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Author

Milton, Jenny, Gillespie, Brigid M., Åberg, David, Erichsen Andersson, Annette, Oxelmark, Lena

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Interprofessional teamwork before and after organizational change in a tertiary emergency department: An observational study

Jenny Milton ^a, Brigid M. Gillespie ^{b,c}, David Åberg ^{d,e}, Annette Erichsen Andersson ^{a,f}, and Lena Oxelmark ^{a,e}

^aInstitute of Health and Care Sciences, the Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; ^bGold Coast Health, Gold Coast University Hospital, Gold Coast, QLD, Australia; ^cSchool of Nursing and Midwifery & NHMRC Wiser Wounds Centre of Research Excellence, Griffith University, Brisbane, QLD, Australia; ^dDepartment of Internal Medicine, University of Gothenburg, Gothenburg, Sweden; ^eDepartment of Acute Medicine and Geriatrics, Region Västra Götaland, Sahlgrenska University Hospital, Gothenburg, Sweden; ^fDepartment of Orthopedic Surgery, Region Västra Götaland, Sahlgrenska University Hospital Mölndal, Gothenburg, Sweden

ABSTRACT

In healthcare settings, suboptimal interprofessional teamwork and communication contribute to unsafe care and avoidable harm. Interprofessional teamwork is essential in high-risk clinical areas such as the emergency department (ED). The aims of this study were to describe interprofessional teamwork in a hospital ED and to evaluate factors influencing interprofessional communication before and after implementation of a department-wide multifaceted intervention. Structured observations were undertaken during 2015/16 and 2019. Differences in interprofessional communication practices, teamwork, and sources of interruptions were compared before and after the intervention. The following domains were surveilled: (a) healthcare professionals (HCPs) communication initiatives, (b) HCPs' contribution to patient assessment, (c) interprofessional communication processes, and (d) team interruptions. The intervention included strategies to enable use of communication tools, changes to team structures, changes in work environment, ethical principles, and establishment of a code of professional conduct during interprofessional communication. Team interruptions significantly decreased post-intervention, and our findings suggest that organizational changes affect domains of teamwork. Statistically significant differences were observed in the initiated communication pre-intervention and contribution to patient assessment significantly increased post-intervention. Multifaceted organizational interventions can positively affect interprofessional team communication and work-flow in the ED, thus patient safety and quality of care can be improved.

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Introduction


Interprofessional communication and teamwork in the emergency department (ED) are complex issues. Effective performance in the ED is crucial for patients presenting with acute conditions. Previous researchers have described the relationship between effective interprofessional teamwork and opportunities for communication as being the most prominent factor for success (Morgan et al., 2015). In contrast, human errors, teamwork, communication failures, and local environmental factors have been identified as factors that contribute to unsafe care in the ED (Kallberg et al., 2015). Globally, adverse events have led to medical complications and injuries due to unsafe care (Jha et al., 2013; Kohn et al., 2000) and have been shown to increase patients' risk of mortality and morbidity from poor quality healthcare (National Academies of Sciences, 2018). Human factors related to the ability to handle interpersonal relationships in the context of technology and specific environments (Reason, 2000) have been identified as contributing to more than 70% of all adverse events (Rall et al., 2015). Reliable systems promote standardization in clinical care, thereby limiting the potential for adverse events (Thomas et al., 2000).

In 2013, the ED management team at the study hospital conducted a risk assessment and identified processes related to patient safety that required improvement. Lack of participation in decision-making resulted in duplicated work, inaccurate information, failures related to collecting information, and increased risk of adverse events (Svanström & Rothenberg, 2013). Having identified these aspects of the risks to patient safety, the management team and healthcare professionals (HCPs) agreed to implement multifaceted interventions; a team-based work structure in the ED.

Background

HCPs work in the context of processes and healthcare structures that can limit their abilities to use standardized interprofessional communication strategies and to enable cohesive and coordinated teamwork (Andersson et al., 2014) and safe care (Leonard et al., 2004). Teamwork skills are recognized as essential for optimizing team cohesion and coordinating patient care in an efficient manner (Salas et al., 1992). Structured interprofessional teamwork has been reported to broaden competence and ensure safe healthcare services, as

CONTACT Jenny Milton  jenny.milton@gu.se  Institute of Health and Care Sciences, University of Gothenburg, Arvid Wallgrens Backe, House 1, Box 457, Gothenburg 405 30, Sweden

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compared to individual work (Reeves et al., 2017). Greater capacity and flexibility, back-up behaviors, team leadership, and error correction have been highlighted as essential components of well-functioning teamwork (Goodwin et al., 2018; Salas et al., 2005). The need for teamwork is especially evident in complex organizations with competing priorities, where suboptimal teamwork may be present even if team members believe themselves to be working collaboratively.

Research suggests that when team members work in silos and fail to share information, patient safety is put at risk (Lyubovnikova et al., 2015). Non-technical skills (NTS), encompassing interpersonal and interprofessional communication skills, are essential for optimal team performance and necessary for the delivery of efficient and safe care. NTS include teamwork, situational awareness, decision-making, leadership, and stress and fatigue management (Flin et al., 2008). The rapid emergence of artificial intelligence, robotic surgery, advanced medical technologies, and computer support has increased the importance of using NTS as a patient safety strategy (Johnson & Aggarwal, 2019).

A significant persistent barrier to safe care in the ED is the presentation of high numbers of patients, leading to overcrowding (Bernstein et al., 2009; Morley et al., 2018). Overcrowded EDs have been reported to be strongly associated with a combination of communication and teamwork failures (Kallberg et al., 2015), together with limited numbers of in-hospital beds, increasing the potential for preventable adverse events (Berg et al., 2019; Af Ugglas et al., 2020). Adequate management, staff planning, work environments, and interprofessional teams can counteract the crowding effect. For example, interprofessional teamwork in an orthopedic ED triage area has been shown to reduce waiting times for patients (Liu et al., 2019). Changes in organizational processes and structures, therefore, seem to be important factors. Although waiting times and adverse events are important quality parameters, research on interprofessional team-based work structures and organizational processes has been limited.

Study aims

The aims of this observational study were to: (a) provide a comprehensive description of interprofessional teamwork in the ED and (b) evaluate the factors that influenced interprofessional communication during the coordination of patient care, both before and after the implementation of a department-wide multifaceted intervention. The following research questions were designed to address these aims:

- (1) To what extent did participation in interprofessional team communication change after implementation of the multifaceted intervention?
- (2) What processes did team members use to communicate clinical information to other team members, and to what extent were these processes used after the intervention?
- (3) To what extent were team members interrupted during the coordination of patient care before and after the intervention?

- (4) What were the primary sources of these interruptions, both before and after the intervention?

Methods

Study design

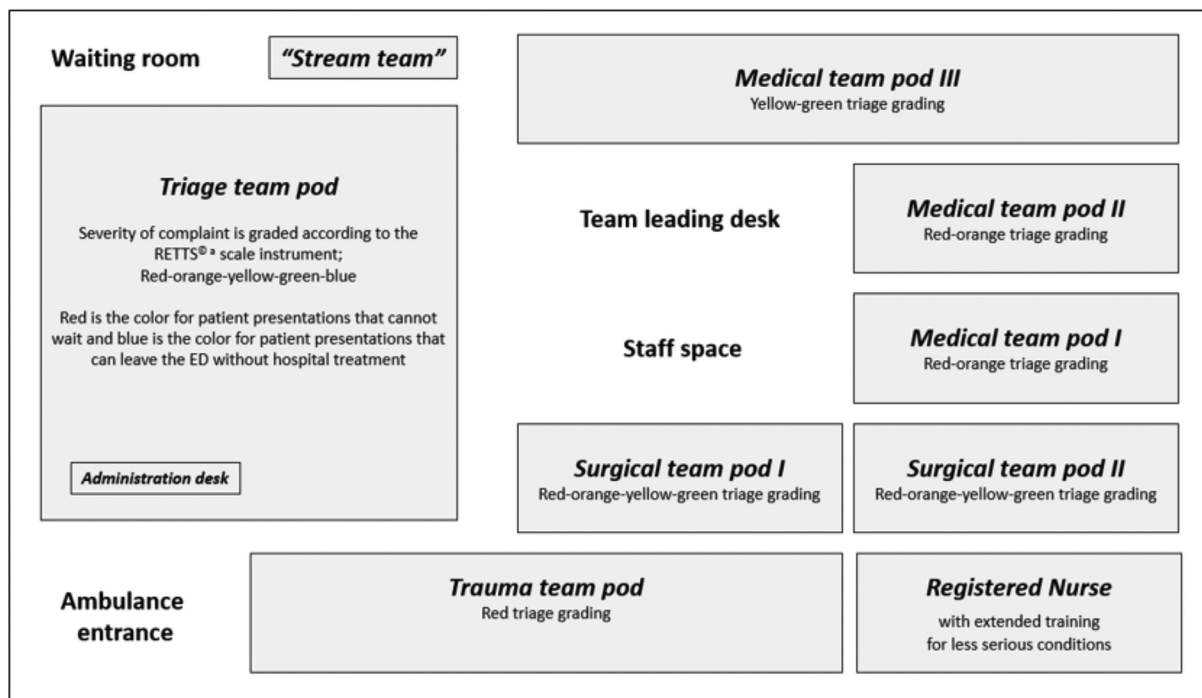
An observational study design with a broad representation of participants is especially useful for understanding the significance of the everyday behaviors, interprofessional communications, and activities of HCPs that characterize the emergency care environment (Fry et al., 2017). Structured observations and field notes were used in this naturalistic field study to describe the teamwork processes used by HCPs during patient assessment in the ED. The study involved a 4-month pre-intervention period (December 2015 to March 2016), a 34-month intervention period (April 2016 to February 2019), and a 4-month post-intervention period (March to August 2016).

Setting, sample, and clinical context

Data from structured observations were collected in an ED at a university hospital in southwest Sweden. This ED has approximately 58,000 patient presentations per year and is one of the most-visited EDs in Sweden. Besides emergency healthcare services for walk-in patients, the ED is also the trauma and casualty center for the region. In this ED, the triage team pod and the trauma team pod were located directly beside the waiting room and the ambulance entrance (Figure 1). The severity of symptoms of each presenting patient was graded in accordance with the Rapid Emergency Triage Treatment Scale (RETTTS[®]; Widgren & Jourak, 2011; Wireklint et al., 2018). After the triage assessment, each patient was either discharged home, directed to other health care providers, such as primary care, or referred to one of the team pods inside the ED setting for further assessment.

The team of HCPs in the ED comprised physicians, registered nurses, nurse assistants, and administrative staff. Among the physicians and registered nurses, there were specialty levels of education and expertise. However, nurse assistants rarely had received any specialist education beyond their formal education. In Sweden, nurse assistants carry a professional title from a degree after 2 years of upper secondary school education or similar programs. In addition, the ED provided in-service training for ED experienced registered nurses. Although this was not recognized as a formalized specialty, it nevertheless offered extended ED training given by ED instructors (registered nurses) and had been approved by the medical director of the ED. A registered nurse team leader was designated to manage the HCPs and patient flow on a daily operations basis. The team leaders were expected to promote and create a positive and open working environment, to uphold a position of authority, and to have an overview of all individuals and team stations during their shifts.

Although the physicians differed in terms of their levels of specialization and experience, we chose in this study to group the physicians as intern physicians (i.e., physician under internship for medical license) or resident physicians



^a Rapid Emergency Triage Treatment Scale (Widgren & Jourak, 2011; Wireklint et al., 2018).

Figure 1. The ED organization and process of triage post-intervention.

Note. Patients entered the ED via ambulance transport or the waiting room, where a registered nurse, nurse assistant, and a physician in the triage team assessed the patient during daytime hours on weekdays. An administration desk, at which clerical staff performed registration of all patients visiting the ED, was connected to all the teams. The medical team worked across three pods, according to the severity of the patient's symptoms. The surgical team worked across two pods, in close connection to the triage team pod, trauma team pod, and ambulance entrance, and managed all types of patient conditions regardless of severity. Patients with less-serious conditions were referred directly to either a registered nurse with extended ED training or the "Stream team" (this was later modified in terms of placing the consultant in the triage team pod; see, Figure 2).

(postgraduate training) or consultant physicians (i.e., senior physician) during the observations. Physicians were often assigned to other medical departments, and their presence in the ED was often not regular. This contrasted with the continuity offered by a physician assigned as the trauma leader and a colleague who had medical responsibility for the ED. Thus, physicians with irregular service in the ED were dependent on support from such colleagues. Most of the HCPs worked across the day, evening, night, and weekend shifts, although some nursing staff only worked the night shifts. The different observed professions, positions, and working hours remained unchanged throughout this three-phase study.

Multifaceted intervention

The intervention period included several changes to the clinical working environment in the ED with the goal of improving interprofessional teamwork (Figure 2). Briefly, earlier triage care was replaced with an intensive team-training program, with management and HCPs together, based on ethical principles and the establishment of a code-of-conduct. Structural changes were made to the ED work environment. The implementation of the multifaceted intervention, comprising team triage assessment, team training, ethical principles and code of conduct, work environment, team assessment structure, and interprofessional teamwork, was intended to improve interprofessional communication practices. These changes were implemented without any manipulation by the researchers.

Data collection

Observations of HCPs were conducted in the ED during the admission coordination stage of patient care. HCPs' teamwork was observed during daytime working hours. The observation periods lasted 4 months, from December 2015 to March 2016, and from March to June 2019. The observation data was based on an observation protocol and included free text for field notes, which provided space for documenting the observed interactions that were not covered by the predefined categories. Observers' understanding of the topic area and context was informed through conceptual and operational definitions of the measures included in a comprehensive codebook, which had been developed based on the relevant literature (Gillespie et al., 2012). Interesting concepts were interprofessional communication and interaction, and definitions of profession specific work procedures (i.e., triage procedures and assessment tools). Observers received study-specific training to ensure the quality and consistency of the data collection. Each observation session lasted between 2 and 60 minutes and took place in one of the ED team pods (Figure 1). Some observation sessions were conducted without patients present, because the team pod was in a separate location from the assessment rooms and monitoring bay area. Observer did not interact with the HCPs or patients during observations. However, to clarify the role of the observers and make them appear similar to the HCPs, they wore scrubs and a nametag together with the designation "Researcher." The researchers' personal thoughts

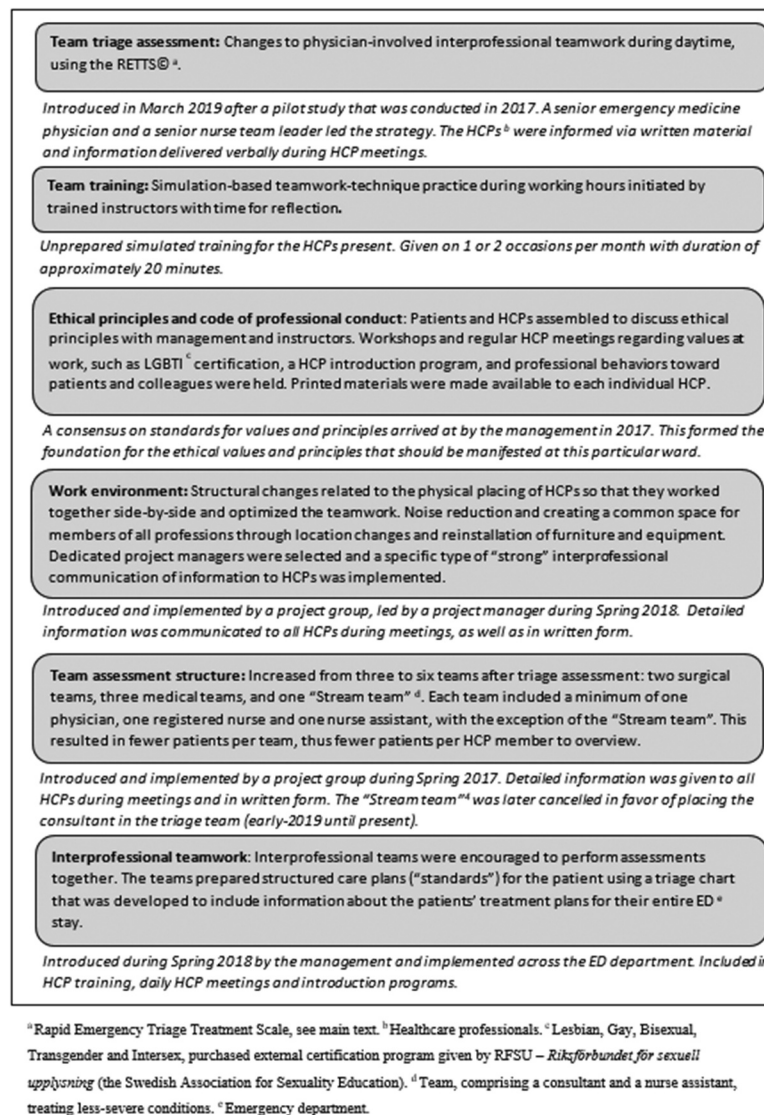


Figure 2. Department-wide strategies implemented in the ED between 2016 and 2019. Note. Targets for intervention are shown with actions implemented between the time periods.

and reflections were documented in a journal each day, to keep any preconceived biases in check (Polit & Beck, 2017). Field notes were transcribed in detail within 24 hours of observations.

Observation tool development

The observation tool, which was originally developed by one of the co-authors, Gillespie et al. (2012), was intended to describe team communication and intraoperative interruptions in the operating room through a structured protocol. This tool was based on a profound review of the literature regarding patient safety, communication, and teamwork in the OR. In other high-risk areas, such as the ED, researchers have illustrated the importance of contextual knowledge of interprofessional communication and social interactions through the application of an observational method (Fry et al., 2017). Hence, the original tool was translated and adapted to the context of a Swedish ED setting (English translation in the online Supplementary file).

Co-authors B.G, A.E.A. and L.O. are researchers with extensive knowledge of and experience in field research methods. The observation tool allowed the observer to collect categorical data using dichotomous coding (0 = no, 1 = yes) and the profession of each team member. The observation tool assessed four domains of interprofessional communication (Figure 3). For example, the use of communication tools were observed in the interprofessional team; Situation Background Action Recommendation (SBAR; Woodhall et al., 2008) that is a handover-over tool in the ED, “Speaking up” and “Closed loop” (Rall et al., 2015) that are used as common tools to raise a crucial opinion during assessment and to confirm communication.

Five consecutive pilot observations were conducted prior to each phase, both pre- and post-intervention, by the lead researcher and the observer linked to the observation phase, respectively. The intention was to pilot the observation tool and calibrate the two observers to obtain the same levels of understanding and accuracy for the tool. Thereafter, the

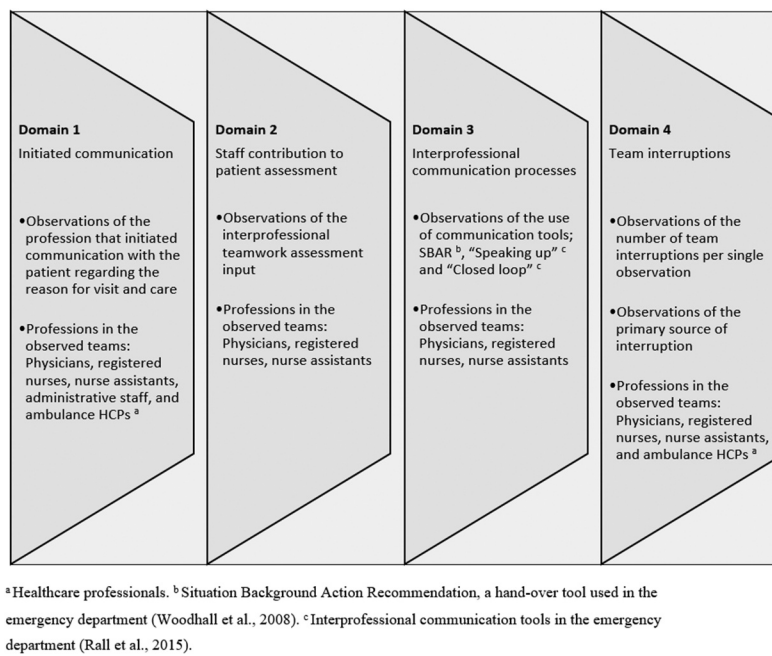


Figure 3. Domains of interprofessional communication in the observation tool used in the pre- and post-intervention periods. Note. The observation tool intended to observe the teamwork processes used by HCPs during patient assessment in the ED.

observers (one observer for each observation phase) undertook structured observations and compiled field notes throughout the study.

Ethical considerations

The present study was promulgated to all the medical, nursing and administrative professions in the ED. Verbal and written information was given before the observation sessions started. Patients were informed and gave their verbal consent to the presence of an observer. However, if the patient or any HCP expressed discomfort, the observation was terminated. The observations were ongoing and therefore, the researcher renegotiated consent for both periods of observation. In cases where patients were unable to receive information (e.g., because they were unconscious) the information was given to relatives if present, and if they assented, the observation was conducted. The study was approved by the Swedish Ethical Review Authority (Dnr. 363–15).

Data analysis

The unit of analysis was a single occasion of observation. The coding of interprofessional communication behavior variables was categorical, and the "Non-applicable" option was used when a specific variable was not relevant or the observation could not be rated (e.g., observations in the team pods where no patients were present). The analysis was performed using SPSS for Windows® ver. 25.0 software (IBM, IL IBM Corp., Armonk, NY). Descriptive statistics were used to describe the sample of participants and the elements of teamwork covered by the observation tool. The data were analyzed on the basis of their levels and distribution. Absolute (*n*) and relative (%) frequencies were used to analyze categorical data. Group

comparisons were made using Fisher's exact test for dichotomy variables and the Mantel-Haenszel test for number variables. A *p*-value of < .05 was considered statistically significant. To add context to the quantitative results, the field notes were imported into NVivo Pro ver. 12 (QSR International Pty Ltd., Melbourne, Australia) and analyzed using a deductive, directed content analysis approach, as described by Hsieh and Shannon (2005). The analysis started with the predefined codes from our quantitative findings, and codes were defined before the data analysis. The field note findings matched the codes and placed the statistical results into context, enabling a more nuanced understanding.

Results

A total of 392 observations were obtained over the pre- and post-intervention periods. The pre-intervention period comprised 192 observations, and the post-intervention period comprised 200 observations. The cumulative time of the observations over the two time periods was 153 hours, including 85 hours pre-intervention and 68 hours post-intervention.

Table 1 presents the characteristics of the HCPs observed in the two periods of the study. The observed professions in the observed teams comprised: 97.7% registered nurses, 72.2% physicians, 76.3% nurse assistants, and 34.7% administrative staff.

Table 2 presents observed interprofessional communication behaviors related to environmental factors during the coordination of patient care. Statistically significant differences were observed in Domain 1; the initiated communication with the patient for all HCPs across the groups pre-intervention (Table 2). Corresponding significant differences were noted for registered nurses and nurse assistants pre-intervention. Moreover, a significant difference across the professional groups was identified in Domain 2, which describes the observed HCPs

Table 1. Characteristics of each interprofessional teamwork in single observation ^a.

Total of single observations with teamwork characteristics <i>n</i> = 392		Pre- <i>n</i> = 192		Post- <i>n</i> = 200		Pre- <i>n</i> = 192		Post- <i>n</i> = 200		Pre- <i>n</i> = 192		Post- <i>n</i> = 200	
		Physician <i>n</i> = 283		Registered nurse <i>n</i> = 383		Nurse assistant <i>n</i> = 299		Administrative staff <i>n</i> = 136					
		<i>n</i> = 96	<i>n</i> = 187	<i>n</i> = 191	<i>n</i> = 192	<i>n</i> = 151	<i>n</i> = 148	<i>n</i> = 32	<i>n</i> = 104				
Total number of HCPs in each discipline observed, pre-intervention and post-intervention periods													
Years of professional experience (mean/SD)													
Intern/resident physician, <i>n</i> (%)													
Consultant physician, <i>n</i> (%)													
Specialization in each profession, <i>n</i> (%)													
•	Medicine	28 (29.1%)	77 (41.2%)	2 (1.0%)	0	0	0	0	0	0	0	0	0
•	Surgery	3 (3.1%)	18 (9.8%)	0	0	0	0	0	0	0	0	0	0
•	Neurology	0	2 (1.1%)	0	0	0	0	0	0	0	0	0	0
•	Anesthesia	0	0	4 (2.1%)	0	0	0	0	0	0	0	0	0
•	Obstetrics/Midwifery	0	0	1 (0.5%)	13 (6.8%)	0	0	0	0	0	0	0	0
•	Emergency care	0	63 (33.4%)	0	0	0	4 (2.7%)	0	0	0	0	0	0
•	Primary care/Home care	0	5 (2.7%)	0	0	0	0	0	0	0	0	0	0
•	Registered Nurse with extensive ED training	0	0	0	13 (6.8%)	0	0	0	0	0	0	0	0

ED, emergency department; HCP, Healthcare Professionals; Pre-, Pre-intervention (2016); Post-, Post-intervention (2019).

^aThe unit of analysis is a single observation. A total sample of observations (*n* = 392), collected pre-intervention (*n* = 192) and post-intervention (*n* = 200).

Table 2. Observed interprofessional communication behaviors related to environmental factors during the coordination of patient care for all HCPs (n = 392 single observations^a).

	Pre-intervention (n = 192)	Post-intervention (n = 200)	p-value
Domain 1. HCPs who initiated communication across the 392 single observations ^{b, d, n} (%)	162 (84.4%)	131 (65.5%)	.009
• Across groups, n (%) (without other ^e)	154 (80.2%)	123 (61.5%)	.033
• Other ^e , n (%)	8 (4.2%)	8 (4.0%)	NA
• Physician, n (%)	4 (2.1%)	12 (6.0%)	.072
• Registered nurse, n (%)	100 (52.1%)	78 (39.0%)	.011
• Nurse assistant, n (%)	50 (26.0%)	33 (16.5%)	.026
Domain 2. HCPs contribution to patient assessment over all the single observations ^b			
• Across groups, n (%)	226 (118%)	452 (226%)	< .001
• Physician, n (%)	19 (9.9%) ²	148 (74.0%) ²	< .001
• Registered nurse, n (%)	129 (67.2%) ²	186 (93.0%) ²	.023
• Nurse assistant, n (%)	78 (40.6%) ²	118 (59.0%) ²	< .001
Domain 3. Interprofessional communication processes used across the 392 observations ^b			
• SBAR ^f , n (%)	126 (65.6%)	122 (61.0%)	.734
• “Speaking up” ^f , n (%)	23 (12.0%)	26 (13.0%)	.115
• “Closed loop” ^f , n (%)	26 (13.5%)	12 (6.0%)	.291
Domain 4. Total number of team interruptions (n) and percentage of interruptions over all the single observation sessions ^b (%)	103 (53.6%)	78 (39.0%)	.004
Primary source of interruption across all observation sessions ^c , n (%)	161 (100%)	142 (100%)	
• Colleague outside team, n (%)	67 (41.6%)	45 (31.7%)	.007
• Colleague within team, n (%)	36 (22.3%)	32 (22.5%)	.506
• Total colleagues (outside + within), n (%)	103 (64.0%)	77 (54.2%)	.003
• Phone, n (%)	33 (20.5%)	20 (14.1%)	.040
• Emergency call alert, n (%)	3 (1.9%)	8 (5.6%)	.221
• Patient, n (%)	6 (3.7%)	15 (10.6%)	.072
• Patient support person (e.g., family member), n (%)	5 (3.1%)	11 (7.7%)	.202
• Hospital porter, n (%)	11 (6.8%)	11 (7.7%)	1.0

^aUnit of analysis is a single observation. ^bPercentage of total single observations pre-intervention or post-intervention. ^cPercentage frequency of observed variable. ^dNon-Applicable (patient not present). ^ePatient, patient support person or ambulance staff. ^fSituation Background Action Recommendation, a hand-over tool used in the emergency department (Woodhall et al., 2008). ^gInterprofessional communication tools in the emergency department (Rall et al., 2015).

contribution to patient assessment. In the interprofessional communication processes in Domain 3, across all observations, the interprofessional communication tool SBAR was used in both the

pre-intervention period and the post-intervention period. However, no significant changes were observed for SBAR, “Closed loop” and, “Speaking up” across all the observation sessions (Table 2). There was a statistically significant decrease in the observed number of interruptions in team assessment, with Domain 4, in the post-intervention period (Table 2). Most interruptions were made by colleagues, both outside and within the team, and there was a significant difference in the number of interruptions made by colleagues pre-intervention compared with post-intervention, as well as in the number of interruptions due to telephone calls (Table 2).

Table 3 demonstrates observed interprofessional communication behaviors related to environmental factors during coordination of patient care for each ED team. The observations of both the medical and surgical teams in Domain 2 showed increased contribution to patient assessment for the majority of HCPs, with physicians increasing their contribution to patient assessment in triage (Table 3). A “Speaking up” approach, in the observed interprofessional communication processes of Domain 3, was used more frequently by the physicians of the trauma team in the post-intervention period (Table 3). Registered nurses in the trauma team “closed the loop” in the post-intervention period, although not in the pre-intervention period (Table 3). The observations of the team assessment, Domain 4, showed that interruptions occurred more often in the medical and surgical teams than in the triage or trauma teams (Table 3).

Field notes

Interprofessional teamwork and communication during observations were described in the associated field notes. Qualitative analysis of field notes that reflected our predefined codes from the statistical analysis covered situations involving interruptions in the triage team. The following field notes exemplify three different situations involving interruptions observed in the triage team:

One registered nurse in the triage team pre-intervention was observed to be exposed to multiple interruptions whilst performing the triage assessment and lost concentration: “The registered nurse is then interrupted several times by different colleagues who ask about other patients. Finally, the nurse begs her colleague in a soft voice, ‘Wait,’ while the nurse is trying to read/concentrate on RETTS.”

A nurse assistant within the triage team post-intervention was observed when she interrupted the registered nurse during patient assessment and the interruption had a clear purpose:

The nurse is interviewing the patient about earlier health issues and asks standard questions from the medical record [...] The nurse pauses between each question and listens to each answer before asking the next question, all the while watching the patient. The nurse assistant interrupts the conversation and hands a patient identity-slip to the nurse. The nurse then turns to the nurse assistant and says, “It’s an acute abdomen”.

A physician who assessed a patient in the triage team post-intervention, in collaboration with a registered nurse, was observed when a telephone call interrupted the work and changed the team composition and flow of the team assessment.

Table 3. Observed interprofessional communication behaviors related to environmental factors during coordination of patient care for each ED team^a.

Area within ED	Medical team (n = 83) Pre-intervention, n = 43; Post-intervention, n = 40				Surgical team (n = 49) Pre-intervention, n = 19; Post-intervention, n = 30				Trauma team (n = 19) Pre-intervention, n = 10; Post-intervention, n = 9			
	Pre- n (%)	Post- n (%)	Pre- n (%)	Post- n (%)	Pre- n (%)	Post- n (%)	Pre- n (%)	Post- n (%)	Pre- n (%)	Post- n (%)	Pre- n (%)	Post- n (%)
Profession	Physician	RN	Admin ^a	NA	Physician	RN	NA	Physician	RN	NA	Admin ^a	Ambulance
Domain 1. HCPs who initiated the communication ^{b, d} , n (%)	7 (5.8%)	74 (61.7)	0	4 (3.3)	1 (2.3)	14 (32.6)	0	1 (4.7)	0	0	0	0 (0.0)
Domain 2. HCPs contribution to patient assessment ^{b, d} , n (%)	10 (8.3)	71 (99.2)	0	0 (40.5)	0 (97.5)	39 (32.6)	0 (97.5)	0 (95.0)	29 (96.7)	0 (93.3)	9 (100.0)	8 (88.9)
Domain 3. Interprofessional communication processes ^b , n (%)	6 (5.0)	95 (79.2)	0	0	0	9 (20.9)	17 (42.5)	0	5 (16.7)	8 (42.1)	9 (90.0)	3 (33.3)
SBAR ^e , n (%)	1 (0.8)	3 (2.5)	5 (4.1)	4 (3.3)	0	6 (14.0)	2 (5.0)	0	2 (6.3)	1 (5.3)	1 (3.3)	4 (40.0)
*Speaking up ^f , n (%)	1 (1.7)	3 (2.5)	3 (2.5)	3 (2.5)	0	3 (7.0)	0	0	0	0	0	0
*Closed loop ^f , n (%)	3 (2.5)	3 (2.5)	9 (7.5)	3 (2.5)	0	0	0	0	0	0	2 (44.4)	1 (10.0)
n (%)	42 (35.0)	76 (63.0)	21 (17.4)	36 (90.0)	39 (90.7)	16 (84.2)	18 (60.0)	6 (60.0)	3 (33.3)	3 (33.3)	3 (33.3)	3 (33.3)
Domain 4. Number of interrupted teams across all single observations ^b , n (%)	43	43	24	67	76	36	49	6	6	3	3	3
Interruption across all single observations ^c , n (%)	36 (83.7)	36 (83.7)	16 (66.7)	20 (29.9)	22 (28.9)	3 (8.3)	9 (18.4)	6 (100.0)	1 (100.0)	1 (33.3)	1 (33.3)	1 (33.3)
Colleague outside team, n (%)	0	0	0	0	26 (34.2)	10 (27.8)	12 (24.5)	0	0	0	0	0
Colleague within team, n (%)	5	5	4	10	17	11	6	0	0	0	0	0
Phone call, n (%)	1 (11.6)	1 (11.6)	1 (6.7)	1 (14.9)	1 (22.4)	1 (30.5)	1 (12.2)	0	0	0	0	0
Emergency alert, n (%)	1	1	3	0	1	1	4	0	0	0	1	1
Patient, n (%)	0 (2.3)	0 (2.3)	1 (12.5)	7 (10.4)	3 (1.3)	3 (8.3)	7 (8.2)	0	0	0	0	0
Patient support (e.g., family member), n (%)	0	0	0	3	1	4	7	0	0	0	0	0
Hospital porter, n (%)	1 (2.3)	1 (2.3)	0	7 (10.4)	6 (7.9)	4 (11.1)	4 (4.5)	0	0	0	0	0

ED, emergency department; RN, registered nurse; NA, nurse assistant; Admin, administrative staff; Pre-, Post-, Pre-intervention (2016); Post-, Post-intervention (2019).
^aUnit of analysis is a single observation. ^bPercentage of total observations pre-intervention or post-intervention. ^cPercentage frequency of observed variable. ^dNon-Applicable (patient not present). ^eSituation Background Action Recommendation, a hand-over tool used in the ED (Woodhall et al., 2008). ^fInterprofessional communication tools in the ED (Hall et al., 2015). ^gAdministrative staff observed only in triage and trauma teams.

The physician looks at the nurse and says, “Medical team pod 3, electrolyte disturbance. Register as neuro lapse.” The physician is interrupted by a phone call, answers the telephone and replies “I’ll be there as soon as possible.” The physician explains to the patient that the condition must be thoroughly further examined. The nurse asks the physician, “It sounds like you need to run?” The physician replies, “Yes, I believe so . . .”

Overall, there were fewer instances of one or more interruptions post-intervention, and most of the interruptions occurred in the medical team across both the pre-intervention and post-intervention periods (Figure 4). Fewer occasions with interruptions were observed in the triage team post-intervention, including those with not more than two interruptions per occasion (Figure 4).

Discussion

We evaluated changes in interprofessional teamwork communication practices before and after the implementation of department-wide multifaceted interventions. Four domains of interprofessional communication practices were observed, of which the most important finding was a significant reduction in workflow interruptions, whereas the changes in the other domains were less-pronounced (i.e., initiation of communication, participation in interprofessional communication, and type of interprofessional communication process). Previous research suggests that interruptions break workflow patterns and potentially contribute to unsafe patient care through increased interprofessional miscommunication (Gillespie et al., 2012); this phenomenon is more frequently observed in the ED than in other healthcare contexts (Walter et al., 2014). Delayed clinician responses, increased risks of error, and high cognitive loads are known consequences of interruptions (Grundgeiger & Sanderson, 2009). Interruptions are

inevitable given the need to expedite the transfer of patient information from one clinician to another. In the ED of the present study, clinicians interrupted colleagues due to working conditions (i.e., work organization practices that demanded interruptions necessary to improve patient care; Berg et al., 2016). These included parallel interruptions classified as crucial for patient safety (i.e., “Speaking up”; Rall et al., 2015; Rowland, 2017), notifying colleagues of potentially vital information about the patient. A significant difference in the number of interruptions from HCP colleagues was found, post-intervention. This may be linked to the changes implemented in the working environment, as well as team training and the presence of more teams. Similar research on ED HCPs has shown a high level of representation of “face-to-face” physicians and nurses as the primary sources of interruption due to organizationally induced factors (Blocker et al., 2017). In line with earlier research, our findings imply that an organizational change has an impact on interprofessional teamwork, particularly on communication.

There was no significant difference in the frequency of use of the communicative process of “Speaking up” between the two time periods. Similarly, there was a low general level of use of interprofessional communication tools, SBAR and “Closed loops.” These findings are discrepant with studies in the literature that argue for the importance of “Speaking up for safety” (Rowland, 2017) and recommendations regarding the handing over of patient information using standardized and structured ways to enhance patient safety (Haig et al., 2006; Leonard et al., 2004; Rall et al., 2015). This “routine communication process” for addressing important information about a patient is, however, particularly challenging when considering the complexity of interprofessional communication demands and the working environment of the ED (Eisenberg et al., 2005). Most hand-overs of patient information occur during coordination of

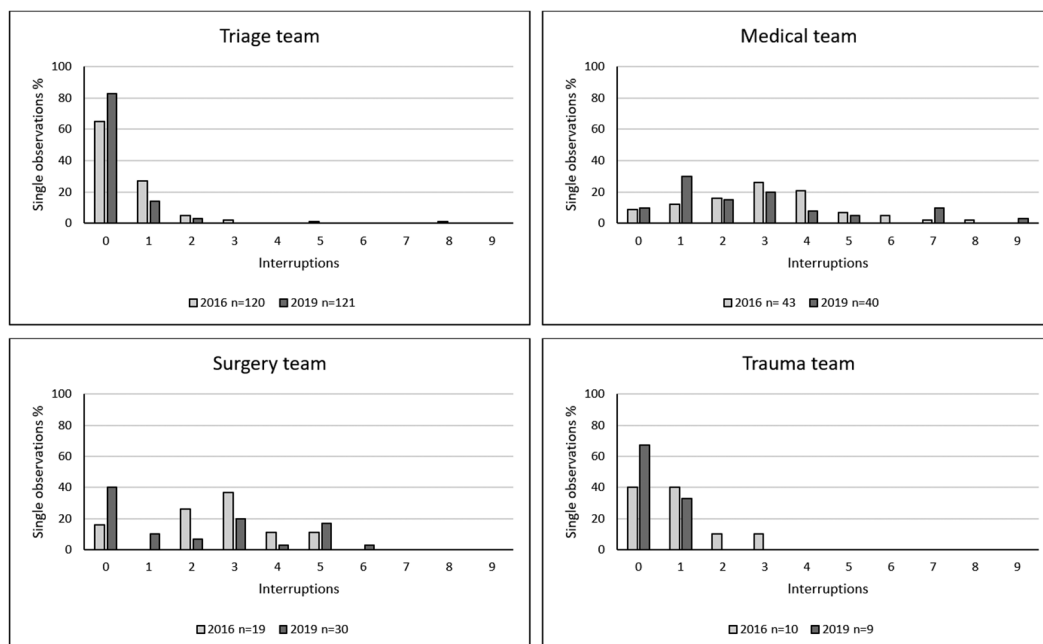


Figure 4. Number of interruptions per single observation (%), pre- and post-intervention.

Note. Interruptions were observed 0–9 times per single observation in the team pods. Statistical evaluation showed lower mean numbers of interruptions per observation post-intervention (2019) than pre-intervention (2016), in the triage team (0.5 vs 0.2; $p = .003$). The same evaluation showed no statistical differences between the pre-intervention and post-intervention values for the medical team (2.6 vs 2.7; $p = .438$), surgery team (2.6 vs 1.8; $p = .286$) or trauma team (0.9 vs 0.33; $p = .138$).

patient care between HCPs, typically within the same category of profession. Feeling safe, identifying with the same category, and having a better understanding of what colleagues need to know are factors that facilitate these pathways of interprofessional communication. Nevertheless, handovers within interprofessional teams are required due to the beneficial team purpose and approach to the patient (Eisenberg et al., 2005; Gibson et al., 2010).

The culture, physical environment, and the emerging clinical needs of patients influence and diminish team members' abilities to use standardized tools and behaviors (Person et al., 2013). Recent research has identified work experience, trust, and interpersonal relationships as decisive factors in determining the responsiveness of communication between physicians and nurses (Manojlovich et al., 2021).

In addition to the observed domains of interprofessional communication, physical situational awareness and body language are advantageous when handing over a patient, in that they emphasize urgency in the ED setting in a way that goes beyond verbal expression (Apker et al., 2010). Although this is important, we did not study such nuances. The present study adds to the understanding of such implemented interventions only in regards to the team training and ethical principles.

Organizational change is underpinned by processes of adaptation for HCPs in implementing new routines (Reeves et al., 2010) and the impact of organizational structures has been found to be particularly profound (Wiig & Lindøe, 2009). It has been argued that all professions on the team need to be involved in the process, emphasizing the importance of team cohesion rather than working in silos as individuals to provide optimal care (Kossaiy et al., 2017). In the present study, such reasoning could be applied to the implemented team triage assessment intervention, which showed a significant increase in the number of HCPs who initiated communication post-intervention. The significant difference in the contributions of HCPs to care coordination highlights the importance of the physician-involved team triage assessment. Burstrom et al. (2012) showed that interprofessional, physician-led team triage results in a shorter and more time-efficient ED stay for the patient, reduced mortality rates, and fewer unscheduled returns. The importance of these factors also highlights other issues of quality involving effective cost reduction, minimizing time consumption for the patient, and improved delivery of service.

Interprofessional communication strategies differed considerably among the team members, both between professional categories and team allocations. This adds complexity to daily clinical practice and care coordination, which has been explained as a different understanding of patient safety by Rowland and Kitto (2014). When implementing organizational changes, it is important to emphasize managers' responsibility in considering different discourses regarding patient safety and how they are interpreted in relation to the local context and efforts to create safer healthcare (Rowland & Kitto, 2014). Managers' responsibility can be linked to the multifaceted intervention implemented. For instance, a better understanding of interprofessional teamwork (Manojlovich et al., 2021; Rydenfält et al., 2019), team training in communicative responsiveness, and ethical principles in relation to establishing

a code-of-conduct (Manojlovich et al., 2021) are beneficial for HCPs when implementing strategies to improve interprofessional communication and interprofessional teamwork.

Limitations and strengths

All observations were conducted during two different periods by two different observers, so there may have been differences in observer interpretations. Although inter-observer reliability was not measured, both observers were instructed by the same person to establish an understanding of the structured observation protocol. Both observers were familiar with the context and may, therefore, be deemed to have been sufficiently prepared to carry out the observations (Thomson, 2011).

The observational nature of this study means that participants could have changed their behaviors because they were aware that they were being observed, giving rise to the Hawthorne effect (Choi et al., 2019; Payne & Payne, 2011). However prolonged engagement of the observer in the field over time lessened the extent to which HCPs were aware of the observer's presence. Moreover, participants were unaware as to what exactly was being observed. Importantly, the observers reflected on the observed professions and on how they may have had an impact on the participants' interactions with each other and with the researcher.

Due to the observational nature of the study, the results cannot be linked directly to any single cause resulting from the implementation of the intervention. The intervention was multifaceted and occurred in stages over a period of 34 months. Moreover, the study was conducted at a single-site hospital and the results may not be generalizable to other locations. Assessing patient outcomes from interprofessional teamwork would be important for future research.

Conclusion

In this naturalistic field study, we evaluated whether the implementation of specific interventions in the ED influenced interprofessional teamwork. The results are promising. Our findings suggest that organizational changes affect specific domains of teamwork, both for the interprofessional team and for the individual HCP. In general, HCPs' contributions to patient assessment increased, as did the interprofessional communication processes. Interruptions to the teams significantly decreased in the post-intervention period. Although no conclusion can be drawn as to specific causality, the results indicate that multifaceted organizational interventions positively affect interprofessional team communication and workflow in the ED, and the patient safety and quality of care may be influenced.

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Notes on contributors

Jenny Milton, RN, MSc with a major in caring science and a postgraduate diploma in specialist nursing - intensive care. Jenny is in her last year of her PhD education at the Institute of Health and Care Sciences at the Sahlgrenska Academy, University of Gothenburg. Jenny is also a lecturer at the Sahlgrenska Academy, focusing on interprofessional teamwork in the emergency care. Jenny is part of the research group Acute and Critical Care Team, (ACCT), at the Institute of Health and Caring Sciences, the Sahlgrenska Academy, University of Gothenburg, and part of the Gothenburg Emergency Medicine Research Group, (GEMREG), at Sahlgrenska University Hospital, Sweden.

Brigid Gillespie is an appointed Professor of Patient Safety in Nursing at the Gold Coast University Hospital and Griffith School of Nursing and Midwifery, Gold Coast campus. Professor Gillespie has expertise in quantitative and qualitative methodologies, clinical trials, systematic reviews, and knowledge translation. She is focusing on the following areas of patient safety; surgical wounds/dressings, pressure injury prevention, and non-technical skills in surgery.

David Åberg (MD, PhD) is an Associate professor, senior Consultant and senior lecturer in Internal Medicine at the stroke unit and the Department of Acute Medicine at the Sahlgrenska University Hospital, Gothenburg, Sweden. After a preclinical Phd in neurobiology (2001), David pursued research in experimental neuroendocrine neurobiology in parallel to cardiovascular epidemiology, focused on life-style factors in large registry studies and in patient studies of stroke. Especially David is focusing on serum biomarkers in relation to recovery, physical activity and cardiovascular risk. David has one part-time post-doc and three doctoral students whereas one doctoral student completed a thesis (2017).

Annette Erichsen Andersson, Associate professor, RN and certified perioperative nurse. Her research has been directed towards different perspectives on Patient Safety, predominantly around infection prevention, teamwork, orthopedic surgery and the science of knowledge translation. For more information visit the home page of The Safe Hands Study Group; <https://www.gu.se/en/research/the-safe-hands-study-group-patient-safety-and-infection-prevention-in-surgery>

Lena Oxelmark is Associate Professor in caring science, senior lecturer and RN. Lena's main research areas are interprofessional learning, simulation-based learning, interprofessional teamwork in emergency care, patients' and nurses' participation in patient safety work. Previous research areas comprise quality of life in patients with inflammatory bowel diseases (IBD), the use of complementary and alternative medicine treatment in IBD patients, and assessment in work-based education. Lena is part of the research group Acute and Critical Care Team, (ACCT), at the Institute of Health and Caring Sciences, the Sahlgrenska Academy, University of Gothenburg, and part of the Gothenburg Emergency Medicine Research Group, (GEMREG), at Sahlgrenska University Hospital, Sweden. Lena has supervised three doctoral students to completion of their thesis, and is currently supervising two PhD students.

ORCID

Jenny Milton  <http://orcid.org/0000-0003-1152-2392>
 Brigid M. Gillespie  <http://orcid.org/0000-0003-3186-5691>
 David Åberg  <http://orcid.org/0000-0002-1474-5666>

Annette Erichsen Andersson  <http://orcid.org/0000-0002-4785-8544>
 Lena Oxelmark  <http://orcid.org/0000-0001-8397-7252>

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