

## HOSPITAL DISASTER RESILIENCE: A CONCEPTUAL FRAMEWORK

BIRUTĖ PAULIKIENĖ<sup>1</sup>

Klaipėda University Hospital, Klaipėda University (Lithuania)

### ABSTRACT

This article analyses the concept of hospital resilience to natural disasters (earthquakes, global warming, pandemics, and man-made disasters such as war, conflict and cyber-attacks) in the context of theoretical insights in scholarly articles on the concept of resilience, and elements of its perception and other aspects. The research conducted identified that the concept of a resilient hospital encompasses its ability to maintain functionality at minimal resource costs, and reduce the likelihood of shock in the event of various disasters. This capacity to withstand hazard can be of various types, for example, constructive, infrastructural or administrative. The following four elements are most commonly identified levels of resilience: context, disturbance, capacity to deal with disturbance, and reaction to disturbance. A resilient hospital maintains the following characteristics: rapidity, robustness, redundancy, resourcefulness, awareness, diversity, self-regulation, unity and adaptiveness. A variety of means are used to amplify resilience to distinct disasters and it is relevant to manage different types of resilience, but the human factor is indisputably essential in this framework.

KEY WORDS: *disaster, resilience, hospital.*

JEL CODES: I10, O2, O20.

DOI: <https://doi.org/10.15181/rfds.v37i2.2427>

### Introduction

The complexity and critical importance of health-care services in supporting public welfare and combating the consequences of disasters is indisputable (Cimellaro *et al.*, 2010; Achour, Price, 2011; Jolgehnejad *et al.*, 2021). Physical and social hospital resilience is crucial in order to manage any increase in demand, while operating continuously 24 hours a day, 365 days a year (Achour, Price, 2011). Notably, there has been a sharp rise in the number of disasters, which are becoming more difficult to predict and are causing increasing damage to society. While at the beginning of the 21st century the focus was on seismic disasters and natural disasters caused by climate change, once the global pandemic hit in 2019, scholarly research shifted its attention to the challenges transmittable diseases pose to health-care systems. The events of recent years, such as the Covid-19 pandemic and international military conflicts, have highlighted the structural, organisational and technological shortcomings of established and prevailing health-care systems, and have shown that the future of health-care provision depends on hospitals' ability to dynamically respond to unforeseen circumstances, and to operate as smoothly as possible in unfamiliar conditions. Building up hospital resilience to disasters and unforeseen circumstances is essential to minimise the damage caused by extreme events, to ensure continuous service provided by hospitals in general and to those affected by the disaster, and to prevent further injuries caused by the disaster (Masten, 2001; Cimellaro *et al.*, 2018; Fallah-Aliabadi *et al.*, 2020). Enhancing hospital disaster resilience saves patients' lives, protects the health and well-being of employees, and ensures the provision of health-care services in emergencies when they are most needed.

<sup>1</sup> Birutė Paulikienė – lawyer, Klaipėda University Hospital, MA in health-care management, Management Department, Klaipėda University  
Scientific field: management, health care  
E-mail: paulikiene.b@gmail.com

The first formal step in formulating international policy action was taken during the International Expert Group Meeting organised by the United Nations Disaster Relief Coordinator in July 1979. In 1994, guidelines for natural disaster prevention, preparedness and mitigation were drawn up at the World Conference on Natural Disaster Reduction held in Yokohama, Japan. These guidelines (the Yokohama Strategy) contained the principles, strategy and plan of action to ensure a safer world, and were the catalyst for a major change in the political and analytical understanding of disaster mitigation. In 2000, the International Strategy for Disaster Reduction was adopted. Its aim was to empower communities to be able to reduce the risk of and prevent the impact of disasters, subsequently minimising the economic and social consequences posed to affected groups of people. By consolidating risk prevention strategies in the plan for sustainability development management, the International Strategy for Disaster Reduction also tried to shift the focus from simply protecting against risks to actively managing them. In 2005, the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters was sanctioned. The aim was to promote the introduction and development of local strategies and policies designed to mitigate the risk of disaster, thus promoting the integration of national and international efforts to reduce the risks posed by disaster (McGlade *et al.*, 2019). The problem of the health-care system's resilience in Lithuania is essentially only beginning to be acknowledged and addressed. The 4 March 2022 public audit report 'Ensuring the Sustainability of Health Care in Emergencies' (Sveikatos priežiūros tvarumo užtikrinimas esant ekstremalioms situacijoms) indicates that participants in the national health-care system must take action to improve the sustainability of the system in emergency situations, because the processes of managing health emergencies, access to and safety of health-care services, and the organisation of accumulating and distributing medical supplies should be improved, and issues of ensuring human resources and improving competences should be addressed. Thus, the topic of increasing the resilience of the health-care system and its institutions is becoming increasingly relevant today, whereby efficient solutions to managing the risk of disaster are instrumental in increasing the responsiveness of the population and the effectiveness of the response in crises (Clack *et al.*, 2002).

In this context, it makes sense to study a scientific problem by working out the concept of a disaster-proof hospital in literature. The subject is conceptualising a disaster-proof hospital. In order to reveal this concept, it is appropriate to answer questions about the concept of a disaster-resilient hospital, its elements and possible measures to strengthen resilience. The aim is to identify the concept of a disaster-proof hospital, its elements, and means of increasing resilience. The objectives are: 1) to define the concept of a disaster-proof hospital used in literature; 2) to identify the elements of the definition of hospital disaster resilience; and 3) to ascertain measures that can be taken to increase the resilience of hospitals. The research method used to explore the problem is the systematic and comparative analysis of the content of relevant literature. Scientific articles ( $n = 39$ ) and other documents from international organisations ( $n = 6$ ) were selected according to the search words 'resilient hospital' and 'resilience' in the database of scientific literature 'Google Scholar', and a comparative, systematic logical analysis of the literature was performed based on them.

## 1. The concept of hospital disaster resilience

Generally, the term 'resilience' is defined as *the ability of a substance to return to its usual shape after being bent, stretched, or pressed* (Dictionary, 2021). The concept of resilience is widely applied in multiple contexts, e.g. organisational, social, financial and structural (Pishnamazzadeh *et al.*, 2020). Resilience can also be attributed to the ability of countries, communities or individual households to manage change and maintain their current or adopt to new living standards in the event of disaster (war, global warming, pandemic) without putting their long-term goals and welfare at risk (DfID, 2011). Resilience is significant for critical infrastructures such as agriculture, airports, seaports, banks, telecommunications, defence, energy, drinking water, infrastructure, transport, information technology, and, of course, the health-care system.

Inevitably, the concept of hospital resilience stems from general frameworks of disaster resilience. The four main domains of this concept are hospital safety, disaster preparedness and resources, continuity of essential medical services, recovery, and adaptation (Zhong *et al.*, 2014). *Operational Framework for Building*

*Climate Resilient Health Systems* by the World Health Organization (WHO, 2015) provided guidance on ways for the health sector to address climate change systematically and effectively. Indeed, the WHO defined the concept of ‘resilience’ as a universal capability and level of responsiveness to change, and the ability to adapt to and function in unfamiliar circumstances and under stress. Thus, the interpretation of resilience stretches beyond the definition of resilience as an absence of vulnerability, and instead encompasses the overall capability of a system. Notably, the focus of managing risks associated with disaster is on minimising susceptibility ahead of disaster, while disaster resilience is designed to empower communities to evolve to withstand external shocks, and to equip the physical, social, and economic sectors with the means to adapt to and continue operating in the event of disaster. These response strategies improve the disaster tolerance of systems, enabling them to withstand shock, and crucially, aid rapid recovery and the ability to return to peak performance within the shortest time frame possible (Simonovic, 2016). Over and above, health-care organisations are deemed resilient if they can offer the best health-care support possible during and after a disaster (Labarda *et al.*, 2017).

In line with the definition provided by the WHO, disaster is a significant event that hinders the running of an affected region or group of people, and the ability of those affected to self-sufficiently maintain pre-disaster economic, environmental, human and material performance. Meanwhile, research literature analyses hospital resistance to shocks, which can be caused by various adversities: natural hazards, e.g. earthquakes (Cimellaro *et al.*, 2010; Achour *et al.*, 2014; Khanmohammadi *et al.*, 2018; Shang *et al.*, 2020), floods, avalanches (Achour, Price, 2011), climate change risks (Loosemore *et al.*, 2011); man-made disasters, e.g. terrorism, military conflicts, cyber-attacks (Splichalova *et al.*, 2021); and outbreaks, e.g. ebola (Kurk *et al.*, 2015), the Covid-19 pandemic (Peiffer-Smadja *et al.*, 2020; Capolongo, 2020; Barbash, Kahn, 2021), seasonal flu (Harris *et al.*, 2021).

The subject also incorporates parallel concepts of preparedness and vulnerability. The term ‘preparedness’ is more commonly found in research conducted during the first decade of the 21st century. It assesses the readiness of hospitals to provide medical assistance in the event of an emergency, and the provision of other medical assistance during and after an emergency (Toner *et al.*, 2006). Meanwhile, some of the more current literature defines resilience as the opposite of vulnerability (Splichalova *et al.*, 2021). From this viewpoint, the vulnerability people exhibit in disaster situations is an intricate inevitability with a profound impact on the social, economic, health and cultural levels (Keim *et al.*, 2008). Such human vulnerability to disaster is bilateral, and comprises of both susceptibility, which can be defined as the level of contact with and effects of hazardous events, and resilience, which is the scope of the ability to manage and overcome the consequences of such events. Vulnerability is also referred to as the amount of exposure to hazard systems and structures experience, while resilience is the capability systems and structures have to manage, withstand, and/or overcome disaster. It is also argued that vulnerability is the opposite of resilience, but that a distinction between passive versus active, and pre-disaster versus post-disaster, is recognised in relation to the terms ‘vulnerability’ and ‘resilience’ (Johnson *et al.*, 2020). Thus, an analysis of research literature leads to the conclusion that the definition of the term ‘resilience’ as the ability to manage external hindrances essentially encompasses the concept of ‘vulnerability’.

Overall, definitions of hospital resilience in literature are similar to the definition of hospital resilience provided by the World Health Organization. The key definitions of the concept of hospital resistance in literature are presented in Table 1.

Table 1. Key definitions of the concept of hospital resilience in literature

	Author	Definition of the concept of hospital resilience
1.	Bruneau <i>et al.</i> , 2003	The ability of a system to reduce the chances of a shock, to absorb such a shock if it occurs, and to recover quickly after a shock
2.	Cimellaro <i>et al.</i> , 2010	The capability to sustain functionality and recover from losses generated by extreme events
3.	Field and Barros, 2014	The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganising in ways that maintain its essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation
4.	Kruk <i>et al.</i> , 2015	The capacity of health actors, institutions and populations to prepare for and effectively respond to crises, maintain core functions when a crisis hits, and, informed by lessons learned during the crisis, reorganise if conditions require it
5.	Zhong <i>et al.</i> , 2015	The ability to resist, absorb and respond to the shock of disasters while maintaining critical health-care functions, and then recover to the original state or adapt to a new one
6.	Cimellaro <i>et al.</i> , 2018	The ability to absorb and recover from hazardous events, containing the effects of disasters when they occur
7.	de Boer, Dubouloz, 2020	Disaster resilience is composed of (1) the absorbing capacity, (2) the buffering capacity, and (3) response to the event and recovery from the damage sustained
8.	Kamissoko <i>et al.</i> , 2021	The ability to absorb the impacts of perturbations, and to recover, in minimum time, with minimum costs (financial, human, workload, etc), a certain functioning capacity in all dimensions of its performances

An emphasis is also laid on interpreting resilience as a means to successfully managing operations during crises, and the rate at which this can be accomplished (Kamissoko *et al.*, 2021). A parallel definition based on an interpretation of resistance as the capability to minimise the likelihood of and speed up the recovery from shocks (Bruneau *et al.*, 2003) explains resistance in a similar but more precise manner by demonstrating the aptness of the system in use mathematically, which in this instance is defined as functionality (Cimellaro *et al.*, 2010). Graphically, resistance is defined as a normalised shaded area under the system functionality  $Q(t)$ . Functionality  $Q(t)$  is measured as a percentage of the time function.  $Q(t)$  ranges from 0 to 100%, where 100% means that productivity does not decrease, and 0% means a complete loss. The functional expression of resistance (Bruneau *et al.*, 2003; Cimellaro *et al.*, 2010) substantiates that its definition is the ratio of a certain functionality to a certain point in time. Thus, resilience efficiency is expressed as the ratio of output to input (Proag, 2014b):

$$\text{Resilience Efficiency} = \frac{\text{Output under Shock}}{\text{Normal Output}}$$

Concepts of hospital resilience used by researchers display no fundamental contradictions. All definitions of the concepts ascertain that hospital resilience is the bilateral ability of a system to maintain its maximum functional capacity, to restore its functionality in the shortest time possible, and to adapt the new situation in various crises and emergency situations. This ambivalence of the concept leads to the fact that two forms of resistance distinguished in literature are (Proag, 2014a): 1) hard resilience; and 2) soft resilience. Hard resilience is defined as the systems' ability to withstand the immediate effects disaster, which is frequently simplistically defined as the opposite of vulnerability. Contrarily, soft resilience is described as the capability to absorb shock, adapt to the after-effects of disaster, and return to pre-hazard levels of performance as quickly as possible without any lasting after-effects to the systems.

## 2. Characteristics of disaster-resilient hospitals

In the context of disaster-resilient hospitals, health-care systems are defined as the interaction of infrastructure, human capital, machinery and processes designed to provide the best possible service to patients and others in need (Pishnamazzadeh *et al.*, 2020). Physical and social factors together make up health-care facilities. Physical factors encompass essential structural components such as beams, columns, equipment and utilities. The social, otherwise known as ‘functional’ or ‘operational’, factor is human capital, e.g. human resources, planning and management processes (Achour *et al.*, 2014).

Since health systems are made up of certain factors, the resilience of hospitals is not homogeneous. Literature, as well as the WHO (2010), usually distinguishes structured, unstructured and functional types of resilience. Notably, based on the results of the research conducted, resilience is divided into three types: constructive, infrastructural and administrative (Fallah-Aliabadi *et al.*, 2020). Constructive resilience includes all elements of hospital buildings, such as architecture, the layout of the space, design, and all structures being optimally, flexibly and firmly adapted to emergencies. This type also includes the transport and transmission of patients and staff, etc. Infrastructural resilience consists of non-structural elements that facilitate the functions of the hospital. These are utilities, such as water, electricity and fire control. The area of administrative resilience includes the activities of hospitals, e.g. disaster management, reduction of hazards and vulnerabilities, etc. Resilience can also be perceived as a system of four components, technical, organisational, social and economic, which are distinguishable by certain characteristics (Bruneau *et al.*, 2003). Other research singles out eight components that affect hospital resilience: structural, non-structural, functional, geographical location, human resources, administration/organisation, and emergency preparedness (Samsuddin *et al.*, 2015).

Distinct levels of resilience, usually four, are also identified in research. These include context (interest group, location, organisation, etc), disturbance (natural disaster, war, etc), capacity (exposure, sensitivity, ability to adapt), and reaction (overcome, accept, rebuild, study, transform) (DfID, 2011). Figure 1 below is the conceptual framework captured by the WHO. To aid the analysis of resilient systems and their application to social groups, structures and other organisations, including health systems (WHO, 2015), five levels of resilience are distinguished in the framework. In this case, the fourth level of choice and opportunities breaks away from the third level of capacity to deal with disturbance. The degree of resilience of the system is identified in step four, whereby if the level of resilience is low the system might collapse.

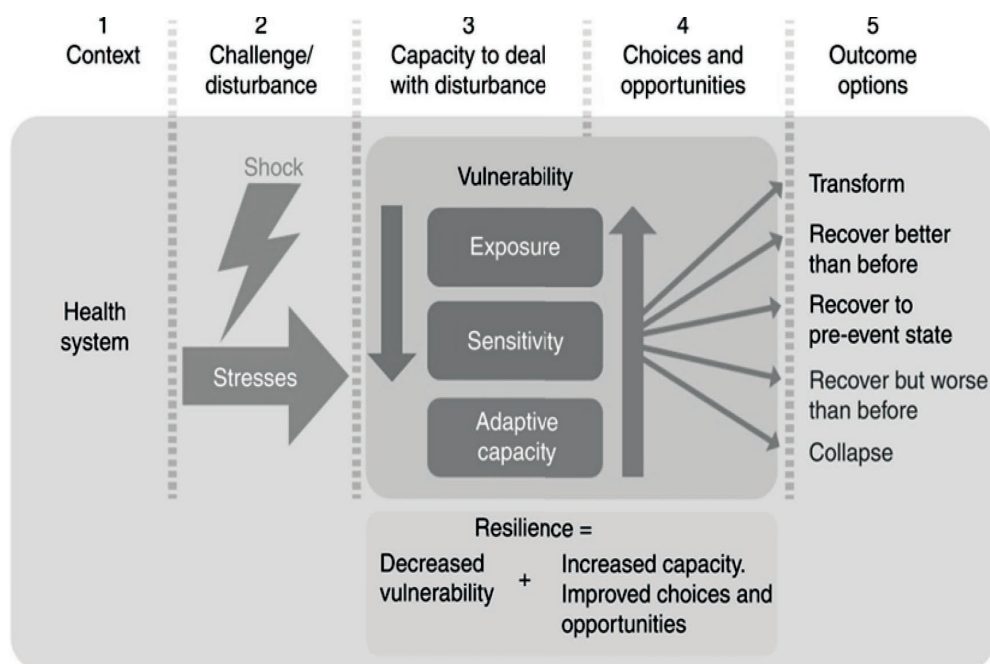


Figure 1. WHO conceptual framework for health system resilience



As is identified in this framework, there are five levels of resilience. The first is the contextual sector of the health system, the second is the type of disaster (flood, pandemic, etc) causing a shock to the system concerned. The capability of the system to resist is established at the third level. The vulnerability of the system manifests through the effects of shock and the sensitivity of the system to disaster. This is followed by the ability to use various options to adapt to the current situation identified at the fourth level. The fifth level highlights outcome options, which can range from system failure to performance improvements.

Other research interprets the characteristics of resilience as a combination of strength manifested as the ability to endure hazard events, and flexibility as a way of adapting to and recovering from shocks (McDaniels *et al.*, 2008). The concept of a resilient system is also interpreted as a system that is less likely to be negatively affected by disaster, can minimise the possible effects of disaster such as loss of life, irreversible social and economic damage, and other negative consequences, and displays the ability to recover and return to pre-disaster levels of function as quickly as possible (Bruneau, Reinhorn, 2006). The corresponding characteristics are also referred to as 1) the ability of a system to absorb shocks, 2) the ability to endure hazards, and 3) the capacity to return to pre-disaster levels (Proag, 2014a).

Four key features (4R) are commonly associated with resistance: *rapidity, robustness, redundancy, resourcefulness* (Bruneau *et al.*, 2003). Further, this system is characterised by five key traits, and is to be *aware, diverse, self-regulating, integrated, adaptive* (Kruk *et al.*, 2015).

In agreement with the statements above, both physical and social systems are distinguished by four characteristics of resistance (Bruneau *et al.*, 2003):

1. *Rapidity*: the ability to respond to crises in the shortest time possible, subsequently achieving the initial objective of response, and preventing any further shock waves of disaster in the future.

2. *Robustness*: the capacity of systems to display strength and endure hazardous events while maintaining functionality during and immediately after a disaster.

3. *Redundancy*: the level or awareness of all possible outcomes and tailor-made measures for each possibility that can replace or enhance functionality and minimise loss during and in the aftermath of a shock.

4. *Resourcefulness*: the ability to recognise and prioritise issues and problems, establish the main concerns, and rally substitute resources if the possibility of disruption and scarcity is a threat. In this framework, resourcefulness is also identified as the capacity to use material (e.g. monetary, structural, technological) and human (managerial, know-how) resources to achieve the best outcome possible in line with the objectives set out.

The level of resilience is dependent on all four interconnected variables.

Resilient health systems are further characterised by the following five traits, and are expected to be (Kruk *et al.*, 2015):

- 1) *aware*. This requires relevant maps of human, physical and information resources, which reveal strengths and vulnerable areas. Awareness requires strategic health information systems and epidemiological surveillance networks that can report on the state of the system and looming health threats in real time to establish predictions.

- 2) *diverse*. Health systems that can deal with a wide range of health problems rather than a few targeted ones are more stable and can detect adversities when they occur.

- 3) *self-regulating*. Capable of limiting and isolating health threats while continuing to provide basic health services and avoiding the spread of instability throughout the system. This includes three elements: (i) the ability to quickly identify and classify a threat and to divert resources to it, (ii) to minimise disruptions in the provision of essential health services in times of crisis, and (iii) the availability of surplus or excess services in specific locations, i.e. excess capacity that can be quickly connected to the Internet.

- 4) *integrated*. In the process, various agents, ideas and groups are brought together to formulate solutions and initiate actions. Information sharing, clear communication and coordination are features of integration that are best achieved in the health system with a designated centre. Public health activities, in particular communication with the public, must be closely coordinated with the provision of health services.

(5) *adaptive*. The ability to transform to improve function under very adverse conditions. Any adaptation should improve performance in the short term and, ideally, contribute to the development of long-term resilience.

System resilience can also be distinguished in terms of time, and is classified in literature as *the pre-hazard, hazard, and recovery periods* (Cheng *et al.*, 2022). Substantial conditions during the pre-hazard period are design configuration, functionality, and the reliability of constituents. The hazard period signifies the extent to which resilience is robust, or, contrarily, vulnerable, and able, or unable, to continue to function in adverse conditions. In such a framework, robustness is the result of the ability of a system to respond, adapt, absorb, resist, dismiss and source. Finally, system resilience is defined by its ability to bounce back after a shock during the recovery period, and includes characteristics such as the speed and ability to return to the pre-event level of performance, and the capability to function thereafter.

Considering the insights identified by researchers, Table 2 below outlines the essential elements that demonstrate the comprehensive concept of hospital resilience.

Table 2. Elements of the concept of hospital resilience

Elements of the concept of hospital resilience	Types of hospital resistance (Fallah-Aliabadi <i>et al.</i> , 2020)	Hospital resistance periods (Cheng <i>et al.</i> , 2022)	Hospital resistance levels (DfID, 2011)	Features of hospital resilience (Bruneau <i>et al.</i> , 2003; Kruk <i>et al.</i> , 2015)
Item Content	1. Constructural 2. Infrastructural 3. Administrative	1. Pre-hazard period 3. Hazard period 3. Recovery period	1. Context 2. Disturbance 3. Capacity 4. Reaction	1. Rapidity 2. Robustness 3. Redundancy 4. Resourcefulness 5. Aware 6. Diverse 7. Self-regulating 8. Integrated. 9. Adaptive

### 3. Actualisation of measures to increase the resilience of hospitals

Managing risk is a wide-ranging system of strategies that comprise prevention (focuses on actions that may prevent a disaster from taking place), mitigation (comprehensive measures planned and taken ahead of a hazard event which are expected to minimise the impact of a shock when it takes place), response (specific means employed to reduce the death toll and other damage, the temporary removal of communities and resources from harm's way, and enacting appropriate rescue efforts, organising relief, and assisting with rehabilitation), and recovery (initiates processes designed to aid a return to pre-disaster levels of functionality) (Clack *et al.*, 2002). The risk management processes and measures are also relevant for increasing patient resilience. Measures to increase the resilience of hospitals may also be divided into appropriate groups, according to the elements of the structure of the health system, the nature of disasters, or other criteria.

Research conducted in 2017 identifies health service delivery, health workforce, health information management systems, medical products including vaccines and technologies, health financing, and health leadership and governance as the six key components of the conceptual framework of the health system (Olu, 2017). A publication by the WHO also recognises that strengthening these elements is precisely what is needed to promote hospital resilience. Further, resilience-enhancing activities can be categorised by area (global/regional, national, municipal/local, community/household), and by type (social/human, financial/economic, environmental/natural, political, technological/physical) (DfID 2011).

In the case of climate-related disaster, four general goals have been set to ensure hospital resilience, namely, the ability to guarantee the provision of necessary infrastructure (e.g. buildings), emphasising and re-

taining personal autonomy, focusing on supporting efficient inter-departmental communication, and enabling employees and patients to safely access and leave the hospital premises (Loosemore *et al.*, 2011). Research into hospital resilience in disaster events such as earthquakes identified three obstacles that most health-care providers are faced with: lack of infrastructural resilience to natural disasters, lack of or inadequate performance of alternative resources, and a deficiency of deliberation about provision for health-care supplies in the event of hazard in resilience policies and legislations (Achour *et al.*, 2014). Further research identified three factors that most accurately signify the resilience of hospitals to seismic disasters: 1) cooperation and training management, 2) resource and equipment capability, and 3) structural and organisational operating procedures (Cimellaro *et al.*, 2018). In 2021, the following traits needed to raise hospital resilience levels in the context of the Covid-19 pandemic were classified and included: 1) well-developed, 2) easy-to-change clinical protocols, 3) flexible electronic health systems, 4) supportive interdisciplinary work environments in which employees can feel safe and able to express concerns or new ideas, 5) effective and united leadership at all levels, and 6) promoting organisation alignment in rapidly changing clinical and administrative environments (Barbash, Kahn, 2021).

Finally, the most recent research highlighted that employees' ability to carry out their work during or post-hazard depends on multiple complex factors, including personal and professional circumstances, the climate at work, awareness of the issue at hand, and the level of responsibility the employee has. Personal characteristics, such as age group and duration of work experience, and personality traits, such as dependability, willingness to travel, level of training received and mental health, all have an impact on the likelihood of the member of staff returning to and being able to carry out duties at the hospital post-hazard (Barbash, Kahn, 2021). The research has also concluded that all hospital departments, services and professions have an ability to impact the provision of health-care services despite hierarchical divisions and differences in roles and background. The significance of the human factor in health care has also been substantiated by recognising the magnitude human resource-related factors have on hospital resilience, and the decrease in performance that changes made to human factors could result in (Pishnamazzadeh *et al.*, 2020).

In light of the research referred to above, it is possible to apportion measures required to increase hospital resilience in a general sense: the physical maintenance of buildings and infrastructure, ensuring access to basic services, developing suitable legislation to include clearly defined established procedures, treatment practices, appropriate human resource management, facilitation of cross-agent communication and cooperation, acknowledging and prioritising employee mental health, promoting good manager-employee relations, and a flexible and efficient electronic health system. More in-depth research, considering specific types of disaster, with an emphasis on the continued development and improvement of hospital resilience to disasters, should be carried out.

## Conclusions

The concept of a disaster-proof hospital encompasses the bilateral ability of a hospital, consisting of the provision of health services, health-care workers, a health information management system, medical products, health financing and health management, and leadership, in order to accomplish the following goals at minimal resource costs: to maintain functionality and reduce the likelihood of shock in the event of various disasters, to quickly recover from the shock/loss caused by a disaster, and restore the original level of performance or adapt to a new one.

In literature research, the characteristics types of resilience are identified as structural, infrastructural and administrative; and the levels as context, disturbance, capacity to deal with disturbance, and reactions to disturbance. The defining characteristics of hospital resistance are speed, strength, access, ingenuity, awareness, diversity, self-regulation, unity and adaptiveness, and can be significant at different stages of adversity: the pre-hazard, hazard and recovery periods.

Measures adopted to improve hospital resistance differ according to the type of disaster, e.g. earthquakes, climate change or pandemics. While improving hospital resilience in the case of an earthquake should



focus on the infrastructure, in the event of outbreaks of transmittable diseases, staff training and reliability of services should be prioritised. More research, based on the specific type of disaster, with an emphasis on the continued development and improvement of hospital resilience to disaster, should be carried out in the future. In each case, the significance of the human factor is indisputable.

The development and deepening of the concept of a disaster-resistant hospital at a theoretical level, revealing its comprehensive concept and highlighting key elements of the concept and measures to increase resilience, contributes to a better understanding of the process, which is important in improving hospital performance and increasing societal resilience in emergencies.

## References

- Achour, N., Price, A. D. F. (2011). Healthcare Resilience to Natural Hazards: An Achievable Target. *International Journal of Disaster Resilience in the Built Environment*, 2 (3).
- Achour, N., Miyajima, M., Pascale, F., Price, A. D. (2014). Hospital Resilience to Natural Hazards: Classification and Performance of Utilities. *Disaster Prevention and Management*, 23 (1), 40–52.
- Achour, N., Elhaj, H., Ali, A. (2022). Hospital Resilience to Extreme Events: A Staff Capability of Attendance Perspective. *International Journal of Disaster Risk Reduction*, 72, 102851.
- Barbash, I. J., Kahn, J. M. (2021). Fostering Hospital Resilience – Lessons from COVID-19. *JAMA*, 326(8), 693–694.
- Bruneau, M., Chang, S. E., Eguchi, R. T., Lee, G. C., O'Rourke, T. D., Reinhorn, A. M., (...) Von Winterfeldt, D. (2003). A Framework to Quantitatively Assess and Enhance the Seismic Resilience of Communities. *Earthquake spectra*, 19(4), 733–752.
- Bruneau, M., Reinhorn, A. (2006). Overview of the Resilience Concept. *Proceedings of the 8th US national conference on earthquake engineering*, 2040, 18–22.
- Clack, Z. A., Keim, M. E., Macintyre, A. G., Yeskey, K. (2002). Emergency Health and Risk Management in Sub-Saharan Africa: A Lesson from the Embassy Bombings in Tanzania and Kenya. *Prehospital and Disaster Medicine*, 17(2), 59–66.
- Capolongo, S., Gola, M., Brambilla, A., Morganti, A., Mosca, E. I., Barach, P. (2020). COVID-19 and Healthcare Facilities: A Decalogue of Design Strategies for Resilient Hospitals. *Acta Bio Medica: Atenei Parmensis*, 91(9-S), 50.
- Cheng, Y., Elsayed, E. A., Huang, Z. (2022). Systems Resilience Assessments: A Review, Framework and Metrics. *International Journal of Production Research*, 60(2), 595–622.
- Cimellaro, G. P., Reinhorn, A. M., Bruneau, M. (2010). Seismic Resilience of a Hospital System. *Structure and Infrastructure Engineering*, 6(1–2), 127–144.
- Cimellaro, G. P., Malavisi, M., Mahin, S. (2018). Factor Analysis to Evaluate Hospital Resilience. *ASCE-ASME Journal of Risk and Uncertainty in Engineering Systems, Part A: Civil Engineering*, 4(1), 04018002.
- De Boer, J., Dubouloz, M. (Eds.). (2020). *Handbook of Disaster Medicine*. CRC Press.
- Dictionary, C. E. (2021). Meanings & Definitions. *Cambridge Dictionary*. Internet access: [Dictionary.cambridge.org](https://dictionary.cambridge.org).
- Field, C. B., Barros, V. R. (Eds.). (2014). *Climate Change 2014–Impacts, Adaptation and Vulnerability: Regional Aspects*. Cambridge University Press.
- Fallah-Aliabadi, S., Ostadtaghizadeh, A., Ardalan, A., Fatemi, F., Khazai, B., Mirjalili, M. R. (2020). Towards Developing a Model for the Evaluation of Hospital Disaster Resilience: A Systematic Review. *BMC health services research*, 20(1), 1–11.
- Harris, G. H., Rak, K. J., Kahn, J. M., Angus, D. C., Mancing, O. R., Driessen, J., Wallace, D. J. (2021). US Hospital Capacity Managers' Experiences and Concerns Regarding Preparedness for Seasonal Influenza and Influenza-like Illness. *JAMA Network Open*, 4(3), e212382–e212382.
- Jolgehnejad, A. K., Kahnali, R. A., Heyrani, A. (2021). “Factors Influencing Hospital Resilience”, *Disaster Medicine and Public Health Preparedness*, 15(5), 661–668.
- Johnson, P. M., Brady, C. E., Philip, C., Baroud, H., Camp, J. V., Abkowitz, M. (2020). A Factor Analysis Approach Toward Reconciling Community Vulnerability and Resilience Indices for Natural Hazards. *Risk Analysis*, 40(9), 1795–1810.
- Kamissoko, D., Nastov, B., Allon, M. (2021). Improved Model for Continuous, Real-time Assessment and Monitoring of the Resilience of Systems Based on Multiple Data Sources and Stakeholder. *Structure and Infrastructure Engineering*, 1–16.
- Khanmohammadi, S., Farahmand, H., Kashani, H. (2018). A System Dynamics Approach to the Seismic Resilience Enhancement of Hospitals. *International Journal of Disaster Risk Reduction*, 31, 220–233.
- Keim, M. E. (2008). Building Human Resilience: The Role of Public Health Preparedness and Response as an Adaptation to Climate Change. *American Journal of Preventive Medicine*, 35(5), 508–516.

- Kruk, M. E., Myers, M., Varpilah, S. T., Dahn, B. T. (2015). What is a Resilient Health System? Lessons from Ebola. *The Lancet*, 385(9980), 1910–1912.
- Labarda, C., Labarda, M. D. P., Lamberte, E. E. (2017). Hospital Resilience in The Aftermath of Typhoon Haiyan in the Philippines. *Disaster Prevention and Management: An International Journal*, 26 (4), 424–436.
- Loosemore, M., Carthey, J., Chandra, V., Chand, A. M. (2011). Climate Change Risks and Opportunities in Hospital Adaptation. *International Journal of Disaster Resilience in the Built Environment*, 2 (3), 210–221.
- Masten, A. S. (2001). Ordinary Magic: Resilience Processes in Development. *American Psychologist*, 56(3), 227.
- McDaniels, T., Chang, S., Cole, D., Mikawoz, J., Longstaff, H. (2008). Fostering Resilience to Extreme Events within Infrastructure Systems: Characterizing Decision Contexts for Mitigation and Adaptation. *Global Environmental Change*, 18(2), 310–318.
- McGlade, J., Bankoff, G., Abrahams, J., Cooper-Knock, S. J., Cotecchia, F., Desanker, P., (...) Wood, M. (2019). *Global Assessment Report on Disaster Risk Reduction 2019*. United Nations Office for Disaster Risk Reduction. ISBN/ISSN/DOI978-92-1-004180-5.
- Zhong, S., Clark, M., Hou, X. Y., Zang, Y., FitzGerald, G. (2015). Development of Key Indicators of Hospital Resilience: A Modified Delphi Study. *Journal of Health Services Research & Policy*, 20(2), 74–82.
- Zhong, S., Clark, M., Hou, X. Y., Zang, Y. L., Fitzgerald, G. (2014). Development of Hospital Disaster Resilience: Conceptual Framework and Potential Measurement. *Emergency Medicine Journal*, 31(11), 930–938.
- Olu, O. (2017). Resilient Health System as Conceptual Framework for Strengthening Public Health Disaster Risk Management: An African Viewpoint. *Frontiers in Public Health*, 5, 263.
- Peiffer-Smadja, N., Lucet, J. C., Bendjelloul, G., Bouadma, L., Gerard, S., Choquet, C., (...) Lescure, F. X. (2020). Challenges and Issues about Organizing a Hospital to Respond to the COVID-19 Outbreak: Experience from a French Reference Centre. *Clinical Microbiology and Infection*, 26(6), 669–672.
- Pishnamazzadeh, M., Sepehri, M. M., Ostadi, B. (2020). An Assessment Model for Hospital Resilience according to the Simultaneous Consideration of Key Performance Indicators: A System Dynamics Approach. *Perioperative Care and Operating Room Management*, 20, 100118.
- Proag, V. (2014). The Concept of Vulnerability and Resilience. *Procedia Economics and Finance*, 18, 369–376.
- Proag, V. (2014). Assessing and Measuring Resilience. *Procedia Economics and Finance*, 18, 222–229.
- Samsuddin, N. M., Takim, R., Nawawi, A. H., Esa, M. R. (2015). Critical Components Contributing to Disaster Resilience Hospitals. *Australian Journal of Basic and Applied Sciences*, 9(7), 72–75.
- Simonovic, S. P. (2016). From Risk Management to Quantitative Disaster Resilience – a Paradigm Shift. *International Journal of Safety and Security Engineering*, 6(2), 85–95.
- Shang, Q., Wang, T., Li, J. (2020). A Quantitative Framework to Evaluate the Seismic Resilience of Hospital Systems. *Journal of Earthquake Engineering*, 1–25.
- Splichalova, A., Vichova, K., Valasek, J., Paulus, F. (2021). Assessing the Resilience of an Acute-Care Hospital in the Context of Current Security Threats. *Chemical Engineering Transactions*, 86, 553–558.
- Toner, E., Waldhorn, R., Maldin, B., Borio, L., Nuzzo, J. B., Lam, C., (...) O'Toole, T. (2006). Hospital Preparedness for Pandemic Influenza. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, 4(2), 207–217.

#### Documents of international organizations

- DfID. (2011). *Defining Disaster Resilience: A DFID Approach Paper*.
- World Health Organization. (2000). *Health Sector Emergency: Preparedness Guide-making a Difference to Vulnerability*.
- World Health Organization. (2008). *International Health Regulations (2005)*.
- World Health Organization. (2010). *Safe Hospitals in Emergencies and Disasters: Structural, Non-structural and Functional Indicators*. Manila: WHO Regional Office for the Western Pacific.
- Public Audit Report. (2022). *Ensuring the Sustainability of Health Care in Emergencies*, No VAE-2.
- World Health Organization. (2015). *Operational Framework for Building Climate-Resilient Health Systems*. Geneva: Public Health & Environment Department (PHE), World Health Organization.

# ASMENS SVEIKATOS PRIEŽIŪROS ĮSTAIGŲ ATSPARUMAS KRITINĖMS SITUACIJOMS: KONCEPCIJOS STRUKTŪRA

BIRUTĖ PAULIKIENĖ

Klaipėdos universitetinė ligoninė, Klaipėdos universitetas (Lietuva)

## Santrauka

Pastarųjų metų įvykiai – COVID-19 pandemija, tarptautiniai kariniai konfliktai – išryškino susiformavusių ir nusistovėjusių sveikatos sistemų struktūrinius, organizacinius, technologinius trūkumus bei parodė, kad sveikatos priežiūros paslaugų teikimo ateitis priklauso nuo asmens sveikatos priežiūros įstaigų gebėjimo dinamiškai reaguoti į nenumatytus ekstremalius įvykius ir kuo sklandžiau veikti naujomis sąlygomis. Straipsnyje analizuojama kritinėms situacijoms, kurias gali sukelti gamtos jėgos (žemės drebėjimai, klimato atšilimo pokyčiai, pandemijos) arba žmonių pastangos (kariniai konfliktai, kibernetinės atakos ir pan.), atsparios asmens sveikatos priežiūros įstaigos samprata, aptariant teorines įžvalgas moksliniuose straipsniuose dėl *atsparumo* sąvokos, jos sampratos elementų, atsparumo didinimo priemonių.

Tyrimo problema: siekiant atskleisti asmens sveikatos priežiūros įstaigos atsparumo kritinėms situacijoms koncepciją, tikslinga apibrėžti *nelaimėms atsparios ligoninės* sąvoką, jos elementus bei nurodyti galimas atsparumo stiprinimo priemones. Tyrimo objektas – nelaimėms atsparios asmens sveikatos priežiūros įstaigos samprata. Tyrimo tikslas – identifikuoti nelaimėms atsparios asmens sveikatos priežiūros įstaigos sampratą ir jos elementus. Tyrimo uždaviniai: 1) apibrėžti mokslinėje literatūroje vartojamą *nelaimėms atsparios asmens sveikatos priežiūros įstaigos* sąvoką; 2) nustatyti reikšmingus šios sampratos elementus; 3) nustatyti asmens sveikatos priežiūros įstaigos atsparumą didinančias priemones. Tyrimo metodai: problemai tirti taikyta sisteminė ir lyginamoji mokslinės literatūros turinio analizė.

Atliekant tyrimą apibrėžiama *asmens sveikatos priežiūros įstaigų atsparumo* sąvoka, mokslininkų požiūriai, sąvokos turinio elementai, nurodomos atsparumo didinimo priemonės. Padarytos esminės išvados, kad *nelaimėms atsparios asmens sveikatos priežiūros įstaigos* sąvoka apima dvipolį įstaigos (sveikatos priežiūros įstaiga apima sveikatos paslaugų teikimą, sveikatos priežiūros darbuotojus, sveikatos informacijos valdymo sistemą, medicinos produktus, sveikatos finansavimą ir sveikatos vadovavimą bei valdymą) gebėjimą minimaliomis išteklių sąnaudomis išlaikyti funkcionalumą ir sumažinti šoko tikimybę, ištikus įvairioms nelaimėms, greitai atsigauti po nelaimės sukulto šoko, patirtų nuostolių, atkuriant pradinę būseną arba prisitaikant prie naujos susiklosčiusios situacijos. Mokslinėje literatūroje nustatyti bendri organizacijų atsparumui būdingi tipai: konstrukcinis, infrastruktūrinis ir administracinis; atsparumo raiškos lygiai, priklausantys nuo konteksto, sutrikdymo, gebėjimo susidoroti su sutrikdymu ir reakcijos į sutrikdymą. Asmens sveikatos priežiūros įstaigos atsparumui priskiriamos spartos, tvirtumo, pertekliško, išradingumo, sąmoningumo, įvairovės, savireguliacijos, integruotumo, prisitaikymo ypatybės, kurios gali būti reikšmingos skirtingose nelaimės fazėse: iki pavojaus, ištikus pavojui ir atsigavimo. Nuo nelaimės tipo (žemės drebėjimas, klimato pokyčiai, pandemijos) priklauso ir asmens sveikatos priežiūros įstaigų atsparumo didinimo priemonės. Siekiant didinti asmens sveikatos priežiūros įstaigos atsparumą žemės drebėjimams, didžiausias dėmesys turėtų būti skiriamas pastatų ir komunalinių paslaugų infrastruktūrai, užkrečiamųjų ligų protrūkių atvejais – personalo mokymo, paslaugų saugumo užtikrinimo klausimams. Atsižvelgiant į tai, asmens sveikatos priežiūros įstaigos atsparumo nelaimėms temą ateityje būtina plėtoti, skiriant pagal skirtingo pobūdžio nelaimes. Žmogiškojo veiksnio reikmė nenuginčijamai esminė šiame kontekste.

PAGRINDINIAI ŽODŽIAI: *nelaimė, atsparumas, ligoninė*.

JEL KLASIFIKACIJA: I10, O2, O20.

Received: 2022-04-10

Revised: 2022-05-09

Accepted: 2022-05-20