2000, p. 770). Today's U.S. healthcare leaders have made progress towards improving care outcomes, but still lack a firm understanding of how to achieve high reliability (Sutcliffe et al., 2017). Health care must not only guarantee safety in reporting, but introduce the concept of "situational awareness" (Kurapati et al., 2020; Sutcliffe et al., 2017) to be an adaptive learning industry, with a low tolerance for error. Situational awareness is "the process of understanding and interpreting what to do about current circumstances" (Marcus et al., 2020, p. 272). Studies conducted in the aviation industry found that failure to gain situational awareness was the source of a significant number of pilot errors (Kurapati et al., 2020). RNs must develop situational awareness concerning patient care to improve patient outcomes. Psychological safety when communicating concerns will be enhanced through anonymous and secure incident reporting systems. Hospitals as HRO's, must establish a climate of trust and respectful daily communication among all levels of healthcare providers to timely recognize, manage and correct safety events (Sutcliffe et al., 2017).

Practice implications

There is no room for "blame and shame" in health care today (Ferguson, 2017; The Joint Commission, 2018, 2021b). To improve identification of system failures, hospital leadership must encourage and support employees throughout their organization to report patient safety incidents that impede the organization's ability to provide safe patient care. Hospital leadership must provide a psychologically safe

culture where RNs are comfortable reporting safety incidents that may harm children. Without open communication, RNs will not perceive they are supported and psychologically safe to report patient safety incidents. It is incumbent upon leaders to question low numbers of incident reports as they are a warning sign that RNs do not feel safe to report.

Strengths and limitations

This study's strengths included the large dataset that provided statistical power for our analysis. The survey data was collected from diverse hospitals throughout the US, which supports the generalizability of our findings. Prior to the analysis, the data were cleaned twice, once at the hospital and a second time by Westat, which is another strength.

A limitation was that our descriptive design used secondary data, presenting a snapshot of perceptions of communications, and does not reflect causality. Another limitation was that hospitals self-selected to participate in the database. Therefore, the factors that supported a decline in participation were not available to this research team. Our predetermined sample selection of RNs created a possible bias. Although there were specific administrative guidelines for hospital officials to follow for survey administration, guideline compliance could not be ensured. The surveys were administered on paper, on a web-based platform, or through a combination of the two, which may have led to disparities in responses (Famolaro et al., 2016). Some hospitals conducted a census survey, while others surveyed only particular physicians and staff. AHRQ required hospitals with less than 500 physicians and staff to administer a census survey, but the methods used for each hospital were not available (Famolaro et al., 2016).

Conclusion

There were four important new findings in this study: 1) Feedback About Error had a greater impact on Reporting Frequency than Open Communication in both the 2016 and 2018 datasets; 2) Feedback About Error had a greater impact on Safety Perceptions than Open Communication in both the 2016 and 2018 datasets; 3) Open Communication and Feedback About Error and its associations with Reporting Frequency and Safety Perceptions showed little difference between the 2016 and 2018; and, 4) The R^2 (proportion of variance) was low, indicating factors other than Open Communication and Feedback About Error were involved with Reporting Frequency and Safety Perceptions. Our analysis did not determine other factors involved.

Future research

Additional research is needed to develop, implement, and evaluate strategies that improve the safety culture within pediatric hospitals, with a focus on communication. Although the HSOPSC is widely used nationally and internationoally, more clarity is required for interpreting the findings. Qualitative methods could assist in identifying potential improvement strategies while implementing research methods that would guide strategy integration.

Disclosure of conflicts of interest

None.

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