



Evaluation of emergency department performance improvement-A systematic review on influence factors

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ABSTRACT

The emergency department as entrance of hospital and in close relationship with other sections of the emergency service providers provides the wide range of services from the stage of acceptance and initial assessment to telling what to do and release of patients and damaged. In recent years, improving the performance of hospitals' emergency department has been included as an important goal in health policy-making of different countries. Since the emergency department has a complex structure and several factors affect its performance, identifying these effective factors is very important for improving the performance of the emergency department. The aim of this research was to determine the factors affecting the improvement of the performance of the hospitals' emergency department in the world. Using MESH and free text, we sought and retrieved the relevant articles from the most appropriate medical databases (the Cochrane Library, PubMed and Scopus) through three separate search strategies up to July 2015. The inclusion criteria were as follows: 1) Studies with specific influence factors; 2) Articles written in English; 3) Those articles conducted in compliance with emergency department performance improvement. Data were analyzed qualitatively using a thematic synthesis technique. After screening the retrieved papers via PRISMA framework, from the 1473 papers, 25 studies were included in the final phase. Criteria for selecting performance improvement (in pre assessment and in the assessment phase) were categorized into five main themes: Communication, Team work, Clinical path way, Patient flow, and Other factors. "mutual respect" had the maximum frequency in communication (4 studies); "group behavior" and "collaboration" had the maximum frequency in team work (7 studies); "time" had the maximum frequency in clinical path way (3 studies); "services" had the maximum frequency in patient flow (5 studies); and "patient safety" had the maximum frequency in other factors (10 studies). The results showed that emergency department is unique in terms of workload and need to be careful of environment and identifying the factors affecting the performance of the emergency department at the increase of the efficiency of hospital is of particular importance. Also redesigning the processes of improving the performance an have an important role in increasing the quality of providing services to the hospitalized patients in the emergency department.

Keywords: Performance Improvement, Emergency Department, Influence Factors, Hospital

INTRODUCTION

Protection of health and treatment of diseases are the valuable goal that achieving to them requires the use of knowledge and experience. Hospitals as the national great capitals have made room for many resources, equipment and staff each of which in turn are the source of numerous services for society [1]. The emergency department is an important component

of hospital, because the patients who refer to this department are in critical condition in terms of physical and mental status and looking after their condition as soon as possible and with the highest quality is the responsibility of medical staff of this department. This department should be organized structurally in a correct manner and the process of service provision be paid great attention so that it has a good performance in providing the desired services to needy patients [2]. The most comprehensive and most vital hospital emergency services are offered in the emergency department. This department as the hospital entrance and in close relationship with other providing sections of the emergency services provides the wide range of services from the stage of acceptance and initial assessment to telling what to do and release of patients and damaged [3].

Quality of services provided in emergency departments has a special important. This is why the special characteristics of emergency department such as variety and number of visits and the large workload, expectations of patients in receiving faster services, the diversity of patients' difficulties and the complexity of all the emergency services can affect the performance of this department [4]. Today the hospitals are faced with many challenges such as rising costs, loss of efficiency of staff and limitation of facilities. The imbalance between resources and increase of demand leads to the overcrowding of patients in the hospitals. In the emergency department, the patients should be treated fast, convenient and with quality. This phenomenon is a common problem in the different sections of hospital including the emergency department [5].

In the emergency department the seconds and minutes are very important for the patient and this times may be decisive for the death and serious disability or useful life. Increase of wait times and providing health care in the emergency department lead to decrease of quality of care and increase of the adverse outcomes in patients who have threatening conditions for life [6]. Emergency department performance can have a great impact on the performance of other sections of the hospital. The speed of provision of services in the emergency department can be of special importance for reducing mortality and disability [7].

In recent years, improving the performance of hospitals' emergency department has been determined as an important goal in health policy-making of different countries. This goal is seriously executed by the staff and management of the emergency department. Since the emergency department has a complex structure and several factors affect its performance, the identification of these influencing factors is of very importance for improving emergency department performance [8].

Improving the performance of emergency department can have a significant role in early diagnosis and treatment of emergency patients. Lack of attention to improvement in performance of the emergency department can have the irreparable damages in the field of performance of emergency team, communication systems, methods of treatment, clinical pathway and patient flow processes and causes to increase the treatment costs, discontent and patient damage [9]. The main goal of this research was to identify the factors affecting the performance improvement of the emergency department of hospitals through a systematic review.

MATERIALS AND METHODS

In the beginning, for finding the articles related with three advanced strategies of search by using the MESH and Free Text, the most important medical databases relevant to the research including Scopus, PubMed, Chochrane electronic library up to July 2015 were searched (Appendix 1).

The used keywords were:

- Performance improvement
- Emergency department [accident and emergency department; emergency room].

After the search, 1473 articles from Scopus, 73 articles from PubMed and 89 articles from Chochrane were obtained. For finding other related studies that may not be found in search of main bases, the google researcher was also used; two other related studies were obtained. Also in order to find Theses related to improving the performance of the emergency department, the Proquest base was searched; there was not found any related Thesis.

Inclusion criteria

Articles that fulfilled the following criteria were included in the review:

- Full-text English language research papers.

- The main purpose was to discuss, analyze, or promote performance improvement that best reflect ED performance.
- Research related to communication and/or teamwork and/or clinical path way and/or patient flow based directly in the emergency department.
- Publication in peer-reviewed journals.
- Research involving patients or any profession in the emergency department.
- Related to adult emergency services, and paediatric.
- The articles reports macro-level performance improvement, thus reflecting an overall departmental performance level.

All studies that did not meet the above criteria were excluded.

Selection

Selection of articles was performed independently by two of the authors (SAM and AAN) by reviewing titles and abstracts. If any doubts arose, the entire article was assessed. Afterwards, a decision about possible inclusion was made on the basis of a discussion between the two authors (SAM and AAN).

RESULTS

The repeated and irrelevant articles were eliminated and 241 ones were remained. Based on the inclusion criteria set out by the researcher, the complete text of obtained articles from the previous stage were investigated and 60 articles were selected after conforming with these criteria. Finally, after conforming articles again with determined criteria, 25 articles were received to final phase. Elimination reasons: lack of conformity with the framework of the factors affecting the improvement of the performance of emergency department (181 articles), lack of abstract or complete text (22 articles), lack of clear and compiled qualitative and quantitative criteria (9 articles) and the presented articles in conference (4 articles). 216 articles in total were eliminated (Fig 1).

A comparison of the included articles is presented in Table 1. No literature older than thirteen years that reviews overall ED performance improvement was identified. Most of articles were of America. With regards to the chosen approach, most of the articles apply a survey based approach. Influence factors of ED performance improvement (in pre-assessment and the assessment phase) were analyzed and synthesized into five main themes as follows: Communication, Team work, Clinical path way, patient flow, and Other factors (Table 2, Appendix 2).

A)Communication

Job Design

In order to improve performance of hospital emergency department, the job design is one of the most important effective factors in US. The emergency department staff should evaluate continuously the department environment in terms of the existence of important information and have a sufficient knowledge from the department physical environment for carrying out daily activities. Partnership in doing department affaires, variety of work, identification of staff duties and the importance of their job duties are the important components of job design in the emergency department [10]. Existence of a strong incentive for communicating and doing works with together is very important. The information that is exchanged among emergency department staff should be complete, concise and transparent so that it increases the employees' performance level [11]. For improving the results of care and treatment of the patients, the communication between physicians and nurses has to be of necessary transparency and take place in the appropriate time frame and in the proper position [12].

Skills

Qualitative evidence confirms the effects of teaching the communication skills to hospital staff and its effects on improvement of the safety and the patients' clinical care. The inability to properly communicate can lead to irreversible events for patients. While communicating with patients, in addition to communication skills the emergency department staff including doctors and nurses should have the enough time to ask questions from the patients. Low opportunity for feedback or low opportunity for learning others' experiences can affect the communication [13]. To appropriately communicate with the patients, the emergency department staff should have the sufficient knowledge from their responsibilities and tasks and during communicating with patients, the patients are given enough time in order to express their questions. Also by receiving the information related to patients from their colleagues, the emergency department staff should have the utmost precision [14].

Barriers

In order to determine the factors affecting the performance of the emergency department, the communication barriers are considered as one of the most important effective factors in Britain. Lack of proper coordination, the existence of different communication styles, absent-mindedness, exhaustion and miss interpretation of symptoms and signs of communication are the most important barriers to appropriate communication among emergency department staff [15]. Also lack of careful evaluation before treatment, inadequate support of department head, inability to create a powerful working group, weak cooperation between staff and failure to provide continuing and focused education are the most important communication barriers in the emergency department. Lack of proper communication between doctor and nurse is the potential obstacle against efficiency of the emergency department [16].

Mutual respect

The emergency department staff should always take in consideration the respect for colleagues and pay attention to the importance of their role in the department. If one of the emergency department employees assist his colleague during the providing care for patients, he or she should be appreciated in an appropriate opportunity [17].

B) Team work

Group behavior

To improve the performance of emergency department, the proper group behavior among the staff is one of the most effective factors in the US that require a lot of attention [18]. The head of the emergency department must ensure that the substantial group activities such as holding sessions and exchange of information regularly among the emergency staff are held and there is a continuous effort to maintain the group behavior among the staff. Among the emergency department staff it should be the strong belief that the collective ability of the group members causes to increase their success in doing the treatment measures [19].

Collaboration

In South Korea the necessary coordination and cooperation among the emergency department staff is from the factors affecting the care of patient. Tendency to get help and helping colleagues in time of need is from the factors affecting team work [20]. The benefits of collaboration and team work include the four wide ranges of clinical benefits, operational ones, the medical team and patient. With cooperation and team work we can use resources properly and increase productivity; the emergency department staff acquire constantly the great experience in the field of patient care and consequently increase the group performance and the efficiency of department [19].

Planning

Emergency department doctors and nurses must collaboratively plan the emergency department affairs. The lack of participation of doctor and nurse in the patient care planning causes to reduce the quality of medical care and harm to patient [10].

Decision making

Participation of emergency department employees in the department decision-makings is essential and the doctor or nurse of department are in charge for decisions made for the patient. In decision- makings the concerns of doctors and nurses about patients' care needs should be considered. Participation of emergency department employees in decision-making of financial issues of department is necessary [21].

Resources management

To improve the performance of the emergency department, the sufficient number of employees is essential for doing the teamwork and dividing and allocating tasks of department should be done carefully and thoughtfully. The employees' duties and responsibilities should be determined and in the same time not strict. Otherwise the difference among employees can affect the performance of the department and cause to decrease the effectiveness of therapeutic measures [22].

Monitoring

Monitoring the performance is one of the most important factors affecting the improvement of the performance of the emergency department in England. Considering the role of each of their colleagues, emergency department employees should try to have group interaction and the head of department should be consider the supervision of the department members' performance. Emergency department employees should have the correct understanding of the role of other sections employees. The department physical environment and adaptation of employees with this environment are important and promote the evaluation of effectiveness of teamwork and monitoring of employees' performance [12].

Leadership

Group leadership is considered as one of the main factors affecting the improvement of the emergency department performance in Sweden. The head of emergency department should devote a time to consultation and conversation with staff in the field of implementation of the plans of patient care and in the case of event of an accident in emergency department, allocated a time to the discussion in relation to it. Also the leadership style of head of the emergency department can have the greatest impact when it is well-proportioned with the behavior of group members [23]. The emergency department staff should have the clear and common goals, their duties be clear and specified and in the same time not be hard and difficult and if necessary, the goals and plans of department revised by them. Emergency department staff should believe that the head of department is their superior and has a crucial role in planning and performance of department and emergency department staff should follow his orders [12].

Mutual trust

Confidence among emergency department staff is considered as a worthy goal and the individual and group appropriate feedback can help to strengthen mutual trust among the staff. Employees' trust in each other is one of the most important factors in achieving organizational goals [22].

In-service training

Emergency department staff should be satisfied from the quality and quantity of in-service teaching [10]. To promote teamwork in teaching staff, there are three main strategies. The first strategy is the selection of specific individuals for doing the teamwork. This strategy requires a precise measurement of individuals' qualification for doing the teamwork and it must be created an appropriate balance between the deontology and team-orientation. The next strategy is adjustment of workflow tasks and structure of the group; in the other words, the environment condition in which the group is acting, should be investigated and designed according to the new conditions. Finally, based on the merits of individuals of the group it can be begun in-service training for them [12].

Mutual support

When the amount of work in the emergency department is very high and the number of visitors is more than usual, the emergency department staff should assist each other in performing the treatment measures up to not cause harm to the patient. Creating appropriate feedback among staff is a way to promote positive interactions and create the fundamental changes in the future. In high-risk situations, the emergency department staff should act intelligently and give each other the necessary warnings [10].

C) Clinical path way**Time**

In the field of improving performance in emergency department the time of patient's residing in the emergency department is one of the most important factors in Australia. Time interval between patient arrival to the emergency department and his acceptance should be reduced as possible. Decreasing the interval between patient arrival to the emergency department and being visited by doctor and, if necessary, transferring him to hospital bed is effective in improving performance of the emergency department. The process of acceptance, transfer to department or release of patient referring to the emergency department must be carried out within at most 4 hours after referring to the emergency department [24].

Process

Doing triage, deciding about the location of hospitalization of patient and his initial treatment constitute together the process of treatment and patient path in the emergency department; this is from the effective factors in improving the performance of the emergency department [19]. Clinical path can be considered as a safe and effective management tool in order to reduce the time of residing in the emergency department and reduce the number of acceptance of patients for accepting in the emergency department [24].

Training

Teaching staff is one of the most important factors affecting performance improvement of the emergency department in Canada. Teaching proper the clinical path to emergency department staff reduces the time of residing in the emergency department, waiting time and even mortality of the patients. Holding the educational workshops, designing web and e-teaching the topics related to different models of clinical path are useful for the emergency department staff. Holding at

least two teleconferences per month and using visual tools such as posters could be influential in the education of clinical path [25].

Efficiency

Easy access to patients in the emergency department, the implementation of strategies concerning reduction of the waiting time and transferring the patients, if possible, to other sections of the hospital cause to increase the efficiency of the emergency department. For facilitate the adoption and allocation of the resources and prioritization of other hospitals in the field of clinical path process, constituting a committee in hospital causes to increase the efficiency. Those individuals involved in the clinical path namely the doctor, nurse and student-nurse can be effective in promoting the work of the emergency department [24].

D) Patient flow

Goals

In order to improve the performance of emergency department, the patient flow purposes are considered as an effective factor in Canada. Putting the performance improvement programs on the list of priorities in the emergency department, putting a general practitioner at the center of clinical priorities of hospital and the amount of interest of emergency department staff to the patient flow process are the factors affecting the performance of emergency department [11].

Awareness

Timely information of emergency department staff about the projects for the hospital development and done planning is a factor for the success of process of the patient flow and increase of productivity of the emergency department [25].

Intercommunity

The partnership between doctors and nurses in management of the emergency department beds causes to improve the patient flow process and increase the efficiency and productivity of the emergency department. Conflict between the motive of doctor and the goals of patient flow process was an effective factor in reduction of the department performance and physicians' delay in carrying out his duties and lack of his partnership with nurse in the treatment intervention cause to reduce the efficiency of emergency department [11].

Services

Improving the skills of service provision to patient is an influencing factor in the improvement of patient flow in the emergency department of the United States [9]. The number of emergency department nurses in the different shifts should be enough and doctors in the situations that the department is busy, if possible, release as soon as the patient or transfer to other sections [26]. Choosing an individual as supervisor in the emergency department is necessary for managing the patient flow process and improving services and the prevention of errors. [8].

Nurse tasks

In the field of improving performance of the emergency department, nursing duties are the most important effective factors in Switzerland. Creating fundamental changes in the initial assessment and nursing interventions, writing radiography request by nurses for emergency patients play an important role in improving the performance of the emergency department [27]. The nursing reports should be written by a complete and standardized way and the timely presence of nurse on patient bedside is effective in improving performance [8].

Facilities and equipment

Existence of facilities and appropriate and advanced equipment in the emergency department is the most important effective factor in improving the performance of the emergency department in China. In the emergency department must exist a suitable space for rest of staff. For short stay of the patients must be designed a local, so that the patients who don't require the long-term hospitalization, are hospitalized in this place and released after treatment [26]. The existence of appropriate diagnostic and therapeutic equipment such as radiographic apparatus and CT scan in the emergency department can accelerate the process of diagnosis and treatment of patients [27].

Lean Management

The presence of a supervisor in the emergency department is necessary for coordinating the entry and exit and movement of patients and creating the fundamental changes in the acceptance process and release of patients in the emergency department [26]. The staff of acceptance should be present round-the-clock to provide insurance services to patients, and it should be issued insurance license before patient's acceptance to not cause delay in patient treatment [8].

Triage

In the field of improving performance of the emergency department, performing more accurately the triage is one of the most important effective factors in New Zealand. Strict observance of triage process causes to improve the performance of the emergency department and any nonchalance in the strict implementation of triage causes an irreparable damage to the patient. Although the long time has not passed from performing triage in hospitals in the world, but still the fundamental changes in triage of patients of the emergency department throughout the world seem to be necessary [11].

E] Status of Other Factors Related to Performance Improvement in Included Studies***Waiting time***

Patient's waiting time in the emergency department is one of the most important effective factors for improving the performance of hospitals across Canada. The waiting time in the emergency department should be considered as an important factor by the hospital officials, because it is an indicator of hospital performance in terms of access, capacity and productivity. Increase in the patient's waiting time in the emergency department have an impact on the cost of treatment and with designing the necessary strategies we can reduce the patient waiting time in the emergency department [28].

Patient satisfaction

In the field of improving performance in emergency department, the patient satisfaction is one of the most important effective factors in the US. The trust and confidence of patient to doctor and nurse, the time interval between patient arrival to the emergency department to acceptance, transfer of patients to other sections as soon as possible and mutual respect of emergency department staff are of impact on patient satisfaction [29].

Patient safety

Patient safety in the emergency department is one of high priorities of health and treatment organizations. Increase of knowledge and skills of emergency department employees causes to increase the patient safety. If there is not a program for execution in the safety emergency department, the emergency department employees should inform the head so that it is replaced by another program [10]. Teaching the basic concepts of patient safety and holding discussion sessions in the field of patient safety for emergency department employees are necessary. Encouraging emergency department staff to actively participate in improving patient safety programs, providing performance criteria related to patient safety, promoting voluntary reporting system of errors and implementing necessary strategies for the prevention of fatigue of emergency department staff may be useful in improving patient safety [30].

Medical error

Error prevention education, teaching teamwork, appropriate planning for treatment measures and compiling appropriate treatment methods for specific patients are effective in reducing medical errors. The use of IT systems, electronic alarm apps and holding discussion sessions cause to reduce medical errors [21 and 22].

Crowding

Formation of a release team in the emergency department, telephone counseling, transferring patients to other sections and cooperation among emergency employees and other hospital sections prevent overcrowding of patients in the emergency department [and 22]. Any intervention and counseling that has maximum impact on emergency department performance should be done as soon as possible. Any diagnostic and laboratory intervention that causes changes in a patient's condition and his transferring to other sections, should be immediately carried out and made electronically a bed request for hospitalizing patients [31].

DISCUSSION

Recent research findings showed that 10 studies from 25 ones in this research were dealt with factors affecting performance improvements in the area of "communication". In this area the most frequency was related to factor of "mutual respect" [4 studies]. In the area of teamwork, 16 studies was related to this area and among the influence factors in this area the group behavior and cooperation have high frequency [7 studies]. In the area of clinical pathway the study had the factors affecting the performance improvement of the emergency department and among these factors the "time" had high frequency [3 studies]. In the area of patient flow, 6 studies had the factors affecting the performance improvement of the emergency department and among those "provision of services" had high frequency [5 studies] and

in the area of other factors 19 studies had the factors affecting the performance improvement of the emergency department and among those "patient safety" had high frequency [10 studies]. The result of this study is comparable to that of the study by Sørup *et al.* [21] who found that the Performance Improvement factors frequencies in relevant studies included time-related measures [7 times], medication errors [3], patient satisfaction [5], educational positions [2], efficiency [3], planning [5], Length of Stay [12], triage [4], disposition decision - discharge [1], treatment space [1] and work environment [1].

Table 1. Characteristics of the included studies

Corresponding author / Year	Title	Objective	Focus	Setting	Method	Influence Factors
Browne/ 2002	Effectiveness of a croup clinical pathway in the management of children with croup presenting to an emergency department	Evaluate the safety and effectiveness of a clinical pathway for croup in an emergency department	Overall	Australia, EDs	Survey and Audit	2
Boudreaux / 2006	The Use of Performance Improvement Methods to Enhance Emergency Department Patient Satisfaction in the United States: A Critical Review of the Literature and Suggestions for Future Research	Review the evidence on performance improvement methods for increasing emergency department (ED) patient satisfaction	Overall and condition specific	American, EDs	A systematic search of electronic databases	4
Woloshynowych/ 2007	Communication Patterns in a UK Emergency Department	Identify the features of the communication load on the nurse in charge of the ED	Overall	United Kingdom, EDs	Observational, nonexperimental study	2
Krug / 2007	Patient Safety in the Pediatric Emergency Care Setting	Decrease the risk of medical error and harm to patients, especially in the emergency care setting	Overall and condition specific	American, PED	Survey and Audit	2
Schull / 2009	Development of a minimization instrument for allocation of a hospital-level performance improvement intervention to reduce waiting times in Ontario emergency departments	Identify factors for a minimization algorithm for the allocation of a hospitallevel intervention to reduce emergency department (ED) waiting times	Overall and condition specific	Canada, EDs	International multi-disciplinary panel evaluated factors in a two-stage modified-delphi and nominal group process	7
Kilner / 2010	The role of teamwork and communication in the emergency department: A systematic review	Develop a systematic review using international research to describe the role of teamwork and communication in the emergency department	Overall and condition specific	Australia, EDs	A systematic search of electronic databases	5
Leary / 2010	Patterns of nurse-physician communication and agreement on the plan of care	Characterise nurse - physician communication and their agreement on patients plan of care	Overall	American, EDs	Interviews of a cross-sectional sample of patients	1
Cameron / 2010	Examining Emergency Department Communication Through a Staff-Based Participatory Research Method: Identifying Barriers and Solutions to Meaningful Change	Elicit communication barriers and engage staff in identifying strategies to improve communication within emergency department	Overall	American, EDs	Multidisciplinary workshop	3
Pruitt & Liebelt / 2010	Enhancing Patient Safety in the Pediatric Emergency Department	Formal communication and medical team training have been an potential means to enhance patient safety	Overall	American, EDs and PEDs	Data collection and analysis	5
Farrokhnia / 2011	Swedish emergency department triage and interventions for improved patient flows: a	Report the development and current status of emergency department	Overall and condition	Sweden, EDs	Survey triage and interventions to improve patient flows	5

	national update	triage and patient flow processes in Sweden	specific			
Carbo / 2011	Developing a High-Performance Team Training Framework for Internal Medicine Residents: The ABC'S of Teamwork	Effective teamwork and communication can prevent error and mitigate harm.	Overall and condition specific	American, Urgent Care Units	Developed a training session, and evaluated learners' patient safety attitudes and knowledge before and after training	3
Schwarz / 2011	Team behaviors in emergency care: a qualitative study using behavior analysis of what makes team work	Use behavior analysis to qualitatively examine how teamwork plays out in practice and to understand eventual discrepancies between planned and actual behaviors	Overall	Sweden, ED	A mixed-methods research project investigating the effects of Teamwork	4
Kocher / 2011	Interventions to Safeguard System Effectiveness During Periods of Emergency Department Crowding	Interventions to Assure Quality in the Crowded Emergency Department	Overall	American, EDs	Data collection and analysis	8
Migita / 2011	Emergency Department Overcrowding: Developing Emergency Department Capacity Through Process Improvement	Describe a systematic and comprehensive effort to decrease ED length of stay	Overall and condition specific	American, EDs	Data collection and analysis	2
Jones / 2012	Implementing performance improvement in New Zealand emergency departments: the six hour time target policy national research project protocol	1)How introduction of the ED target affected broader hospital performance and 2)Which initiatives and strategies have been successful and	Overall and condition specific	New Zealand, EDs	A mixed methods study with three interdependent research streams	8
Jabbour / 2013	Best strategies to implement clinical pathways in an emergency department setting: study protocol for a cluster randomized controlled trial	Develop and comprehensively evaluate best strategies for effective local implementation of externally developed expert clinical pathways.	Overall	Canada, EDs	Two cluster randomized controlled trials	2
Ajeigbe / 2013	Nurse-Physician Teamwork in the Emergency Department	Examine differences between staff in the interventional group EDs and control group EDs	Overall	American, EDs	A comparative cross-sectional study	2
Melon / 2013	Beat the clock! Wait times and the production of 'quality' in emergency departments	Conceptualization of quality including the documentary facts and figures produced to substantiate quality emergency care	Overall	Canada, EDs	Survey and Audit	1
Sørup / 2013	Evaluation of emergency department performance – a systematic review on recommended performance and quality-in-care measures	To describe, map, and critically evaluate which performance measures that the published literature regard as being most relevant in assessing overall ED performance	Overall	Denmark, EDs	A systematic search of electronic databases	5
Chan / 2014	Lean techniques for the improvement of patients' flow in emergency department	1)To evaluate the current patient flow in ED and 2) to identify and eliminate the non-valued added process, and 3) to modify the existing process	Overall	China, EDs	quantitative, pre- and post-lean design study	4

Mercer / 2014	Physician Identification and Patient Satisfaction in the Emergency Department : Are They Related?	Identify factors associated with improved satisfaction among ED patients,	Overall and condition specific	American, EDs	A survey-based study that compared their ability to correctly identify their treating physicians and their overall satisfaction rating	7
Zajano / 2014	Development of a Survey of Teamwork and Task Load Among Medical Providers	Develop a survey to quantify providers' perceptions of teamwork and task load during critical care resuscitations	Overall	United Kingdom, PED	Survey and Audit	5
Lowthian / 2015	Redesigning emergency patient flow with timely quality care at the Alfred	Evaluation TQC's effect on achieving the National Emergency Access Target and associated safety and quality indicators	Overall and condition specific	Australia, EDs	Retrospective analysis	2
Simmons / 2015	Mind the (knowledge) gap: The effect of a communication instrument on emergency department patients' comprehension of and satisfaction with care	Develop a communication instrument to be used in the Emergency Department (ED)	Overall	American, EDs	Comprehension of care was assessed by chart review and satisfaction measured via validated survey	2
Ahn / 2015	Teamwork and Clinical Error Reporting among Nurses in Korean Hospitals	To examine levels of teamwork and its relationships with clinical error reporting among Korean hospital nurses	Overall and condition specific	South Korea, Urgent Care Units	A cross-sectional survey	3

Table 2.Outcome evaluation influence factors of selected studies

		Ahn 2015	Ajeigbe 2013	Boudreaux 2006	Browne 2002	Cameron 2010	Carbo 2011	Chan 2014	Farrokhnia 2011	Jabbour 2013	Jones 2012	Kilner 2010	Kocher 2011	Krug 2007
Communication	Job Design		×											
	Skills		×				×		×					
	Barriers													
Team work	Mutual respect			×		×						×		
	Group behavior			×							×			
	Collaboration	×							×				×	×
	Planning												×	
	Decision making												×	
	Resources management												×	
	Monitoring												×	
	Leadership												×	
	Mutual trust											×	×	
	Inservice training												×	
Clinical pathway	Mutualsupport													
	Time				×				×					
	Process													
	Training									×				
Patient flow	Efficiency									×				
	Goals													
	Awareness													
	Intercommunity										×			
	Services			×				×						
	Nurse tasks							×	×		×			
	Facilities and Equipment								×		×			
	Lean Management							×			×			
Other	Triage										×			
	Waiting time				×			×			×	×	×	
	Patient satisfaction			×		×						×		
	Patient safety	×				×	×					×		×
	Medical error	×					×							
	Crowding									×				

Table 2. Outcome evaluation influence factors of selected studies(*continued*)

		Leary 2010	Lowthian 2015	Melon 2013	Migita 2011	Pruitt 2010	Mercer 2014	Schull 2009	Schwarz 2011	Simmons 2015	Sørup 2013	Woloshynowych 2007	Zajano 2014
Communication	Job Design												×
	Skills												
	Barriers					×		×					×
	Mutual respect								×				
Team work	Group behavior	×						×	×	×			×
	Collaboration					×	×		×		×		
	Planning					×	×						
	Decision making					×	×						
	Resource management						×						×
	Monitoring												
	Leadership										×		
	Mutual trust											×	
	Inservice training						×						
	Mutualsupport										×		
Clinical pathway	Time		×										
	Process		×										
	Training												
	Efficiency												
Patient flow	Goals							×					
	Awareness							×					
	Intercommunity							×					
	Services			×									
	Nurse tasks												
	Facilities and Equipment												
	Lean Management												
Triage													
Other	Waiting time				×		×	×			×		
	Patient satisfaction						×	×		×	×		
	Patient safety				×	×			×			×	×
	Medical error											×	
	Crowding												

Appendix 2. Classification of main dimentionns and influence factors based on Frequency in reviewed Studies (in pre-Assessment and also in Assessment phase)

Fields	Communication		Team work		Clinical pathway		Patient flow		Other factors	
	Factor	Frequency	Factor	Frequency	Factor	Frequency	Factor	Frequency	Factor	Frequency
1	Job Design (12, 19)	2	Group behavior (8, 9, 11, 12, 14, 18, 23)	7	Time (19, 24, 27)	3	Goals (11)	1	Waiting time (8, 11, 16, 19, 21, 22, 24, 29, 31)	9
2	Skills (10, 19, 27)	3	Collaboration (13, 20, 22, 27, 28, 30, 31,)	7	Process (19)	1	Awareness (11)	1	PatientSatisfaction (9, 11, 14, 16, 17, 21, 29)	7
3	Barriers (11-13)	3	Planning (13, 22)	2	Training (25)	1	Intercommunity (8)	1	Patient safety (10, 12, 13, 15-17, 20, 23, 30, 31)	10
4	Mutual respect (9, 16, 17, 23)	4	Decision making (12, 22)	2	Efficiency (25)	1	Services (8, 9, 26-28)	5	Medicalerror (10, 20)	2
5			Resource management (22, 29)	2			Nurse tasks (8, 26, 27)	3	Crowding (8, 19)	2
6			Monitoring (22)	1			FacilitiesandEquipment (9, 27)	2		
7			Leadership (22)	1			Lean Management (8, 26)	2		
8			Mutual trust (15, 16, 22, 29)	4			Triage (8)	1		
9			Inservice training (29)	1						
10			Mutualsupport (21)	1						

Appendix 1.

1. Search Strategy for the Cochrane Library

#1: "Performance improvement" /128
 #2: Mesh descriptor performance improvement explode all trees/965
 #3: (#1 or #2)/1088
 #4: "Performance improvement"/5227
 #5: "Emergency Unit*"/85
 #6: (#4 or #5)/5288
 #7: (#3 and #6)/89

2. Search Strategy for Pub Med

#1: "performance improvement"/2603
 #2: "performance improvement"[MeSH Terms]/0
 #3: (#1 or #2)/2603
 #4: "Emergency Department*"/52280
 #5: "Emergency Unit*"/1410
 #6: (#4 or #5)/53558
 #7: (#3 and #6)/73

3. Search Strategy for Scopus

("performance improvement*" AND "emergency department*") AND (LIMIT-TO (SUBJAREA, "MEDI") OR LIMIT-TO(SUBJAREA,"BIOC") OR LIMIT-TO (SUBJAREA, "HEAL") OR LIMIT-TO (SUBJAREA,"NURS") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE,"re")) AND (LIMIT-TO (LANGUAGE, "English")) /1473

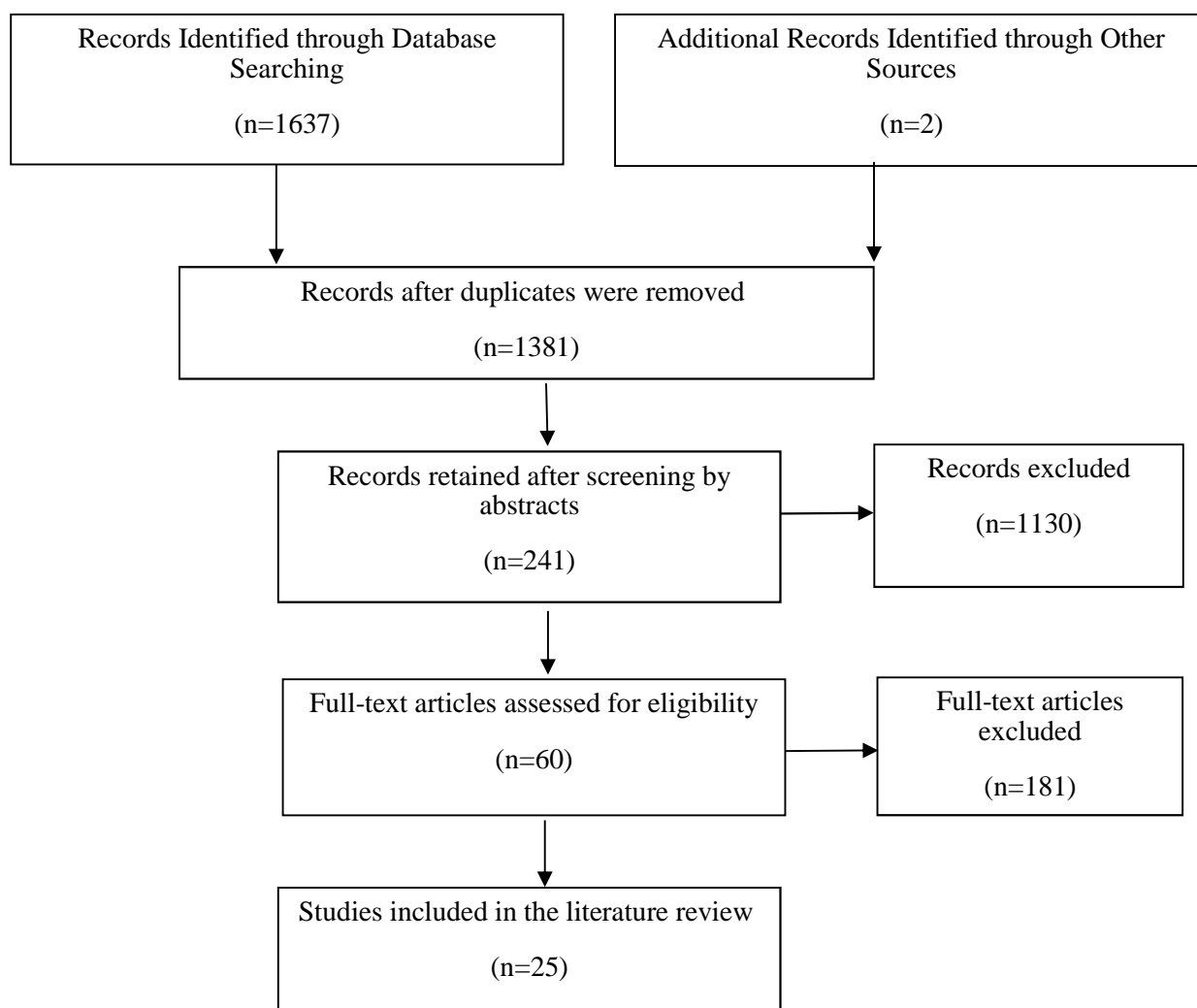


Figure 1 .Flow-chart of article selection.

CONCLUSION

This systematic review confirms that the ED is a unique environment due to the volume of work and the need for accuracy under pressure. Implementation of policies and interventions for improving the performance of the emergency department requires often the considerable human and financial resources and serious evaluation of these two in order to investigate their effects and identify better the factors affecting the performance of ED. Compiling and teaching teamwork, communication, clinical pathway, patient flow and other criteria affecting the performance improvement of the emergency department are of particular importance and have the closely and related task. Their common and considerable goals cause to improve patient safety, reduction of medical errors, reduction of patient's waiting time, increase of quality of care, increase of patient satisfaction, increase of the employees satisfaction of ED, reduction of patient stress, reliability in service provision, improving communication between doctors and nurses and the proper management of ED.

It is clear that redesigning processes of performance improvement of the emergency department was important and doing the further researches in the future in order to find real solutions for solving ED problems seems necessary. However, the inherent nature of ED is characterized such that it needs to do high quality and multidisciplinary researches.

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Limitations

During the performance of this research, there was no access to the Web of Science (WOS) database in Iran.

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