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Review Article

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Managing Quality Improvement and Risks in the Hospital Emergency Department: A Systematic Literature Review

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Abstract

Purpose: The research aims to understand the current state of knowledge on risk, quality improvement and resilience in the healthcare field, namely in hospitals emergency departments, in light of the Covid-19 pandemic. There is the need to valorize the emergency department role that has been underestimated even if it represents the most important linkage point between territorial healthcare assistance and hospital management. **Methodology:** The study adopted a systematic literature review approach to summarize existing evidence on managing quality improvement and risks in the healthcare field. Following the inclusion criteria, a total of 59 articles published between 2011 and 2020 were detected. The authors analyzed the bibliometric characteristics and classified the works into three main themes and four sub-themes (Service quality, composed of Effectiveness of quality improvement strategies and Medical scribes; and Risk management, including Handoff and crowding issues; Resilience). **Findings:** A cross-analysis of the themes highlights future research opportunities and managerial implications for professionals and academics and the development of interventions to enhance the value creation process in the healthcare ecosystem. **Originality:** This research emphasizes the need to invest in emergency department improvement for pursuing the patients' well-being.

Keywords: Hospitals; Health care; Quality improvement; Risk management

Introduction

In the last years, there has been a growing interest among academics and practitioners on risk management, resilience and quality improvement in the healthcare sector [1], even considering impact and effects of the Covid-19 pandemic. Before the Covid-19 pandemic the public hospital organization was worldwide characterized by budgetary pressure, cutbacks, recovery logic and waste reduction even though to the detriment of patients dignity and service quality. Evans et al. (2000) [2] argued that performance of health systems has been a major concern of policy makers for many years and that several countries have introduced changes in the health sector for improving their performance [3,4]. Several authors highlighted that the more critical situation evidenced within the Emergency Department, manly characterized by overcrowding, long waiting times, staff and patients' dissatisfaction [5-8].

In Italy, the waiting time average for the doctor's visit in an emergency unit for a patient classified as medium seriousness conditions (yellow code), was 57 minutes. In particular, in the Lazio region, the waiting times for yellow codes was one hour and four minutes, followed by Liguria (56 minutes) and Lombardy (53 minutes) [9]. Moreover, as highlighted by the Italian Society

of emergency-urgency medicine (Simeu, 2020) [10], recorded overcrowded emergency units, shortage of medical staff, lack of beds in the wards and danger of assaults.

During the last two years, there was a drop of visits to hospitals to primary care due to the risk of transmission of SARS-CoV-2 that caused an increasing pressure worldwide on emergency rooms that have to face covid-19 illness, assuring on the other side a covid-free accessibility for the other patients [11]. The emergency room and the implications related to its connected risks, service quality and resilience are interesting themes to be analyzed in order to identify opportunities of improvement for the future.

As a matter of facts, in this field, no systematically reviews emerged from the existing literature about risk, resilience and quality improvement in emergency units. Our research aims to identify key themes and results put forward in reviewed studies, detect research gaps and provide future research opportunities for professionals and academics with the aim to push the research on this topic for valorizing at academic and policy levels [12]. Our study adopted a Systematic Literature Review (SLR) methodology for the transparency, repeatability and rigor to synthesize and conceptualize the current state of knowledge of quality and risk management in the healthcare sector focusing on the emergency unit in hospitals [13].

The paper is organized as follows: Section 2 describes the research methodology adopted. The results are discussed in Section 3. Section 4 presents a cross-discussion of the identified themes analyzing the main critical issues in the healthcare services. Section 5 describes the gaps for future researches in order to improve the risk and quality management in emergency units. Section 6 concludes the work and examines the limitations of our review.

Methodology

The study adopted a systematic review methodology with a structured, robust, repeatable and transparent process [14] to investigate analytically the existing literature [15]. After the screening phase, the records selected for the eligibility were analyzed, firstly, author-centrically and then concept centrically in order to extract the relevant information [16]. Considering the aim of our study is to review and summarize the literature, the authors carried out a descriptive and interpretative analysis [17]. The attempt to synthesize and integrate the current body of knowledge provides a theoretical groundwork for the future development of the topics. This methodological approach was used in several fields of health, social science and education to synthesize research and to provide useful directions for future research [18].

The SLR is structured in three main stages: 1. Planning the review; 2. Conducting the review; 3. Reporting and dissemination.

1. Planning the review

The study is aimed at understanding how risk, quality management and resilience in the emergency departments have been researched and delved into healthcare scientific literature.

The literature search was conducted in the Scopus database in September 2021. The search was conducted on one database for purposes of clarity and rigor [19]. We have chosen Scopus database that indexes all of the other potentially relevant databases (e.g. ACM, IEEE, Springer, AIS Electronic Library, DBCP Computer Science Bibliography) consistent with our research aims considering managerial perspective. The search of literature in the Scopus database was conducted using the following search query:

Keyword (TITLE-ABS-KEY) "*Emergency Room"* OR "*Emergency Unit*" OR "*Emergency Department*" OR "*first aid"* AND "*service quality*" OR *quality* OR "*quality management*" OR "*continuous improvement*" AND "*risk management*" OR *risk* OR *resilience* AND *efficiency* OR *effectiveness*.

The literature search resulted in a total amount of 712 records.

2. Conducting the review

Following Moher et al. (2009) [20], we included the records identified in Scopus considering these criteria:

1. The search included conference papers, articles in journals, reviews, book and book chapters;
2. The research has no time limits.
3. The research papers must be written in English.

Regarding the characteristics of the identified studies, the following inclusion criteria were used:

1. Papers must be mainly focused on quality and risk management, resilience and efficiency and effectiveness of emergency departments;
2. Articles must be available in full text and must be already published.
3. Studies that focusing on these topics (quality, risk management, resilience, efficiency and effectiveness) from a managerial perspective. Technical and engineering papers are excluded.

Figure 1 reported the steps that documented the SLR procedure through PRISMA flow diagram [20].

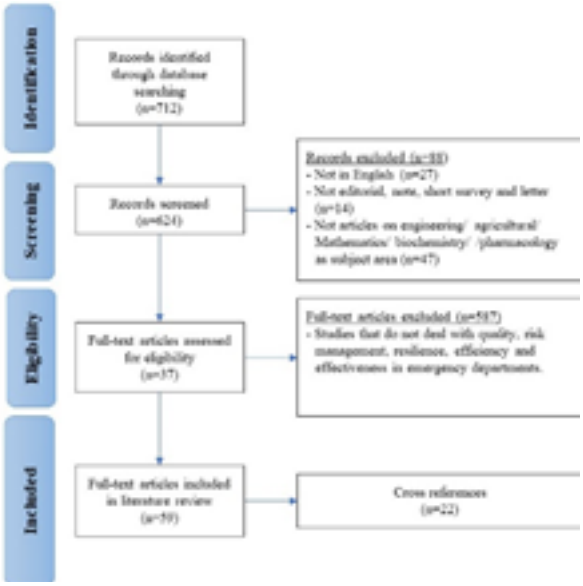

Figure 1: PRISMA flow-chart.

We have evaluated the studies by reviewing the title and abstract to ensure quality and relevance. The number of articles selected for eligibility for full-text analysis was 712 hits. 88 articles were excluded: 27 papers were not in English; 14 studies were editorial, note, short survey and letter; 47 studies had no focusing on healthcare field and 587 researches were analyzed from a technical/engineering perspective and do not deal with quality, risk management, resilience, efficiency and effectiveness in emergency departments. After selecting the 37 references, the cross-reference (Cooper, 1989) [21] was carried out which added 22 papers to the selected records. The final body of literature consists of 59 papers.

3. Reporting and Dissemination

The full texts of the final body of literature were analyzed integrating additional information such as: Study approach (conceptual or empirical), Methodology (qualitative, quantitative, or mixed method), Method of data collection, Country, Aim, Findings, and Further research. These information were collected on an excel file and summarized through tables [22]. The analysis of reviewed papers was performed in parallel by two researchers and, for inclusion and methodological quality; the other two researchers reviewed the whole process. Considering the research questions guiding our SLR, the reviewed studies were analyzed in order to provide the bibliometric characteristics of existing literature, to identify the main themes in ED context and for each theme to deepen the results and suggestions for further research [23,24]. The articles were analysed to cluster the works into themes and subsequently identified sub-themes [24-28]

Results

Bibliometric Characteristics

As shown the Figure 2, the distribution of papers over time highlighted that academic interest for the subject has developed in particular among 2017-2021 (34 papers published).

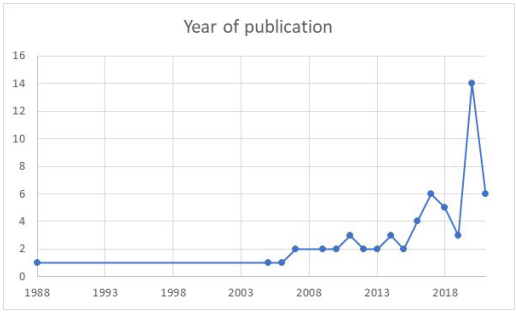

Figure 2: Distribution of publications according to the year of publication.

Most of the studies on risk, quality improvement and resilience topics in the emergency departments are articles (68%), literature reviews (30%) and just a conference paper.

Document type	Frequency	Percentage
Article	40	68%
Review	18	30%
Conference Paper	1	2%
Total	*59*	*100%*

Table 1: Number of articles for document type.

From the analysis and as shown in Figure 3, it emerged that the study approach most used are the empirical research (55%) and SLR methodology (41%).

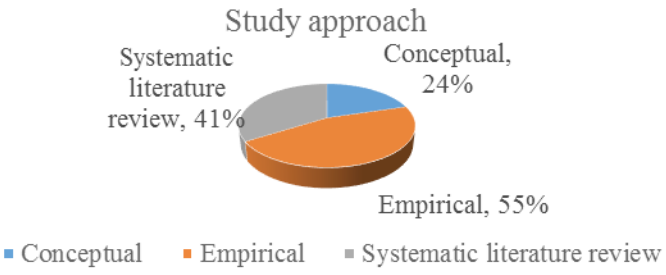

Figure 3: Number of articles according to study approach applied.

In particular, with regard to empirical research, most of the studies were conducted in the USA (44%), UK (18%), Italy (11%) and Australia (11%) (Figure 4).

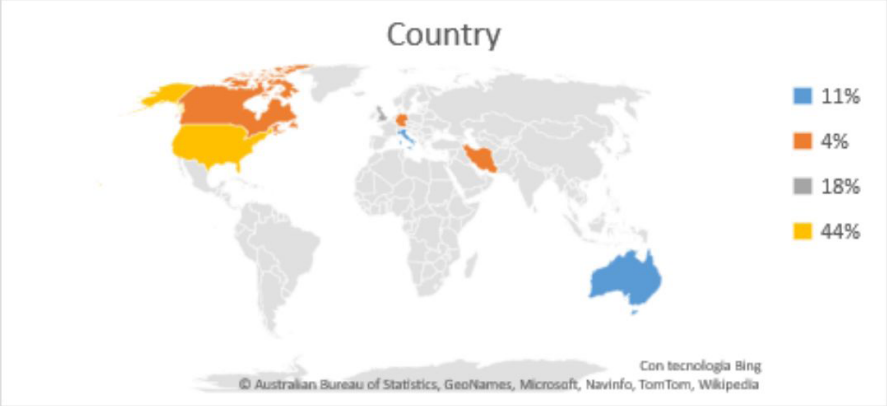

Figure 4: Frequency of data collection with respect to country.

The research target major investigated in the empirical studies reviewed are: patients (10), medical staff (4), patients and medical staff (3). (Table 2).

Target	Frequency	Percentage
Patients	10	37%
Medical staff	4	15%
Patients and medical staff	3	10%
Clinical and administrative leaders	2	7%
Nurses	2	7%
Health care provider	1	4%
Inter professional staff	1	4%
Medical staff and nurses	1	4%
Patients and nurses	1	4%
Patients, nurses and physicians	1	4%
Scribes, providers, clinic managers, quality improvement specialists, and scribe program managers	1	4%
Total	*27*	*100%*

Table 2: Frequency of research' target investigated.

Most of the reviewed papers were published in the following Journals: *Annals of Emergency Medicine, Academic Emergency Medicine, Cochrane Database of Systematic Reviews and Emergency Medicine Journal*. All papers were found in Journals and Conference on healthcare field. (Table 3) listed the source title of reviewed studies.

Source title	Frequency	Percentage
Annals of Emergency Medicine	6	10%
Academic Emergency Medicine	4	7%
Cochrane Database of Systematic Reviews	4	7%

Emergency Medicine Journal	3	5%
BMC Emergency Medicine	2	3%
BMJ Open	2	3%
International Journal for Quality in Health Care	2	3%
International Journal of Health Care Quality Assurance	2	3%
Journal of Emergency Medicine	2	3%
Systematic Reviews	2	3%
Advanced Emergency Nursing Journal	1	2%
American Journal of Medical Quality	1	2%
Annali di igiene: medicina preventiva e di comunità	1	2%
Australian Health Review	1	2%
BMC Family Practice	1	2%
BMJ (Online)	1	2%
Clinical Governance	1	2%
CMAJ	1	2%
Disaster Medicine and Public Health Preparedness	1	2%
EMA - Emergency Medicine Australasia	1	2%
European Journal of Emergency Medicine	1	2%
Health Affairs	1	2%
Internal and Emergency Medicine	1	2%
International Emergency Nursing	1	2%
International Journal of Healthcare Management	1	2%
International Journal of Nursing Practice	1	2%
JBI database of systematic reviews and implementation reports	1	2%
Journal of Emergency Nursing	1	2%
Journal of healthcare risk management : the journal of the American Society for Healthcare Risk Management	1	2%
Journal of Interprofessional Care	1	2%
Journal of Nursing Care Quality	1	2%
Journal of the American Board of Family Medicine	1	2%
Journal of the American Medical Informatics Association	1	2%
Journal of Trauma Nursing	1	2%
Pilot and Feasibility Studies	1	2%
Psychiatric Services	1	2%
Quality management in health care	1	2%
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine	1	2%
Sustainability (Switzerland)	1	2%
The Kansas nurse	1	2%

Table 3: Frequency of the source title.

Themes and Sub-Themes on Quality and Risk Management Research

To extract, synthesize and analyze the results of studies, we used the content analysis in order to identify the main themes and sub-themes addressed in the reviewed papers. Indeed, through content analysis is possible to identify, analyze, and resume data in the form of themes within a text [29-31]. In particular, the title, abstract, author's keywords context, aim and research gap of the 59 studies were reviewed and coded.

We summarized the results of the studies in order to identify the main results and further research for any theme identified in the emergency department context.

As shown Figure 5, our SLR reveals three main themes and four sub-themes: *Quality Improvement* (17 papers) topic composed of *Effectiveness of quality improvement strategies* (9) and *Medical scribes* themes; (3) *Risk Management* (12), including *Handoff* (3) and *Crowding* (6) issues; and *Resilience* (9) theme.

Figure 5: Themes and sub-themes on quality and risk management research in Emergency Department (ED). Below, we better explained the contents and key findings of each theme and sub-theme.

Quality Improvement Theme

As shown in Table 4, most articles focused on the quality improvement theme, analyzing several processes or indicators that aim to enhance healthcare needs and focus on patient-centered satisfaction and medical staff [32,33]. Hansen et al. [34] analyzed how to improve the quality and safety in ED and triage process [35] even during the Covid-19 pandemic. Olry De Labry Lima et al. (2020) [36] summarized the effectiveness of de prescription interventions in primary care and described the barriers and enablers of the process from the viewpoint of patients and healthcare professionals in order to analyze the key current issues in ED safety to improve the patient safety [37]. Buttigieg et al. [38] developed an integrated patient-focused framework to improve quality of care in accident and emergency units as Lean [39] exploring the implementing systems of quality assurance [40], the customer service [41] and evaluating the impact of consultant-level doctors overnight [41]. Sinclair et al. [42] identified and appraised the evidence for the effectiveness of e-learning programs on health care professional behaviour and patient outcomes.

Other studies [43] presented a model web-based system for reporting errors that occur in patient care in the ED. Reznek & Barton (2014) [44] evaluated the effectiveness of an ED peer review process in promoting incident reporting the effectiveness of e-learning programs.

Jacobson et al. [45] highlighted that it is crucial to create a continuous quality improvement program using a suggestion-based model to empower physicians, increase communication effectiveness and reduce clinical risk [47-49].

Eighteen studies analyzed the Quality improvements theme: three conceptual research [34,37,49], four SLRs [37,43,48,50] and eleven empirical studies, in particular, three quantitative research respectively conducted in the USA [45] in Australia [46] and UK [41] one qualitative study carried out in the USA [41], one mixed method approach conducted in the USA (Reznek and Barton, 2014) [44], two experiments performed in USA [36,43], one random chart review conducted in the USA [35], one case study on a Maltese emergency department [38] and finally one study that implemented the Lean in an ED in the UK [39].

The reviewed studies showed that the implement quality management must improve an underdeveloped quality culture, inadequate data collection, poor incentives for improvement and high external pressures, including staff shortages, departmental crowding, overcrowding of patients, a shortage of beds and lack of public empowerment [38,40].

Quality measurement can play an essential role in improving the quality and value of ED care, including effective care measures for serious conditions and efficient use of resources, such as high-cost imaging and hospital admission [48].

The combined QFD and LFA and also Lean [39,45] methods are effective to improve the quality and safety of care involving all stakeholders and adopting a process approach focused on patients [38]. For instance, the feedback supported quality improvement initiatives [43] in the emergency room by generating mental health support for staff. Programs (debrifing) that facilitate clinicians to communicate their concerns with team leaders reduce negative outcomes, improve processes, alleviate burnout and increase resilience [36]. In addition, Reznek & Barton (2014) [44] showed that a non-punitive peer review process provides feedback and is perceived as valuable for error identification and education can lead to increased incident reporting by Health Care Providers (HCPs) optimizing health care quality and safety.

To improve patient safety in the ED it is crucial to decrease the length of time at triage, assessment, intervention and disposition. To improve patient safety, have to create specialized patient care units, strategic staffing, admission lounges, streamlining communication, and medical record delivery systems [37]. Overnight ED waiting time performance issues are rooted in process problems occurring during the day and early evening. Night working harmed sleep patterns, performance, and well-being but did not significantly impacts on the total time patients spend in the department by the consultant night working [41]. Nurses need to be involved and trained to identify problems and solutions to improve the triage process [35]. EDs improvement strategy include audits, incident monitoring, guidelines, morbidity and mortality review, integration and communication with an ambulance, hospital specialties and primary care [34].

It is necessary to improve communication with patients as well as other colleagues involved in inpatient care. The study conducted by Olry De Labry Lima et al. [36] showed that the identified barriers in ED were lack of time, inability to access all information, being stuck in a routine, resistance to change and a lack of willingness to question the prescription decisions made by healthcare colleagues. Indeed, healthcare professionals must cooperate, communicate, and share documentation responsibilities [46].

Quality Improvement				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
Penn et al. (2019)	To evaluate the impact of consultant-level doctors overnight.	Empirical *(Quantitative)* UK	Overnight ED waiting time performance issues are rooted in process problems occurring during the day and early evening. Night working had a negative impact on sleep patterns, performance and well-being. Did not emerge a clinically important impact of consultant night working on total time patients spend in the department.	To develop quantitative and qualitative studies for quality, safety and process considering measures of emergency admissions, benefits to trainee workforce and intrahospital rate-limiting effects such as delayed transfers of care or hospital occupancy.
Azizoddin et al. (2020)	To improve the quality management of ED during the Covid-19 pandemic.	Empirical *(Experiment)* USA	The feedback supported quality improvement initiatives in the emergency room by generating mental health support for staff. Programs (debriefing) that facilitate clinicians to communicate their concerns with team leaders reduce negative outcomes, improve processes, alleviate burnout and increase resilience.	/

Khare et al. (2005)	To present a model Web-based system for reporting of errors that occur in patient care in the ED.	Empirical *(Experiment)* USA	A web-based error reporting creates more opportunities for system improvement through anonymity.	To propose system changes to reduce future errors in order to pursue continuous quality improvement.
Reznek & Barton (2014)	To evaluate the effectiveness of an ED peer review process in promoting incident reporting.	Empirical *(Mixed method approach)* USA	A non-punitive peer review process provides feedback and is perceived as valuable for error identification and education can lead to increased incident reporting by HCPs optimizing health care quality and safety.	To identify opportunities in order to enhance peer review process in promoting incident reporting.
Sammy et al. (2013)	To explore the successes and challenges of implementing systems of quality assurance.	Empirical *(Qualitative)* USA	It's necessary the implement quality management to improve an underdeveloped quality culture, inadequate data collection, poor incentives for improvement and high external pressures, including staff shortages, departmental crowding and lack of public empowerment.	To provide and analyze opportunities and challenges in the area of quality management and clinical governance in the developing world.
Hansen et al. (2020)	To improve the quality and safety in ED.	Conceptual	Emergency personnel must be trained to provide prompt patient care. Crowding directly impacts patient quality of care, morbidity and mortality. Quality indicators should be pragmatic, measurable and prioritized as components of an improvement strategy. EDs improvement strategy include audits, incident monitoring, guidelines, morbidity and mortality review, Integration and communication with ambulance, hospital specialities and primary care.	To develop indicators that improve clinical outcomes, staff and patient experience in a cost-efficient manner.
Reinhardt (2017)	To improve emergency department triage.	Empirical *(Random chart review)* USA	Continuous and systematic assessment and improvement are needed to streamline the triage process and improve accuracy and efficiency. Nurses need to be involved and trained to identify problems and solutions to improve the triage process.	/

Buttigieg et al. (2016)	To develop an integrated patient-focused framework to improve quality of care in accident and emergency unit.	Empirical *(Case study)* Malta	The main problems in the ED were overcrowding and a shortage of beds. The combined QFD and LFA methods are effective to improve the quality of care involving all stakeholders and adopting a process approach focused on patients. The implementation of the quality improvement program is fewer hospital admissions, faster patient flow, expert triage and shorter waiting times at the A&E unit.	To develop empirical studies in other countries also to establish causal relationships among the constructs for healthcare quality improvement using structure equation modelling or other techniques such as the analytic hierarchy process, the analytic network process, fuzzy theory, etc.
Vukmir (2006)	To analyze the customer service in ED.	Systematic literature review	Patient satisfaction is related to the timeliness and quantity of care. the presentation of symptoms, the style of practice, the position and problems of the physician have a direct impact on satisfaction. It is necessary to consider the demographic profile, the presentation of symptoms and the interventions of the physician by creating an empathic relationship with the patient to improve the quality of care and patient satisfaction.	To define goals in patient care and service to improve the quality care and patients satisfaction.
McCulloch et al. (2010)	To evaluate the Lean intervention to improve safety processes and outcomes on ED.	Empirical *(Lean)* UK	Lean improves compliance with a bundle of safety-related processes but it's crucial the senior management support to facilitate change across multiple departments.	To understand the lean applications and effects on quality improvement.
Olry De Labry Lima et al. (2020)	To summarise the effectiveness of deprescription interventions in primary care, and to describe the barriers and enablers of the process from the point of view of patients and healthcare professionals.	Systematic literature review	It's necessary to improve communication with patients as well as other colleagues involved in patient care. Amongst the identified barriers we found lack of time, inability to access all information, being stuck in a routine, resistance to change and a lack of willingness to question the prescription decisions made by healthcare colleagues. The educational component of deprescription procedures is a key factor. Good communication between healthcare professionals is a key element for success in the deprescription process.	/
Duncan et al. (2020)	To increase the effectiveness of communication and reduce clinical risk.	Empirical *(Quantitative)* Australia	The rate of documentation of emergency department security interventions in clinical notes can be increased by encouraging clinicians and security staff to collaborate and share documentation responsibilities.	To evaluate the rate of documentation of security interventions in other countries.

Jacobson et al. (2009)	To create a Continuous Quality Improvement program using a suggestion-based model to empower physicians.	Empirical *(Quantitative)* USA	Through Kaizen program, all ED stakeholders can propose initiatives or solutions for active initiatives in order to promote a continuous quality improvements process.	To test kaizen in other countries and departments adopting a multicenter prospective approach and considering its impact on patient outcomes.
Schuur et al. (2013)	To develop quality measurement for ED.	Conceptual	Quality measurement can play an important role in improving the quality and value of ED care, including measures of effective care for serious conditions, measures of efficient use of resources, such as high-cost imaging and hospital admission; and measures of diagnostic accuracy.	To support the development of measures of care coordination and regionalization and the episode cost of ED care.
Ciesielski & Clark (2007)	To summarizes key current issue in ED safety in order to improve the patient safety.	Conceptual	To improving patient safety in the ED it's crucial to decrease the length of time at triage, assessment, intervention and disposition. To improve patient safety have to create specialized patient care units, strategic staffing, admission lounges, streamlining communication, and medical record delivery systems.	To delve how improve the patient safety analyzing the problem and to create solution for the continuous improvement in the ED.
Sinclair et al. (2016)	To identify and appraise the evidence for the effectiveness of e-learning programmes on health care professional behaviour and patient outcomes.	Systematic literature review	E-learning was at least as effective as traditional learning approaches, and superior to no instruction at all in improving health care professional behaviour. There was variation in behavioural outcomes depending on the skill being taught, and the learning approach utilised.	To provide empirical research on the effectiveness of e-learning and on how it changes healthcare professional behaviour or patient outcomes.
Grant et al. (2018)	To improving the capacity, cccessibility, and quality of mental health services.	Systematic literature review	Peer Support Workers can reduce hospital admissions and inpatient days and engaging severely ill patients. Most PSW programs have reported implementation challenges but these workers can improve access to and quality of care.	To investigate and describe how these approaches (PSWs) can be combined to expand a community's capacity to provide care.

Table 4: Quality improvement theme.

Effectiveness of Quality Improvement Strategies Sub-Theme

The effectiveness of quality improvement strategies theme evaluates several interventions in ED to enhance the service quality provided and medical staff and patients' satisfaction (Table 5).

Several studies evaluated the effectiveness of quality improvement strategies, which translates into improving the coordination and organization of health care [51,52]. Team changes and multidisciplinary teams were likely effective in reducing emergency department visits and admission [53,54]. Patient education and self-management were quality improvement strategies targeting patients that reduces resource usage in the hospitals [55].

This theme is described by nine articles: eight SLRs [51,53,56-61] and one empirical research conducted in the USA using mixed-method approach [62].

The study conducted by Tsou et al. [56] highlighted the effectiveness of telemedicine services for their economy especially in emergency.

Interdisciplinary teams can improve the quality of healthcare provided through a more collaborative and global approach to the patient [57]. The studies reviewed confirmed that interventions targeting and case management to frequent users reduce emergency room visits and costs [53]. Targeted interventions must include the implementation of team changes, case management and the promotion of self-management in order to reduce the use of healthcare [51,59,60].

Cost is important when determining the sustainability of interventions. The total cost of an intervention includes the costs of the intervention itself (medical time, paramedical staff, infrastructure, services), savings deriving from a lower use of health care (emergency room visits, hospitalizations), costs of greater use of the service (e.g. community or outpatient services), and savings from increased productivity of more medically and socially stable patients (employment gain, stable housing) [53,58].

In addition, coordinated, team-based Drop-In Group Medical Appointments DIGMAs integrating medical and behavioral health care and care management services is a cost-effective model to reduce ED visits and charges [62].

Reay et al. [61] found that a standardized approach to healthcare ensures the creation of a dialogue between doctor and patient while meeting the needs of patients.

Effectiveness of Quality Improvement Strategies				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
Tsou *et al.* (2020)	To evaluate the results of emergency telehealth and assess their effectiveness and cost-effectiveness.	Systematic literature review	Emerged the effectiveness of emergency telehealth services, evidence on their effectiveness and cost-effectiveness in rural and remote.	To analize the effectiveness and cost-effectiveness of emergency telehealth services in several contexts.
Cassarino *et al.* (2018)	To explore the impact and content of early assessment and/or intervention carried out by health professionals in the ED on the quality, safety and cost-effectiveness of care.	Systematic literature review	Interdisciplinary teams can enhance the quality of care provided in healthcare settings thanks to a more collaborative and comprehensive approach to the patient.	/
Althaus *et al.* (2011)	To evaluate the effectiveness of interventions to reduce the number of ED visits by frequent users.	Systematic literature review	Interventions targeting frequent users may reduce ED use. Case management, the most frequently described intervention, reduced ED costs and seemed to improve social and clinical outcomes.	/

Moe *et al.* (2017)	To evaluate effectiveness of interventions targeting adult frequent ED users in reducing visit frequency and improving patient outcomes.	Systematic literature review	The interventions targeted toward adult frequent ED users effectively decrease ED visit frequency overall. Cost is important when determining interventions' sustainability. The overall cost of an intervention includes costs of the intervention itself (physician time, paramedical staff, infrastructure, services), savings from decreased healthcare utilization (ED visits, hospitalizations), costs of increased service use (e.g., community or outpatient services), and savings from improved productivity of more medically and socially stable patients (gains in employment, stable housing).	To evaluate interventions' cost-effectiveness and should employ standardized definitions and high methodological rigor to allow comparable research.
Tricco *et al.* (2014)	To improve the coordination of care to reduce health care utilization.	Systematic literature review	The interventions targeted to frequent users should consider specific strategies, such as team changes, case management and promotion of self-management, because these approaches are more effective than other quality improvement strategies in reducing health care utilization.	To determine how to optimize care coordination strategies for specific patient subgroups and settings.
Khalil *et al.* (2017)	To determine the effectiveness of professional, organisational and structural interventions compared to standard care to reduce hospital admissions, emergency department visits, and mortality in adults.	Systematic literature review	Interventions in primary care for reducing preventable medication errors probably make little or no difference to the number of people admitted to hospital or the number of hospitalizations, emergency department visits, or mortality.	To explore which interventions involving healthcare professionals (nurse, physician or pharmacist) are beneficial in preventing errors in primary care should also be addressed, improving the study' quality and defining the 'usual care'.
Crane *et al.* (2012)	To reduce utilization by uninsured frequent users of the ED.	Empirical *(Mixed method approach)* USA	Coordinated, team-based drop-in group medical appointments DIGMAs integrating medical and behavioral health care and care management services is a cost-effective model to reduce ED visits and charges.	/
Raven *et al.* (2016)	To evaluate the effectiveness of visit reduction programs in ED.	Systematic literature review	Case management for high-risk individuals can be effective in reducing ED visits; its effectiveness may in part be related to the size of the copayment. The data on the costs of ED visit reduction programs are insufficient to determine whether any of these programs are cost-effective.	To provide high-quality studies on effectiveness of visit reduction programs in ED.

Reay *et al.* (2017)	To examine the effectiveness of strategies that lead to improvements in communication and the factors that mitigate or improve transitions in care specifically from Emercengy Medical Services practitioners to ED nurses.	Systematic literature review	A standardized approach to transitions in care ensures that patient expectations and needs are communicated, thereby making ED care more responsive to patient needs.	To identify the existing evidence on transitions in care between EMS and ED nurses.

Table 5: Effectiveness of Quality Improvement Strategies Sub-Theme.

Medical Scribes Sub-Theme

Medical scribes theme is a sub-category of the Quality improvement theme. A scribe assists medical staff with primary documentation and nonclinical functions. In fact, through the medical scribes, it is possible to implement and pursue the continuous improvement process in the Emergency Departments to enhance patient-provider interaction (i.e. productivity, efficiency, patient and provider experience) and patient satisfaction [63].

The studies included in the literature review aimed to assess the effect of scribes on throughput, revenue, provider satisfaction, and patient satisfaction and safety in the emergency department.

The theme is composed of three articles, two of which are a SLR [64,65], and an empirical study [66] that shows the results of a mixed method approach with interviews and observations in the USA (Table 6).

The empirical study showed that medical scribes reduce perceived risks in the emergency room, but suppliers and scribes must receive training to improve safety [66].

Scribes strengthened the patient-provider relationship and improved provider experience, for instance, enhanced Relative Value Units (RVUs) per hour, RVUs per encounter, patients per hour, and enhanced patient satisfaction but not an improvement in ED length of stay. Medical staff are more engaging with patients increasing the interaction during the visit face-to-face and reducing, through the scribes work, the interaction with a computer [64].

Furthermore, spending more time visiting the patient enhance the patient care experience and patient satisfaction. Indeed, scribes increase patients seen per day and decrease the length of stay, improving emergency department efficiency. A lack of studies emerged that examined the effects of scribes based on compensation structure, qualifications or duties [65].

Following the quality improvement lens, integrating medical scribes with medical providers improve access, quality of care, enhance patient/medical staff satisfaction, and increase productivity revenue.

Scribes				
Authors	**Purpose**	**Method and context**	**Key findings**	**Further research**
Gottlieb *et al*. (2021)	to assess the effect of scribes on throughput, revenue, provider satisfaction, and patient satisfaction.	Systematic Literature Review	Scribes enhanced relative value units (RVUs) per hour, RVUs per encounter, patients per hour, provider satisfaction, and patient satisfaction but not an improvement in ED length of stay.	To determine the cost-benefit effect of scribes and the effect on satisfaction, physician stress and burnout also in other countries.
Ash *et al.* (2021)	to investigate the effect of scribes on patient safety.	Empirical *(Mixed method approach)* USA	Scribes reduce perceived risks in the emergency room. It is necessary that suppliers and scribes receive training to improve safety.	To identify national oversight needs and new roles and investigate the potentiality of scribes.

Ullman *et al.* (2021)	to evaluate the effects of medical scribes in ED.	Systematic Literature Review	Scribes increase patients seen per day and decrease the length of stay improving emergency department efficiency. Scribes may increase financial productivity but costs associated with developing, implementing, and maintaining scribe programs must be thorough. No studies examined the effects of scribes based on compensation structure, qualifications or duties.	More information is needed on the effectiveness and clinical findings, harms, patient or clinician satisfaction, financial productivity in EDs and costs before widespread implementation of scribes. There are no data on the use of virtual scribes, and no published data on the cost of developing, implementing, or maintaining a scribe program.

Table 6: Medical Scribes Sub-Theme.

Risk Management Theme

Risk management theme analyzes how improves the effectiveness and safety of test-result management through the establishment of clear governance processes of communication, responsibility and accountability harnessing health information technology [67]; for instance, to enhance a triage process [68,69].

The studies evaluate telephone follow-up systems and their effect on patient care and satisfaction [52] considering causes patient safety incidents in emergency departments [14,70].

Welch & Jensen [71] showed that the differences in culture between emergency medicine and other high-risk organizations and points to the qualities that promote reliability.

Recent studies have instead investigated benefits and risks generated from Covid-19 [72,73] in particular investigates the hospital risk analysis and management (the indoor air quality and determination of microbial load, surface management and strategies in cleaning activities, ventilation and air conditioning systems' management and filters' efficiency) [74] and assesses the effectiveness of screening for Covid-19 infection compared with no screening [75]. Furthermore, during the health crisis, the number of nurses was optimized [6].

As shown in Table 7, twelve studies analyze risk management topic: four conceptual research [71,72,73,74], two SLRs [70,75] and six empirical studies that adopted a qualitative approach in the USA [76] and in Australia [77], a quantitative approach in Iran (Apornak, 2021) [78] and in Canada [60], a mixed-method approach in Australia and a study has implemented in an Italian ED the root cause analysis.

The main critical issues that emerged from the studies highlighted a lack of resources such as intensive care unit beds, emergency room beds, ventilators, personal protective equipment and, medications. A crisis standard of care can serve as a guide for rationing supplies and care [73]. ED triage is one of the innovations in the provision of current emergency services to regulate the flow and trajectory of patient care within the emergency room [68]. Facial covers, physical distance, quarantine and appropriate personal protective equipment for frontline workers are required to prevent transmission. In high prevalence settings such as congregated housing facilities, universal testing with RTPCT (Reverse Transcription-Polymerase Chain Reaction) may be a preferred strategy for screening [71,75]. Multilevel telemedicine with tele-triage and therefore a virtual visit of the ED doctor could improve the quality of the service provided to patients [72].

The most common incidents were related to patient behavior, patient management, and medications. The mixed method approach captures the experiences and opinions of patients and doctors to improve communication and resource management [67]. Differences in the personal and clinical characteristics of patients whose emergency room care involved reported incidents highlights the need for a better understanding of incidents occurring in the emergency room in order to improve systems for high-risk patients [77].

The pressure, in addition to reducing the accuracy of nurses and increasing the likelihood of error in care, leads to stress for nurses. Due to the shortage of nurses in the emergency room to maintain the quality of the nursing service, some programming was done to create motivation and enthusiasm in the staff. The regulation of the 9-hour shift for part of the nursing staff, approaches such as the use of part-time nurses and the rotation of nurses between the various departments of the hospital may be useful [78]. However, it is crucial to provide nursing education, since training programs allow to develop technical, scientific and interpersonal skills [69]. Participation in efforts to reduce risk and improve patient safety through adequate incident reporting,

communication and collaboration is critical to removing barriers to the safety of care [70].

A follow-up call system for selected patients is an effective method of demonstrating patient concern, improving quality assurance, and providing helpful feedback to emergency personnel [76]. A reliability model for designing emergency medicine for the masses rather than the individual aims at safety, efficacy, patient-centeredness, timeliness, efficacy and equity [71].

Risk Management				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
West (2020)	To analyze and implement a crisis standard of cure.	Conceptual	There is a relatively scarcity of critical resources, such as intensive care units beds, emergency department beds, ventilators, personal protective equipment, and medications. A crisis standard of care can act as a guidepost for rationing supplies and care.	/
Jones *et al.* (1988)	To evaluate telephone follow-up systems and its effect on patient care and satisfaction.	Empirical *(Qualitative)* USA	A follow-up call system for selected patients is an effective method for demonstrating patient concern, improving quality assurance, and providing useful feedback to the emergency staff.	To develop a quality assurance program.
Considine *et al.* (2011)	To examine reported incidents affecting ED episodes of care.	Empirical *(Qualitative)* Australia	The most common incidents were related to patient behaviour, patient management and medications. Differences in personal and clinical characteristics of patients whose ED care involved reported incident(s) highlights the need for better understanding of incidents occurring in the ED in order to improve systems for high-risk patients.	To investigate perceptions of a reportable incident, attitudes to incident reporting, and comparison of 'reported' and 'reportable' incidents to improve the systems and accurate reporting of incidents in emergency care.
Santa Guzzo *et al.* (2012)	To improve a triage process.	Empirical *(Root cause analysis)* Italy	The ''root cause'' simplest to solve was the absence of nurse training. training program aim to acquire technical, scientific and interpersonal competencies; discuss real-life case studies and simulate cases which might occur.	/
Amaniyan *et al.* (2009)	To understand what causes patient safety incidents in emergency departments.	Systematic literature review	Participation in efforts to diminish risk and improve patient safety through appropriate incident reporting, communication and collaboration is critical for removing barriers to safe care.	To investigate the causes of practice errors and formulate safety improvement strategies.

Welch & Jensen (2007)	To illustrate the differences in culture between emergency medicine and other high-risk organizations and points to the qualities that promote reliability.	Conceptual	A reliability model for emergency medicine designing for the masses instead of the individual will effectively aims the safety, effectiveness, patient centeredness, timeliness, efficacy and equity.	/
Dahm *et al.* (2018)	To improve the effectiveness and safety of test-result management through the establishment of clear governance processes of communication, responsibility and accountability harnessing health information technology to monitor test-result management.	Empirical *(Mixed method approach)* Australia	Mixed method approach capture the experiences and opinions of trained health consumer representatives and patients to improve communication and resource management.	/
Mazurik *et al.* (2020)	To analyze benefits and risks generated from Covid-19.	Conceptual	Improved use of tiered ED telemedicine with teletriage and then an ED physician virtual visit could improve the ED quality service.	/
Apornak (2021)	To anayze the specialized human force in ED during pandemic to optimize the number of nurses.	Empirical *(Quantitative)* Iran	The pressure in addition to nurses' accuracy reduction and raising the error probability in the cares lead to stress for the nurses. Due to nurses' shortage in the ED for keeping the nursing service quality, some programming is done for creating motivation, and enthusiasm in medical employees. The regulation of 9 h shift for some of the nursing personnel, approaches like using the part-time nurses, and rotating the nurses among the various departments of hospital can be useful.	To investigate, in other countries, how ED managed the allocation of human resources to manage the flow of patients during the pandemic.

Gola *et al.* (2021)	To investigate the hospital risk analysis and management (the indoor air quality and determination of microbial load, surface management and strategies in cleaning activities, ventilation and air conditioning systems' management and filters' efficiency).	Conceptual	Enhanced ventilation may be a key element in limiting the spread of the SARSCoV- 2 virus. If the ventilation system is properly designed and kept clean to preserve the correct pressure among the functional units, it can be effective in removing airborne infectious agents.	/
Alsharawneh *et al.* (2020)	To explore if, and how, triage affected their treatment outcomes.	Empirical *(Quantitative)* Canada	The ED triage is one of the innovations to the delivery of the current emergency services to regulate the flow and trajectory of patients' care within the ED setting.	To examine the occurrence of severe adverse health outcomes such as sepsis, septic shock, and death.
Viswanathan *et al.* (2020)	To assess the effectiveness of screening for Covid-19 infection compared with no screening.	Systematic literature review	It's necessary greater emphasis on other ways to prevent transmission, such as face coverings, physical distancing, quarantine, and adequate personal protective equipment for frontline workers.	To test different screening strategies considering more comprehensive symptom and risk assessment, rapid laboratory tests, and combinations of approaches.

Table 7: Risk Management Theme.

Crowding Sub-Theme

Among the risks that affected access and quality of care in ED, crowding emerged. Crowding harms patients and medical staff [79], involving the healthcare delivery process and outcomes. Crowding generates delays or no visits for patients or to the abandonment of patients due to the long perceived length of stay [80]. Indeed, the existing literature has shown excess mortality in crowded emergency departments [81,82]. This issue generated a lack of privacy and dignity [83] for patients. The most affected by the harms of crowding are the elderly, the critically ill, the mentally ill and the vulnerable [84]. Delayed patient assessment and delivery of care can generate medical errors as well as negatively impact the cost of treatment and patient satisfaction [85] and an increase in bed occupancy rate [86]. The increased flow of patients generates a delay in the provision of health care, increasing stress and burnout of the medical staff.

As shown in Table 8, this theme evaluates the effectiveness and efficiency of interventions on reducing emergency room crowding also considering the effects of locating primary care professionals in the emergency room to provide care to patients with non-urgent health problems [87-89]. In particular, some studies analyze the crowding within EDs, the most appropriate access target, the clinical effects of the 4-h rule and to delve the evidence on the effectiveness and safety of short-stay units, compared with usual care [90,91]. While, the study conducted by Aacharya et al. [92] provide an ethical analysis of emergency department triage considering the biomedical ethics principles (i.e. respect for autonomy, beneficence, non-maleficence and justice).

The Crowding theme includes six papers, two of these conceptual [90,92], three SLRs [87,88,91] and one empirical study conducted in Germany [89].

The main cause for crowding in ED is the slow transfer of emergency patients to in-patient beds. Several remedial strategies parallel the processing of probable admissions, direct-to-ward admissions, and single-point medical registrars for receiving and processing all referrals directed at specific speciality units [90]. Furthermore, to reduce the negative consequences on hospital costs and patient satisfaction, the study conducted by Galipeau et al. (2015) [91] highlighted that a short-stay unit is a cost-savings option for the effectiveness and safety of short-stay units, compared with inpatient care.

The rapid evaluation of care for the elderly based on time efficiency objectives by dedicated staff reduces the length of stay in the emergency department, but quality methodological approaches are needed to highlight the effectiveness of the intervention in reducing crowding [87].

The Event-Process-Chain is a useful tool for understanding the complexity of emergency medical care and identifying key performance indicators for effective quality management, reducing crowding and improving patient safety and satisfaction. This tool supports hospital managerial leaders to identify critical process steps in the ED [89]. The studies conducted in Ireland, the UK, and Australia have not shown the effectiveness and safety of care provided to non-urgent patients by general practitioners and nurse practitioners versus emergency physicians in the ED to mitigate problems of overcrowding, wait times, and patient flow [88].

It is crucial to give a clinical-ethical-based triage planning process to provide support on educational (communication, stress and aggression management), psychological (feedback), and ethical level. The triage planning phase is crucial for the hospital context to reduce risks such as crowding, adopting a comprehensive ethics perspective [92].

Crowding				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
Aacharya *et al.* (2011)	To provide an ethical analysis of emergency department triage considering the four principles of biomedical ethics (respect for autonomy, beneficence, nonmaleficence and justice).	Conceptual	To provide support on educational (communication, stress and aggression management), psychological (feedback) and ethical level, is essential for realizing a clinical-ethical based process of triage planning.	/
Scott *et al.* (2018)	To analyze the crowding within EDs, the most appropriate access target, the clinical effects of the 4-h rule and differential effects on different patient populations.	Conceptual	Factors preventing timely transfers of emergency patients to in-patient beds is major causes for ED crowding, for which several remedial strategies are possible, including parallel processing of probable admissions, direct-to-ward admissions and single-point medical registrars for receiving and processing all referrals directed at specific specialty units.	/
Galipeau *et al.* (2015)	To update the evidence on the effectiveness and safety of short-stay units, compared with usual care, on hospital and patient outcomes.	Systematic literature review	A short-stay unit is a cost-savings option highlighting the effectiveness and safety of short-stay units, compared with inpatient care.	Further economic studies of short-stay units are required to justify whether the costs of implementation are worth the outcomes compared to usual care.

Hesselink *et al.* (2019)	To assess the effectiveness of interventions on reducing ED crowding by older patients.	Systematic literature review	The rapid assessment and streaming of care for older adults based on time-efficiency goals by dedicated staff lead to a decrease in ED length of stay but poor methodological quality hinder drawing firm conclusions on the intervention's effectiveness in reducing ED crowding by older adults.	To conduct experimental research on reducing ED crowding by older adults, using uniform and valid effect measures to evaluate the effectiveness of interventions.
Gonçalves-Bradley *et al.* (2018)	To assess the effects of locating primary care professionals in EDs to provide care for patients with non-urgent health problems.	Systematic literature review	The study showed weak evidence that the primary care professionals to the ED do not modify patients' subsequent use of primary care or the ED. There is very weak evidence to suggest that general practitioners and nurse practitioners may use fewer resources to treat non-urgent patients in the ED than emergency physicians, and thus that employing sessional primary care providers may introduce cost-savings to EDs.	To investigate whether providing primary care in EDs generates more demand and increases the use of EDs for non-urgent problems and analyze how to maximise the number of practitioners. The effect on wait times, adverse effects, mortality, and patient outcomes must be thorough.
Möckel *et al.* (2015)	To detect critical process steps in the ED with respect to time and efficiency.	Empirical *(Mixed method approach)* Germany	Modelling with Event-Process-Chain is a useful tool to understand the complexity of emergency medical care and to identify key performance indicators for effective quality management, reducing crowding and improving patient safety and satisfaction.	To implement the Event Process Chain methodology and relatively KPI in other countries, to evaluate the effect of these interventions to reduce crowding and to monitor the effectiveness of processes.

Table 8: Crowding sub-theme.

Handoff Sub-Theme

The Handoff theme evaluates the effectiveness and safety of this phase between physicians in the ED analyzing a novel model attending physician staffing to decrease patient handoffs through the standardized procedure in providing diagnostic and follow up care [93-95]. The literature review emerged that the handoffs topic is connected to the risk management theme, as it represents a criticality to be overcome within the healthcare field. A key role during handoffs is played by nurses who provide all information about the patient. This phase allows for identifying predictive actions or interventions on patient care [96,97].

Three papers focused on the handoff theme: two empirical studies conducted in the USA, using quantitative [94] and mixed method approach [93] and one conceptual paper [95]. The papers are summarized in Table 9.

The study conducted by Cheung et al. (2010) [95] showed that handoff aims to provide a clear summary of the patient's visit. Indeed, the medical staff must receive a complete overview of all information on the patient's health status to reduce handoffs by communicating outstanding activities, anticipating changes and making information readily available for direct review.

From empirical studies, it showed that standardizing handoff communication from the Emergency Department to Primary Care Providers improves the quality of patient care by ensuring timely diagnostic and follow-up care. Using the electronic Emergency Provider Written Plan of Discharge (eEPWPD) template, medical staff provides immediate diagnostic and follow-up care reducing waiting times for the patient and improving the service provided [94]. In addition, in a Pediatric Emergency Department in the USA, a multidisciplinary team has redesigned an attending physician staffing model in which there are two zones with overlapping "waterfall" shifts in order to reduce patients handoffs, optimize provider efficiency, and balance workload without increasing total attending physician hours. This overlapping staffing model improved patient safety, emergency department flow, and job satisfaction, reducing the proportion of patient handoffs [93].

Handoff				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
Cheung *et al.* (2010)	to analyze the process and safety of handoffs between physicians in the ED.	Conceptual	To reduce the number of unnecessary handoffs it's necessary to provide a clear summary of the patient's visit, communicating outstanding tasks, anticipating changes, and making information readily available for direct review.	To evaluate how technology supports handoffs and modifies behavior in order to monitor the performance. In addition, to derive the best timing and location of handoffs, define the optimal order of presentation within handoffs and among patients and characterize the integration and influence of medical records.
Watkins & Patrician (2014)	to evaluate the effectiveness of the standardizing handoff in providing diagnostic and follow up care.	Empirical (*quantitative*) USA	To standardize handoff communication from ED to Primary Care Providers improves the quality of patient care by ensuring timely diagnostic and follow-up care.	To validate the use of this tool (an electronic Emergency Provider Written Plan of Discharge) to standardized handoff communication.
Yoshida *et al.* (2019)	to evaluate a novel attending physician staffing model to decrease patient handoffs.	Empirical *(mixed method approach)* USA	An overlapping staffing model improved perceptions of patient safety, ED flow, and job satisfaction reducing the proportion of patient handoffs.	To deepen how this novel staffing model affects patient safety and analyze the effects in other care settings.

Table 9: Handoff sub-theme.

Resilience Theme

Resilience is the ability to react to complex and emergency situations to strengthen ED's staff integrity [98-100].

Medical staff, through resilient strategies, reduce moral distress, increase workplace engagement, reduce turnover and improve patient satisfaction [101].

Nine studies analyzed the resilience theme (Table 10): two conceptual papers [102,103], one SLR [104] and six empirical researches: qualitative studies conducted in Italy [105] and UK [106], two mixed method approach in the UK [107,108], one experiment conducted in USA [109] and one study that implemented discrete event simulation and system dynamics methodology in Italian emergency department.

The reviewed studies analyze social reality and rethink resilience among health professionals identifying system vulnerabilities and quality improvement interventions [102,106]. The studies describe some processes to prevent fatigue in ED nurses and the mental health problems of healthcare professionals, people in isolation, and general citizenship [105,109]. The resilience theme examines the effects of interventions aimed at supporting the resilience and mental health of medical staff identifying barriers and facilitators of these, analyzing also the increase in demand of patients or a reduction in the capacity of beds and the different hospital's adaptive resource allocation strategies in emergency situations [103,104,107,108,110].

Anxiety, loneliness, depressive symptoms and fear of contagion were the main motivations prompting population and health-care professionals to ask for a psychological help highlighting the detrimental role of COVID-19 on both physical and mental health [105].

Monitoring patients and workflow in the ED was identified as a priority for supporting staff to manage the complexity of the work. Staff who are resilient, engaged and enjoy their work provide better quality care to patients and their families [102,106].

Personal Reflective Debrief process alleviates the stress of nurses promoting their resilience. Increasing nurses' resilience to workplace stress can counter compassion fatigue by providing planned, proactive resources to positively improve resiliency [109]. Even monitoring escalation is essential in understanding how to manage workload, analyzing the barriers and facilitators to improvement [107].

Learning through systematic training (for instance workshops and symposia) and simulation can be an important tool for identifying factors that have an impact on adaptive capacity of a resilient culture and to transfer skills [103,108].

Resilience				
Authors	**Purpose**	**Method and Context**	**Key Findings**	**Further Research**
Maldonato *et al.* (2020)	To present a mental health first aid service for people vulnerable to mental health problems, health-care professionals, people in isolation, and general citizenship.	Empirical *(Qualitative)* Italy	Anxiety, loneliness, depressive symptoms and fear of contagion were the main motivations prompting population and health-care professionals to ask for a psychological help highlighting the detrimental role of COVID-19 on both physical and mental health.	To consider different professionals and methods in order to provide psychological support.
Anderson *et al.* (2020)	To develop a method based on resilient healthcare principles to identify system vulnerabilities and quality improvement interventions.	Empirical *(Qualitative)* UK	Monitoring patients and workflow in the ED was identified as a priority for supporting staff to manage the complexity of the work. It's crucial the need to visualize the load on the system so that experts could detect and solve problems efficiently using resilient healthcare principles to address quality improvement.	To test resilient healthcare principles in different settings and organizations, including dental primary care, residential nursing homes and mental healthcare.
Aburn *et al.* (2020)	To explore social reality and rethink resilience among health professionals.	Conceptual	Staff who are resilient, engaged, happy and enjoy their work provide better quality care to patients and their families.	To delve into alternatives to maintaining staff resilience and well-being and analyze social constructionism and social constructivism.

Schmidt & Haglund (2017)	To describe compassion fatigue and to present the process of Personal Reflective Debrief as an intervention to prevent compassion fatigue in ED nurses.	Empirical *(Experiment)* USA	Personal Reflective Debrief alleviates the stress of nurses promoting their resilience. Increasing nurses' resilience to workplace stress can counter compassion fatigue by providing planned, proactive resources to positively improve resiliency.	To evaluate the components of compassion fatigue over time evaluating the appropriate time frame needed for the intervention, large sample sizes, matching pre and post-test compassion fatigue evaluation scores, and evaluation over long periods of time.
Back *et al.*(2017)	To examine escalation policies to analyze the increase in demand of patients or a reduction in the capacity of beds.	Empirical *(Mixed method approach)* UK	Monitoring escalation is essential in understanding how to manage workload, analyzing the barriers and facilitators to improvement.	To test these actions of escalation policies in other contexts in order to generalize the findings.
Pollock *et al.* (2020)	To assess the effects of interventions aimed at supporting the resilience and mental health of frontline health professionals identifying barriers and facilitators of the resiliente interventions.	Systematic literature review	To conduct quantitative and qualitative evidence during or after epidemics that can generate interventions of resilience for the mental health frontline workers highlighting organizational, social, personal, and psychological factors.	To investigate barriers and facilitators to implementation of resilience interventions.
Jeppesen & Wiig (2020)	to understand how resilience can improve the ED context.	Conceptual	Learning through systematic training and simulation can be an important tool for identifying factors that have an impact on adaptive capacity.	To conduct empirical research to build and support resilient systems and processes in ED, identifying factors that promote resilience, both on individual-, team- and system-levels.
Trucco *et al*. (2021)	To assess and compare different hospital's adaptive resource allocation strategies in responding to a Mass Casualty Incident.	Empirical *(Discrete event simulation, system dynamics)* Italy	In the daytime scenario, during the recovery phase of the emergency, a gradual disengagement of resources from the ED to restart ordinary activities in operating rooms and wards, returned the best performance. In the night scenario, the absorption capacity of the ED was evaluated by identifying the current bottleneck and assessment of the benefit of different resource mobilization strategies.	To analyze also additional resilience capacities, such as operational coordination mechanisms, in different countries.
Anderson *et al.* (2016)	To test the feasibility of translating Resilience Engineering concepts into practicalì methods to improve quality in ED.	Empirical *(Mixed method approach)* UK	Clinicians find the philosophy and principles of RE attractive because it accurately portrays the constant variability of clinical work, the need for adjustment and the important role of flexible adaptation in producing outcomes. Workshops and symposia for clinical practitioners may also be used to transfer skills.	To investigate the interaction of varying contextual factors to produce resilience and suggest different ways in which it can be strengthened and to test the application of RE at a larger scale will be required, including studies of other healthcare settings, organizational contexts and different interventions.

Table 10: Resilience theme.

Discussion

The SLR has shown that majority of the studies focuses on quality and safety improvement in ED even during the Covid-19 pandemic [36]. In particular, it is possible to highlight a lack of studies conjointly comparing patients and medical viewpoint or evaluate the effects of all the stakeholders involved in the ED ecosystem. A cross-analysis of the themes showed that the key driver is represented by the development of training courses, since they produce multiple benefits for ED management.

The SLR evidenced that the most implemented improvement strategies are QFD, LFA and Lean [39,40,46] for reducing waste, costs and improving patient care. Patient satisfaction is related to timeliness, quality of care, and trust that is established with the medical staff. To improve patient safety in the emergency room, it is necessary to reduce the duration of triage, evaluation, intervention, and disposition by simplifying medical records' communication and delivery systems [38].

Olry De Labry Lima et al. [37] identified lack of time, inability to access all information, being stuck in a routine, resistance to change, and unwillingness to question decisions made by other colleagues as barriers in the ED. Indeed, the medical staff must cooperate, communicate and share responsibility for patient documentation [47]. In order to improve the processes in the ED, it is necessary to enhance communication with patients and other colleagues and establish a relationship of trust.

The different methodologies and strategies of quality improvement are efficient if they reduce emergency room visits and admissions by avoiding overcrowding [53,54]. In addition, telemedicine services reduced visits and costs during the health emergency period [62,111]. Therefore, the scribes improve patient-operator interaction (i.e. productivity, efficiency, and patient and provider experience) and patient satisfaction [63]. Through the scribes, the number of patients visited per day increases and the length of hospitalization decreases, improving the efficiency of the ED and reducing the perceived risks. However, constant training is necessary to improve process safety [66].

The main risks detected from the SLR managed before the pandemic are: organizational risks (overcrowding, shortage of staff, turnover), security risks (lack of resources and beds); and handoff. Lack of resources and staff generates pressure, stress, and burnout in medical staff, increasing the likelihood of failure to provide care. This problem also emerged during the pandemic, in which the number of nurses had to be optimized [78]. Indeed, to maintain the quality of the nursing service, it is necessary to motivate staff, regulate the 9-hour shift, insert part-time nurses, and apply the rotation of nurses between the hospital's various departments [78].

The main risks that emerged during Covid-19 highlighted a shortage of resources such as intensive care beds, emergency room beds, ventilators, personal protective equipment and drugs. A crisis standard of care can guide rationing supplies of resources, personnel, and care [73]. Another critical issue investigated in recent research is managing hospital risk regarding indoor air quality, surface management and cleaning activities, ventilation and air conditioning systems, and filter efficiency [72,73, 74].

However, it has been possible to mitigate and manage both organizational and security risks during these months through telemedicine with tele triage. Therefore, a virtual visit of the ED doctor improves the quality of the service provided to patients [72].

Despite identifying risks, it is always crucial to provide staff training to acquire technical, scientific and interpersonal skills [69]. The participation of all stakeholders involved in the ED ecosystem for reducing risk and improving patient safety through adequate incident reporting, communication and collaboration is pivotal to remove barriers to care safety [70].

A growing part of the literature, also in light of the Covid-19 health crisis, focuses on resilience. It emerged that through training courses it is possible to implement a resilient culture within healthcare settings [112,103,108].

Anxiety, loneliness, fear of contagion have pushed healthcare workers to ask for psychological help, highlighting the damage generated by Covid-19 on both physical and mental health [105]. Medical staff, through resilient strategies, reduces moral distress, increases workplace involvement, reduces turnover and improves patient satisfaction [101]. For instance, debriefing programs facilitate communication between clinicians and team leaders by reducing adverse outcomes, improving processes, alleviating burnout, and increasing resilience [36].

Agenda for Further Research

The SLR highlighted the need to further investigate viewpoints of patients and medical staff in health systems of different cultural contexts and delving into how the digitalization contributes to enhancing service quality and disseminating a resilience culture.

For each theme and sub-theme detected, we propose specific directions for future research (Figure 6).

The *Quality improvement* theme highlighted the need to develop empirical studies in other countries for enhancing the quality, safety and process considering measures of emergency admissions, benefits to trainee workforce and intrahospital rate-limiting effects such as delayed transfers of care or hospital occupancy, also developing and monitoring indicators that improve clinical outcomes, staff and patient experience in a cost-

efficient manner. In addition, evaluate analytic hierarchy process, the analytic network process, fuzzy theory and test kaizen in other countries and departments adopting a multicenter prospective approach and considering its impact on patient outcomes.

Further studies could understand the lean applications and effects on quality improvement and patients' satisfaction. Scholars must focus on patient safety for continuous improvement in the ED considering resource management (care coordination and cost).

Furthermore, considering the diffusion of technological tools to support the healthcare context, future studies will have to evaluate the effectiveness of e-learning and telemedicine and on how it changes healthcare professional behaviour or patient outcomes (Table 4).

As shown Table 5, the *Effectiveness of quality improvement strategies* theme reveals the need to analyze the effectiveness and cost-effectiveness of emergency telehealth services and visit reduction programs in several contexts to allow comparable researches. It is crucial to delve into how to optimize care coordination strategies (for instance transitions in care between EMS and ED nurses). In light of this, further research could identify the "usual care" that define healthcare workers involved to prevent errors in primary care.

For the *theme Scribes* (Table 6), future studies could be developed to determine the cost-benefit effect of scribes and the effect on satisfaction, physician stress and burnout in other countries. More information needed on the effectiveness and clinical findings, harms, patient or clinician satisfaction, financial productivity in EDs and costs before widespread implementation of scribes. In fact, there is a lack of data on the potential of virtual scribes and the costs of developing, implementing or maintaining a scribe program.

Further research for *Risk management* theme could investigate attitudes to incident reporting, and comparison of 'reported' and 'reportable' incidents to improve the systems and accurate reporting of incidents in emergency care. Scholars in order to improve service quality can investigate the causes of practice errors and formulate safety improvement strategies and a quality assurance program. Regarding the risks that emerged during the pandemic, it is necessary to investigate how the EDs managed the allocation of human resources to manage the flow of patients, testing screening strategies considering more comprehensive symptom and risk assessment, rapid laboratory tests, and combinations of approaches (Table 7).

From the *Crowding theme* (Table 8), there arises the necessity to investigate, through experimental research, whether providing primary care in EDs generates more demand, increases the use of EDs for non-urgent problems, and analyze how to maximize the number of practitioners.

Regarding the *Handoff theme* (Table 9), the need emerges for the development of further studies to evaluate how technology, such as electronic Emergency Provider Written Plan of Discharge supports handoffs and modifies behavior for monitoring the performance and standardizing communication. In addition, to derive the best timing and location of handoffs, one must define the optimal order of presentation within handoffs and among patients and characterize the integration and influence of medical records, analyzing also the effects in other care settings.

Regarding the *Resilience theme*, reviewed studies have shown the need to test resilient healthcare principles in different settings and organizations to generalize findings, exploring barriers and facilitators to implementation of resilient interventions both on individual, team and system levels. Future studies will need to consider several professionals and methods in order to provide psychological support to medical workers. In addition, to delve into alternatives to maintaining staff resilience and well-being and analyze social constructionism and social constructivism (Table 10).

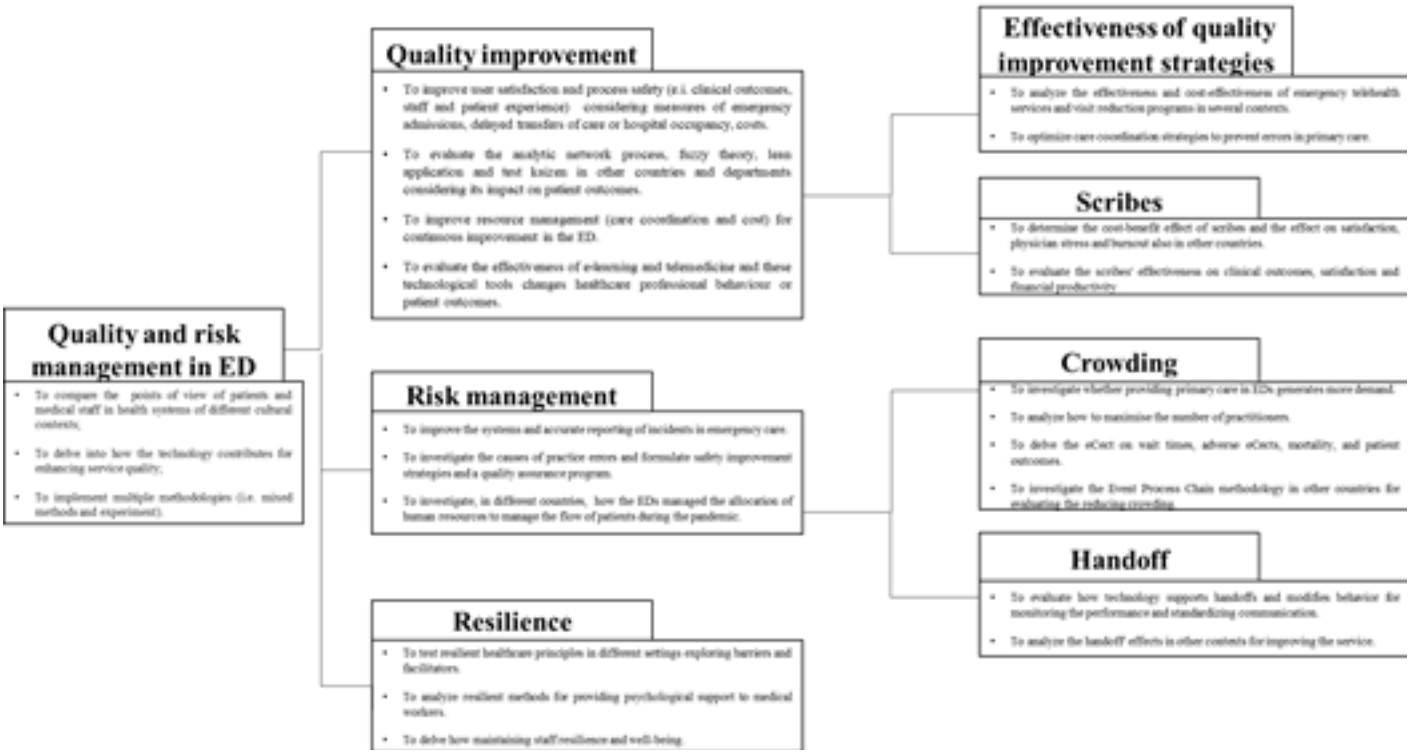

Figure 6: Directions for future research.

Conclusions

The SLR overview informs scholars and practitioners on future research opportunities and the development of interventions to enhance service quality improvement in the ED setting.

The research shows the growing interest in quality improvement, risk management and resilience issues, emphasizing the recent changes. Therefore, our SLR highlighted the need to invest in the ED improvement, as it is a crucial linkage point between territorial healthcare assistance and hospital management. Managing service quality and risks are pivotal strategies to achieve excellence and to enhance performance in ED [113,114], enhancing satisfaction of both staff and patients. The spread of a resilient culture increases medical staff well-being by generating autonomy, personal growth, job satisfaction and the proactivity to manage several risks.

Our research highlights how risk management and continuous improvement through monitoring the workflow of healthcare personnel and the satisfaction of patients and medical staff are strategic and synergistic variables for identifying barriers to resilience.

The research has some limitations. We considered one database and papers written in English. Therefore, some studies lacks by not including other databases and languages other than English. In addition, the study sought only papers focused on risk management to improve the service quality and the advantages of the spread of a resilience' culture in the Emergency Departments. Future studies analyses more specific themes to inform scholars and practitioners on interventions to enhance service quality and involving all the stakeholders of the ED ecosystem [114].

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