

Factors affecting quality of nurse shift handover in the emergency department

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Abstract

Aim: The aim of this study was to explore and test factors hypothesized to influence quality of Emergency Department nurse-to-nurse shift handover communication.

Background: Nurse-to-nurse shift handover communication includes the transfer of information and responsibility for patients at shift change. The unique environment of the Emergency Department, where there is a high degree of patient unpredictability, increased patient volumes and rapid patient turnover, can create challenges for high quality handover communication. There is considerable literature addressing handover communication and factors that influence quality or effectiveness. However, few studies have empirically tested those factors.

Design: A quantitative, cross-sectional design was used to test a conceptual model of factors hypothesized to influence quality of handover communication.

Methods: In 2014, data were gathered using surveys mailed to Emergency Department nurses across Ontario, Canada.

Results: The final eligible sample was 231 of 576 for an overall response rate of 40.1%. Analysis was performed using backwards elimination stepwise multiple linear regression. Four statistically significant explanatory variables were retained in the final multiple regression model, explaining 34% ($p < .0001$) of variance in handover quality. Handover quality was increased when patients flowed smoothly through triage, when nurses experienced positive intrusions, in the presence of a positive safety climate and when there were positive relationships between incoming and outgoing nurses.

Conclusions: By understanding those factors that contribute to handover quality, it is possible to develop targeted interventions aimed at improving the quality of Emergency Department nurse-to-nurse shift handover.

KEYWORDS

communication, emergency department, nurse, quality, shift handover

1 | INTRODUCTION

Nurse-to-nurse shift handover communication is defined as bidirectional communication that results in the transfer of information and responsibility for one or more patients at shift change (Friesen,

White, & Byers, 2008; McFetridge, Gillespie, Goode, & Melby, 2007). This transfer of information creates continuity and allows incoming nurses to make decisions about priorities and plan the provision of patient care during the shift (Strople & Ottani, 2006). Internationally, handover communication is an important aspect of

providing safe patient care, yet researchers have suggested that handover communication is often incomplete and/or inaccurate (Kerr, Lu, McKinlay, & Fuller, 2011; McCloughen, O'Brien, Gillies, & McSherry, 2008; Meissner et al., 2007; Ong, Biomed, & Coiera, 2011). It has been documented that poor quality or ineffective shift handover can result in negative consequences for patients, staff and healthcare organizations (Australian Council for Safety and Quality in Health Care, 2005, Drach-Zahavy & Hadid, 2015; Kitch et al., 2008; Meissner et al., 2007; Moon, Gonzales, Woods, & Fox, 2016). Although there is considerable literature addressing factors that influence handover quality or effectiveness, few studies have empirically tested those factors. This paper presents findings from a study aimed at exploring and testing factors hypothesized to influence quality of Emergency Department (ED) nurse-to-nurse shift handover communication.

1.1 | Background

The ED is a unique environment that presents many challenges to effective and high quality shift handover communication (Klim, Kelly, Kerr, Wood, & McCann, 2013). This is attributed to the chaotic and erratic nature of the environment where patient volumes are irregular, there are frequently multiple caregivers for a single patient and numerous transfers occurring within and out of the department (Baker, 2010; Klim et al., 2013; Lawrence, Tomolo, Garlisi, & Aron, 2008; Ong et al., 2011). Recent literature suggests that handover communication at shift change is a vulnerable activity that may pose challenges to patient safety (Drach-Zahavy & Hadid, 2015; Moon et al., 2016). Poor quality shift handover has been associated with adverse outcomes such as incorrect treatment, delays in diagnosis, increased length of stay and both nurse and patient dissatisfaction (Apker, Mallak, & Gibson, 2007; Funk et al., 2016; Kitch et al., 2008; Meissner et al., 2007; Moon et al., 2016).

1.2 | Conceptual model

Many studies have examined factors that influence handover communication. However, there is a limited amount of research focused on understanding and empirically testing factors that influence the quality of ED nurse-to-nurse shift handover. Using findings from the literature, 18 factors and four interaction effects were included in a hypothesized conceptual model described below and presented in Figure 1.

Handover communication may be negatively influenced by high levels of nurse cognitive work, defined as the amount of mental processing required by an individual that allows them to accept and understand information and carry out actions (Lamond, 2000; Neill, 2011). Cognitive work includes both cognitive capacity and the nurse's ability to remain focused on the task at hand (referred to below as focus of attention) (Currie, 2002; Kerr et al., 2011; Lamond, 2000; Lawrence et al., 2008; Laxmisan et al., 2007; Sharit, McCane, Thevenin, & Barach, 2008; Siemsen et al., 2012). Distractions and interruptions negatively influence handover by causing information

Why is this research or review needed?

- Handover communication is an important aspect of providing safe patient care, yet it can often be incomplete and/or inaccurate.
- Poor quality handover communication can result in negative consequences for patients, nurses and healthcare organizations.
- Many studies have examined factors that influence handover communication. However, there is limited research focused on understanding and empirically testing factors that influence the quality of Emergency Department nurse-to-nurse shift handover.

What are the key findings?

- This study tested a conceptual model including 18 factors hypothesized to influence quality of handover communication in the Emergency Department.
- Four of 18 factors hypothesized to influence handover quality were found to be significant.
- Smooth flow of patients through triage, positive relationships between the incoming and outgoing nurse, positive safety climate and positive intrusions were found to positively influence quality of nurse-to-nurse shift handover.

How should the findings be used to influence policy/practice/research/education?

- Having an understanding of factors that influence handover quality can inform the development of interventions to promote handover quality and ultimately lead to improved patient safety, continuity of care and staff and organizational outcomes.
- Each of the significant factors identified as having an influence on handover quality is modifiable, thus facilitating the development of handover interventions.
- Opportunities for future research include testing the hypothesized model in other populations and examining handover quality from the perspectives of both incoming and outgoing nurses.

loss (Devlin, Kozji, Kiss, Richardson, & Wong, 2014, Laxmisan et al., 2007), unclear handover presentation (McCloughen et al., 2008), and increasing the length of time required for nurses to provide handover (Currie, 2002). Interruptions can be further classified into intrusions and distractions (Jett & George, 2003). Intrusions are unexpected and disrupt the flow of activity (Jett & George, 2003; McGillis Hall, Ferguson-Pare, et al., 2010; McGillis Hall, Pedersen, & Fairley, 2010; McGillis Hall, Pedersen, Hubley, et al., 2010), while distractions are breaks in concentration triggered by the outside environment or competing activities unrelated to the current task (Jett & George, 2003).

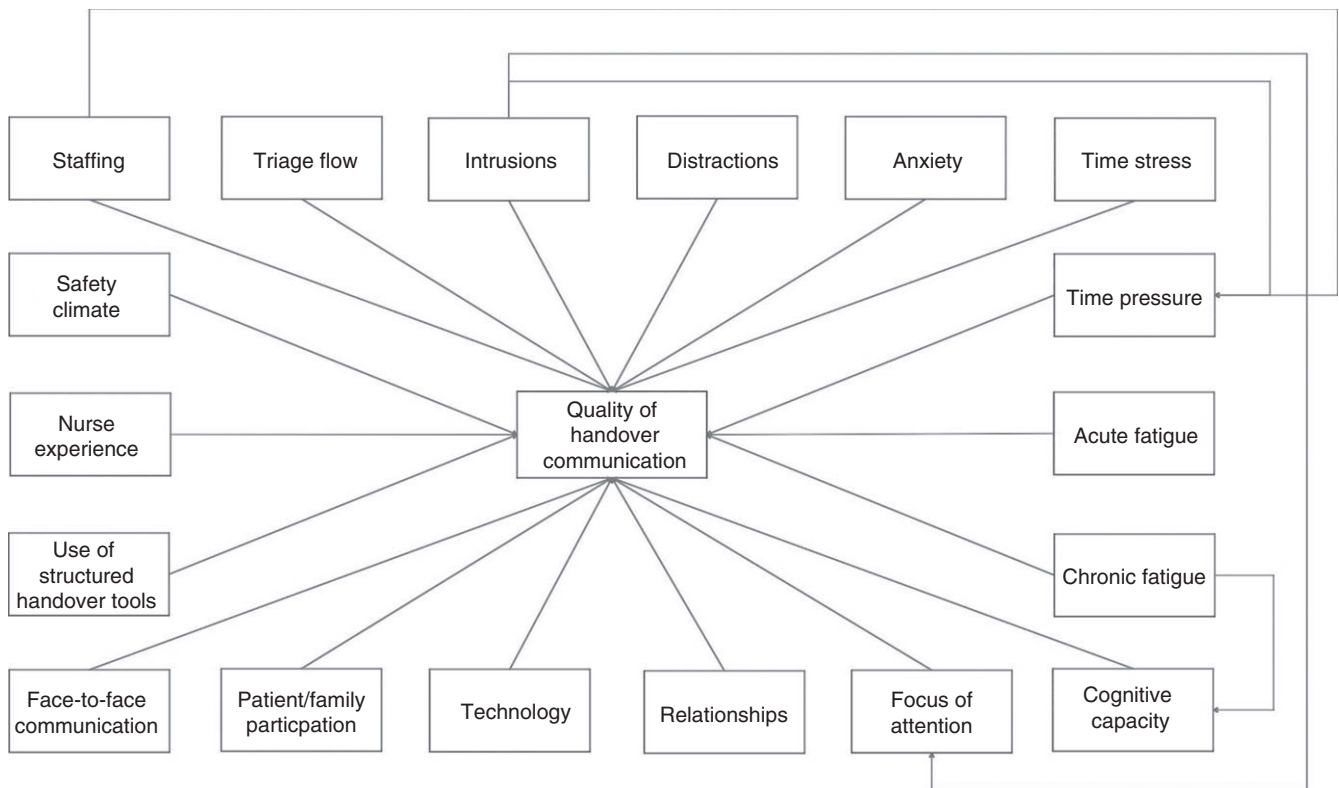


FIGURE 1 Hypothesized model of factors that contribute to quality handover communication from the perspective of the incoming nurse

In both conceptual and empirical handover literature, it has been suggested that psychological precursors (Leape, 1994; Reason, 1990) such as time pressure and fatigue have an influence on handover communication (Birmingham, Buffum, Blegen, & Lyndon, 2015; Cheung et al., 2010; Lawrence et al., 2008). Since psychological precursors negatively impact performance (Ebright, Patterson, Chalko, & Render, 2003) and can ultimately lead to mistakes (Leonard, Graham, & Bonacum, 2004), psychological precursors including job stress, time pressure and fatigue (both acute and chronic), may have a negative impact on handover quality.

In addition to those factors that negatively influence handover communication, several factors that positively influence handover communication were identified. For example, good relationships with peers were identified as having a positive influence on handover communication (Anthony & Preuss, 2002; Bost, Crilly, Patterson, & Chaboyer, 2012; Carroll, Williams, & Gallivan, 2012; Cheung et al., 2010; Meissner et al., 2007).

Strople and Ottani (2006) and Randell, Wilson, and Woodward (2011) identified that the use of technology such as electronic documentation, bedside documentation devices and other point of care technology had the potential to improve handover quality by organizing and streamlining the presentation of patient information.

Furthermore, face-to-face verbal handover was reported to provide nurses with the opportunity to clarify information and ask questions (Friesen et al., 2008). Face-to-face communication provides the opportunity for both incoming and outgoing nurses to ensure that all

relevant information is communicated and is more likely to result in a shared understanding as opposed to recorded reports (Drach-Zahavy & Hadid, 2015; Randell et al., 2011). In addition, including the patient in handover communication made it easier for incoming nurses to assume accountability since they were given the opportunity to visualize patients (Anderson & Mangino, 2006; Birmingham et al., 2015; Jeffs et al., 2014). Other studies reported perceptions of increased continuity of care and opportunities for clarification when handover included patients (Jeffs et al., 2014; Lu, Kerr, & McKinlay, 2014).

Studies examining the use of handover tools reported improved consistency, organization and amount of information shared between nurses (Currie, 2002; McFetridge et al., 2007; Siemsen et al., 2012). A literature review by Foster and Manser (2012) found that seven of twelve studies using standardized handover sheets reported significant improvements in outcomes such as information retention and adverse events. Similarly, use of structured handover tools has shown positive results in improving perceptions of handover effectiveness or quality when included as part of a bundle of handover interventions (Feraco et al., 2016; Funk et al., 2016; Moon et al., 2016).

There is conflicting evidence related to nurses' levels of experience and the influence on handover communication (Carroll et al., 2012; Cheung et al., 2010; McFetridge et al., 2007; Sharit et al., 2008). Some authors suggest that increased experience has a positive influence on handover (McFetridge et al., 2007; Sharit et al.,

2008), while Carroll et al. (2012) reported that level of experience may have had a negative impact on handover depending on the level of familiarity with the patient.

Although not commonly explored in handover related research literature, the quality of handover communication may be influenced by safety climate. This is a reasonable hypothesis because of the documented relationship between a positive safety climate and decreased rates of adverse events (Agnew, Flin, & Mearns, 2013; Clarke, 2010; Taylor et al., 2012). Organizations with higher safety culture scores have been reported to have lower rates of patient adverse events and complications (Agnew et al., 2013; Clarke, 2010; Mardon, Khanna, Sorra, Dyer, & Famolaro, 2010; Taylor et al., 2012).

2 | THE STUDY

2.1 | Aim

The objective of this study was to test the conceptual model of factors hypothesized to influence handover quality among ED nurses at shift change. Understanding the factors that contribute to handover quality can guide future efforts in developing interventions aimed at improving the quality of nurse-to-nurse shift handover.

2.2 | Design

A cross-sectional survey design was used to test the hypothesized conceptual model of factors influencing quality of handover communication among nurses in the ED. Recent evidence suggests that there may be differences in perceptions of handover quality between incoming and outgoing nurses (Carroll et al., 2012; Manser, Foster, Flin, & Patey, 2013). For the purposes of this current research, perspectives of incoming nurses were examined, as it was posited that the quality of handover would directly impact their ability to plan and provide patient care.

2.3 | Participants

In Ontario, in 2014, there were 7,064 RNs who identified the hospital ED as their primary area of practice at the College of Nurses of Ontario (CNO, 2015). A random sample of ED nurses who agreed to participate in research was obtained through the CNO. In 2014, using the CNO sample, 650 nurses were invited to participate in a self-administered paper survey mailed to their homes.

Participants who met the following inclusion criteria were included in this study: (1) a Registered Nurse that provided direct patient care in the ED; (2) received handover at least once within 10 days of receiving the survey; (3) worked in the ED for at least 6 months; (4) able to read and speak English; and (5) able to provide informed consent. As a token of appreciation for participation, a donation was made on behalf of participants to one of three charities. A total of 316 participants returned their surveys. Seventy-four reported that they did not meet study inclusion criteria and eleven surveys were either blank or indicated that they did not wish to

participate in the study. The final eligible sample was 231 of 576 for an overall response rate of 40.1%. Sample size calculations were carried out using the rule of thumb formula of $N \geq 50 + 8 \times$ (number of explanatory variables) (Tabachnick & Fidell, 2013). This formula is based on the assumptions of $\beta = 0.20$ and $\alpha = 0.05$ to ensure that there is power of at least 80% to detect a medium sized effect (Tabachnick & Fidell, 2013). Using this calculation ($N \geq 50 + 8 \times 22$), a sample size of at least 226 participants was required for this study. Since a Bonferroni adjustment was made to the p value (described below), a posthoc power analysis based on the General Linear Model was carried out using $G \times$ Power (Erdfelder, Faul, & Buchner, 1996). Using study data ($f^2 = 0.51$, $\alpha = 0.0023$, $N = 227$), this retrospective power calculation resulted in power of 99.9% for the overall model.

2.4 | Ethical considerations

Ethics approval was obtained from the local University research ethics board (File #29574). Participants indicated consent to participate by returning a completed survey.

2.5 | Data collection

Data were collected using self-administered paper surveys consisting of questions scored on Likert-type scales. Surveys were mailed to potential participants using a modified version of Dillman, Smyth, and Christian's Tailored Design Method (2009) consisting of a maximum of four mailings. The first and third mailings included complete survey packages. The second and fourth mailings consisted of thank-you/reminder postcards. The third and fourth mailings were sent to non-responders as required.

2.6 | Variables and measures

Both single items and valid and reliable instruments were included in the survey. The outcome variable, handover quality, was measured using a single item adapted from Manser et al.'s (2013) study of handover in the operating room. The item, "Overall, the quality of this handover was" used a five-choice response scale ranging from poor to excellent. Table 1 includes study variables and associated measures. Psychometric properties of all multi-item instruments were tested during data analysis and are also displayed in Table 1. The survey was pilot tested with a group of six RNs working in the ED of an urban teaching hospital. Pilot participants were asked to think out loud while they completed the survey, commenting on wording and interpretation of items (Groves et al., 2009; Knafl et al., 2007) and overall ease of completion. Minor survey modifications were made following the pilot.

2.7 | Data management and analysis

Data were coded and double-entered into SPSS 22.0 to ensure accuracy. Descriptive statistics were used to describe study sample characteristics. Four surveys that were missing more than 10% of

TABLE 1 Variables and measures

Variable	Definition	Measure	Cronbach's Alpha
Handover quality	Degree to which communication results in a discussion of patient care, presents information in an organization manner, and creates a shared understanding (Manser et al., 2013)	Adapted from Manser et al. (2013)-single item	N/A
Triage flow	Smoothness of the triage process where patients are seen and assigned a triage score by the triage nurse	Researcher created single item	N/A
Staffing	Sufficient number of nurses to care for patients and manage workload	Researcher created single item	N/A
Intrusions	Unexpected encounters initiated by another individual that disrupt the flow of activity and cause activity to halt temporarily (Jett & George, 2003; McGillis Hall, Ferguson-Pare, et al., 2010; McGillis Hall, Pedersen, & Fairley, 2010; McGillis Hall, Pedersen, Hubley, et al., 2010)	Researcher created single item	N/A
Distractions	Breaks in concentration triggered by competing activities or environmental stimuli that are not related to the task at hand	Researcher created single item	N/A
Cognitive capacity	Having sufficient mental space to be able to carry out cognitive work such as information processing and decision making (Kreps & Thornton, 1984)	Researcher created single item	N/A
Focus of attention	Ability to direct attention to a situation (such as handover) based on one's understanding and knowledge of the situation, and surrounding activity (Dekker, 2011)	Researcher created single item	N/A
Anxiety	"...An unpleasant emotional state that has adaptive or maladaptive consequences" (Addae & Wang, 2006, p. 477)	Job stress scale: anxiety subscale (Parker & Decotiis, 1983)	0.83
Time stress	"Time stress relates to employees' perception of insufficient time to accomplish the demands of their job" (Addae & Wang, 2006, p. 477)	Job stress scale: time stress subscale (Parker & Decotiis, 1983)	0.91
Time pressure	Transient feeling that occurs when an individual perceives that there is insufficient time to complete required tasks (Teng, Hsiao, & Chou, 2010).	Adapted time pressure scale (Teng et al., 2010)	0.93
Acute fatigue	Temporary state that can be overcome with rest (Winwood, Winefield, Dawson, & Lushington, 2005)	Occupational fatigue exhaustion recovery (OFER-15): Acute Fatigue subscale (Winwood, Lushington, & Winefield, 2006)	0.90
Chronic fatigue	Persistent state that affects both physical and mental functioning (Winwood et al., 2005)	Occupational fatigue exhaustion recovery (OFER-15): chronic fatigue subscale (Winwood et al., 2006)	0.91
Relationships	Feelings that the incoming and outgoing nurse have towards one another (Kreps & Thornton, 1984)	Positive relationships subscale (Carroll et al., 2012)	0.84
Safety climate	Employee perceptions of safety related policies and practices, and perceptions of management priorities of safety (Clarke, 2010)	Safety attitudes questionnaire: safety climate subscale (Sexton et al., 2006)	0.75
Technology	Use of electronic documentation and bedside documentation devices that organize and present patient information (Strople & Ottani, 2006)	Researcher created single item	N/A
Face-to-face communication	Handover communication conducted verbally between two or more nurses in close physical proximity to one another	Researcher created single item	N/A
Handover tools	Checklists or mnemonic devices used by nurses to guide handover communication	Researcher created single item	N/A
Patient/family participation	Including the patient (or family if the patient was unable to participate) in handover communication	Researcher created single item	N/A

responses were omitted from the analysis, leaving a total sample of 227. Remaining missing data were imputed using imputation strategies such as mean substitution. Assumptions of multivariate normality, linearity, multicollinearity and homoscedasticity were checked.

The assumptions of normality and linearity in the explanatory variables were not met. As a result, all explanatory multiple item variables were recoded into dichotomous categorical variables to meet assumptions for analysis. Variables were dichotomized using

published scale cut-points where possible. Where published cut-points were not established, variables were dichotomized using the scale median (see Data S1). This decision was made to increase ease of interpretation of results after unsuccessfully attempting data transformations.

To begin regression analysis, all explanatory variables and interactions were entered into a model simultaneously, as all explanatory variables were hypothesized to impact the outcome variable of handover quality equally (Tabachnick & Fidell, 2013). The regression equation and total variance explained (adjusted R^2) derived from simultaneous regression were assessed. To understand which explanatory variables had the greatest impact on handover quality and to identify a more parsimonious model, all hypothesized explanatory variables were entered into a backward deletion stepwise multiple regression model (Tabachnick & Fidell, 2013). Variables that were the least significant in the model were removed individually according to the highest p -value (Streiner, 2013). Once the F change test was statistically significant ($p = .023$), variables were no longer removed, as this indicated that removal of additional variables would have produced a significantly different model that would have explained less variance.

To test the four hypothesized moderating relationships, interaction effects were included in each of the models. Assessing the presence of interaction effects required multiple occurrences of statistical testing, which increased the risk of a Type 1 error (Tabachnick & Fidell, 2013), where the null hypothesis is falsely accepted. To minimize this risk, a Bonferroni adjustment was applied to the study p -value. A Bonferroni adjustment was calculated by dividing the desired p -value by the number of estimated explanatory variables (Tabachnick & Fidell, 2013). For this study, to achieve statistical significance, the adjusted p -value had to be less than .0023.

3 | RESULTS

A total of 227 nurses were included in the final sample, the majority of which were female (96.5%) with a mean age of 51.4 (range 34–76, SD 7.4). See Table 2 for descriptive characteristics.

The average sample score on quality of handover communication was 3.42 (of 5.0), meaning that participants rated on average, handover being between good and very good. As the remaining study variables were recoded into dichotomous variables, proportions of responses are presented in Table 3 below.

The original conceptual model included 18 variables. However, prior to analysis, the variable face-to-face communication was removed because of low variability in responses. Only two participants did not use a face-to-face handover method. The remaining 17 variables were simultaneously entered into a linear regression model. The final model indicated that four of 17 explanatory variables explained 34% of variance in handover quality: triage flow, relationships, intrusions and safety climate ($R^2 = 0.34$, F (4, 222) = 29.85, $p < .0001$). Table 4 displays model results.

TABLE 2 Participant demographics

Characteristic	Mean [SD] or frequency (% of sample)
ED experience in years	17.1 [8.4] range 1–47 years
Nursing diploma as highest level of education	184 (81.1%)
Baccalaureate in nursing as highest level of education	39 (17.2%)
Masters in nursing as highest level of education	4 (1.8%)
Urban teaching hospital	51 (22.5%)
Community hospital (more than 100 beds)	99 (43.6%)
Small hospital (less than 100 beds)	75 (33.0%)
Patients on stretchers	177 (78.0%)
Patients on stretchers in an ambulatory area	17 (7.5%)
Patients in a fast track, rapid assessment or ambulatory area	32 (14.1%)

Note: Sample percent does not always add up to 100% as a result of missing data. Missing data that were not part of the conceptual model were not imputed.

4 | DISCUSSION

The quality of handover received by incoming nurses received was rated good to very good. This is congruent with findings reported by Manser et al. (2013). In their study of postoperative handover, quality ratings were positive, with means ranging from 3.1–3.9 on a five-point scale. Similarly, Carroll et al. (2012) reported similar findings from the perspectives of incoming and outgoing nurses.

The flow of patients through triage was a significant explanatory variable, suggesting that perceptions of handover quality increased when the flow of patients through triage was smooth. Flow of patients through triage may reflect future workload for incoming nurses, and indications of workload experienced by outgoing nurses. When the flow of patients through triage is backlogged, nurse workload becomes unpredictable and less manageable as a result of patient volumes.

The relationship between the incoming and outgoing nurse was found to be a significant explanatory variable. Positive relationships between incoming and outgoing nurses led to higher ratings of handover quality. This is not surprising given that a significant portion of communication involves feelings that the sender and receiver have for one another (Ellis, Gates, & Kenworthy, 1995). Relationships with peers and overall teamwork were identified as influencing handover communication in several studies and conceptual models (Anthony & Preuss, 2002; Bost et al., 2012; Carroll et al., 2012; Cheung et al., 2010; Meissner et al., 2007). In this study, most nurses generally rated relationships with their outgoing colleagues as being positive. Through the development of positive relationships with colleagues, incoming nurses are more likely to feel comfortable asking questions and clarifying information with their outgoing colleagues.

TABLE 3 Variable proportions

Variables	Dichotomous categories	%
Technology	No access to technology	72.7
	Access to technology	27.3
Patient and/or family participation	Patient or family not included in handover	91.6
	Patient or family included in handover	8.4
Use of structured handover tool	Did not use structured handover tool	89.0
	Used structured handover tool	11.0
Intrusions	Intrusions with negative impact	89.4
	Intrusions with positive impact	10.6
Distractions	Distractions with negative impact	96.0
	Distractions with positive impact	4.0
Triage flow	Frequent or occasional triage backlogs	74.0
	Smooth flow of patients through triage	26.0
Nurse staffing	Inadequate unit staffing	63.0
	Adequate unit staffing	37.0
Cognitive capacity	Decreased cognitive capacity	28.2
	Sufficient cognitive capacity	71.8
Focus of attention	Decreased focus of attention	36.1
	Sufficient focus of attention	63.9
Relationships	Negative relationship with outgoing nurse	23.3
	Positive relationship with outgoing nurse	76.7
Time pressure	Low time pressure	79.7
	High time pressure	20.3
Anxiety	Low anxiety	76.2
	High anxiety	23.8
Time stress	Low time stress	75.8
	High time stress	24.2
Acute fatigue	Low/moderate acute fatigue	17.2
	Moderate/high acute fatigue	82.8
Chronic fatigue	Low/moderate chronic fatigue	51.1
	Moderate/high chronic fatigue	48.9
Safety climate	Negative safety climate	73.6
	Positive safety climate	26.4

Positively perceived intrusions were found to have a positive impact on handover quality ratings. In the present study, the majority of nurses reported having intrusions with a negative impact. The impact on handover quality was not contingent on whether nurses experienced intrusions, but rather, whether the intrusions were perceived as being positive or negative in nature. This builds on findings by Jett and George (2003), McGillis Hall, Ferguson-Pare, et al.

TABLE 4 Backwards elimination stepwise multiple regression analysis

Variable	B	SE	β	P	95% CI
Triage flow	0.353	0.115	0.169	.002	(0.126, 0.579)
Relationships	0.995	0.121	0.459	<.001	(0.757, 1.232)
Intrusions	0.374	0.164	0.125	.023	(0.051, 0.698)
Safety climate	0.315	0.116	0.151	.007	(0.086, 0.543)

$n = 227$, B = unstandardized regression coefficient, SE = standard error, β = standardized regression coefficient, CI = confidence interval.

(2010), McGillis Hall, Pedersen, and Fairley (2010), McGillis Hall, Pedersen, Hubley, et al. (2010) suggesting that there are different types of intrusions, both positive and negative. Findings from this study suggest that positive intrusions that offer additional information to the handover may prevent omissions or clarify existing information, thus leading to higher ratings of handover quality. These findings are contrary to other literature findings suggesting that interruptions in general can result in information loss and unclear presentation of handover information (McCloughen et al., 2008; Laxmisan et al., 2007). Additional research on intrusions is required to identify, whether or not, positive intrusions can overcome negative consequences (decreased attention span, concentration and ability to store information) that have been associated with intrusions in general (Berg et al., 2013; Jett & George, 2003).

Interestingly, most participants perceived the safety climate in their EDs as being negative. Yet, results from this study suggest that a more positive ED safety climate positively influences handover quality. Evidence in support of this finding includes several studies that have identified an association between positive safety climate and increased clinician safety behaviour (Agnew et al., 2013; Clarke, 2010; Steyrer, Schiffinger, Huber, Valentin, & Strunk, 2013), and a relationship between positive safety climate and fewer adverse events (Mardon et al., 2010; Taylor et al., 2012). Related specifically to handover, Richter, McAlearney, and Pennell (2016) reported that management support for safety was positively associated with perceived handover success. Siemsen et al. (2012) reported that existing organizational culture did not support handover and that many clinicians did not perceive handover to be a safety related behaviour. The authors suggested that creating a culture of safety could have a positive impact on patient safety as it relates to handover (Siemsen et al., 2012).

4.1 | Limitations

There are several known limitations associated with this cross-sectional study. As data were collected at one point in time, participant responses were limited by their ability to recall previous events (Shi, 2008). Selection bias was a threat to study validity, as those who responded to the survey may have been different from those who chose not to participate. The use of self-report measures was another limitation, as self-report measures reflect participants' perceptions of handover quality. Participants' perceptions may not be a

true reflection of handover quality as a result of biases such as reactivity, where participants may provide socially desirable answers rather than true answers (Shi, 2008). Additionally, there may have been other variables that could potentially influence handover quality that were not included in this study. Despite limitations, this study contributes to our understanding by providing theoretical contributions to handover communication literature, as to date, few quantitative studies reporting factors that influence quality of nurse shift handover in the ED have been published.

4.2 | Implications

In developing interventions targeted at improving handover quality, it is necessary to understand modifiable factors that influence quality. It is proposed that all four influencing factors identified in this study can be modified. For example, to improve the flow of patients through triage, hospital administrators could implement a surge capacity triage model, where extra triage nurses are brought in during times of increased demand. At a system level, healthcare leaders and policy-makers should encourage patients to visit primary care providers and urgent care centres whenever possible, to divert patients with non-urgent issues away from the ED (Morgan, Chang, Alqatari, & Pines, 2013).

With respect to intrusions, ED staff should be encouraged to communicate vital patient information even if it results in an intrusion during a handover exchange (Devlin et al., 2014). It is recognized that not all intrusions are positive in nature, therefore, it is important for ED staff to be cognizant of those that do not contribute to handover quality. As intrusions can come from a variety of sources, orientation for all new ED staff should include education about the impact of intrusions on handover communication (McGillis Hall, Pedersen, & Fairley, 2010). Staff should also be taught recovery strategies to prevent information omissions following intrusions (Devlin et al., 2014).

Nurse managers and leaders should promote positive relationships among staff. This can be achieved through the implementation of team-building interventions such as TeamSTEPS (Drach-Zahavy & Hadid, 2015; Feraco et al., 2016), and through the promotion of a collegial work environment. Avoiding the use of agency or temporary staff may also improve continuity and opportunities for staff to build relationships.

Finally, although not as straightforward, hospital administrators, managers, leaders and ED staff should aim to create and support a culture of safety (Siemsen et al., 2012). Weaver et al. (2013) identified several strategies that can be used to improve safety culture. These interventions include staff training related to teamwork and communication, executive walk rounds in the ED and leadership empowering staff and encouraging them to report safety concerns, errors and near misses.

Recent literature suggests that bundling several handover intervention strategies (such as mnemonic devices, team training etc.) may lead to improved handover (e.g., Feraco et al., 2016; Moon et al., 2016). As such, administrators and leaders should consider

implementing multi-pronged approaches that include the aforementioned factors to improve handover quality.

4.3 | Future research

Findings from this study present several future research opportunities. The majority of handover related literature used to inform the development of this study was carried out on inpatient units in acute care. Therefore, although the final model included only four significant influencing factors, it is possible that some of the remaining 14 factors would be significant in explaining handover quality in settings outside of the ED. Hence, further testing and refining of the originally hypothesized model in inpatient settings is suggested.

Similar to handover research by Carroll et al. (2012) as well as Manser et al. (2013), these findings highlight potential differences in perceptions of handover quality depending on the role of the nurse participating in the information exchange (e.g., incoming vs. outgoing). There were several factors included in the hypothesized model that were not significant explanatory variables despite support for them in the literature. Future research is needed to examine handover quality from the perspectives of both the sender and receiver.

5 | CONCLUSION

Poor quality handover communication can result in negative consequences for patients, nurses and healthcare organizations (Australian Council for Safety and Quality in Health Care, 2005). As such, this study tested a conceptual model of factors influencing quality of ED nurse shift handover from the perspective of incoming nurses. After testing the hypothesized model using data gathered from ED nurses across Ontario, only four factors were identified as significant explanatory variables in nurse-to-nurse shift handover quality in the ED. Smooth flow of patients through triage, positive relationships between the incoming and outgoing nurse, positive safety climate and positive intrusions were found to positively influence handover quality. Despite the need for additional research, findings from this study contribute to our understanding of factors influencing handover quality and result in several implications for nurses, nurse leaders and researchers. By developing interventions targeted towards these four modifiable influencing factors, ED nurse-to-nurse shift handover quality can be improved.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the author(s).

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (<http://www.icmje.org/recommendations/>)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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