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A review of policies and procedures relating to patient safety and healthcare quality

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Abstract

Many organisational, technological, human and patient behavioural factors affect patient safety and care quality. Appropriate policies and procedures need to be implemented to improve patient safety and healthcare quality. Much research has been done on these aspects.

This review aimed to answer three questions related to the factors of patient safety and care quality, and policies and procedures to be used to enhance them. Google Scholar was searched to identify the relevant papers published during 2020-2025. After screening and selecting through the PRISMA flow process, 25 papers were finally selected. These papers were described, discussed, and conclusions were drawn.

Based on the findings discussed above, it can be concluded that this review of 25 papers answered all three research questions well. Many organisational, technological, human behavioural and patient behavioural factors were identified to be affecting patient safety and the quality of healthcare. The findings also showed the great promise of IoT and AI tools to ensure patient safety and care quality. Mobile-based applications of these technologies might be more useful. However, none of the papers reported any findings on this aspect. The numerical trends of the reviewed papers show dominance of reviews at the cost of empirical studies, although the quality of these papers was generally good.

Some limitations and scope for further research have been mentioned.

Keywords: Patient safety, care quality, policies and procedures, factors affecting.

Introduction

WHO defines patient safety as “the absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum." (WHO, 2023).

The Institute of Medicine (IOM) defined quality as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.” (Mitchell, 2008).

According to a WHO report (WHO, 2023), almost 1 in every 10 patients is harmed in health care, and more than 3 million deaths occur annually due to unsafe care. This is as high as 4 in 100 in low-to middle-income countries. About half of this is contributed by

medications, and 50% of them are preventable. About 80% of the 4 in 10 patients affected by primary and ambulatory care are preventable. Common adverse events of avoidable patient harm are medication errors, unsafe surgical procedures, health care-associated infections, diagnostic errors, patient falls, pressure ulcers, patient misidentification, unsafe blood transfusion and venous thromboembolism. The economic effects of these harms are about a 0.75% decrease in global GDP and indirect costs of trillions of dollars. Reduction in inpatient harm through improved patient engagement has been found to reduce the harm by about 15%.

One or more of the factors related to system and organisational factors, technological factors, human behavioural factors, patient-related factors, and external factors are responsible for such patient harms.

Thus, policies and procedures for patient safety and healthcare quality consists of a framework of organisational commitment, evidence-based practices, staff training, and incident reporting systems to prevent harm, improve outcomes, and foster a culture of continuous learning and safety. Critical elements include leadership engagement, creating a fair and just culture, implementing specific safety initiatives (like medication safety), standardised care processes, technology adoption, and continuous data collection and analysis to drive improvement and ensure accountability.

The specific examples are preventing medication-related errors through standardised processes and technology, implementing steps to prevent hospital-related infections, adhering to surgical protocols and implementing procedures for precise identification of patients. The Joint Commission in the USA has prescribed certain standards of patient safety, and organisations are instructed to report adverse events. The WHO promotes global efforts by providing guidelines and action plans, like the Global Patient Safety Action Plan. The National Health Mission of India has implemented quality assurance standards and other initiatives to improve patient safety in India.

The above information led to a PRISMA review of recent research related to these topics. This systematic review aims to answer the following research questions:

a) What are the organisational factors, technological factors, human behavioural factors, patient-related factors, and external factors affecting patient safety?
b) What are the organisational factors, technological factors, human behavioural factors, patient-related factors, and external factors affecting healthcare quality?
c) What are the policies and procedures to be followed to enhance patient safety and healthcare quality?

The methodology followed for identifying papers, screening and selection, description of the results and discussions, integrating the findings from the reviewed papers, conclusions and recommendations derivable from the review, and some limitations of this review are provided in the following sections.

Methodology

Google Scholar was searched to identify the papers for possible inclusion in the review. They were screened and selected through the PRISMA flow process using some inclusion and exclusion criteria as given in Table 1.

Figure 1

PRISMA

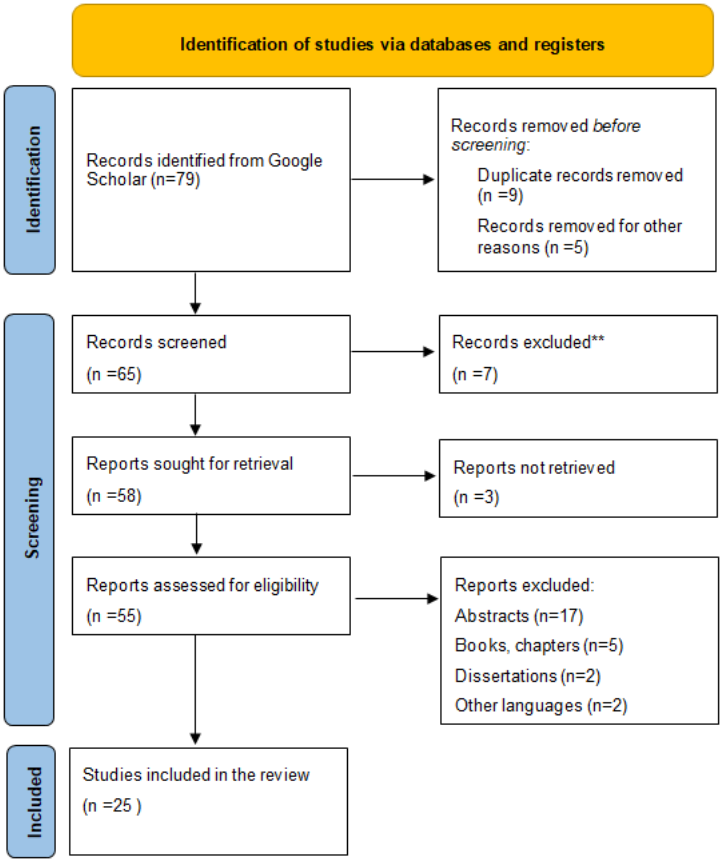

Table 1

Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria	Remarks
Only full-texts	Abstracts	Abstracts may not contain the full information needed.
Published in English only	Other languages	Even the best translation might distort information
Only those published during 2020-2026.	Earlier years	To reflect the recent trends.
	Books, book chapters	Full-texts may not be available in Google Scholar
	Dissertations	Guided research
	Editorials, comments, etc	They are on other research papers
	Inadequate reference details	Citation problems

Quality assessment of papers

The quality of the selected papers was assessed as listed in Table 2.

Table 2

Quality assessment criteria for reviewed papers

Quality criterion	Range of points
Whether the title reflects the actual work	Reflects-1 No-0
Whether the introduction section provides adequate background to the research	Provides-1 No- 0
Whether the Aim of the research is defined well.	Defined well-1 Not defined well-0
Whether the Methodology is appropriate for the Aim.	Appropriate-1 Not appropriate- 0
Whether the Findings are clear and useful either for research or for practice, or both	Research- 1 Practice - 1 Both- 2 None- 0
Whether the discussion considers all possible explanations for the findings and justifies the one given as the best one.	All possible explanations- 1 Selecting the right one- 1 Justifying this as the best one- 2 None-0
Whether the conclusions are appropriate to the research	Yes- 1 No- 0
Whether any limitations have been provided	Yes- 1 No-0
Whether any useful recommendations have been given for research or practice, or both	Research-1 Practice-1 Both- 2 None- 0

The overall quality was given as the sum of all these quality scores.

An Excel file was prepared to facilitate the identification of quantitative trends and the quality of the reviewed papers.

Results

Using a mixed approach consisting of a survey of 562 nurses and focus group interviews with 48 UAE nurses, Bani Issa, et al. (2020) noted that about 48% nurses expressed concerns about the security of electronic health records of patients. Concerns most commonly reported included administrative security issues, insufficient staff training, and unauthorised user access. Key patient safety risks stemmed from non-technical challenges such as inadequate staff auditing, ineffective communication with technology providers, and excessive time spent on documentation. Inconsistencies in data integrity policies were an additional factor identified in the interviews. These results show that frontline nurse managers should implement practical policies that help staff adhere to ethical standards when handling online data. Nurses are expected to follow institutional guidelines that encourage the reporting of potential risks through digital incident reporting systems to maintain data integrity. Establishing a cohesive health policy grounded in multidisciplinary collaboration is essential for protecting online data and reinforcing public confidence. Limitations of convenience sampling, restricting to certain healthcare organisations, and only one EHR from the same vendor reduce the generalisability of the findings.

A systematic review of six papers by Vaismoradi, Tella, Logan, Khakurel, and Vizcaya-Moreno (2020) showed that patient safety aspects of clinical nursing interventions included the management of peripheral venous catheters, surgical hand rubbing instructions, double-checking policies of medicines management, nursing handover

between wards, cardiac monitoring and surveillance, and care-associated infection precautions. Patients' participation, healthcare providers' knowledge and attitudes, collaboration by nurses, appropriate equipment and electronic systems, education and regular feedback, and standardisation of the care process influenced nurses' adherence to patient-safety principles. Thus, both individual and systemic factors are involved in patient safety during nursing care. The limitations of only six papers used for the review and focusing only on nurses adhering to patient safety have been mentioned. Ongoing education and consistent feedback play a vital role in reinforcing nurses' accountability for their actions and professional conduct. Healthcare leaders are expected to empower nurses to act in alignment with care standards, which can be fostered through a strong culture of patient safety, structured training initiatives, and timely reminders. Standardised procedures, supported by validated tools, help guide nursing practice and promote adherence to safety protocols. Moreover, the effectiveness of clinical guidelines is enhanced by their usability, clear formatting, ease of access, and attention to practical factors such as time constraints, staffing levels, communication pathways, procedural accuracy, equipment availability, and logistical support-all of which contribute to the delivery of safe and reliable care.

A comprehensive review by Bhati, Deogade, and Kanyal (2023) stressed the importance of hospital administration for positive patient outcomes, including patient safety and quality care. Efficient hospital administration hinges on strong leadership and nuanced financial oversight, both of which are vital to advancing patient-centred care and fostering interdisciplinary teamwork. Additionally, the authors emphasised the importance of data-informed evaluation through measurement, analysis, and benchmarking as a cornerstone for gauging hospital performance. Looking forward, the trajectory of healthcare administration will be influenced by technological innovations, shifting policy landscapes, and enduring systemic challenges. Recommendations include prioritising the development of capable, forward-thinking administrators, investing in technology, promoting value-based care, sharing responsibility and addressing disparities to ensure that the promise of better patient outcomes remains at the heart of healthcare administration.

A survey of 117 Slovakian nurses by Soósová (2021) showed that elevated levels of burnout were strongly associated with diminished patient safety ratings, poorer overall perceptions of safety, increased incidence of adverse events, and a rise in medication errors. Positive perceptions of safety were linked to effective teamwork within hospital units and a culture that avoids punitive responses to mistakes. Conversely, the frequency of reported incidents showed a negative correlation with hospital management support and supervisory engagement, but a positive association with feedback mechanisms. Medication errors were more prevalent in settings emphasising organisational learning and ongoing safety improvements, yet less common where staffing levels were adequate. Notably, key associations emerged between management support, non-punitive error responses, intra-unit teamwork, and specific adverse events. The limitations include the cross-sectional descriptive design of the study, which limits the clarification of causal relationships between variables. The selection and size of the sample, the number and type of hospitals involved in the study, limit the generalizability of the results and may cause a slight skew in the data. There is also a lower overall reliability of the instrument. The authors recommend that optimising the workplace safety climate can contribute to promoting mental health and preventing burnout in employees, and consequently to having better patient safety outcomes.

There is a need to have adequate staffing, to prevent burnout syndrome, to build a national system aimed at comprehensively improving patient safety, and to integrate the issue of patient safety culture into education in healthcare study programs.

Rangachari and Woods (2020) used an organisational resilience framework to explain how an indifferent approach to supporting the healthcare workers during the COVID-19 pandemic compromised patient safety and staff retention due to reduced organisational resilience. There is a need for healthcare organisational leaders to adopt a holistic consideration of worker psychological safety, recognising the broader impact of emotional distress created by COVID-19.

In a systematic review of 45 papers, Chauhan, et al. (2020) used narrative synthesis to show that individuals from ethnic minority backgrounds were understood and categorised in diverse ways; compared to the general population, they experienced disproportionately higher rates of hospital-acquired infections, medical complications, adverse drug reactions, and dosing inaccuracies and the contributing factors to these elevated safety risks were language barriers, cultural beliefs regarding illness and treatment, reliance on both formal and informal interpreters, levels of patient involvement, and the nature of their interactions with healthcare professionals. Thus, ethnic minority patients may experience inequity in the safety of care and be at higher risk of patient safety events. The individual, inter- and intra-ethnic variations, like safety events, need to be understood to determine where and how to invest resources to enhance equity in the safety of care. The findings underscore the urgent need for richer socio-cultural data integration across health systems. There remains a limited understanding of both the contributing and compounding factors that influence healthcare safety among ethnic minority populations, as well as the distinct safety-related experiences across different groups. Actively involving ethnic minority consumers in the co-design of safety-enhancing interventions is essential to address these gaps effectively. The limitations were related to the diversity of the definitions used to determine the ethnic minority population, shaping the findings, the exclusion of unpublished and grey literature, and possible publication bias.

Continuous surveillance monitoring was found to be effective in addressing the risk of sedative/analgesic-related respiratory arrests in hospitals. McGrath, et al. (2021) used a retrospective review of 111,488 patients with surveillance monitoring in units of rural settings for 10 years. None was harmed or died from opioid-induced respiratory depression when surveillance monitoring was in use. One limitation of this study was that there was no possibility to compare with the data before the implementation of the continuous surveillance monitoring in 2007. The methods used in this study may not give the same results in other settings. Thus, surveillance monitoring for pharmacologically induced respiratory arrest in hospitalised patients can virtually eliminate deaths due to this serious but treatable complication. However, it may be possible to use engineering design principles and systems and tools already available to eliminate deaths due to sedative/analgesic medications in hospitalised patients, without waiting for research findings.

The role of the Internet of Things (IoT) in ensuring patient safety and quality care was reviewed by Pradhan, Bhattacharyya, and Pal (2021). IoT is used for connecting various medical devices, sensors, and healthcare professionals to provide quality medical services in a remote location. It has reduced healthcare costs, enhanced the accessibility of healthcare services, and increased operational efficiency in the healthcare industry.

The authors discussed the architecture of healthcare IoT (HIoT), different applications of IoT in healthcare related to identification, communication and location, services possible with HIoT, challenges and limitations of scalability, cost, power consumption, standardisation, data privacy and security, self-configuration, continuous monitoring, exploration of new diseases and environmental impact.

Nine important challenges related to HIoT in patient safety were identified by Sittig, et al. (2020). They were categorised according to their stages of occurrence as 1) developing models, methods, and tools to enable risk assessment; (2) developing standard user interface design features and functions; (3) ensuring the safety of software in an interfaced, network-enabled clinical environment; (4) implementing a method for unambiguous patient identification (1-4 Design and Development stage); (5) developing and implementing decision support which improves safety; (6) identifying practices to safely manage information technology system transitions (5 and 6 Implementation and Use stage); (7) developing real-time methods to enable automated surveillance and monitoring of system performance and safety; (8) establishing the cultural and legal framework/safe harbor to allow sharing information about hazards and adverse events; and (9) developing models and methods for consumers/patients to improve health information technology safety (7-9 Monitoring, Evaluation, and Optimisation stage). Solutions to each of these challenges need to be completed by the time they occur.

Medical errors are leading causes of death among patients. Both causes and viable solutions to all types of errors in all contexts are difficult to find. Medical errors due to omission occur when action is not taken at the appropriate time. Medical errors due to commission occur due to wrong actions. The Joint Commission has issued 10 patient safety goals. Many of these errors are beyond the control of clinicians. Hence, accountability is a problem. Medical errors can happen when extreme cost control steps are taken, or when an error is not reported by the clinician for fear of punishment or reputation loss. Cultivating an error-free culture is important. Medical errors can be classified into active, adverse, latent, near miss, never events, noxious episode, or negligence. Medical errors account for several billion dollars. The authors examined many errors of different types and their solutions (Rodziewicz & Hipskind, 2020).

A review of 42 reviews by Ocloo, Garfield, Franklin, and Dawson (2021) showed that a meaningful commitment to patient-public involvement (PPI) and collaborative working requires a comprehensive, system-wide approach. This entails recognising and navigating the intricate personal and institutional factors that either facilitate or hinder engagement, while actively confronting power disparities among stakeholder groups. Despite their importance, issues of equality, diversity, and the application of theoretical frameworks to guide PPI remain underexplored. However, the longstanding culture of involvement within health and social care offers valuable insights and experience that can inform and enhance PPI strategies. This is particularly crucial in the realm of patient safety, where PPI is a relatively recent development compared to other healthcare domains. Some authors used patient safety theory, the theory of planned behaviour, and the health belief model. One limitation of this study was its exclusion of grey literature, as the review concentrated exclusively on published, peer-reviewed systematic reviews. The data were extracted from the content provided by the review authors, which constrained the analysis to the level of detail and scope they reported.

The SEIPS and SEIPS 2.0 models offer a structured approach to embedding human factors engineering (HFE) into efforts aimed at enhancing health care quality and patient safety. With the growing spatial and temporal dispersion of care delivery, the "process" element within the SEIPS framework must adapt to reflect this heightened complexity. After reviewing different process components of the SEIPS 2.0 model, Carayon, Wooldridge, Hoonakker, Hundt, and Kelly (2020) proposed SEIPS 3.0 model. This model uses the concept of patient journey to expand the process component. The National Academies of Sciences, Engineering and Medicine (NASEM) defined the patient journey as follows: "The patient journey consists of the myriad interactions that patients have with the health care system, health care providers (formal and informal), and families and friends and among themselves. These interactions occur over time and across multiple health care settings, such as clinics and hospitals, and within communities. The spatio-temporal interactions and transitions in care experienced by a person constitute the essence of the patient journey." However, the new model poses many challenges when considering multiple perspectives, issues related to the genuine participation of patients and human factors. The SEIPS 3.0 sociotechnical framework conceptualises the patient journey as a sequence of interactions within localised micro work systems, each nested within broader socio-organisational structures. This layered, multi-level configuration unfolding across spatial and temporal dimensions defines the core of the patient experience. Enhancing the patient journey and outcomes like safety demands that human factors engineering (HFE) experts and health care practitioners devise creative strategies to involve diverse stakeholders, reconcile their viewpoints, and operate effectively across various system interfaces.

A systematic review of 53 papers by Choudhury and Asan (2020) showed that AI-enabled decision support systems, when implemented correctly, can aid in enhancing patient safety by improving error detection, patient stratification, and drug management. Decision tree models recognised clinical alarms and drug safety, and SVM analysed clinical reports. A lack of standardised benchmarks and differences in AI description were also noted among the reviewed papers. Limiting the scope of the literature search to only machine learning and natural language processing, and only to papers in English, was mentioned by the authors. The review addressed safety issues as identified by the Health Insurance Portability and Accountability Act (HIPAA) and the US Department of Health & Human Services (HHS). The HIPAA regulations identify risk analysis as part of the administrative safeguard requirement to improve patient safety. The HHS advocates analysis of clinical notes to track, detect, and evaluate potential risks to patients. AI has the potential to provide valuable insights to treat patients correctly by identifying future health or safety risks to improve healthcare quality and reduce clinical errors. Recommendations for future research include developing gold standards to measure AI performance, a standard framework to measure and interpret AI evaluation metrics, investments in infrastructure for the storage of large volumes of data, studies on AI adaptation to evolving conditions, and integration of AI into the current healthcare systems.

From a systematic review of 76 papers, Hussein, Pavlova, Ghalwash, and Groot (2021) obtained reasonable evidence that accreditation improves the quality of care in hospitals. Beyond its influence on the quality of care and on healthcare workers, especially concerning job stress, the findings revealed that hospital accreditation consistently enhances safety culture, process-related performance indicators, operational efficiency, and patient length of stay. However, no significant association

was observed between accreditation and employee satisfaction, patient satisfaction and experience, or the 30-day hospital readmission rate. Conflicting evidence regarding its impact on mortality rates and healthcare-associated infections prevented definitive conclusions on these outcomes. The authors acknowledge that the non-inclusion of some papers not published in peer-reviewed journals and not including grey literature is still possible. Hospital accreditation stimulates performance improvement and patient safety. In synchronisation with other health policies, efforts to incentivise and modernise accreditation are recommended to move towards institutionalisation and sustain the performance gains.

A survey of 15,738 nurses and 5312 physicians by Aiken, et al. (2023) revealed that enhancing clinician well-being and retention requires deliberate actions by management to improve nurse staffing, work environments, and patient safety culture. Hospital-based clinicians are experiencing pervasive burnout, which has been linked to high staff turnover and risks to patient safety. Moreover, many clinicians express limited trust in management's ability to address care-related challenges. They prioritise enhancements in staffing levels and workplace conditions over the implementation of wellness or resilience initiatives when it comes to supporting their mental health and overall well-being. This study has several limitations. It was conducted during the COVID-19 pandemic, a period marked by heightened strain on clinician well-being, though evidence indicates that burnout levels were already elevated before the pandemic. The participating hospitals were Magnet-recognised, limiting the generalizability of findings to the broader hospital landscape. Notably, a concurrent study involving a more representative sample of hospitals found that nurse well-being, along with assessments of quality and safety, was markedly poorer in non-Magnet institutions. Additionally, the cross-sectional design of this study precludes causal inference. Finally, the reliance on email surveys, which typically yield lower response rates, was further challenged by pandemic-related disruptions. The lack of collaboration between clinicians and management affects patient safety culture. Both physicians and nurses were more concerned about improving their ability to provide better care to patients than about patient care or safety.

Although many benefits have been attributed to electronic medical records (EMR), there are problems of cost, interoperability and standardisation. There is a need to implement policies to solve these problems. EMRs, when effectively implemented, have demonstrated improvements in the quality and consistency of healthcare delivery. A critical insight from the experience of Janett and Yeracaris (2020) is the importance of thoughtfully aligning EMR systems with clinical workflows to fully harness their potential in enhancing patient care. A comprehensive primary care model consists of EMR as an essential component. Core components of this integrated care model include the assignment of patients to dedicated provider teams (empanelment), streamlined access to appointments, and a collaborative, multidisciplinary approach to care delivery. Team members share accountability for implementing evidence-based interventions consistently and reliably. The model emphasises seamless sharing of clinical information across the care team, facilitates electronic communication with patients, and employs structured checklists to proactively address care gaps during office visits. Additionally, it incorporates targeted outreach to patients who are not actively engaged in care but are identified as having unmet health needs. Although the implementation cost is high, the overall benefit-to-cost ratio favours the use of EMR. Though younger, tech-savvy providers tend to accept EMR more readily, training, policies, procedures

and financial incentives can increase acceptability. EMR improves patient-physician relationships. EMR can be used for population health despite the barriers of missing data, lack of standards for interoperability of different EMR systems, loss of productivity, and overly complex technology. EMR improves care quality through enhanced efficiencies. Team-based care models are supported by EMR. It improves communication. Interventions at all levels of workflow can improve care quality due to EMR. The authors tabulated the essential features of high-performance EMR and the best medication management practices. EMR has different functions at pre-visit, during the visit, post-visit and between visits phases. Electronic Medical Records (EMRs) represent a transformative technology with the potential to fundamentally reshape patient care delivery. Insights from the US experience highlight two critical factors for successful implementation: ensuring interoperability across diverse systems and thoughtfully integrating EMRs into clinical workflows to fully realise their capacity to enhance care quality.

The effectiveness of EMR-driven strategies to enhance patient safety is multifaceted and highly contingent on the context in which they are implemented, including the specific individuals involved, the nature of the intervention, its timing, purpose, and delivery method. Outcomes hinge not only on the traits and actions of those targeted by the intervention, but also on its technical design and the broader organisational culture and infrastructure of the health system deploying it. To address these issues, Singh and Sittig (2020) proposed a Safety-related EHR Research (SAFER) reporting framework. The framework has eight dimensions and targets patient safety. The eight sociotechnical dimensions are hardware and software, clinical content, human-computer interface, workflow and communication, people, internal organisational features, external rules and regulations, and measurement and monitoring. The authors have tabulated how these eight dimensions SAFER framework address the questions: what, why, and how. The SAFER Reporting Framework does not replace previous research reporting guidelines, but provides a sociotechnical adjunct that complements their use. The authors have given recommendations for conducting research and for reporting using this framework.

A narrative review by Haque, et al. (2020) revealed that despite its historical origins, hand hygiene remains the cornerstone of global efforts to prevent healthcare-associated infections (HCAIs). It is part of a broader set of practices aimed at maintaining a clean and safe hospital environment and curbing the spread of infectious agents, including those resistant to multiple drugs. In addition, antibiotic stewardship plays a vital role in mitigating the burden of HCAIs by preserving the effectiveness of existing antimicrobial therapies. Limitations of narrative reviews and the possible inadequacies in the coverage of all HCAI prevention practices are mentioned. Recommendations are given for rigorous practice of hand hygiene and prudent use of antimicrobials as part of multimodal hygienic practices. The importance of these practices to prevent HCAIs has been highlighted.

Marzban, Najafi, Agolli, and Ashrafi (2022) categorised the findings of a scoping review of 17 papers related to patient engagement into four groups: health outcome, patient compliance, self-efficacy, and return on investment. Patient engagement (PE) can improve both treatment outcomes and, consequently, patient satisfaction and health, as well as the productivity of the service provider. However, increasing self-care and patient adherence are among the positive effects, and return on investment remains a challenge for PE. Health outcomes included care quality, achieving treatment results,

patient satisfaction, and reduction of depression and anxiety. Patient compliance was related to adherence to treatment procedures. Self-efficacy was related to self-control and patient responsibility. Return on investment included both time and resources spent. Limitations include the limited papers available and the inclusion of only papers published in English. Based on the observations, the authors recommend more research on the topic. PE might be beneficial to patients and service providers alike. Patients can be apprehensive about participating in clinical trials, but it is imperative to have the patient's perspective when designing and implementing trials to ensure that their perspective is at the forefront.

Generative AI, with its ability to produce novel data-including text, images, and other modalities-offers transformative potential for improving patient care, advancing diagnostic accuracy, and broadening therapeutic possibilities. Yet, its practical value and implications within healthcare systems remain insufficiently explored. Key concerns persist around ethical governance, medico-legal accountability, integration into clinical workflows, and implications for workforce roles. Moreover, a clear and actionable roadmap for the implementation and integration of generative AI into routine healthcare delivery is still lacking. A comprehensive overview (Reddy, 2024) showed that Generative AI, consisting of Generative Adversarial Networks (GAN), variational autoencoders (VAE), large language models (LLM), autoregressive models, diffusion models, flow-based models (FBM), and energy-based models (EBM), can be used for the generation of texts, images and other data. These can be used for synthetic data, drug discovery, medical diagnosis, clinical documentation, patient education, personalised care, healthcare administration, and medical education and training. To study the acceptance and adoption of Generative AI in the medical field, the technology acceptance model (TAM) and the Non-Adoption, Abandonment, Scale-up, Spread and Sustainability (NASSS) model can be used. Generative AI is not a panacea for systemic failures in healthcare, but its thoughtful and ethically guided integration can catalyse meaningful reform. Success hinges not merely on technological advancement, but on the principles and processes that shape its adoption. When steered by insight and empathy, generative AI holds the potential to revive core values that have eroded in many health systems-ensuring care that is high-quality, accessible, and deeply humane.

A systematic review of 14 papers by Al Shamsi, Almutairi, Al Mashrafi, and Al Kalbani (2020) revealed that language barriers in healthcare settings often result in miscommunication between providers and patients, leading to diminished satisfaction on both sides and compromising the quality and safety of care. While interpreter services are commonly employed to bridge these gaps, they can inadvertently increase healthcare costs and prolong treatment durations. A review highlighted that digital translation tools-such as Google Translate and MediBabble-when implemented in hospital settings, significantly enhanced provider and patient satisfaction (up to 92%) and contributed to improved care quality and safety. Despite these promising innovations, many institutions continue to rely on traditional interpreter services, which may not be cost-effective or time-efficient. These results demonstrate the usefulness of online translation tools in improving communication between providers and patients, leading to improved satisfaction, care quality and patient safety. The Availability of only a few papers on the use of online translation tools and challenges of language barriers in private healthcare organisations are two limitations of this study. The authors recommend new updates with more medical phrases for Google Translate and with more languages included for MediBabble applications.

A systematic review of 297 papers by Buljac-Samardzic, Doekhie, and van Wijngaarden (2020) showed three types of team interventions for improved team performance in healthcare. They included training, subdivided into training that is based on predefined principles (i.e. CRM: crew resource management and TeamSTEPPS: Team Strategies and Tools to Enhance Performance and Patient Safety), on a specific method (i.e. simulation), or on general team training; tools covers tools that structure (i.e. SBAR: Situation, Background, Assessment, and Recommendation, (de)briefing checklists, and rounds), facilitate (through communication technology), or trigger (through monitoring and feedback) teamwork; and organisational (re)design is about (re)designing structures to stimulate team processes and team functioning. A fourth sub-group was an integrative programme combining the previous types. The majority of studies evaluated a training focused on the (acute) hospital care setting. Principle-based training (i.e. CRM and TeamSTEPPS) and simulation-based training seem to provide the greatest opportunities for reaching the improvement goals in team functioning. Limitations of not using umbrella reviews for each topic, exclusion of certain topics and grey literature from the review, and including only papers in English were mentioned. More research on the reviewed topics has been recommended.

In healthcare, conventional top-down approaches-anchored in linear models of change and dependent on policy directives, hierarchical structures, and standardisation- have consistently fallen short in addressing this challenge. In response, we must integrate principles from complexity science and continuous improvement with the vision of a deep learning health system. Such a system offers the capacity to synthesise diverse data streams, including patient histories, clinical records, laboratory results, and cost metrics, to enable more timely and informed decision-making. When effectively implemented, it promises to make healthcare more evidence-driven, while reducing inefficiencies and harm. Realising this vision will require a purpose-built digital infrastructure, the strategic application of artificial intelligence to enhance diagnostic and therapeutic choices, and the ability to incorporate genomic and other emerging data types. Crucially, it must also facilitate meaningful, informed dialogue among patients, families, and clinicians. Although multiple iterations of the model will emerge, widespread adoption will depend on innovation diffusion and locally tailored adaptations. Performance has flatlined: 60% of care on average is in line with evidence- or consensus-based guidelines, 30% is some form of waste or of low value, and 10% is harm. The 60-30-10 Challenge has persisted for three decades. Deep learning technologies offer powerful means to harness the growing volume and diversity of health data, ranging from conventional datasets to emerging sources such as genomics and cost metrics, while also integrating patient preferences into clinical decision-making. As envisioned, these systems will advance healthcare's commitment to continuous improvement, particularly in relation to the 60-30-10 performance benchmarks. Although contemporary health systems generate vast amounts of data, only recently have we developed the capacity to consolidate, operationalise, and transform this data into actionable insights that enable more informed and timely decisions than previously possible. The consequences of failure to make the transition to AI models of healthcare on patient safety and healthcare quality will be serious (Braithwaite, Glasziou, & Westbrook, 2020).

In telehealth, audio and video technologies are used. This method of healthcare delivery has transcended from providing primary care to rural and underserved populations to a widely practised method, especially after the COVID-19 pandemic. The benefits of

telehealth include improved patient satisfaction, efficiency and quality of care with minimum cost. The barriers are the lack of a multistate telehealth license, inadequate patient privacy and confidentiality, inadequate provider-patient relationships, medical liability issues, fraud and abuse, prescribing controlled substances, and reimbursement problems. Thus, acceptance and adoption of telehealth are increasing despite some barriers (Gajarawala & Pelkowski, 2021).

From a scoping review of 392 papers, Bates, et al. (2021) observed many instances demonstrating the application of AI across all eight harm domains, employing a range of methodological approaches. The most frequently utilised novel data sources stem from diverse sensing technologies, including vital sign monitors, wearable devices, pressure sensors, and computer vision systems. These innovations present substantial opportunities to harness AI and emerging data modalities to mitigate harm and enhance safety across each domain. The limitations include using only a single database, screening and data extraction by a single reviewer, and the projections were limited by the incidence, cost, and preventability of harm, as well as the effectiveness of current strategies and the promise of AI solutions. AI has great potential to improve the safety of care. Recommendations for future research include the careful evaluation of clinical decision support systems based on AI analytics before widespread implementation to ensure safety and accuracy. This evaluation should also involve cross-validation of AI algorithms and tools across multiple sites. Additionally, it is essential to identify important barriers and facilitators, as well as to adhere to reporting standards. Early harm domains-such as adverse drug events (ADEs), clinical decompensation, and diagnostic errors-offer auspicious entry points for AI-enabled interventions. Building robust and equitable models will depend on transparent, population-level datasets that integrate both conventional sources (e.g., electronic health records, insurance claims) and emerging data streams (e.g., sensor outputs, wearable technologies, and broader social determinants of health). To realise the full potential of AI, healthcare organisations must invest in the development, support, and iterative refinement of clinician, team, and system-level workflows that embed data-driven analytics into routine practice, thereby advancing continuous improvements in patient safety.

Discussion

The research questions for this review were:

a) What are the organisational factors, technological factors, human behavioural factors, patient-related factors, and external factors affecting patient safety?
b) What are the organisational factors, technological factors, human behavioural factors, patient-related factors, and external factors affecting healthcare quality?
c) What are the policies and procedures to be followed to enhance patient safety and healthcare quality?

Overall, the reviewed papers indicated the involvement of many organisational, technological, human behavioural, patient and external factors affecting both patient safety and healthcare quality. Many recommendations of both research and practice were given to solve the problems in these respects. Governments can devise policies and procedures according to these recommendations.

Some of the specific factors were concerns about EHR (Janett & Yeracaris, 2020) among nurses (Bani Issa et al., 2020). Some individual (nurses and patients) and systemic factors (care environment) were identified by Vaismoradi et al. (2020) and by Haque et

al. (2020). The importance of hospital administration (organisational factors) was stressed by Bhati et al. (2023) and Aiken et al. (2023). Human behavioural factors like burnout of healthcare professionals can affect patient safety and care quality, according to Soósová (2021) and Rangachari and Woods (2020) with respect to the COVID-19 pandemic. Individual factors like ethnicity can deny quality care and thus the safety of patients (Chauhan et al., 2020). The promise of IoT and AI tools in ensuring patient safety and quality care was highlighted by Pradhan and Bhattacharya (2021), Sittig et al.(2020), Chaudhary and Asan (2020), Reddy (2024), Bates et al. (2021) and of telehealth by Gajarawala and Pelkowski (2021). The importance of controlling medical errors was stressed by Rodziewicz and Hipskind (2020). Care models to improve patient safety and care quality were proposed by Carayon et al. (2020) and Singh and Sittig (2020). The favourable effect of hospital accreditation on the quality of care was noted by Hussein et al. (2021). Communication and, thus, care quality are affected by language barriers when treating non-native patients (Al Shamsi et al., 2020).

Some numerical trends are discussed below:

Year of publication

No. of papers according to the year of publication is presented in Table 3.

Table 3

Year of publication

Year	No.
2020	14
2021	7
2022	1
2023	2
2024	1

No paper was identified beyond 2024. In 2022 and in 2024, only one paper could be selected. The number of papers declined with the advancement of the year. Thus, in 2020, the maximum number of papers (14) could be selected. In 2021, only half of this number could be selected.

Country of study

No country could be assigned for reviews and discussion papers (18). Out of the remaining seven papers, five were from the USA and one each was from the UAE and Slovakia. Thus, many leading developed and developing countries were not represented in this review.

Method of study

Table 4 provides the Methods used in the reviewed papers.

Table 4

Method of study

Method	No.
Systematic review	9
Qualitative review	5
Narrative review	1
Patient review	1

Discussion paper	6
Survey	2
Mixed method	1

Systematic reviews (9), qualitative reviews (5) and discussion papers (6) accounted for 20 out of 25 papers selected. There were two papers which used surveys, and one paper used a mixed approach. One paper used a narrative review and a review of patient records.

Mention of limitations

All papers did not mention limitations. Out of 25, 14 papers mentioned limitations, and the remaining 11 did not mention any limitations.

Recommendations

Recommendations were given in 12 papers and were not given in 13 papers. Out of 12 papers which gave recommendations, three were on research, eight were on practice, and one was on both research and practice.

Implications

Out of 25, 20 papers gave implications, and five did not.

Quality of papers

The quality of reviewed papers was assessed as outlined in the Methodology section (Table 2). The maximum possible score was 12. The reviewed papers scored between 8 and 11.5. The overall quality scores of the reviewed papers are presented in Table 5.

Table 5

Quality of papers

Quality	**No.**
<9.5	8
9.5 to 10.5	7
>10.5	10

Assuming 9.5 as the mid-value, papers scoring below 9.5 can be considered as poor quality. The range of 9.5 to 10.5 was assumed to be of medium quality, and those above 10.5 were considered high quality. Based on these assumptions, there were 10 high-quality papers, seven medium-quality papers and eight low-quality papers. Thus, the general tendency is to tilt from medium to high-quality papers.

Limitations of this review

Depending on a single search engine, limiting to papers in English, and to 2020 to 2025, might have missed many important papers published earlier (as Table 3 shows) and in other languages. Not including books and book chapters would also have missed many important papers. The search strategy led to the domination of reviews rather than empirical studies.

The results of this review may not be generalisable, as only 25 papers were included. Also, the numerical trends presented above may not reflect the general trend that could be obtained from a review of several papers. Hence, caution needs to be exercised when accepting the findings of this review.

Conclusions

Based on the findings discussed above, it can be concluded that this review of 25 papers answered all three research questions well. Many organisational, technological, human behavioural and patient behavioural factors were identified to be affecting patient safety and the quality of healthcare. The findings also showed the great promise of IoT and AI tools to ensure patient safety and care quality. Mobile-based applications of these technologies might be more useful. However, none of the papers reported any findings on this aspect. The numerical trends of the reviewed papers show dominance of reviews at the cost of empirical studies, although the quality of these papers was generally good.

Scope for further research

The limitations indicate the scope for future research. A meta-analytic review covering a much longer period and using many data sources will provide much more insight into the factors related to patient safety and quality of healthcare.

There is a need for many more empirical studies on the subject. More case studies of patient records will be useful. Much more research is required before IOT or AI tools can be adopted on a larger scale. Mobile applications using these tools need to be researched well. There is a need to develop more care models. Another area for further research is the development of the provider-patient relationship over the patient journey through the treatment history.

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