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A culture of innovation that promotes safety in hospitals

Kultura innowacyjności promująca bezpieczeństwo w szpitalach

Abstract

The aim of this article is to identify key factors contributing to a safety-enhancing innovation culture in hospitals. Based on a critical literature review, a unique approach to safety-enhancing innovation culture is proposed, integrating the perspectives of innovation culture and safety culture, particularly psychological and relational safety. Empirical research was conducted using an expert panel and MicMac structural analysis in three public hospitals with different reference levels: clinical, regional, and district. Nineteen factors of safety-enhancing innovation culture were analyzed, and their interactions and interdependencies were then determined. The analyses indicate that soft factors, such as trust, teamwork, organizational community, and learning, are primarily key in shaping a safety-enhancing innovation culture, rather than formal

and structural solutions. The results indicate that innovation and safety are not competing categories but rather interdependent, provided that appropriate cultural conditions exist.

Key words: organizational culture, innovation, safety, structural analysis, hospitals

Streszczenie

Celem artykułu jest próba identyfikacji kluczowych czynników kultury innowacyjności sprzyjającej bezpieczeństwu w szpitalach. Na podstawie krytycznego przeglądu literatury zaproponowano autorskie ujęcie kultury innowacyjności sprzyjającej bezpieczeństwu, integrujące perspektywę kultury innowacyjnej, oraz kultury bezpieczeństwa zwłaszcza psychologicznego i relacyjnego. Badania empiryczne przeprowadzono z wykorzystaniem panelu ekspertów oraz analizy strukturalnej MicMac w trzech publicznych szpitalach o różnym poziomie referencyjnym: klinicznym, wojewódzkim i powiatowym. Do analizy przyjęto 19 czynników kultury innowacyjności sprzyjającej bezpieczeństwu, a następnie określono ich wzajemne oddziaływania i zależności. Przeprowadzone analizy wskazują, że w procesie kształtowania kultury innowacyjności sprzyjającej bezpieczeństwu kluczowymi są przede wszystkim czynniki miękkie, takie jak zaufanie, współpraca zespołowa, wspólnota organizacyjna i uczenie się, a nie rozwiązania formalno-strukturalne. Uzyskane wyniki wskazują, że innowacyjność i bezpieczeństwo nie są kategoriami konkurencyjnymi, lecz wzajemnie współzależnymi, pod warunkiem istnienia odpowiednich uwarunkowań kulturowych.

Słowa kluczowe: kultura organizacyjna, innowacyjność, bezpieczeństwo, analiza strukturalna, szpitale

1. Introduction

The modern healthcare system operates under conditions of exceptional legal and organizational complexity, growing pressure from external stakeholders, and staff shortages, which directly impact the safety of patients and medical staff. In this context, organizational culture is becoming increasingly important as a model for shared and binding assumptions developed by a group in the process of effectively addressing issues of external adaptation and internal integration. However, in the

current environment, it is not only about the overall perspective of organizational culture, but also its focus on innovation and safety. Both of these issues appear crucial in the functioning of hospitals, which occupy a strategic place in the healthcare system. Thus, hospital safety can be considered a multidimensional state of an entity's ability to protect the lives and health of patients and staff, as well as the continuity of hospital operations – both in everyday operations and in emergency situations (health crises, technical failures, cyberattacks, natural disasters, or hybrid threats). In this perspective, safety and the associated organizational culture go beyond classic occupational health and safety or clinical procedures, but also encompass psychological and relational safety. At the same time, the World Health Organization emphasizes that patient and staff safety are largely determined by organizational culture and are treated as a primary value, not as an additional procedural requirement. Another important issue is the fact that hospitals operate in an environment of innovation, which requires the generation, implementation, and dissemination of new or significantly improved solutions in clinical, organizational, technological, and management processes. The literature emphasizes that innovation in hospitals is not limited solely to technological advancements or the implementation of modern medical equipment, but also encompasses changes in work organization, leadership, communication between various professions, knowledge management, and relationships with patients and staff. This leads to the conclusion that a culture of innovation that fosters safety exists in these institutions. While studies exist on shaping a culture of innovation or a culture of safety in hospitals, there is a lack of work addressing the construct that integrates these perspectives.

Therefore, the aim of this publication is to identify the key factors driving this type of culture in hospitals. The study is structured as a critical review of selected literature on safety-enhancing innovation culture, the research methodology, the results, and conclusions and recommendations. The findings can be helpful to hospitals seeking to shape a safety-focused innovation culture. This study may also inspire other researchers to further explore this topic.

2. Theoretical background

A critical review of the literature reveals that the concept of a culture of innovation that promotes safety is virtually absent. Rather, distinct constructs such as innovation culture or safety culture are cited. It's worth recalling the concept of organizational culture itself, defined as a set of shared values, norms, and practices that shape the behavior of organizational members[1]. Furthermore, an innovation culture is a type of culture that fosters the development and implementation of new ideas and improvements. It can be defined as a set of characteristic organizational values and attitudes that enable innovative activities within a healthcare facility[2]. These values include, among others, creativity, courage, flexibility, leadership, openness to change, the ability to manage risk, and continuous learning[3]. This type of culture encourages employees to seek new solutions, experiment, and share knowledge, rather than clinging to established practices[4]. In hospitals, this may mean, for example, a willingness to implement new clinical procedures, improve care processes, pro-innovative people management, use of modern technologies, or improve work organization within departments.

In turn, safety culture, as presented in the literature, is considered a key element of a systems approach to safety, as it influences the effective implementation of standards, procedures, and risk management tools[5]. It can be defined as a set of shared values, norms, attitudes, beliefs, and behavioral patterns that determine how organizational members perceive risk, respond to threats, and take actions to prevent harm and learn from mistakes[6]. This concept refers not only to formal procedures and regulations but also to informal organizational practices that shape everyday decisions and employee behaviors, simultaneously influencing psychological and relational safety. In hospitals, safety culture takes on

[1] E.H. Schein, *Organizational Culture and Leadership*, 5th ed., Hoboken 2017.

[2] B. Domańska-Szaruga, J. Jończyk, A. Knap-Stefaniuk, *Diagnosis of Organizational Culture of Healthcare Entities in Poland*, „Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacja i Zarządzanie" 2024, vol. 199, pp. 93–107.

[3] J. Jończyk, *Proposed models for shaping pro-innovative organizational culture in public hospital*, „European Research Studies Journal" 2022, vol. XXV, no. 3, pp. 729–739.

[4] E.C. Martins, F. Terblanche, *Building organizational culture that stimulates creativity and innovation*, „European Journal of Innovation Management" 2003, vol. 6, no.1, pp. 64–74.

[5] A. Edmondson, *Psychological safety and learning behavior in work teams*, „Administrative Science Quarterly "1999, vol. 44, no. 2., pp. 350–383.

[6] J. Reason, *Human error: models and management*, „British Medical Journal" 2000, vol. 320, no.7237, pp. 768–770.

particular importance, as their functioning is associated with a high level of complexity and uncertainty, as well as a direct risk to the health and lives of patients.

From the perspective of the purpose of this publication, it is important to identify the factors that determine the stimulation of a culture of innovation that promotes safety. Generally, this type of organizational culture can be defined as a construct in which:

– innovation is treated as a learning process, not a source of threats,
– safety (patient, employee and organisation) is a prerequisite for experimentation and innovation,
– errors and incidents are analyzed using system logic, not personnel logic,
– employees have a sense of psychological and relational security that enables them to think critically, report problems and co-create improvements,
– leadership actively supports innovation while strengthening ethical, quality and safety standards.

In this context, personal incentives, especially those related to the psychological and relational balance of medical and non-medical personnel, should be considered the primary factors stimulating a culture of innovation that promotes safety. Such factors are particularly important in high-risk organizations, such as hospitals, where innovations must be implemented while maintaining high standards of quality and patient safety[7]. In hospital settings, a lack of a sense of safety can lead to concealing problems, reducing organizational learning capacity, and increasing the risk of adverse events[8]. Research indicates that teams operating in conditions of high psychological or relational balance are more likely to engage in innovative activities while demonstrating a higher level of alertness to threats[9]. Furthermore, a significant factor in an innovation culture that promotes safety is the leadership style, which combines an innovation orientation with a concern for the quality and safety of medical services. This type of leadership promotes learning from mistakes and separating systemic responsibility from personal blame. Communication

[7] K.E. Weick, K.M. Sutcliffe, *Managing the Unexpected: Sustained Performance in a Complex World*, 3rd ed., Hoboken 2015.
[8] L.T., Kohn, J.M. Corrigan, M.S. Donaldson, *To Err Is Human: Building a Safer Health System,* Washington 2000.
[9] A.C, Edmondson, Z. Lei, *Psychological safety*, „Annual Review of Organizational Psychology" 2014, Vol.1, pp 23–43.

and the quality of relationships are also important elements[10]. This involves the existence of communication channels enabling the exchange of knowledge and information about risks between representatives of various professional groups[11]. The quality of relationships strengthens teams' ability to adapt and share responsibility for patient safety[12]. Research on the experiences of patients and staff shows that a sense of safety on both sides is strongly linked to communication, attitudes, and the efficiency of organizational processes, such as delay reduction and clarity of information procedures. Furthermore, a culture of innovation that promotes safety is based on moving away from blame and toward learning[13]. A systematic approach to errors and risk management enables the assessment of the consequences of innovations before their implementation[14]. Therefore, hospitals with a high level of innovation culture that promotes safety are characterized by systematic reflection on practice and the analysis of adverse events[15]. In this approach, innovation is not an end in itself, but a tool for organizational learning, thereby strengthening the hospital's organizational resilience[16].

In summary, a group of key factors can be identified that can foster a culture of innovation that fosters safety in hospitals. These include leadership that fosters trust and inclusivity, selection of employees based on creative thinking skills, motivation for innovation, reporting systems and learning from errors and accidents, mechanisms for rewarding pro-innovation and safety-promoting behaviors, standardization of critical communication processes while maintaining room for initiative, development of team competencies, and a sense of psychological and relational safety.

[10] B. Buchelt, *Koncepcja systemu zarządzania efektywnością pracy personelu medycznego w szpitalach*, Kraków 2017; B. Buchelt, B. Ziębicki, J. Jończyk, J. Dzieńdziora, *The enhancement of the employer branding strategies of Polish hospitals through the detection of features which determine employer attractiveness: A multidimensional perspective*, „Human Resources for Health" 2021, 19(1), p. 119.

[11] G. Philipp, Ł. Sułkowski, *Generative AI and Generation Z: Redefining Language, Identity, and Communication in the Digital Workplace,* „Discourses on Culture" 2025, 24(1), pp. 73–103; E. Salas, D.E. Sims, C.S. Burke, *Is There a "Big Five" in Teamwork*?, „Small Group Research" 2005, 36, pp. 555–599; D. Henk, *Cross-Cultural Competence: A Key Enablement for 21st Century Military Leaders*, „Open Journal of Leadership" 2026, vol.15, no. 1, pp 1–24.

[12] M. West, K. Armit, L. Loewenthal, R. Eckert, T. West, A. Lee, *Leadership and leadership development in health care: the evidence base*, London 2015

[13] S. Dekker, *Just Culture. Balancing Safety and Accountability,* 2nd ed., London 2012.

[14] J. Jończyk, G. Pawelec, *Zarządzanie ryzykiem w szpitalach*, Warszawa 2025.

[15] J. Jończyk, *Proposed models…*, pp. 729–739.

[16] P.M. Senge, *Tue Fifth Discipline*, New York 2006.

The above review of selected literature served to develop a proprietary list of factors contributing to hospital safety-enhancing innovation culture, which formed the basis for the empirical research. The list of factors analyzed is described in the next section of this publication.

3. Research methodology

The empirical research was conducted in the form of an expert panel and the results were developed based on a structural analysis, the main goal of which was to identify variables using the MicMac program (*Impact Matrix Cross – Reference Multiplication Applied to a Classification).* This program allows for the organization and consideration of sets comprising a larger number of variables (factors) that interact with each other[17]. The advantage of this method is the ability to find connections between factors (variables) whose mutual influences are not obvious and may remain unrecognized, although they are likely important in relation to the phenomenon being studied. Structural analysis allows for the isolation of the following factors influencing a given research area:

- determinants (engines and brakes) – having a very strong influence on the system and characterized by a low level of dependence on other factors (driving and braking factors, but difficult to control),
- key factors – characterized by high impact and a high degree of dependence on other factors (require detailed attention and research),
- goal factors – more dependent on other factors and changing under their influence than influencing other factors (they represent possible goals of the system being examined),
- result factors – characterized by low impact and high dependence on other factors (they are particularly susceptible to changes in key factors),
- auxiliary/regulatory factors – characterized by a low impact on the system, may prove helpful in achieving strategic goals,

[17] J. Ejdys, Ł. Nazarko, *Foresight gospodarczy – instrumentem orientacji na przyszłość,* „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu" 2014, vol. 340, pp. 651–664; J. Nazarko, J. Ejdys, K. Halicka, Ł. Nazarko, A. Kononiuk, A. Olszewska, Structural *analysis as an instrument for identification of critical drivers of technology development*, „Procedia Engineering" 2017, vol. 182, pp. 474–481.

– external factors – have a less significant impact on the system than the influence of determinants, but greater than the influence of autonomous variables, and are not influenced by other variables,
– autonomous factors – have the least influence on changes occurring in the system as a whole[18].

In the context of the aim of this article , the study was conducted in three Polish public hospitals operating in northeastern Poland. These hospitals were of varying levels of expertise: a clinical hospital (Hospital A), a regional hospital (Hospital B), and a district hospital (Hospital C). Hospital A is one of the largest and most modern hospitals in northeastern Poland. Hospital A handles the most medically challenging cases, requiring highly specialized knowledge and state-of-the-art equipment. Hospital A's key role is also to provide pre- and postgraduate medical training, as well as to conduct scientific and research activities aimed at advancing medicine and improving the quality of treatment. Hospital B, on the other hand, has a more limited scope of responsibilities due to its lack of scientific and research activities. Its primary responsibilities include providing hospital services, inpatient and 24-hour healthcare services other than hospital services, outpatient healthcare services, and occupational health services. The latter hospital has the status of a district entity and is the smallest facility. The goal of Hospital C is to provide healthcare services aimed at preserving, saving, restoring, and improving health, as well as promoting health. It is important to emphasize that, despite differences in reference levels, all hospitals are involved in projects involving innovative activities. Eight experts from each hospital participated in the study: two representatives from the top management, two from the physicians, two from the nurses, and two from lower-level management.

The research procedure consisted of three stages. The first stage of structural analysis involved developing a list of factors (variables) that stimulate a culture of innovation conducive to safety, based on a critical analysis of the relevant literature.

After consultation with experts from the studied hospitals, 19 factors were finally accepted for structural analysis (Table 1).

[18] J. Arcade, M. Godet, F. Meunier, F. Roubelat, *Structural Analysis with the MicMac Method & Actors' Strategy with MACTOR Method, AC/UNU Millennium Project Futures Research Methodology*, Paris 1994, pp. 17–19.

Table 1. Set of factors (variables) adopted for structural analysis

No.	Name of the factor	Acronym
1	The hospital has a strategy that takes into account the development and implementation of innovations.	F1
2	The hospital's mission and vision focus on finding new solutions that improve the quality and safety of services provided.	F2
3	Innovation in the hospital is perceived as an organizational value.	F3
4	The hospital provides the resources necessary to implement innovations.	F4
5	There is consistency in employee norms and values within the hospital.	F5
6	The hospital is witnessing a conscious building of an organizational community integrated around the hospital's goals and tasks.	F6
7	There is support for change and innovation among hospital staff.	F7
8	In the employee selection process, an important criterion is openness to change.	F8
9	Hospital staff are encouraged to experiment and take risks.	F9
10	At the hospital, employees are encouraged to develop and share knowledge.	F10
11	The employee evaluation system takes into account, among other things, the criterion of staff creativity.	F11
12	The hospital has a motivational system that rewards innovative activities of employees.	F12
13	Professional information and communication management is observed in the hospital.	F13
14	In the hospital there are interpersonal relationships based on trust.	F14
15	The hospital's organizational structure is adapted to changing goals and tasks.	F15
16	There is teamwork in the hospital, which is demonstrated by mutual understanding of different views.	F16
17	Employees accept the rules and regulations in force in the hospital.	F17
18	The hospital observes staff orientation towards patient needs.	F18
19	The hospital tolerates minor imperfections in work that are a natural part of the learning process.	F19

Source: Own study.

In the second stage, the experts assessed individual variables for their mutual influences and interdependencies. For each pair of variables A and B, each expert answered the question: Does variable A have a direct influence on variable B? The strength of the factors' influence was assessed on the following scale: 0 – "no influence," 1 – "weak influence" (significant but not decisive), 3 – strong influence (decisive).

In the third stage of the research process using the MicMac program, groups of factors responsible for stimulating a culture of innovation that promotes safety in individual hospitals were identified.

4. Research results

All of the above-mentioned stages of the research procedure were conducted in three hospitals. However, due to the limited size of this publication, the entire research process is presented using the example of Hospital A. The results of the studies in the remaining hospitals are presented. First, experts from Hospital A assessed 19 variables for the study entity. The MicMac analysis yielded specific dominants of the strengths of the impacts of individual factors on other factors in the form of a direct influence matrix (Table 2).

Table 2. Direct impact matrix for Hospital A

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F1	F11	F12	F13	F14	F15	F16	F17	F81	F19
F1	0	2	1	2	1	0	1	2	0	0	2	0	0	0	3	1	1	2	0
F2	2	0	2	3	0	0	2	1	0	1	1	3	1	0	2	1	1	1	0
F3	3	3	0	0	0	1	3	2	1	1	2	2	0	0	3	0	2	0	1
F4	3	3	1	0	1	2	2	2	0	2	1	1	2	0	1	0	0	0	0
F5	1	2	0	0	0	3	3	2	0	3	2	0	2	3	1	3	2	3	2
F6	0	3	1	3	1	0	1	2	0	2	1	1	1	2	3	3	1	3	3
F7	3	3	2	2	2	1	0	3	2	1	3	2	1	2	3	1	3	1	1
F8	1	2	3	1	1	2	0	0	0	1	2	0	2	0	2	3	1	0	0
F9	2	1	0	0	0	1	2	3	0	2	1	3	0	2	2	3	1	2	3
F10	0	0	1	0	2	2	2	3	1	0	0	1	2	3	3	3	0	3	1
F11	2	3	1	1	1	2	3	2	2	3	0	3	2	2	0	2	1	2	2
F12	0	2	2	2	3	3	2	0	2	1	3	0	2	2	1	3	2	2	0
F13	2	2	0	2	1	1	2	0	0	1	2	1	0	2	0	2	3	3	0
F14	0	0	0	3	3	2	1	2	3	2	0	0	2	0	3	2	2	1	2
F15	1	2	2	3	0	0	1	0	0	1	2	1	3	0	0	0	1	0	0
F16	3	2	1	0	3	3	2	0	0	2	0	0	2	3	3	0	3	3	3
F17	2	1	0	0	2	1	0	1	2	0	1	0	0	2	1	2	0	1	2
F18	1	3	1	1	2	1	3	0	0	2	0	0	1	2	0	3	1	0	2
F19	0	1	2	2	0	0	3	2	1	2	0	0	1	2	0	2	3	0	0

Source: own study using the MicMac program.

The resulting characteristics of the basic values of the direct impact matrix are presented in Table 3.

Table 3. Characteristics of the direct impact matrix for Hospital A

Indicator	**Value**
Matrix dimension	19
Number „0" (no effect)	109
Number „1" (low impact)	82
Number „2" (significant but not decisive influence)	103
Number „3" (significant, decisive influence)	67
Filling level	69.80609%

Source: own study using the MicMac program.

The experts identified 252 relationships between 19 factors. In 109 cases, the dominant value was "0," indicating no relationship between variables, in 82 cases, weak relationships were identified ("1"), and in 103 cases, a significant but non-decisive influence was determined ("2"). Significant and decisive relationships between variables were identified in 67 cases ("3"). Non-zero values were entered in 69.80609% of the fields. The summary results of the calculations regarding the strengths of influence and direct relationships of factors stimulating a pro-innovative organizational culture at the hospital are presented in Table 4.

Table 4. Total strength of direct interactions (influence strengths and dependencies) occurring between the factors of structural analysis in Hospital A

No.	**Factor name (long label)**	**Total influence**	**Total strength of dependencies**
1	The hospital has a strategy that takes into account the development and implementation of innovations.	18	26
2	The hospital's mission and vision focus on finding new solutions that improve the quality and safety of services provided.	21	35
3	Innovation in the hospital is perceived as an organizational value.	24	20
4	The hospital provides the resources necessary to implement innovations.	21	25
5	There is consistency in employee norms and values within the hospital.	32	23

No.	Factor name (long label)	Total influence	Total strength of dependencies
6	The hospital is witnessing a conscious building of an organizational community integrated around the hospital's goals and tasks.	31	25
7	There is support for change and innovation among hospital staff.	36	33
8	In the employee selection process, an important criterion is openness to change.	21	27
9	Hospital staff are encouraged to experiment and take risks.	28	14
10	At the hospital, employees are encouraged to develop and share knowledge.	27	27
11	The employee evaluation system takes into account, among other things, the criterion of staff creativity.	34	23
12	The hospital has a motivational system that rewards innovative activities of employees.	32	18
13	Professional information and communication management is observed in the hospital.	24	24
14	In the hospital there are interpersonal relationships based on trust.	28	27
15	The hospital's organizational structure is adapted to changing goals and tasks.	17	31
16	There is teamwork in the hospital, which is demonstrated by mutual understanding of different views.	33	34
17	Employees accept the rules and regulations in force in the hospital.	18	28
18	The hospital observes staff orientation towards patient needs.	23	27
19	The hospital tolerates minor imperfections in work that are a natural part of the learning process.	21	22

Source: own study using the MIC-MAC program.

Finally, using the strength of direct interactions (the higher the value of a given factor, the stronger the direct influence on other factors or the greater the dependence on the others), using the MicMac program, the factors were distributed on the influence-dependence plane, separating several characteristic groups.

The distribution of these factors in Hospital A (clinical) allowed us to identify five characteristic groups of factors stimulating the development of a culture of innovation that promotes safety. These are key factors, regulatory factors, outcome factors, auxiliary factors, and

determinant factors. The largest number of factors (five) falls within the key factors category, characterized by a strong impact and a high degree of dependence on other factors. This set contains:
- in the hospital, there is a conscious building of an organizational community integrated around the goals and tasks of the hospital (F6),
- there is support for change and innovation among hospital staff (F7),
- in the hospital, employees are encouraged to develop and share knowledge (F10),
- in the hospital there are interpersonal relations based on trust (F16),
- there is teamwork in the hospital, which is reflected in mutual understanding of different views (F17).

The next grouping of factors related to a culture of innovation that promotes safety concerned Hospital B (a regional hospital). The research procedure was identical to that for Hospital A. Using MicMac software, the factors were divided into six groups. Key, regulatory, objective, outcome, auxiliary, and determinant factors were identified. The structural analysis, similar to that for Hospital A, revealed no autonomous or external factors.

The key factors, characterized by a high impact and a high degree of dependence on other factors, include:
- in the hospital, there is a conscious building of an organizational community integrated around the goals and tasks of the hospital (F6),
- the hospital's organizational structure is adapted to changing goals and tasks (F15),
- in the hospital, staff are observed to be oriented towards the needs of the patient (F18),
- In the hospital, there is tolerance for minor shortcomings in work that are natural in the learning process (F19).

The third hospital analyzed was Hospital C (district hospital). In the case of this entity Seven groups of factors influencing the development of a pro-innovation organizational culture were identified. These include key factors, regulatory factors, goals, results, auxiliary factors, autonomous factors, and external factors. However, in the case of this hospital, the structural analysis revealed only one key factor: openness to change (F8) is a significant criterion in the employee selection process.

5. Conclusions and recommendations

The research results indicate that safety-enhancing innovation cultures varied across the hospitals studied in terms of the number, type, and role of key factors. It is worth emphasizing that, according to the adopted methodology, these factors are characterized by high impact and a high degree of dependence on other factors, and therefore require detailed attention and research. For example, in the case of Hospital A, the most extensive and balanced system was identified, consisting of five key factors (F6, F7, F10, F14, and F16). This system indicates that the safety-enhancing innovation culture at Hospital A is based on strong integrative and relational mechanisms, which, by stimulating this type of culture, simultaneously serve as a cultural core for the organization. In Hospital B, four key factors were identified, including: building organizational community (F6, F15, F18, F19). However, compared to Hospital A, the set of factors is more formal and structural in nature (patient focus, tolerance for shortcomings), and relational factors such as trust and teamwork are less prominent. This may indicate that the culture of innovation fostering safety at Hospital B depends more on organizational solutions than on internal staff cohesion. In Hospital C, however, the MicMac analysis identified only one key factor: openness to change in the employee selection process (F 8), which was not present in any of the previous hospitals. The absence of other key factors – particularly relational or formal-structural ones – may indicate a lower level of maturity of the safety-enhancing innovation culture. Here, innovation is primarily dependent on acquiring human resources, and only then on relationships, communication, or other formal-structural mechanisms, such as learning.

Generally, it can be argued that the ability to stimulate a culture of innovation that promotes safety is determined more by a set of soft factors, such as organizational community, trust, support for change and learning, or staff orientation towards patient needs , than by formal and structural issues.

Based on the above conclusions, a set of recommendations was formulated for individual hospitals, as well as for general ones at the systemic, organizational, and individual levels. In the case of Hospital A, it is important to strengthen key factors and formally and structurally integrate knowledge-sharing mechanisms (F10) with safety and risk management systems.

In the case of Hospital B, it is important to expand the system of key factors of a formal and structural nature with relational elements, in particular interpersonal trust (F14) and team cooperation (F16).

In the case of Hospital C, the catalogue of key factors should be expanded to include those of a relational nature, such as building an organizational community (F6), relationships based on trust (F14), teamwork (F16), and systemic support for innovation that promotes safety in the hospital after employment should be introduced.

From a systemic perspective, it is worth emphasizing the need to incorporate a culture of innovation that promotes safety into public policies within the healthcare system. Strategic documents regulating the functioning of healthcare entities at the system level should address cultural factors, such as building an organizational community (F6), interpersonal trust (F14), and organizational learning (F10), as fundamental conditions for implementing innovations that promote safety. Another issue is a holistic approach to adverse events. Solutions that foster tolerance for minor shortcomings as an element of learning (F19) should be strengthened, limiting the dominance of the punitive narrative. This applies particularly to adverse event reporting systems and institutional oversight. Systemic investment in programs for the development of managerial and leadership competencies that integrate innovation management, safety, and organizational culture is also recommended. The accreditation process and the assessment of the quality of healthcare services are also important factors in shaping a culture of innovation that promotes safety in hospitals at the systemic level. It seems that in this context, the evaluation systems of healthcare entities should take into account soft indicators to a greater extent, such as team cooperation (F16) or effective communication (F13).

At the same time, changes are necessary at the hospital level as an organization. Hospital management should consciously shape organizational communities around safety and innovation. It is important to consistently strengthen the sense of shared mission and responsibility for safety and organizational innovation (F6, F7), which – as demonstrated by the results of Hospitals A and B – is one of the key factors stimulating a culture of innovation that fosters safety. Another issue is the development of organizational learning mechanisms. It is recommended to create formal and informal spaces for knowledge sharing (F10), analyzing experiences, and discussing flaws in the learning and

knowledge-sharing logic. Linking these mechanisms to improving patient safety is particularly important.

Equally important at the organizational level is strengthening relationships based on trust and teamwork. Hospitals should invest in developing teamwork (F16), especially between professional groups that often represent different values and goals.

At the individual level, it is recommended to encourage employee participation in innovation processes, from accepting change (F7) to continuous competence development (F10). It is also recommended to strengthen individual awareness that safety and innovation are a shared responsibility of teams, not solely the responsibility of management. Acceptance of regulations (F17) should be coupled with a willingness to improve them. At the individual level, developing collaborative competences (F16) is also important, which promotes early risk identification and the generation of safe innovations.

Applying the recommendations simultaneously at three levels: systemic, organizational and individual, can enable a coherent and lasting strengthening of the culture of innovation that promotes safety in hospitals.

6. Summary

A critical literature review demonstrated that the concept of a safety-enhancing innovation culture does not function as a coherent theoretical construct, and research typically focuses on distinct approaches to innovation culture or safety culture. To address this gap, we propose an original approach that integrates both dimensions, treating innovation as an organizational learning process and safety as a condition enabling experimentation, reporting problems, and implementing improvements. The research findings demonstrate that a safety-enhancing innovation culture is a multidimensional yet integrated construct, in which innovation is primarily embedded in relational and formal-structural safety. The empirical results presented in this study align with the theoretical assumptions, pointing to the key role of relational and communal factors in stimulating safety-enhancing innovation, even without increasing organizational risk. Furthermore, the analysis of these factors provides

specific recommendations for consciously shaping this culture in hospitals with varying levels of reference.

Finally, it's worth noting that the authors of this publication are aware of the study's strengths and weaknesses. Its primary strength is providing empirical evidence on factors that foster a culture of innovation that promotes safety in hospitals. However, its weakness may be the fact that the study was conducted in only three institutions. However, it seems that the obtained research results, combined with the limited literature on the subject, expand the body of scientific knowledge and may inspire further exploration of the issue not only in hospitals but also in other organizations operating under conditions of organizational complexity, systemic pressure, and multidimensional risks.

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