Effectiveness of Risk Management in Healthcare Organisations During Health Crises: A Systematic Review

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ABSTRACT
Following the COVID-19 pandemic, healthcare systems continue to face persistent risks, highlighting the need to implement effective risk management systems to ensure safe practice. By combining bibliometric analysis with a systematic literature review, the article identifies and classifies risk management approaches examined in the context of health crises, as well as the barriers and success factors influencing their implementation. The database used comprises 541 publications extracted from the Web of Science, and the analysis was conducted using the RStudio software through the Biblioshiny interface. The application of the PRISMA-P 2020 methodology enables the identification of major research trends, applied methodologies, and insufficiently explored areas in the existing literature. The study highlights the interconnection between risk management and the continuity of healthcare services, with particular emphasis on the role of strategic planning and digital tools in mitigating the impact of health crises such as the COVID-19 pandemic. The conclusions provide relevant benchmarks for future research directions and for improving decision-making processes within healthcare organisations.

KEYWORDS: *risk management, effectiveness, healthcare, systematic review, barriers, success factors*

JEL CLASSIFICATION: *I10, I18, D81*

1. INTRODUCTION

Medical companies operate in environments characterised by high uncertainty, complexity, and significant stakes, which can only be effectively managed through a proper understanding of risk management. Risk management refers to the systematic process of identifying, assessing, and mitigating potential threats to patient safety, operational continuity, and regulatory compliance. Its objective is not only to minimise harm but also to enhance the quality and efficiency of healthcare services (Chiozza & Plebani, 2006). Pandemics, regulatory changes, and technological advancements have further intensified the need for robust risk management frameworks within the healthcare industry (Liu, 2021).

Despite continuous progress in the field, healthcare systems continue to face persistent risks, including medical errors, supply chain disruptions, and cybersecurity breaches, all of which negatively affect patient outcomes and organisational sustainability (Kohn, 2000). The implementation of effective reporting systems and the development of a culture of organisational learning are essential for ensuring safe medical practice (Chiozza & Plebani, 2006). However, it is the proactive response to risk-related data – supported by domain experts – that translates reporting into tangible improvements in safety and service quality (Alsulami,

2023). In this context, governance is not a discrete activity, but a continuous component that requires commitment at all organisational levels (Chiozza & Plebani, 2006).

In recent years, efforts to improve risk management in the medical industry have evolved from isolated, department-level assessments to organisation-wide strategies incorporating international standards, such as ISO 31000 (Ferdosi et al., 2020). System-based approaches have emerged that emphasise holistic risk identification and the development of customised mitigation plans and dynamic monitoring, thereby supporting operational resilience in the context of internal and external pressures (Kruse, 2017). Technological advancements and data-driven models now enable organisations to predict, assess, and mitigate adverse events more effectively; however, they also introduce new categories of risk, particularly related to cybersecurity and data management (Dias et al., 2021).

Effective risk management requires the alignment of organisational culture, internal control systems, and leadership accountability, thereby promoting a risk-aware workplace in which continuous training and communication are prioritised (Liu, 2021).

It is important to distinguish between efficiency and effectiveness when evaluating risk management interventions in healthcare. Efficiency refers to the performance of an intervention under controlled conditions, such as those found in pilot clinical studies. These settings demonstrate the potential of risk management strategies to achieve the intended outcomes when implemented within a limited, optimised framework where external factors are minimised (Singal et al., 2014). In contrast, effectiveness reflects the real-world impact of an intervention when applied in everyday healthcare settings, taking into account the variables of complex organisational contexts, such as variations in resource availability (Singal et al., 2014).

Therefore, differentiating between efficiency and effectiveness is essential, as interventions that succeed in controlled environments may face constraints when translated into routine practice. Consequently, both dimensions should be integrated: efficiency establishes the baseline potential, while effectiveness determines practical value and informs subsequent adaptation (Singal et al., 2014).

Moreover, effective risk management approaches should be designed with sustainability and scalability at their core. The effectiveness of risk management is measured by its ability to protect organisational assets and ensure business continuity. Researchers demonstrate that effective risk management enhances decision-making processes and safeguards assets through a proactive approach to uncertainty, thereby improving organisational performance (Liu et al., 2024).

The measurable impact of risk management strategies extends beyond regulatory compliance, influencing operational performance, financial stability, and – —most importantly – —patient safety (Singal et al., 2014). Furthermore, the integration of risk management underscores its strategic role in promoting patient-centred and highly reliable organisations (Chiozza & Plebani, 2006).

This paper aims to examine the effectiveness of risk management in healthcare organisations by synthesising existing frameworks, methodologies, and empirical findings.

2. LITERATURE REVIEW

Given that healthcare organisations operate in high-risk environments, risk management requires comprehensive strategies that integrate human factors, systematic frameworks, and technological innovation. Research conducted by Reason (1995) indicates that human failures represent the greatest threat within healthcare systems, which are inherently complex and potentially hazardous. He classifies errors into several categories, including execution failures, lapses, violations, and planning errors involving rule-based and knowledge-based mistakes. These different types of errors require distinct risk management approaches.

Organisational responses to the COVID-19 pandemic crisis demonstrate that companies with well-defined risk management systems were better prepared to maintain operations and adapt to rapidly changing circumstances. In contrast, organisations that invested in proactive risk assessment and mitigation strategies experienced fewer disruptions and faster risk response compared to those relying on reactive approaches (Kruk et al., 2017).

While the effectiveness of risk management focuses on the achievement of objectives, its efficiency relates to how resources are optimally utilised (Kruk et al., 2017). The efficiency dimension of risk management extends beyond mere cost reduction. Studies have shown that organisations adopting advanced technologies— – such as artificial intelligence and predictive analytics— – achieve higher efficiency through automated risk identification, accelerated decision-making processes, and improved resource allocation (Blanchet et al., 2017). Consequently, these technological factors reduce the manual effort required in risk management processes (Blanchet et al., 2017).

To establish a clear direction regarding the efficiency of risk management in the healthcare sector, synthesise existing findings, and identify research gaps, a systematic review of the specialised literature is required.

3. OBJECTIVES AND METHODOLOGY

This paper aims to identify the barriers and success factors of risk management practices, as well as the measurable outcomes associated with effective risk management. The specific objectives of the research are as follows:

1. To analyse, from a bibliometric perspective, how risk management in healthcare systems has been addressed in the specialised literature in the context of health crises, with the aim of highlighting emerging trends, underexplored research areas, and implications for future research and decision-making processes.
2. To identify and classify the risk management approaches considered during health crises.
3. To analyse the barriers and success factors that influence risk management during health crises.

The research is based on the following hypothesis: the effective implementation of risk management strategies in medical organisations during health crises is positively associated with high organisational resilience, enhanced patient safety, and the continuity of healthcare services.

To achieve the stated objectives and support the proposed hypothesis, a systematic literature review was conducted using the PRISMA-P 2020 methodology, which comprises 17 essential elements designed to enhance the transparency and completeness of systematic review protocols (Shamseer et al., 2015). The development of PRISMA-P reflects the growing

recognition that systematic reviews require robust planning procedures, with the 17-item checklist specifically targeting prospective authors to ensure that submitted protocols meet the highest standards of scientific rigor (Shamseer et al., 2015).

The analysed database was constructed using the Web of Science (WoS), including indexed articles relevant to the systematic literature review. The extracted articles were subjected to bibliometric analysis using the Bibliometrix package in RStudio, resulting in an initial dataset of 551 articles identified through a topic-based search across the entire database.

The inclusion criteria comprised the following document types: *Article*, *Review Article*, *Proceedings Paper*, and *Early Access*; English language; and a publication period spanning from January 1975 to September 2025. The exclusion criteria included *Book Chapters* and *Retracted Publications*, yielding a refined dataset of 541 articles.

Following data extraction from WoS, the Bibliometrix extension within RStudio was used to conduct the bibliometric analysis. The database was further refined by including only studies addressing the following themes: *effectiveness*, *crisis*, *continuity*, *barriers*, *success factors*, and *evaluation factors*, while duplicate records were removed. This process resulted in 182 articles selected for qualitative analysis.

After assessing data quality in relation to impact, efficiency, and effectiveness, and eliminating remaining duplicate records, a final sample of 167 articles was retained for in-depth analysis. All stages of the selection and screening process followed the standard steps of the PRISMA-P 2020 methodology, as illustrated in Figure 1.

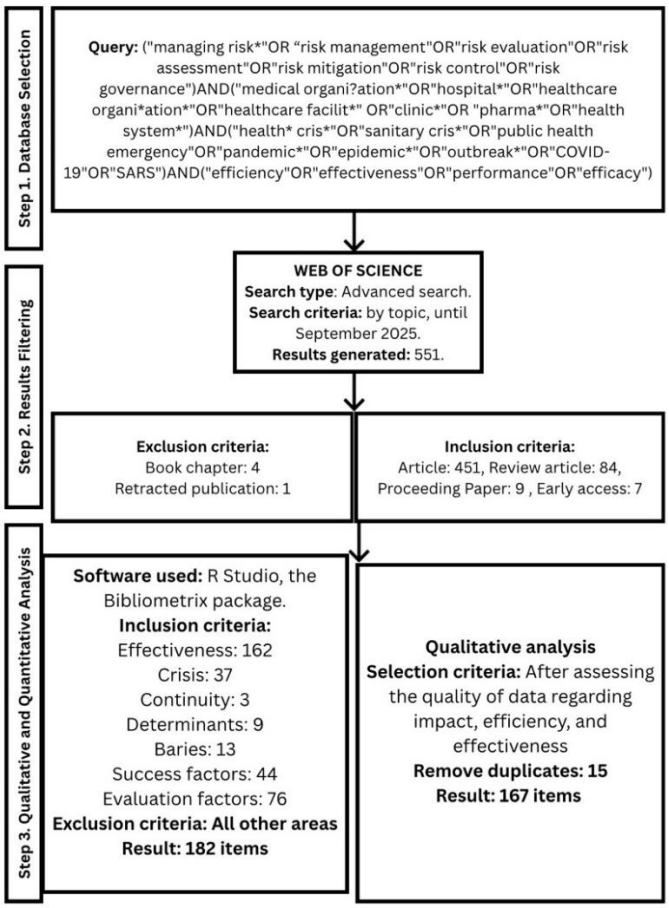

Figure 1. PRISMA Methodology
Source: Authors' own elaboration

4. BIBLIOMETRIC ANALYSIS

For the bibliometric analysis, data were extracted on the evolution of published articles over time, relevant research themes, and the most prolific authors during the analysed period.

The analysis covered a 31-year period, from 1994 to September 2025, and included 541 documents published across 383 sources. The annual growth rate of published works is 13.59%, indicating a significant increase in research interest in this field. The documents have an average age of 3.97 years, and a single document has been cited up to 16 times. Regarding keywords, a total of 1,540 keywords and 1,939 author keywords were identified, highlighting the thematic complexity of the field. Of the 4,074 authors contributing to the database, only 13 are single-authored contributors, while the level of international co-authorship is 7.79%.

The evolution of scientific production and citation counts between 1994 and 2025 is illustrated in Figure 4. During the first nearly two decades (1994–2014), publication activity was limited, with only a few articles published per year and a low number of citations, suggesting restricted interest and an emerging research domain. A sharp increase in scientific output occurred starting in 2020, when both the number of publications and citations rose substantially. This period coincides with the COVID-19 pandemic, which generated heightened interest in digital transformation, telemedicine, and intelligent solutions across multiple sectors.

The peak of scientific production was reached in 2023, with more than 100 publications, followed by a slight decline in 2024–2025; however, the output levels remained well above the average of previous years. In parallel, the citation curve peaked in 2024, exceeding 1,600 citations, confirming the high scientific impact of works published in the preceding period. After 2024, a decline in citations can be observed, a natural phenomenon explained by the fact that very recent publications have not yet had sufficient time to accumulate a significant number of citations.

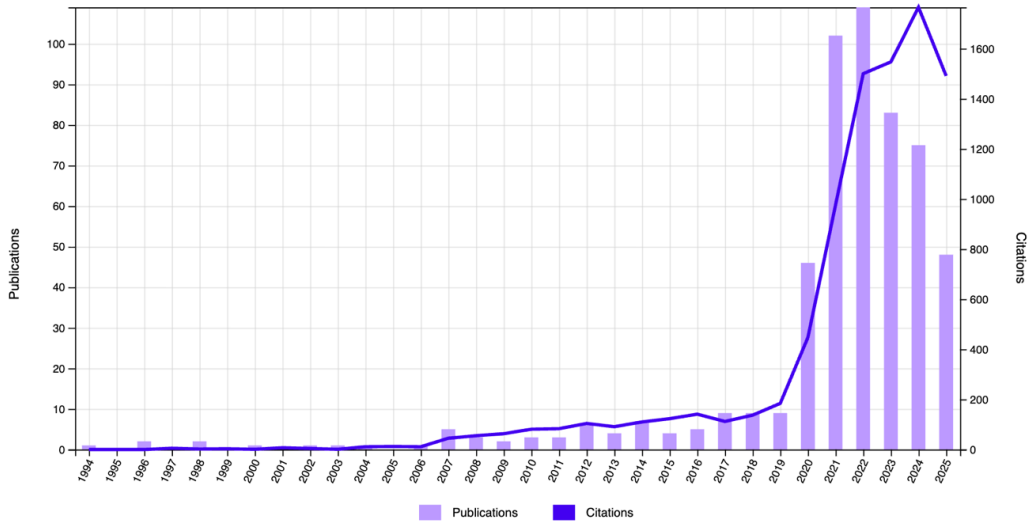

Figure 2. Evolution of Publications and Citations

Source: Authors' own elaboration based on data extracted from Web of Science (WoS)

Figure 2 highlights a pronounced concentration of research activity after 2020, dominated by terms such as *COVID-19*, *risk assessment*, *risk management*, and *pharmaceuticals*, reflecting the significant impact of the pandemic on the scientific agenda. In parallel, the increasing prominence of terms such as *machine learning*, *prediction*, and *performance* indicates a shift

in the field toward advanced technologies and predictive models. Traditional terms, including *surveillance*, *prevention*, and *healthcare workers*, remain relevant, although with notable intensifications during crisis periods. Overall, the observed trends reveal a transition from classical public health themes to modern approaches focused on risk assessment and technology-driven solutions.

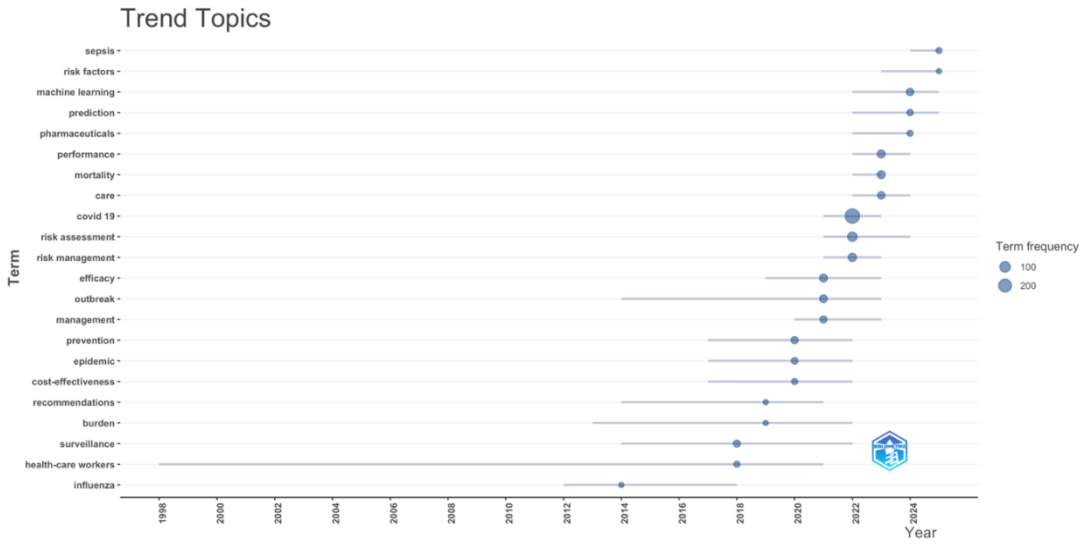

Figure 3. Thematic Trend Analysis

Source: Authors' own elaboration based on data extracted from Biblioshiny

The chart in Figure 4.3 shows a relatively balanced distribution among the most productive authors, with the top five authors reaching the same level of productivity, each having published four papers. This uniformity suggests the presence of active research groups within the field. Authors with three publications, such as Belser, Biringer, and Busselberg, represent a second tier of significant contributions that complement the overall structure of scientific productivity. Overall, the distribution reflects a diverse authorship landscape, without excessive concentration around a single researcher, indicating a dynamic and collaborative research domain.

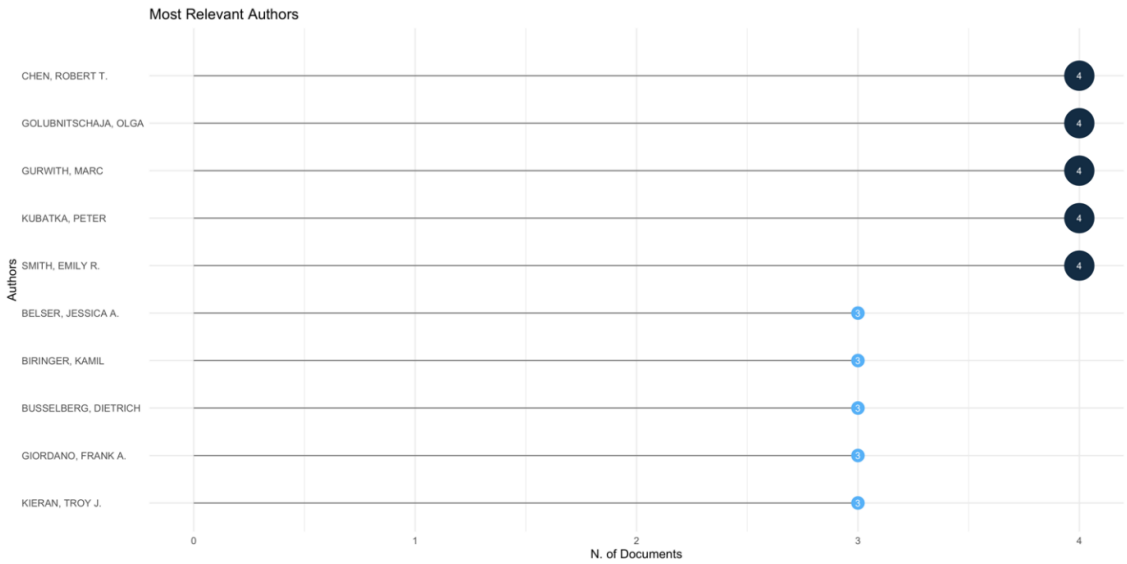

Figure 4. Distribution of the Most Relevant Authors

Source: Authors' own elaboration based on data extracted from Biblioshiny

Thus, starting in 2020, a marked increase in publications can be observed, correlated with the COVID-19 pandemic, which generated a need for adaptation to changing social, economic, and technological conditions. In this context, effective risk management has become a critical component not only for organisational adaptability but also for maintaining the stability of economic systems. Consequently, the evolution of the literature confirms the need to integrate effective risk management into organisational transformation strategies and corporate decision-making processes, positioning it as a pillar of sustainable and long-term adaptive development.

5. CONTENT ANALYSIS

5.1 Classification of Risk Management Approaches Considered During Health Crises and Related Mitigation Strategies

In the context of health crises, risk management approaches have evolved to encompass a wide range of strategies, from assessing the vulnerability of public health systems to implementing predictive tools and digital technologies.

5.1.1 Classification of Risk Management Approaches

The analysis of the relevant literature from the reviewed documents indicates that, during health crises, researchers and practitioners adopt multiple types of risk management approaches, which can be classified based on how they address uncertainty, systemic degradation, and interactions among components of the healthcare system. One prominent category is proactive (anticipatory) risk management, which relies on models to assess the probability of occurrence and evolution of health threats, combined with scenario planning and predictive tools. Arnold (2005) argues for the necessity of developing a rational, four-stage risk estimation framework – hazard, event, damage, and disaster – in the management of health emergencies (Arnold, 2005). Complementarily, several authors propose data-driven approaches and hybrid methodologies (monitoring, modelling, and management) to enable real-time adaptation of response strategies to the evolving dynamics of epidemics (Alamo et al., 2021).

A second category encompasses reactive and adaptive risk management, which involves adjusting decisions as a crisis unfolds, including through predictive control, feedback mechanisms, and resource reallocation. This approach is characteristic of resilient healthcare systems that integrate anticipation, situational analysis, and adaptive learning (Emami et al., 2024). Additionally, resilience-based and organisational learning approaches emphasise systemic recovery and post-crisis adaptation mechanisms. Scholars highlight the importance of post-event evaluation, institutional learning, and system reforms as integral components of risk management (Emami et al., 2024).

In the modern healthcare context, cyber and logistical risk management has also emerged as an extension of systemic risk. Sardi et al. (2021) emphasise the role of cybersecurity risks within medical digital infrastructures during pandemics, while Radanliev and De Roure (2022) propose intelligent approaches for the proactive security of healthcare systems. Overall, these approaches range from rigorous statistical estimation techniques to dynamic mechanisms of adaptation and systemic resilience, all of which are mobilised during health crises and function as complementary elements within a robust risk management system.

In parallel, Hallett et al. (2021) highlight the need for interdisciplinary collaboration between mental health professionals and law enforcement agencies to manage risks associated with the use of conducted electrical weapons among individuals experiencing mental distress,

emphasising the importance of non-coercive interventions. Racine et al. (2023) demonstrate the utility of screening instruments such as the Fordham Risk Screening Tool (FRST) for assessing violence risk in emergency services, offering a structured, evidence-based approach. In the field of child and youth mental health, Carter et al. (2019) identify a lack of standardised tools for assessing imminent risk of self-harm and suicide, calling for the development of valid and reliable instruments.

Staples et al. (2024) explore the role of crisis cafés as accessible community-based services, demonstrating how these initiatives can provide alternatives to emergency departments and enhance system resilience. An innovative approach is presented by Lind et al. (2018) through the Effortless Assessment of Risk States (EARS) tool, which uses mobile sensors to passively detect states of psychological risk, representing a step toward predictive and personalised interventions. Sanders and Lavoie (2021) analyse police officers' perceptions of mental health screening tools, revealing tensions between technological frameworks and experiential knowledge, thereby underscoring the need to align technological solutions with frontline practices.

Harris et al. (2021) compare perceptions and practices related to safer suicide care between mental health providers and substance use disorder service providers, identifying a need for enhanced training and self-efficacy. Fu et al. (2025) propose a hybrid model for assessing the vulnerability of urban public health systems by combining Bayesian best–worst methods with cloud models to address uncertainty. Alfano and Ercolano (2022) extract lessons from the COVID-19 pandemic for insurance policies and risk management, emphasising the importance of non-pharmaceutical interventions and institutional quality.

Jatobá et al. (2023) develop a framework to assess the potential resilience of healthcare systems using fuzzy logic, while Mercogliano et al. (2025) conduct a systematic review of public health emergency preparedness in low- and middle-income countries, identifying multimodal interventions. Jatobá et al. (2025) analyse the volatility of essential public health functions in Brazil and propose a resilience framework. Najafi et al. (2023) identify senior managers' experiences in preparing for the COVID-19 response, with an emphasis on resource management, disaster management, and social resilience. Similarly, Coccia (2021) evaluates countries' preparedness for pandemic crises by proposing resilience and preparedness indices to inform future policy decisions (Table 1).

Table 1. Classification of Health Crises Based on Risk Management Approaches

Axis	Approach	Measures	Strategies	Type of Crisis	Authors
Strategic orientation of the intervention	Proactive	Clinical screening, prevention, anticipatory triage	Implementation of validated tools, interinstitutional collaboration	Acute mental health crises, violence	Racine et al. (2023)
	Reactive	Use of force, coercive interventions	Rapid field response, use of control equipment	Community crises, psychological agitation	Hallett et al. (2021)
Operational dimension of the strategy	Technical	Assessment algorithms, screening tools	Psychometric validation, integration into clinical workflows	Violence-related crises, risk assessment	Racine et al. (2023)

Axis	Approach	Measures	Strategies	Type of Crisis	Authors
	Organisational	Staff training, interinstitutional protocols	Coordination between law enforcement and mental health services, procedural standardisation	Psychiatric crises in public and institutional settings	Hallett et al. (2021)
	Policy-related	Regulations on use of force, mental health policies	Promotion of non-coercive interventions, equity-oriented access policies	Mental health crises in vulnerable communities	Staples et al. (2023)
Scale of intervention applicability	Local	Community services (crisis cafés), informal support	Creation of alternatives to emergency departments, stigma reduction	Emotional crises, psychological distress	Staples et al. (2023)
	National	Risk assessment tools, paediatric health policies	Development of standardised tools for children and adolescents	Paediatric suicidal crises	Carter et al. (2019)
Resource allocation axis	Human	Professional training, multidisciplinary teams	Enhanced response capacity, integration of local expertise	Acute hospital crises, emergency interventions	Racine et al. (2023); Carter et al. (2019)
	Informational	Screening systems, clinical databases	Data-driven rapid decision-making, continuous assessment	Recurrent crises, risk evaluation	Racine et al. (2023)
	Logistical	Control equipment, intervention infrastructure	Equipping emergency services, adapting community spaces	Crises in public spaces, rapid interventions	Hallett et al. (2021); Staples et al. (2023)

Source: Authors' own elaboration based on data extracted from the analysed articles

Collectively, these studies illustrate a trend toward diverse approaches that integrate risk assessment, digital technologies, intersectoral collaboration, and system strengthening, all of which are essential for the effective management of health crises.

5.1.2 Types of Health Crises, Approaches, and Impact

The specialised literature on health crises is dominated by analyses of the COVID-19 pandemic, which appears in approximately 80% of recent studies and is characterised by recurring features such as rapid transmission, high morbidity and mortality rates, economic pressure, and significant social disruption (Nemoianu, 2025). In parallel, other types of crises are also addressed, including SARS, H1N1, Ebola, and Zika, as well as complex emergencies of an infectious, chemical, or radiological nature, along with chronic stressors with systemic impact (Sugaretty, 2012). The geographical scope of this research ranges from global analyses

– including contexts such as Hong Kong – to country-specific studies focused on Romania, South Korea, the Czech Republic, Brazil, and Cuba (Nemoianu, 2025).

With regard to risk management approaches, four main directions can be identified:

(a) preparatory measures, such as crisis protocols and best-practice models based on international health regulations (Sugaretty, 2012);
(b) governance and leadership strategies emphasising coordination, resource allocation, and risk perception (Savin, 2023);
(c) technological and surveillance interventions, including integrated cybersecurity, artificial intelligence, contact tracing, and digital monitoring (Nemoianu, 2025);
(d) financial management practices, such as econometric modelling and budgetary rebalancing (Antohi et al., 2022).

Agostini et al. (2023) propose a clear distinction between proactive strategies (preparedness and prevention) and reactive strategies (response and recovery), applied transversally across technical, organisational, and political dimensions, with implementation levels ranging from individual to systemic. In certain contexts, such as South Korea, measures including contact tracing and coordinated government responses have been associated with effective crisis control, while other studies highlight persistent challenges related to underfunding, outdated infrastructure, and insufficient coordination (Choi et al., 2020). Table 2 structures these findings to provide a more nuanced understanding of how different types of interventions can be calibrated according to the specific nature of the crisis and the institutional context in which they are applied.

Table 2. Risk management approaches and their impact

Author	Study focus	Health Crisis Type	Geographic Context	Risk management approaches examine	Implementation level	Impact
Nemoianu, 2025	Cybersecurity vulnerabilities and risk management in healthcare	Pandemic (COVID-19)	Romania	Integrated cybersecurity strategy, vulnerability management, and artificial intelligence (AI) integration	National, organisational	Disruption of services, improved awareness, need for modernisation
Sugaretty, 2012	Risk management during SARS pandemic	Pandemic (SARS, H1N1)	Global (focus on Hong Kong)	Best-practice model, risk identification/assessment, travel advisories	Organisational, system	Improved risk control (qualitative), need for practical models
Savin, 2023	Resilience of healthcare management during COVID-19	Pandemic (COVID-19)	Romania	Crisis protocols, risk perception, crisis management, prevention, governance	Organisational, national	Strain on system, lack of coordination, need for resilience
Agostini et al., 2023	Frameworks for resilience in healthcare	Pandemic (COVID-19, Ebola, Zika), chronic stressors	Global	Proactive/reactive resilience, preparedness, leadership, resource allocation	Individual, organisational, system	Enhanced resilience, need for leadership and resources
Choi et al., 2020	Crisis management during SARS-CoV-2 outbreak	Pandemic (COVID-19)	South Korea	Contact tracing, testing, quarantine, digital surveillance, financial reallocation	National	Flattened death tolls, no lockdown, privacy concerns
Antohi et al., 2022	Financial management and impacts during COVID-19	Pandemic (COVID-19)	Romania	Financial rebalancing, econometric modelling, strategic management	System, national	Budget disruptions, underfunding, need for strategic management

Author	Study focus	Health Crisis Type	Geographic Context	Risk management approaches examine	Implementation level	Impact
Hoke et al., 2020	Crisis preparedness and risk management in healthcare	Pandemic (COVID-19)	Czech Republic	Risk management systems, preparedness tools (not detailed)	Organisational	Strain on system, lack of readiness
Carmo et al., 2008	Public health emergencies and preparedness	Public health emergencies (infectious, chemical, radiological)	Brazil	International Health Regulations (2005) framework, risk analysis, surveillance system strengthening	National, system	Improved management, timely response
Calixto et al., 2020	Risk management actions during COVID-19	Pandemic (COVID-19)	Cuba	World Health Organisation (WHO)-aligned measures, government/Ministry of Health coordination	National	Coordinated response, political will
Recchia et al., 2022	Risk management and communication from SARS to COVID-19	Pandemic (SARS, COVID-19)	Global	Science-based, socially-based, and policy-based risk management	System, policy	Need for harmonisation, no quantitative impact

Source: Authors' own elaboration based on data extracted from the analysed articles

As previously indicated, the specialised literature highlights pandemics as the predominant form of health crisis analysed. These events are characterised by rapid international spread, high levels of morbidity and mortality, intense pressure on healthcare systems, and an acute need for institutional and operational adaptation. The impact of such crises is profound and multidimensional. From a healthcare perspective, they are associated with the overburdening of medical infrastructure and disruptions in the delivery of essential services. Economically, they manifest through budgetary imbalances, forced resource reallocations, and chronic underfunding (Antohi et al., 2022). Socially, they involve behavioural changes, declining public trust, and concerns related to data protection and privacy (Choi et al., 2020). At the level of healthcare systems, capacity constraints, workflow dysfunctions, outdated infrastructure, and vulnerabilities in cybersecurity are also evident (Mondino et al., 2023).

Although some studies provide quantitative data on case numbers, mortality rates, or budgetary adjustments, the majority of the literature focuses on qualitative analyses of impact. With respect to the classification of healthcare risk management approaches, several analytical axes emerge from the literature. The first major distinction is between proactive strategies, which emphasise preparedness and prevention, and reactive strategies, which focus on response and recovery. These are further differentiated according to the nature of the crisis – acute shocks versus chronic stressors – based on the framework proposed by Agostini et al. (2023).

A second analytical axis concerns the nature of interventions, which may be technical (e.g., digital surveillance solutions or cybersecurity measures), organisational (e.g., training, protocols, and leadership), or political (e.g., national strategies, international regulations, and alignment with World Health Organisation standards) (Savin, 2023; Spinei et al., 2020). A third dimension examines the level of implementation, ranging from individual- and organisational-level interventions to systemic measures and national policies (Staples et al., 2023). Finally, a fourth axis is related to resource focus, where some frameworks emphasise hardware components—such as physical infrastructure and human resources—while others prioritise software resources, including management tools, decision-making capacity, and adaptive leadership (Carter et al., 2019; Racine et al., 2023).

5.3 Analysis of Barriers and Success Factors Influencing Risk Management During Health Crises

5.3.2 Barriers

In the context of risk management during health crises, barriers play a critical role as influential and impact-generating factors. They can be conceptualised as systemic, organisational, cognitive, or logistical obstacles that affect the capacity for prevention, response, and recovery in the face of risks. The World Health Organisation (WHO, 2020) defines barriers in pandemics and public health crises as "structural, procedural, or behavioural constraints that hinder the effective implementation of risk management strategies during health emergencies" (WHO, 2020).

In analysing the capacity of health systems to respond to shocks, Kieny et al. (2017) argue that "barriers in risk management refer to any limiting factor – be it institutional inertia, fragmented governance, or lack of coordination – that impedes timely and effective decision-making during crises" (Kieny et al., 2017). From the perspective of probabilistic analysis and risk assessment, Aven (2016) states that "barriers are conceptualised as intervening variables that reduce the probability or impact of adverse events, but may also introduce complexity or delay in response mechanisms" (Aven, 2016).

Based on the main conclusions of the reviewed scientific literature, Table 6 structures the identified barriers in health crisis risk management into categories, according to their specificity and the level of impact they exert on the adoption of different risk management approaches within the analysed domain.

Table 3. Types of Barriers and Their Impact on the Adoption of Specific Risk Management Approaches in Health Crises

Barrier Category	Specific Barrier	Impact	Quantitative Impact Analysis	Authors
1. Technical and Process Barriers	Misalignment with existing workflows.	New tools fail to integrate smoothly into standard practices, generating friction and resistance	**High impact.** Causes major resistance to adoption. Qualitative studies indicate this is one of the most frequent causes of implementation failure, even for tools perceived as beneficial.	O'Dwyer et al. (2024)
	Lack of protocols, standardisation, and clear guidance.	Professionals are reluctant to adopt new practices due to the absence of well-defined implementation frameworks	**High impact.** Wilson et al. (2016) found that although 90% of residents were willing to prescribe naloxone, only 15% actually did so, largely due to lack of confidence and absence of clear protocols.	Clark et al. (2021); Wilson et al. (2016)
	Privacy and data security concerns	Concerns regarding patient data protection inhibit the use of digital communication channels	**Moderate impact.** A study involving 30 physicians found that most were hesitant to support email communication due to concerns about utility, security, lack of protocols, and established guidelines.	Clark et al. (2021)
2. Knowledge-Based and Attitudinal Barriers	Lack of confidence in intervention effectiveness	If an intervention—such as mask use during a pandemic—is perceived as ineffective, adoption rates decline	**Measurable impact.** Individuals perceiving masks as ineffective were significantly less likely to wear them, directly affecting viral transmission rates in the community	Gray et al. (2020)

Barrier Category	Specific Barrier	Impact	Quantitative Impact Analysis	Authors
	Safety concerns	Fear of adverse effects of vaccines or medications.	**Measurable impact.** Negative perceptions of vaccine safety led to vaccination rates 26.2% lower among rural Latino populations compared to desired public health targets	Straus et al. (2023); Rafie et al. (2024)
	Lack of applied knowledge and low self-efficacy	Professionals know what should be done but lack confidence in their ability to act (e.g., naloxone prescribing)	**Measurable impact.** 52% of residents reported low confidence in identifying at-risk patients, directly correlating with a low prescription rate (15%)	Wilson et al. (2016)
3. Organisational and Resource Barriers	Time and staffing constraints	Increased workload and insufficient staffing hinder the implementation of new protocols or counselling activities	**High impact.** A pervasive limiting factor affecting the implementation of nearly all new interventions, from counselling services to telemedicine integration	Clark et al. (2021); Ogedegbe et al. (2014)
	Limited financial resources and patient costs	Financial barriers prevent institutions from investing in technology and patients from accessing care	**Direct impact on access.** Financial concerns were identified as a major barrier for patients resuming elective procedures, delaying diagnosis and treatment	Nguyen et al. (2021); Ogedegbe et al. (2014)
	Vulnerable supply chains and logistics	Fragile supply chains lead to critical shortages of medical products.	**Extremely high quantitative impact.** Alfina et al. (2025) modelled that critical shortages increase the probability of severe supply disruptions by 25% (from 41.9% to 66.3%), directly affecting system resilience and public health outcomes	Alfina et al. (2025); Liza et al. (2023)
4. Socio-Cultural and Communication Barriers	Linguistic and cultural barriers	Public health messages fail to resonate with or reach certain communities	**Significant equity impact.** These barriers contribute to a disproportionate disease burden in vulnerable populations, such as rural Latino communities, exacerbating health inequities	Straus et al. (2023)
	Lack of trust in authorities and healthcare systems	Fundamental mistrust undermines the effectiveness of any intervention	**Major systemic impact.** A strong predictor of vaccine hesitancy and non-compliance with public health measures, triggering cascading effects on pandemic control	Straus et al. (2023)
	Misinformation and incorrect perceptions.	Belief in false information (e.g., masks being reserved for those "who need them more") undermines collective responses	**Measurable behavioural impact.** The belief that masks were intended for "others" significantly reduced usage despite availability	Gray et al. (2020)
5. Environmental and Infrastructure Barriers	Limited geographical access to healthcare services	Rural or remote populations face physical barriers to receiving interventions	**Measurable coverage impact.** Physically limits access, requiring solutions such as telemedicine to bridge service gaps	Straus et al. (2023); Woodward et al. (2024)

Barrier Category	Specific Barrier	Impact	Quantitative Impact Analysis	Authors
	Risk of contamination in healthcare environments	Care settings (e.g., dental offices) can become transmission hotspots if poorly managed	**Direct safety impact.** Increases nosocomial infection risk for patients and staff, potentially leading to temporary facility closures	Cocârţă et al. (2021)
6. Political and Regulatory Barriers	Restrictive regulations	Laws and policies artificially limiting access to essential healthcare services (e.g., medication abortion)	**Major access impact.** Regulations such as REMS for mifepristone have restricted access for millions despite strong safety evidence	Rafie et al. (2024)
	Insufficient institutional preparedness for crises	Lipsa unor planuri strategice solide de asigurare a agilității și rezilienței în fața unei crize.	**High systemic impact.** Absence of a strategic supply chain resilience plan was identified as the most critical barrier (Level 1 in the ISM hierarchy), leading to disruptions in essential medicine supply	Liza et al. (2023)

Source: Authors' own elaboration based on data extracted from the analysed articles

The analysis indicates that the adoption of effective risk management practices during health crises represents a complex systemic challenge. Barriers are not merely technical in nature, but are deeply embedded in human, organisational, and structural factors. Findings across multiple studies highlight the complexity of implementing and sustaining public health measures and technological innovations across diverse contexts.

A qualitative analysis of digital contact tracing (DCT) in a paediatric hospital revealed that, although the technology was perceived as feasible and effective in protecting the workforce and was generally well accepted, its adoption was influenced by ease of use, privacy concerns, and the need to align with existing practices (O'Dwyer et al., 2024). Similarly, regarding preventive behaviours, a study conducted within Latino communities found that although the perceived risk of contracting COVID-19 was higher in rural areas, this did not translate into an increased willingness to vaccinate, highlighting the influence of unique structural and cultural factors (Straus et al., 2023). This gap between perception and action was also reflected in a study from New Zealand, where the main barriers to mask use were the belief that supplies were scarce and that others had a greater need (Gray et al., 2020).

Preparedness for future pandemics also requires resilient logistics and supply chains. Research on pharmaceutical supply chains identified insufficient strategic planning and weak information structures as the most critical barriers to post-pandemic sustainability (Liza et al., 2022). Alfina et al. (2024) demonstrated that integrating circular economy principles and dynamic barrier management can significantly enhance both resilience and sustainability, while simultaneously preventing critical product shortages. In the clinical domain, the safe resumption of elective procedures was enabled through the implementation of rigorous risk mitigation strategies, as demonstrated by a tiered urgency-based model for endoscopic procedures (Nguyen et al., 2021).

The broader adoption of telemedicine and digital communication was accelerated by the COVID-19 pandemic, but remained constrained by persistent barriers. A complex integrated telemental health program was sustained and scaled through the strategic use of facilitation and continuous adaptation to a changing context (Woodward et al., 2024). Nevertheless, healthcare

professionals remained reluctant to adopt email communication with patients due to concerns related to time constraints, confidentiality, and the absence of clear protocols (Clark et al., 2021). Another innovation – the distribution of naloxone for overdose prevention – encountered similar barriers, with medical residents reporting low confidence in identifying at-risk patients despite high willingness to prescribe (Wilson et al., 2016).

Finally, research extends to areas such as chronic disease control and occupational risk management. An implementation study in Ghana evaluated the effectiveness of task shifting for community-based cardiovascular risk management (Ogedegbe et al., 2014), while an analysis of air quality in dental offices emphasised the need for enhanced preventive measures to reduce exposure to fine particles and bioaerosols, a major concern during the pandemic (Cocârţă et al., 2021). Concurrently, within reproductive health, scholars argue that involving pharmacists in the distribution of mifepristone represents a critical step in overcoming access barriers to medication abortion (Rafie et al., 2024).

Collectively, these studies underscore the importance of adaptive, human-centred, and context-sensitive approaches to building more resilient and equitable healthcare systems. To improve preparedness and response to future crises, efforts must extend beyond the development of tools and protocols to include trust-building, enhancement of professional competencies, adequate resource allocation, and the creation of political and regulatory frameworks that support – rather than hinder – access to care.

5.3.2 Success Factors

In academic research, success factors are defined as variables, conditions, or practices that significantly contribute to achieving desired outcomes within a project, intervention, or organisational process. Rockart (1979) initially argued that "critical success factors are the limited number of areas in which satisfactory results will ensure successful competitive performance for the organisation" (Rockart, 1979). In quantitative analyses, the definition proposed by Pinto and Slevin (1987) is more frequently employed, stating that "success factors are those inputs, conditions, or processes that are significantly associated with the achievement of desired outcomes in a given context" (Pinto & Slevin, 1987). According to the World Health Organisation (WHO, 2010), "in health systems research, success factors refer to the enabling conditions – such as leadership, governance, and resource availability – that facilitate effective implementation of interventions" (World Health Organisation, 2010).

Building on these definitions and the analysis of the relevant literature, it can be observed that most authors address a wide range of topics related to the management of crises generated by the COVID-19 pandemic, as well as other emergency situations, such as mental health crises, infectious disease outbreaks in humanitarian settings, and risk management in the pharmaceutical and healthcare sectors. In the context of the COVID-19 pandemic, numerous studies highlight the success of strategies such as testing, tracing, and isolation (TTI) programs (Ruiz et al., 2021), the use of mobile applications for risk assessment (Birinci et al., 2022), and the rapid implementation of non-pharmaceutical interventions and vaccination campaigns (Warren & Lofstedt, 2021; Zhong et al., 2021). Research further emphasises the importance of risk assessment, effective communication, and adaptive measures in controlling virus transmission, as demonstrated in the cases of the Tokyo and Beijing Olympic Games (McCloskey et al., 2023).

Beyond COVID-19, other studies focus on the management of mental health crises, identifying the need for non-coercive interventions and accessible community-based services, such as

crisis cafés (Staples et al., 2024). In humanitarian settings, strategies including vaccination campaigns, epidemiological surveillance, and improvements in water, sanitation, and hygiene (WASH) services have proven essential to prevent infectious disease outbreaks (Mercogliano et al., 2025).

Another critical area concerns risk management in the pharmaceutical industry and medical research, where emphasis is placed on the accelerated development of products – such as vaccines and monoclonal antibodies – without compromising safety (Folegatti et al., 2022; Xu et al., 2022), as well as on the implementation of robust risk management frameworks for complex projects (Zaki et al., 2024).

Table 4. Classification of Success Factors in Crisis Management

Category	Subcategory	Impact	Efficiency Evaluation	Authors
Intervention Strategies and Control Measures	Testing, Tracing, and Isolation (TTI)	Significant reduction in mortality and healthcare system costs	Cost-effectiveness analysis; 67% reduction in mortality	Ruiz et al. (2021)
	Mobile applications for risk assessment	Effective identification of positive and high-risk cases; control of disease spread	Number of individuals identified as positive following assessment	Birinci et al. (2022)
	Non-pharmaceutical interventions (e.g., mobility restrictions)	Control of pandemic progression and "flattening the curve"	Mathematical modelling of viral dynamics; time to rebound period	Yuan et al. (2021); Gunaratne et al. (2022)
	Vaccination	Reduced risk of hospitalisation and death; potential end of the pandemic"	Safety monitoring; immunogenicity studies; benefit–risk analysis	Warren & Lofstedt (2021); Folegatti et al. (2022)
	Treatments such as monoclonal antibodies	Significant decrease in hospitalisations and emergency department visits	Retrospective cohort studies; relative risk analysis	Rhudy et al. (2022)
System and Resource Management	Risk planning and assessment	Effective management of mass events and hospitalisations; prevention of nosocomial infections	Zero COVID-19 cases linked to events; absence of staff infections	Carter et al. (2024); McCloskey et al. (2023);
	Resource and supply chain management	Continuity of essential healthcare services	Ability to conduct testing despite reagent shortages; uninterrupted care delivery	Chong et al. (2020); Oliva et al. (2020)
	Public–private partnerships (PPP)	Delivery of high-quality and sustainable healthcare services	Fulfillment of contractual quality and performance requirements	Ramesh et al. (2023)
Communication and Engagement	Transparent risk communication	Increase of public trust and vaccination rate.	Analysis of the public perception and the vaccine adoption rate .	Warren & Lofstedt (2021)
	Community and stakeholder engagement	Support for implementation and sustainability of programs	Feedback from patients, staff, and communities; continued program success	Staples et al. (2024); Woodward et al. (2024)

Category	Subcategory	Impact	Efficiency Evaluation	Authors
Innovation and Research	Accelerated research and development (R&D)	Rapid delivery of treatments and vaccines during crises	Reduced time from development to authorisation and clinical use without compromising safety	Wang et al. (2024); Xu et al. (2022)
	Use of technology and data (e.g., telemedicine, MCDM)	Improved access to care and enhanced strategic decision-making	Procedure success rates; patient satisfaction; classification of critical success factors	Kerestes et al. (2021); Yazdi et al. (2021)
Policy and Legal Framework	Adaptive legislative frameworks and policies	Enable rapid responses and protect healthcare professionals	Capacity to implement emergency measures (e.g., vaccine authorisation); reduced litigation risk	Ahamat et al. (2023); Oliva et al. (2020)

Source: Authors' own elaboration based on data extracted from the analysed articles

The common success factors identified across these studies include risk planning and assessment, effective communication, interdisciplinary and international collaboration, flexibility and adaptability of measures, the use of technology and data, and strong leadership and community engagement.

In academic research, facilitators may also be regarded as success factors, particularly in the implementation and sustainability of complex interventions. The study conducted by Woodward et al. (2023) provides an illustrative example in which implementation facilitators played a critical role in the planning, launch, and maintenance of an interdisciplinary telehealth intervention within the Veterans Health Administration. The authors demonstrate that facilitators are not merely operational support actors, but strategic agents who directly influence the success and sustainability of interventions. Their role is inherently adaptive, contributing to the continuity of interventions in the face of emerging barriers and changing contextual conditions (Woodward et al., 2023).

6. CONCLUSIONS

Using the PRISMA methodology, this study investigates the real-world effectiveness of various risk management approaches within healthcare organisations during health crises. Unlike the controlled efficacy demonstrated under experimental conditions, performance in real implementation environments – such as hospitals, communities, or emergency services – is largely determined by the alignment of interventions with operational realities. Consequently, automated pathogen reporting systems or digital risk screening tools for violence in emergency departments demonstrate effectiveness only when they are coherently integrated into existing workflows and supported through continuous staff training. Similarly, interdisciplinary collaborative models and community-based interventions – such as task-shifting programs for hypertension control – have proven to be robust solutions capable of improving access, coordination, and continuity of care, particularly in resource-constrained settings.

The existing literature reveals significant research gaps that limit a comprehensive understanding of risk management effectiveness in practice. Most studies rely on retrospective or descriptive approaches without isolating organisational variables such as workforce

structure, leadership, and resistance to change. Moreover, long-term cost-effectiveness analyses and evaluations of operational sustainability remain insufficiently explored.

Therefore, this study contributes to strengthening the theoretical framework on the effectiveness of risk management in healthcare by offering a holistic perspective on how technological, organisational, and human factors interact under crisis conditions. Strategic risk management – grounded in adaptive leadership and responsible digitalisation – emerges as a key element for maintaining the stability and sustainability of healthcare systems during periods of uncertainty.

Future research directions include the empirical validation of intervention models, the integration of economic analyses, and the development of cross-national comparisons to enable a broader assessment of the real-world effectiveness of risk management in diverse health crisis contexts

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