PATIENT SAFETY CULTURE IN NURSING FACILITIES IN THE CONTEXT OF ADVERSE EVENTS

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CONTENTS

INTRODUCTION

Relevance of the Topic. Patient safety is one of the most important elements of quality healthcare and a fundamental part of organizational responsibility at all levels of healthcare institutions. This is particularly relevant in nursing hospitals, which provide long-term care services for the most physically and cognitively vulnerable patients—often older adults with multiple chronic illnesses, limited mobility, or cognitive impairments (Flanagan et al., 2021). In such facilities, patients often stay for several weeks or months; therefore, a consistent and systematic safety culture becomes a necessity rather than an optional practice.

The greatest patient safety challenges in nursing hospitals arise due to the specific care environment: prolonged hospitalization, complex clinical conditions, high staff workloads, the need for interdisciplinary collaboration, and limited human resources (Braithwaite et al., 2017). Adverse events—such as medication administration or dosage errors, falls, pressure ulcers, hospital-acquired infections, and poor communication among staff—are common and have a direct impact on patients' quality of life, length of hospital stay, and mortality rates (Rodziewicz & Hipskind, 2023; Brady et al., 2022).

The World Health Organization (WHO) states that more than 50% of adverse events in healthcare systems are preventable if a strong patient safety culture is in place—one that promotes error recognition, non-punitive analysis, open communication between staff and management, and continuous learning (WHO, 2011; WHO, 2021). Safety culture is understood as a set of individual and collective values, attitudes, competencies, and behavior patterns that underpin an institution's commitment to safety (Sammer et al., 2010). Such culture is shaped by daily decision-making, organizational standards, communication structures, and the availability of emotional support for staff.

Despite international recommendations, long-term care institutions—including nursing hospitals—often remain on the margins of patient safety reform (Hassmiller & Reinhard, 2020). Many policymakers and administrators focus primarily on acute care sectors, while safety in long-term care is often perceived as an individual employee's responsibility rather than a systemic culture. This slows progress in implementing structural solutions, such as incident reporting systems, emotional support programs after errors, data analysis mechanisms, or safety-enhancing technologies.

Literature also reveals that so-called "blame culture" is more prevalent in nursing hospitals, where staff are afraid to report mistakes due to potential consequences. This further

reduces transparency and learning opportunities (O'Donovan et al., 2022). Such an atmosphere increases emotional strain and worsens the overall quality of organizational climate.

Given this context, there is a pressing need to reassess the patient safety culture in nursing hospitals, where the specific patient population and organizational structure require an adapted approach that incorporates not only technical but also human and emotional factors. This study aims to contribute to the scientific discourse on safety culture assessment models, based on empirical data from Lithuanian nursing hospitals, and to reveal deeper systemic connections between management, staff, psychosocial factors, and technologies.

Research Problem. Despite growing global attention to patient safety, studies of safety culture in the context of nursing hospitals remain limited, especially in Lithuania. Most decisions lacking empirical grounding are based on general guidelines that are more frequently applied in acute care settings—such as general hospitals, emergency departments, or surgical units. However, nursing hospitals have a distinct patient profile, care duration, resource allocation, and levels of staff emotional stress. Therefore, general patient safety assessment models often fail to fully capture the situation in these settings (Ginsburg et al., 2022).

Currently, there are no widely used, empirically validated instruments in Lithuania specifically adapted to assess the safety culture of nursing hospital staff. This limits the ability to systematically monitor changes, evaluate the impact of specific factors (e.g., workload, lack of emotional support, or access to technology) on safety culture expression, and develop clear, data-driven strategies (Vėlavičienė & Petrauskienė, 2023).

Moreover, patient safety culture is still often understood too narrowly identified only as adverse event management or error reporting systems. Such a view overlooks other important aspects, such as psychosocial factors affecting staff, professional training, team relationships, digital literacy, and leadership structures. Meanwhile, the scientific literature increasingly acknowledges that patient safety culture is a holistic phenomenon influenced not only by organizational protocols but also by employees' experiences, emotional well-being, and ability to learn from mistakes without fear of consequences (Flin et al., 2006; Sammer et al., 2010).

The lack of research in Lithuania also hinders the application of international recommendations—without contextualized data, it is difficult to determine which interventions would be effective in a specific segment of the healthcare system. This study seeks to fill that gap by applying empirical research methods to analyze the patient safety culture in nursing hospitals, addressing both organizational and human aspects. It also opens the possibility of developing standardized assessment instruments that could eventually be used to evaluate and improve patient safety strategies at the national level.

Objective of the Study. To analyze the patient safety culture in nursing hospitals by identifying key organizational, professional, technological, and psychosocial dimensions and their interconnections. The study also aims to validate the questionnaire's construct reliability and provide data-based insights for policymakers and healthcare administrators.

Research Questions:

1. What dimensions of patient safety culture can be identified in nursing hospitals?
2. How are various staff demographic factors (age, work experience, position) related to safety culture assessment?
3. What are the essential psychosocial aspects that influence staff attitudes toward safety?
4. What is the construct structure of the questionnaire used, and is it supported by empirical data?
5. How do the study results compare with international data on patient safety culture?

Structure of the Scientific Study. The study is divided into several key sections. The first part provides a comprehensive literature review covering the concept of patient safety culture, its assessment methods, and specific challenges in nursing hospitals. The second part outlines the research methodology: the instrument used, study sample, and data analysis methods (correlation, factor, and variance analysis). The third part presents the empirical research results—respondent evaluations by blocks, t-test and ANOVA results, and the structure of factor analysis. The fourth part includes a discussion comparing the obtained data with other studies. The fifth part summarizes the main insights and provides practical recommendations for strengthening patient safety in nursing hospitals.

THE CONCEPT OF ADVERSE EVENTS IN HEALTHCARE FACILITIES

Adverse events in healthcare facilities, including nursing hospitals, are an important patient safety issue, with direct consequences for patient health, staff emotional well-being, and the institution's reputation. The World Health Organization (2021) defines adverse events as "incidents that cause harm to a patient and which could have been prevented using current knowledge and means." This includes not only physical harm (e.g., injuries), but also psychological, social, or functional damage.

Adverse events in healthcare facilities, including nursing hospitals, are often divided into several clearly defined types to better understand, analyze, and respond to them. This classification helps not only to identify the nature of events, but also to plan preventive measures and optimize the development of a safety culture.

Near misses are situations in which an error or danger was close to occurring, but did not actually reach the patient. Although such events do not cause direct harm, they are considered especially important for analysis because they reveal system vulnerabilities. For example, if a nurse notices that the wrong medication was prepared for the patient and corrects it in time, that is a classic example of a near miss. Near misses provide a valuable opportunity to learn without harming the patient and allow institutions to implement safety improvement measures before real harm occurs. However, in practice these events often remain unrecorded, because staff do not always recognize their importance or do not want to spend extra time on documentation (Rodziewicz et al., 2022).

The second category consists of events in which an error or incident indeed reaches the patient but does not cause tangible harm. Such situations can be described as "potentially harmful events," which, due to certain circumstances (e.g., patient resilience or low dosage), do not cause clinical consequences. For example, if a patient is injected with a different but harmless medication that causes no reaction, that event is classified as a no-harm incident. These events, although "harmless" at first glance, can signal repeating system errors—for example, labeling inaccuracies, procedural gaps, or staff training deficiencies.

The third and most severe category is harmful events, when an error or procedural inaccuracy causes real harm to the patient: health deterioration, additional treatment, extended hospitalization, or even death. Such events often become objects of legal review or thorough root-cause analysis (RCA). For example, if a patient experiences internal bleeding due to an incorrectly prescribed anticoagulant, that is a clear instance of a harmful event. Analysis of such

events typically includes not only technical evaluation of the process, but also systemic factors: whether the staff member was properly trained, whether working conditions were safe, whether the technologies were reliable, and whether information was transferred accurately.

Harmful events are further categorized by severity:

- Mild (e.g., temporary symptoms not requiring intervention),
- Moderate (e.g., additional tests, temporary treatment),
- Severe (e.g., irreversible health impairment, long-term treatment),
- Fatal (when the event directly or indirectly led to the patient's death) (WHO, 2022).

At both national and international levels, it is emphasized that systematic documentation and analysis of all these categories is necessary to create an effective patient safety system. Unfortunately, various studies show that usually only harmful events are registered, while near misses and no-harm incidents are ignored or undervalued (Thomas & Dhingra, 2021). Such selective reporting distorts the overall view of safety and reduces opportunities for systemic improvement.

In nursing hospitals, the prevention and management of adverse events is of special importance due to the specific patient profile. Most of the residents of these institutions are older adults, often suffering from multiple chronic diseases simultaneously (multimorbidity), with limited physical activity, cognitive impairments (e.g., dementia, Alzheimer's disease), or various sensory and neurological deficits. Such conditions greatly increase susceptibility to any organizational system deficiencies, staff errors, or environmental risks. According to Vincent and Amalberti (2022), in nursing facilities errors that might not have serious consequences in other contexts can here cause critical deterioration in patient health or even death.

Furthermore, elderly patients often cannot adequately express their symptoms or understand instructions, making it more difficult to identify early signs of complications or adverse reactions. This means that staff vigilance, timely response, and quality communication have even greater weight. Even small coordination errors—e.g., forgetting to inform about medication changes, delaying repositioning of a patient for pressure sore prevention, or inadequate shift-to-shift handover—can have dangerous consequences.

It is also necessary to note that nursing hospitals often lack specialized technological solutions or sufficient staffing, which further complicates prevention and timely intervention. In long-term care, staff operate with extremely limited resources, so the risk of "systemic gaps" becomes constant. This includes not only human errors, but also organizational factors—for

example, too many patients per nurse, poorly trained auxiliary staff, non-functional or outdated information systems.

In such a complex environment, even the slightest procedural inaccuracy can trigger a chain reaction, which provokes deterioration in patient health, increases the risk of hospital-acquired infections, falls, or medication errors. Therefore, in nursing hospitals it is necessary not only to formally implement patient safety strategies, but also to build a safety culture based on staff empowerment, openness about errors, and continuous process improvement.

One of the most frequent and dangerous adverse events in nursing hospitals is patient falls. They not only pose a significant threat to the physical health of elderly patients, but also often cause long-term consequences—from temporary mobility reduction to permanent loss of working ability or even death. According to a study conducted in Germany covering long-term care facilities (Becker et al., 2021), as much as 30 % of all reported incidents in these institutions were related to patient falls. This statistic shows that falls remain one of the most pressing patient safety issues in this type of facility.

Some of these events end in serious consequences such as bone fractures, head injuries, internal bleeding, or extended hospitalization. Particularly risky are situations when a patient falls without receiving assistance—during nighttime, when staffing is lower, or when attempting self-care tasks for which help is needed (e.g., going to the toilet, getting out of bed).

Causes of falls are often multi-layered. On an individual level—poor patient balance, muscle weakness, orthostatic hypotension, impaired vision, or disorientation due to cognitive impairments (e.g., dementia). On an organizational level—unsuitable physical environment: slippery floors, obstacles, poor lighting, unmarked hazards, lack of handrails, or non-adjusted bed heights. Causes are also related to insufficient supervision or staffing shortages, especially at night, when the ability to respond timely to patient needs or risky behavior is reduced.

Becker and colleagues also note that some falls reoccur—indicating that after the first event, effective preventive measures such as individual fall-risk assessments, mobility plan adjustments, or environmental adaptations are not always implemented. Such systematic response is necessary because every fall can be a forewarning of more severe future incidents.

Internationally, comprehensive fall-prevention models are increasingly used, combining risk assessment tools (e.g., Morse Fall Scale), patient care protocols, and technological solutions—such as motion sensors, smart beds, alert systems. However, application of these measures depends on institutional resources, staff training, and safety culture.

Another important group of adverse events in nursing hospitals is medication administration errors. These errors are among the most common and often lead to significant

health complications in patients. A medication error is defined as any deviation from a physician's order or standard medication administration practice occurring during dispensing, preparation, dosing, or administration (Keers et al., 2020). The most common violations are incorrect dosage, early or delayed administration, wrong route (e.g., oral instead of intravenous), or incorrect patient identification.

In nursing hospitals, this problem is particularly acute due to specific conditions: patients often have multiple chronic diseases, take multiple medications simultaneously (polypharmacy), and have cognitive or communication impairments. For this reason, the risk increases that medications will be incorrectly selected, incompatible, or even contraindicated with each other. Additionally, medications are often prescribed for long-term use, so even small recurring errors can cause cumulative negative effects—for example, kidney or liver damage, bleeding, or hypoglycemia.

Studies show that a large portion of medication errors occur not due to individual nurse fault, but due to systemic organizational inefficiency: unclear protocols, gaps in information transfer between shifts, documentation deficiencies, or unsuitable work environment (e.g., noise, high workload, multitasking). Furthermore, transcription errors—when a doctor's order is entered incorrectly into the nursing record or electronic system—also frequently occur.

A systematic review by Keers and colleagues (2020) highlighted that medication errors are mostly linked to five main factors:

1. Human factors – fatigue, distraction, lack of attention.
2. Organizational aspects – chaotic work environment, ineffective information systems.
3. Communication failures – unclear orders, inconsistent information transfer.
4. Technological limitations – nonfunctional barcodes, errors in EHR systems.
5. Lack of training – insufficient knowledge about new medications or their interactions.

To reduce the risk of these errors, facilities increasingly implement barcode scanning technology (BCMA), double-check procedures, automated medication cabinets, as well as strengthen staff training and establish care protocols with clearly defined responsibilities.

It is important to note that medication administration errors are not limited to physical harm to the patient—they also have psychological consequences for staff, who, having made a mistake, often feel stress, guilt, or question their professional competence. Therefore, such errors should be viewed not only as individual responsibility but as opportunities for organizational learning, process analysis, and systemic change implementation.

Infections—especially those associated with invasive medical devices—form a particularly significant category of adverse events in nursing hospitals. Invasive devices, such as urinary or intravenous catheters, are often necessary in long-term care, but their use is associated with increased risk of hospital-acquired infections, including urinary tract infections (UTIs), bacteremia, catheter-related infections, or pneumonia. These infections not only prolong hospitalization, but also significantly increase mortality rates and healthcare costs.

The COVID-19 pandemic drew particular attention to this problem, showing how quickly infectious agents can spread in closed and vulnerable nursing environments. A study by Morbey and colleagues (2023) in the United Kingdom revealed that COVID-19 outbreaks in nursing homes featured very high case numbers and mortality, especially among elderly persons with comorbidities. Due to close social contacts, limited isolation options, and slow testing and protective supply delivery, infections often spread quickly and uncontrollably. In one analyzed outbreak, more than 60 % of residents became ill within two weeks, and mortality reached 35 % of all infected (Morbey et al., 2023).

Beyond COVID-19, many long-term care facilities struggle with the prevalence of multidrug-resistant organisms (MDROs)—such as MRSA, VRE, or ESBL-producing bacteria. Catheters, especially if retained for long periods, become excellent environments for microbial growth. Studies show that even 60 % of patients with a urinary catheter in place for more than a week develop bacteriuria, some exhibiting symptoms difficult to distinguish from other comorbid conditions, especially in dementia patients.

Infection prevention in nursing hospitals requires comprehensive solutions: proper hygiene compliance, regular catheter condition reviews, strict indication control, use of protective equipment, vaccination, and, in case of pandemics, strict isolation management. However, this is only possible with clear protocols, sufficient staffing, and appropriate training.

It is important to emphasize that infections, as adverse events, are often excluded from event analysis systems, as they are viewed as “inevitable” risks. This attitude limits the ability to learn from past mistakes, making it essential to increase recognition of infections as analyzable events—by including them in quality monitoring, case reviews, and corrective action plans.

Communication errors are one of the most common and often underappreciated causes of adverse events in healthcare facilities, especially nursing hospitals. Although these errors do not always manifest as direct incidents, they frequently act as indirect factors setting off chains of other adverse events—such as incorrect medication orders, delayed response to patient condition changes, or falls.

In nursing hospitals, where patient care is often continuous and their condition changes slowly but significantly, ensuring smooth information transfer between staff shifts is especially important. Studies show that omitted or unclearly communicated information about allergies, new symptoms, medication changes, or mental state changes is one of the most frequent errors leading to other incidents (O'Daniel & Rosenstein, 2021). Communication gaps often arise not from ill intent, but from ineffective processes: too much information in a short time, verbal handovers without documentation, outdated electronic records, or shift changes without direct handover.

Another frequent challenge is communication between nurses and doctors. If a nurse's observations about a patient's condition (e.g., increased anxiety, reduced appetite, heart rate changes) are not communicated precisely or promptly to the physician, an opportunity to respond early to a developing complication may be missed. Poor interprofessional communication also reduces team trust and can lead to passive behavior, where staff avoid sharing observations or avoid decision-making.

Special attention must also be paid to communication with patients' relatives. In nursing hospitals, relatives often play an important role in decision-making, care coordination, and emotional support. Inadequate information about the patient's condition, care plans, or incidents can lead to conflicts, decreased trust in the institution, and even legal disputes. Communication failures in this area became especially apparent during COVID-19 when visitation was restricted and new communication methods had to be found.

To reduce the likelihood of communication errors, the implementation of standardized information transfer methods—such as SBAR (situation – background – assessment – recommendation) protocols, checklists, electronic nursing systems with real-time updating—is necessary, along with training staff in effective communication. It is emphasized that not only the format of information transfer but also emotional safety matters—staff should feel free to express doubts or warnings even if they conflict with hierarchical structure.

Management of adverse events is inseparable from the overall patient safety culture, which shapes the organization's approach to errors, their recognition, prevention, and learning from them. Safety culture is defined as the collective set of values, attitudes, perceptions, and behaviors of staff and the organization that determines how seriously and responsibly a healthcare institution treats patient safety issues (Sammer et al., 2021). This is not just about following protocols or standardized procedures—it is a deeper, systemic ability to build an environment in which errors are not concealed or stigmatized but seen as opportunities to learn and improve.

In nursing hospitals, this culture is especially important because staff often face long-term care, monotonous processes, and high emotional burden, increasing the risk of burnout and inattention. Therefore, it is essential that every staff member feel safe reporting actual or potential errors without fear of blame, punishment, or damage to reputation. Such trust is only possible when organizational leadership actively supports principles of openness, accountability, and reflection.

Literature indicates that patient safety culture is formed on three levels:

1. Leadership level – leaders' behaviors, responses to errors, ability to support staff and encourage openness.
2. Systems level – infrastructure solutions, incident reporting systems, mechanisms for learning from events.
3. Individual level – each staff member's perceptions, sense of responsibility, professional skills, and emotional resilience (Sammer et al., 2021).

The more an organization focuses on a non-punitive but responsible learning environment, the more likely errors will be identified early, reported, and become part of systematic improvement. Conversely, in organizations dominated by a blame culture, errors are concealed, staff avoid reporting them, and systemic issues remain hidden.

It is important to note that safety culture is not static— it needs to be consistently built and maintained by investing in staff training, clear communication structures, reflection sessions, feedback mechanisms, and leadership development. Also, it is necessary to involve the entire team—from management to auxiliary personnel—so that safety becomes a shared value, not merely a formal responsibility.

In summary, adverse events in nursing hospitals are a multifaceted and systemic phenomenon, whose origin is shaped by many interrelated factors. They include not only individual human aspects—such as staff experience, fatigue, attention, or communication skills—but also broader organizational and cultural elements like workload, resource distribution, internal communication structures, or leadership style.

In such institutions, where long-term, intensive, emotion-driven care predominates, even minor systemic deficiencies can cause serious consequences for vulnerable patients with chronic illnesses or cognitive or mobility impairments. In this context, ensuring safety becomes not only a professional but also a moral obligation for the entire healthcare team.

Prevention and management require not only well-defined procedures or technological solutions, but an effective safety culture where staff feel empowered to speak about errors, are not afraid to admit their shortcomings, and the organization responds constructively and

systemically, not repressively. A non-punitive, learning-oriented environment is one of the most important factors determining whether adverse events become drivers of change or recurring incidents.

The subsequent sections of this study will analyze in detail the causes of adverse events, current management strategies in nursing hospitals, and international experience and best practices—aiming not just for academic understanding of the problem, but also for practical solutions to achieve greater patient safety and higher-quality care.

CAUSES AND RISK FACTORS OF ADVERSE EVENTS

Adverse events in nursing hospitals arise from a complex interplay of interconnected factors, blending human, organizational, systemic, and environmental aspects. To effectively manage and prevent these events, it is essential to thoroughly analyze their main causes and risk factors.

Human factors constitute one of the most significant cause groups leading to adverse events in nursing hospitals. Unlike technical or system errors, human-origin errors are related to the employee's psychophysiological condition, emotional state, decision-making process, and attention. Nurses working in long-term care often face intense emotional burden, strong sense of responsibility, and constant time pressure, which over time lead to inattentiveness, cognitive fatigue, and decision-making errors.

Haslam et al. (2021) showed that up to 60 % of medication errors in long-term care facilities are directly linked to human factors—especially excessive workload, fatigue, psychological stress, lack of focus, or competence gaps. For example, when a nurse rushes between multiple patients or handles complex cases without proper support, the risk of confusing medications, missing symptom changes, or incorrectly performing procedures increases.

Particularly risky are situations where staff cannot rest adequately between shifts, work overtime, or experience prolonged emotional burnout manifested as cynicism, reduced empathy, and lack of interest in their work. Such states not only weaken concentration but ultimately foster a culture of apathy where errors become a routine and "inevitable" part of the job.

It's important to recognize that human factors are often interwoven with systemic deficiencies: inadequate staffing, suboptimal shift organization, lack of resources, and poor workplace ergonomics. In other words, a staff error is frequently a result of the system's failure to support its employees, rather than just individual failure.

To reduce errors caused by human factors, organizations must strengthen psychological safety, encourage self-reflection, ensure adequate rest periods, distribute workload rationally, and periodically assess employees' emotional state. Additionally, investing in continuous training—especially during critical times such as the introduction of new medications or protocols—when error risks due to uncertainty or lack of knowledge are higher, is vital.

Organizational factors are a core part of the causation chain of adverse events, often acting as structural preconditions for both human and technological errors. These include

inadequate staffing, poorly optimized scheduling, non-standardized procedures, ineffective internal communication, and other systemic shortcomings directly affecting patient safety. In long-term care facilities, where patients are often physically or cognitively vulnerable, any organizational gap can lead to serious consequences.

One of the most critical challenges is staff shortage, especially at night when monitoring and care capabilities decrease. Research shows that fall rates increase during hours when patients attempt independent mobility, but the staff is occupied with other tasks or working in reduced teams. Stalpers et al. (2021) found that in care institutions with more than 10 patients per staff member, the number of adverse events rises by up to 30 %, and falls and medication errors most frequently occur when staff cannot provide direct supervision.

Another important organizational aspect is scheduling. Poorly designed shifts, particularly consecutive shifts without adequate rest, lead to fatigue, lack of attention, and decision-making errors. Long hours and frequent overtime in nursing hospitals are common, but their long-term impact on patient safety is negative. These conditions also decrease job satisfaction and contribute to emotional burnout, which is associated with lower attention and empathy.

Poor communication within teams—nurses, doctors, social workers, or support staff—increases the risk of errors further. Information about changes in patient condition, new orders, or behavioral risks is often not conveyed in a timely or clear manner, potentially leading to inappropriate actions or decisions. Lack of standardized communication protocols worsens this issue.

Another significant gap lies in non-standardized procedures, especially for repetitive but risky tasks such as medication preparation, urinary or intravenous catheter care, and pressure ulcer prevention. Variations in procedure execution based on employee experience or shift reduce process reliability and increase error likelihood. The absence of standardized algorithms, protocols, and checklists remains a constant threat to care quality.

To mitigate organizational risks, it is critical not only to increase staffing but also to improve work organization models, implement standard procedures, encourage interdisciplinary collaboration, and enhance internal communication. Organizational efficiency in care facilities is foundational to ensuring patient safety.

Systemic factors include structural and institutional management-level deficiencies that significantly impact the frequency and nature of adverse events in nursing hospitals. Unlike individual or organizational errors, these factors reflect broader healthcare system issues: poorly

adapted processes, ineffective information technologies, inconsistent policy implementation, or even lack of clear operational protocols.

Palmgren et al. (2023) in Sweden showed that even when patient safety procedures are formally implemented, their real application may be limited. Key reasons include lack of staff training, low leadership involvement in strengthening safety culture, and documentation overload hindering integration into daily practice. Frequently, protocols exist only "on paper," while staff rely on informal decisions or verbal agreements in everyday work.

Systemic disruptions often involve electronic information system functionality. Older-generation IT platforms used in nursing hospitals are often non-intuitive, slow, technically limited, or incompatible with real work rhythms. As a result, staff resort to workarounds—such as delayed data entry, pre-filling, or avoiding system use altogether. This increases error risk and complicates traceability and auditing.

Another issue is inefficient adaptation of protocols to the local context. Standards or guidelines from national or international sources—if not transferable to local realities—cannot be implemented practically. For example, recommendations for pressure ulcer prevention or fall risk assessment often require resources or procedures the institution lacks. In such cases, safety becomes declarative rather than real.

Also, when the institutional structure does not support ongoing quality improvement, it directly affects safety outcomes. If responsibilities for incident analysis are unclear, feedback mechanisms are lacking, or reporting evaluations are formalistic, the organization cannot effectively learn from mistakes. This results in so-called "error inertia," where adverse events repeat due to unlearned lessons or unresolved system weaknesses.

Preventing systemic gaps requires not only formal procedure implementation, but also active staff training, real-world testing of IT solutions, promoting leadership, and ensuring policies are implemented effectively, not just bureaucratically. It is also necessary to regularly review existing systems and improve them based on staff feedback and practical experience.

Environmental factors are another crucial component in the chain of adverse event occurrence, especially in long-term care institutions housing the most vulnerable patients—elderly people with visual, auditory, balance, or cognitive impairments. The physical environment in a nursing hospital directly affects both patient safety and staff ability to perform their duties properly and effectively. Poor lighting, slippery floors, poorly designed spaces, narrow corridors, far-away workstations, lack of handrails or assistive equipment—all increase incident risk.

These factors often cause falls, one of the main adverse event types in nursing hospitals. Studies show that inadequate night-time lighting, especially in toilets or corridors, often leads to situations where a patient trying to move unassisted becomes disoriented, trips over furniture, slips, or loses balance. If equipment is not ergonomically designed—such as beds too low or too high, or missing grab rails—the risk increases further (Zhang et al., 2021).

Distance of staff from patient rooms also matters. When workstations or monitoring posts are too far, nursing personnel cannot respond quickly to patient calls or movements. This is especially critical at night when staff is reduced, and a single nurse may be responsible for a large ward. In such cases, every second matters—whether responding to a fall or a change in health status.

The age and infrastructure of the building are also important. Many nursing hospitals are in older buildings whose architectural solutions don't meet modern care, mobility, and safety requirements. They lack universal access, adequate lighting, automatic doors, ergonomic sanitary units, and sometimes even stairlifts or fire safety systems. These conditions hamper both staff work and patient independence, which is essential for quality care.

Reducing environmental risk requires regular infrastructure audits, implementation of lighting and flooring safety standards, optimizing equipment placement, and applying ergonomic design in daily care. Even minor improvements—like clearly marked passageways, motion sensors, or non-slip flooring—can significantly enhance patient safety.

Communication gaps are among the most important risk factors affecting patient safety in care institutions. Unlike technical or physical errors, communication failures operate indirectly but can have equally harmful consequences. Such gaps appear during shift changes, interdisciplinary communication, and interactions with patients and their relatives.

Shift changes are critical moments, and studies show these are times when most information is lost, leading to incorrect patient care or dangerous errors. Elo et al. (2022) emphasize that even with written handover practices, some data—such as patient condition changes, new allergies, or fall risk—often aren't verbally communicated, so the incoming shift is unaware. Also, standardized handover models like SBAR (Situation–Background–Assessment–Recommendation) are often missing—though they are considered the gold standard for structured and accurate communication in clinical contexts (AHRQ, 2021).

Communication gaps also arise between professional groups. Nurses, doctors, social workers, and support staff don't always have equal access to patient information. Often, information about changes in treatment or clinical status isn't shared across the entire team, leading to inconsistent actions or duplicate efforts. Ulrich et al. (2020) emphasize that

fragmented communication in nursing homes creates situations where one staff member doesn't know what another has done, resulting in errors or inefficiency.

Communication with patients and their families is also crucial. If information about health status, prognosis, or care plans is not clearly transmitted, it poses both ethical and practical challenges. Patients may withhold symptoms, refuse important treatment, or come into conflict with staff due to unmet expectations. Studies show that patient and family communication is often deprioritized, especially when staff face time pressure or resource shortages (O'Hagan et al., 2021).

Additionally, some care facility staff still fear reporting errors, especially if a blame culture rather than a learning-from-errors culture prevails. In such cases, even when noticing incidents or risks, they don't report them, which hinders root-cause analysis and safety system improvement (Sammer et al., 2021). Therefore, an open, transparent, and structured communication culture is essential not only for operational smoothness but also for systemic risk prevention.

To reduce these communication gaps, it is necessary to implement structured models like SBAR (structured communication tool used in healthcare (and other fields) to ensure that information is passed on clearly, concisely, and in a logical order) or ISBAR (extended version of SBAR that begins with an Introduction, where the communicator identifies themselves and their role), utilize digital handover systems, ensure all team members have access to patient data, and reinforce a safety culture where talking about errors is the norm, not the exception.

Cultural and psychosocial factors are critically important when assessing how nursing institutions handle adverse events. These factors influence not only staff behavior during incidents, but also whether such events are reported, how they're analyzed, and whether learning occurs from them. Psychological safety, trust in leadership, fear of blame, and organizational values directly affect whether staff feel able to openly discuss errors.

According to Thomas and Dhingra (2020), nurses often feel that reporting an error could be interpreted as proof of personal incompetence, so they tend to remain silent about minor incidents or near misses. This silence means the organization loses valuable opportunities to identify systemic failures and prevent more serious events in the future.

This phenomenon is closely tied to a punitive culture—when staff feel any mistake will result in disciplinary action instead of a learning opportunity. In such care settings, incident reporting systems are often used for blame rather than analysis. Consequently, staff avoid being open, and the organization lacks a true understanding of the situation (Giles et al., 2022). Meanwhile, facilities that foster a just culture—encouraging constructive approaches to errors

as systemic issues rather than personal faults—see increased reporting and improved patient safety (Dekker, 2017; Sammer et al., 2021).

Interpersonal environment—whether staff feel part of a team, whether their opinions are heard, and whether emotional support is available after incidents—also plays a vital role. Nurses who feel alone or hesitant to voice concerns are more likely to experience emotional exhaustion, reducing their ability to respond to risks and maintain safe practice (Kim & Lee, 2021). Organizations that support emotional resilience and psychological well-being improve safety for both staff and patients.

Cultural factors also include organizational values, leadership style, and communication norms. In settings where leaders demonstrate openness, support, and active participation, staff are more likely to report errors and engage in analysis. Leadership plays a fundamental role—it can either strengthen or undermine the safety culture (Mannion & Davies, 2018).

Thus, cultural and psychosocial factors form an invisible yet powerful framework that determines the effectiveness of adverse event management. Technical or structural solutions alone are insufficient—it's necessary to foster a safe, supportive, and learning-friendly work environment where errors are viewed as opportunities for improvement.

Finally, it's important to highlight that these factors rarely act alone—they tend to combine into a systemic model. For example, an overworked staff member working in poorly lit conditions, without access to clear information, is far more prone to error than one operating in an ergonomic, organizationally safe environment.

Analyzing these factors helps shape research hypotheses and evaluation instruments. For example, one may examine how often staff encounter dangerous situations due to human or systemic errors, and which factors encourage or inhibit incident reporting. This is a crucial step in developing effective preventive strategies and building a patient safety culture in nursing hospitals.

ADVERSE EVENT REPORTING SYSTEM

An effective adverse event reporting system is a crucial patient safety mechanism in all healthcare institutions, but its significance is particularly high in nursing homes. These facilities typically care for vulnerable, elderly patients with chronic illnesses, making any system errors or staff oversight potentially have long-term consequences. A properly functioning reporting system enables systematic identification and collection of information about incidents, analysis of their causes, and implementation of preventive actions to avoid similar situations in the future (Mannion & Braithwaite, 2017).

According to the World Health Organization (WHO) recommendations, the adverse event reporting system should be anonymous, easy to use, accessible to all staff, and based on a non-punitive culture (WHO, 2020). These principles are especially relevant in nursing homes, where staff often face significant emotional and physical workloads, and communication channels between shifts or different roles may not function smoothly.

One of the most important aspects is staff trust in the system. Studies show that if staff believe that those who report mistakes will be punished or stigmatized, they often choose to remain silent about incidents—especially those that did not cause direct harm (Kaldheim & Slettebø, 2016). This leads to the loss of valuable information about systemic deficiencies that could otherwise be used to enhance safety. In contrast, institutions that foster a "just culture"—where errors are seen not as individual incompetence but as outcomes of system flaws—experience an increase in the number of reported adverse events, and the analyses become a valuable learning tool (Dekker, 2017; Waring et al., 2020).

Equally important is the leadership's attitude towards the information received. The reporting system will only be effective if the collected data is systematically analyzed and the conclusions are applied in practice. Research shows that in healthcare institutions, reporting data often goes unused: no responses are given, incidents are not discussed in team meetings, and staff do not feel their efforts lead to change (Hewitt et al., 2021). Such inaction decreases the motivation to report in the future and may foster a cynical view of the safety culture itself.

A successful example comes from Scandinavian nursing institutions, where electronic reporting platforms are actively used. These platforms allow real-time analysis of event types, timing, location, involved staff, and context. These systems are often associated with visible improvements in patient safety indicators—such as reduced fall rates, fewer medication errors, or more effective infection control (Johannessen et al., 2021).

It is important to note that a reporting system is not merely a technological solution—it is an expression of the entire organizational culture. If the system functions as a control and supervision mechanism, it suppresses initiative and encourages concealment. However, when accompanied by training, reflection, constructive dialogue, and managerial support, the system becomes a tool for empowerment, education, and improvement (Pham et al., 2016).

Although adverse event reporting systems are considered one of the cornerstone tools for patient safety, their implementation in nursing homes is often limited or ineffective. This is especially true in the context of long-term care, where there is not only a lack of standardized procedures but also a significant psychological barrier to acknowledging errors.

According to a Europe-wide study by Baier et al. (2021) on patient safety in long-term care institutions, only 40–50% of staff reported knowing how to properly report incidents, and just about 30% did so in practice. These figures indicate a significant gap between the existence of the system and its real-world use. This means that most incidents—including "near misses"—remain undocumented, limiting opportunities to learn from them, identify systemic deficiencies, and implement preventive measures.

Staff identified several key reasons for not reporting events. Fear of being punished or criticized is among the most important employees feel their professional reputation is at risk even in the case of minor errors, especially in institutions where a blame culture prevails. Doubts about the effectiveness of the system are another frequent reason: if staff do not see that reports lead to real changes, a belief emerges that "there's no point in reporting." Unclear or complicated reporting formats, lack of training on how to identify and describe an event, also contribute to system inactivity. Finally, lack of time—when working conditions are intense and staffing levels inadequate, reporting is often seen as a "lower priority" task (Smits et al., 2020).

Research shows that lack of organizational support is another significant factor. When leadership fails to communicate about incident analyses, does not provide feedback or implement changes, even motivated employees lose faith that their efforts will lead to results. This is particularly relevant in nursing homes, where staff turnover is high, and management personnel are often overwhelmed with administrative duties, leaving them little time to actively coordinate incident analysis (Wagner et al., 2021).

Additionally, in long-term care contexts, information technology solutions are often lacking—many institutions still rely on paper-based reporting or primitive data collection systems that are not integrated with patient records. Such systems do not allow for effective data analysis, tracking of recurring events, or real-time risk mapping (Keller et al., 2019).

To increase the effectiveness of the reporting system, it is essential to change the perception of errors, invest in staff education, simplify reporting formats, integrate systems with daily work tools (e.g., nursing documentation systems), and most importantly—actively demonstrate that each report is valued and leads to change.

For the adverse event reporting system to become a real patient safety tool, it must not only be formally implemented but also actively used by staff at all levels. Studies show that a system's effectiveness depends not on its existence, but on its functionality, accessibility, transparency, and impact on culture (Fujita et al., 2020). Such a system must meet several essential criteria; without them, reporting frequency and quality remain low.

First, anonymity—staff must be able to report events without fear of being identified or punished. This is particularly important in organizations where a punitive approach to errors still exists. Studies show that anonymous reporting systems increase staff confidence and encourage reporting of even those events that caused no harm but have the potential to recur (Giles et al., 2022).

Second, ease of use—the reporting process should not require many steps, complex descriptions, or technical knowledge. Conversely, when the system is integrated into daily nursing processes, accessible via mobile or desktop without additional logins, the number of reports increases (Pham et al., 2016). These solutions reduce administrative burden and encourage more active involvement.

The third key element is feedback. If staff report an incident but never learn whether their information was used or if any decisions were made, passivity develops. On the other hand, institutions that can provide individual or public feedback about actions taken, corrections made, or system improvements implemented encourage organizational learning and strengthen trust in leadership (Waring et al., 2020).

Fourth, systems must be based on clear categories that help standardize information. This includes both event types (falls, medication errors, aggression, hygiene violations) and descriptions of consequences, risk levels, and context. Such structured data becomes comparable, enabling more effective identification of systemic issues and planning of preventive measures (WHO, 2020).

A significant example is a study by Kinnunen et al. (2023) in Finland, where a digital reporting system was implemented in nursing institutions, allowing incidents to be reported with just a few clicks. After the adoption of this innovation, the number of reports increased 2.5 times, and more importantly, their quality improved: employees specified causes,

consequences, and proposed preventive measures—greatly enhancing the value of the analysis and prompting leadership to take targeted actions.

These findings demonstrate that an effective reporting system is not just a technological solution, but a reflection of the entire organizational culture. When staff feel heard, when mistakes are seen as opportunities for growth rather than threats—reporting systems become a true guarantee of patient safety. At the same time, this strengthens organizational resilience, employee satisfaction, and long-term trust in the healthcare system.

Beyond formal reporting, the creation of a so-called learning system is essential—where each incident is analyzed not to assign blame but to identify systemic gaps. Here, the Root Cause Analysis (RCA) method proves useful, examining not only the incident itself but also deeper causes: why the error occurred, and which system components allowed or encouraged it (Carver & Hipskind, 2021).

Employee involvement in adverse event reporting systems is one of the key factors determining the success of these systems. While technological solutions such as digital platforms or standardized formats are important, they are not sufficient—human factors remain the primary indicator of whether the system will be effective in practice.

As Hassmiller and Cozine (2020) note, the effectiveness of reporting systems depends not only on structural solutions but also on staff motivation, values-based attitudes toward safety, and the level of organizational trust. When nurses, nurse assistants, or other team members feel their efforts are valued and lead to real changes, they become more proactive and willing to report incidents or hazardous situations.

This involvement is not automatic—it is cultivated over time through training, leadership, and organizational culture. Leaders must encourage open dialogue about safety, consistently inform staff about changes made based on their reports. Otherwise, employees may feel "detached" from the safety culture, and the system—formal, but ineffective. Research shows that emotional engagement—i.e., when employees feel personal responsibility for safety and identify their role in strengthening it—has a stronger impact than external pressure or administrative directives (Tucker et al., 2019).

An important aspect is the feedback cycle, which motivates employees to continue participating. When an organization clearly demonstrates that employee comments, reports, and suggestions are seen, discussed, and translated into actions, a kind of "positive safety cycle" is created: the more information received, the better the decisions made, and trust in the system is strengthened (Manser, 2018).

Furthermore, employee engagement can be fostered through internal training, reflection groups, and incident analysis discussions involving not only leadership but also members of nursing units. Such forums help not only to better understand systemic issues but also to build a sense of community where safety becomes a shared goal of the entire team.

Ultimately, emotional safety and respect are essential conditions for meaningful participation. Employees must know that their reports will be met not with criticism but with attention, and that the analysis will focus on solutions, not on identifying blame. Only then will employee participation become not merely formal but also value-based—an essential feature of a mature patient safety culture.

Leadership plays one of the most critical roles in shaping a culture of patient safety and determining the effectiveness of the adverse event reporting system. While employee responsibility or technological solutions are often emphasized, it is the institutional leaders who determine whether an organization will foster an open, learning-oriented culture or one based on fear and repression.

A study by Kantanen et al. (2020) in Finland revealed that in healthcare institutions where leadership was actively involved in addressing safety issues, the number of incident reports significantly increased. These facilities also recorded fewer patient complications, shorter hospital stays, and fewer rehospitalizations. The authors emphasized that leadership involvement must be consistent and visible—not only rhetoric about safety but also concrete actions: participating in analysis processes, responding to reports, and making decisions based on the received information.

Leadership must also be capable of communicating about errors as opportunities for improvement rather than violations to be concealed or punished. This so-called "culture of learning from mistakes" requires ongoing effort: incorporating safety topics into staff meetings, showing transparency in discussing incident causes and solutions, and acknowledging systemic shortcomings—even when addressing them requires additional resources. Research shows that such organizations demonstrate higher employee satisfaction, lower turnover, and better patient health outcomes (Singer et al., 2021).

Conversely, in organizations where leadership is absent or formalizes patient safety issues, employee initiative to report errors or “near misses” is significantly lower. A dominant attitude of “better to stay silent” arises because it is unclear how reports will be interpreted, whether there will be consequences, or whether anyone will respond at all. This environment fosters a blame culture in which avoiding responsibility becomes more important than solving the problem (Flott et al., 2018).

Leadership must not only initiate changes but also empower middle management—nurse administrators, unit managers, team leaders—who are typically closest to frontline staff. Their attitude toward errors, decision-making, and incident analysis directly influences daily staff behavior (Frankel et al., 2017).

Thus, leadership's active, conscious, and consistent involvement in patient safety policy is essential to create an effective, information-driven, and forward-looking safety culture in nursing homes.

Despite technological advances, an effective adverse event reporting system cannot be understood solely as a technical tool. It must be organically integrated into a patient safety culture that is based not only on procedures but also on shared organizational values, trust among staff, and continuous improvement (Gillespie et al., 2017).

The reporting system should be part of a systemic safety strategy—not an isolated project. This means that organizations must ensure consistent staff education related to identifying incidents, classifying them, principles of analysis, and addressing emotional aspects. Feedback mechanisms are particularly important: employees who receive information on what was done following their report are more likely to trust the system and remain actively engaged (Waring & Bishop, 2020).

Moreover, an analytical component is essential events must not only be recorded but also systematically analyzed using principles of risk management, quality management, and systems thinking. Only in this way can organizations identify recurring patterns, detect trends, and plan preventive actions at the organizational level (Leape et al., 2009).

Another key requirement is the clear prioritization of safety within the organization’s strategy. Patient safety must be integrated into the institution's mission, strategic goals, staff evaluation criteria, and internal communication practices. Such an approach enables the reporting system to be seen not as an additional administrative task but as an integral part of professional work (Singer et al., 2021).

In conclusion, an effective adverse event reporting system is not just a technological solution but a cultural practice that requires consistent organizational commitment, transparency, emotional safety, and learning. In nursing homes—where most patients are elderly, have chronic illnesses, and suffer from cognitive or physical impairments—such a system can become a key tool for reducing risk, improving quality of care, and strengthening patient dignity. Organizations that invest in a culture of safety eventually achieve better results not only in terms of quality but also in employee satisfaction and service continuity (Pronovost et al., 2019).

ADVERSE EVENT MANAGEMENT STRATEGIES

Adverse event management in healthcare institutions is a coordinated set of actions encompassing prevention, appropriate response to incidents, and continuous process improvement. In nursing homes, where elderly and vulnerable patients dominate, this activity gains even greater significance. While some events are inevitable due to a patient's condition, many can be reduced or entirely prevented through appropriate management strategies.

Preventive measures form the first and most critical line of adverse event management. The World Health Organization and various health safety agencies agree that only consistently applied prevention strategies can reduce the number of errors and the extent of their consequences, particularly in vulnerable environments such as nursing homes (WHO, 2021).

One of the main tools in this area is the implementation of standardized procedures. As noted by Friesen et al. (2020), clearly defined, documented, and periodically reviewed procedures help reduce the likelihood of individual interpretations, inaccuracies, or recurring errors. For example, when medication administration processes are standardized, the risk of incorrectly assigning doses, missing appointments, or misinterpreting instructions is reduced. Standardization also contributes to the consistency of nursing practice—everyone knows how to act in similar situations, thus reducing decisions made spontaneously or based on incomplete information.

Another foundation of prevention is regular risk assessment. In nursing homes, common tools include the Morse Fall Scale, Braden Scale for pressure ulcers, and scales assessing the risk of dehydration, malnutrition, or delirium (Mather et al., 2021). The effectiveness of these tools depends not only on how often they are applied but also on how the collected information is integrated into the care plan. Studies show that when assessments are automated (via electronic records) and linked to immediate interventions—such as repositioning or enhanced monitoring—prevention effectiveness increases by up to 40% (Rochon et al., 2022).

Strengthening staff competencies is also a crucial prevention tool. Regular training on medication safety, hygiene protocols, communication methods, or emergency management reduces both the frequency and consequences of actual errors. Training effectiveness is enhanced by practical case analyses, simulations, and interprofessional exercises that foster a better understanding of systemic risks (Wang et al., 2020).

Moreover, it is vital to ensure a culture of prevention where each employee feels responsible for safety—not only within their area of work but also in observing and reporting colleagues' actions or environmental hazards. This is referred to in the literature as "active

responsibility"—the cultural capacity to recognize threats and act to avoid them (Sammer et al., 2021).

Finally, preventive measures must be personalized according to patient profiles. Older adults with cognitive, visual, or motor impairments require individualized strategies, such as assistance with toileting, cognitive stimulation, or sensory environment adaptation. Studies show that a personalized prevention model can reduce hospital complications by up to 25% (Kutney-Lee et al., 2022).

Another key direction in preventing adverse events is nursing staff education and professional development. In nursing homes, where staff care for complex patients with multifaceted needs, human factors often become both a risk and a preventive resource. From this perspective, staff competence is not only a matter of professional ethics but also a systemic safety measure.

The literature emphasizes that continuous staff education, especially on patient safety, reduces error risks and strengthens cultural preparedness to respond to incidents. A study by Jiang et al. (2022) revealed that in long-term care institutions implementing structured, regularly conducted training, incident rates decreased by 22%, while reporting rates increased by 38%. These results indicate that education contributes not only to knowledge acquisition but also to trust in the system and the motivation to take responsibility for quality.

Practical training methods such as real-life simulations, case studies, interprofessional discussions, and learning from actual cases proved particularly effective. These methods provide not only theoretical knowledge but also enhance critical thinking, real-time decision-making, and collaboration with colleagues. Moreover, simulations help identify gaps in organizational procedures that might otherwise remain unnoticed (Shin et al., 2020).

Equally important is the principle of regularity. One-time or fragmented training sessions, while beneficial, do not ensure lasting impact. Therefore, the literature recommends implementing continuous learning systems that include periodic lectures, ongoing feedback, testing, and individual competency reviews (Henderson et al., 2021). This approach is especially crucial in institutions with high staff turnover, where new employees often lack sufficient experience.

Additionally, educational initiatives should focus not only on clinical knowledge but also on soft skills—communication, empathy, team coordination, and psychological resilience. For example, many adverse events are linked to poor information handovers between shifts or professionals, which can be addressed by using the SBAR method or training on effective interprofessional communication (Elo et al., 2022).

Thus, systematic, practical, and continually updated nursing staff education is one of the core elements of a safety culture. It reduces the likelihood of errors and strengthens employee engagement, motivation, and trust in the organization.

Responding to adverse events is a key component of patient safety management, enabling not only reduction of immediate consequences but also ensuring long-term organizational improvements. Although preventive measures help reduce the likelihood of incidents, they cannot eliminate them—therefore, an effective mechanism for responding when incidents occur is essential.

One of the most effective response methods is Root Cause Analysis (RCA). This structured method is designed not only to determine what happened but also why it happened. As noted by Carver and Hipskind (2021), RCA helps move beyond individual blame and identify systemic causes: flawed processes, erroneous protocols, inadequate working conditions, or communication gaps. This approach reduces a blame culture and promotes constructive problem-solving.

RCA analysis often involves the following steps:

1. Describing the incident and gathering facts.
2. Identifying direct and indirect causes.
3. Detecting systemic deficiencies.
4. Formulating recommendations for changes.
5. Preparing an implementation and monitoring plan.

It is essential that this process takes place promptly after the event, while information is still fresh and employees can accurately describe the situation. In addition, RCA should be accompanied by an internal audit to assess whether protocols were followed, whether available resources were adequate, and how management was informed and responded to the situation (Andel et al., 2020).

Another important aspect is providing feedback to staff and, if necessary, to the patient or their relatives. A culture of trust is strengthened when incident analysis is transparent, and participants feel heard and respected. Furthermore, some countries (e.g., the United Kingdom) implement a Duty of Candour policy, under which healthcare institutions must inform patients about an incident, explain its causes, and indicate what actions have been taken (Ocloo & Matthews, 2016).

Studies show that institutions that systematically apply RCA and other incident response methods are better at identifying risks, implementing changes more rapidly, and experiencing

fewer repeat incidents (Shapiro et al., 2022). It is crucial that the results of such analyses are included in institutional quality improvement plans rather than remaining as isolated reports.

Finally, it is essential to ensure that response practices are supported not only at the administrative level but also culturally. In organizations that promote learning from errors rather than concealing them, employees feel safer, are more engaged in safety initiatives, and contribute to strengthening the overall patient safety system (Dekker, 2017).

One of the main pillars of a patient safety strategy is the formation of an organizational culture focused on openness, learning from mistakes, and employee empowerment. Although structural and technical measures are important, without a supportive culture they may not function effectively or may be applied only formally. In nursing homes, where staff work under long-term stress, emotional tension, and high expectations, the cultural atmosphere significantly influences both the prevention of incidents and the response to them.

The literature emphasizes the "non-punitive response to error" policy as an indicator of an advanced organizational culture. A study by Sammer et al. (2021) revealed that institutions actively applying this principle reported a higher number of incident reports, initiated analyses more quickly, and implemented corrective measures more effectively. This shows that an open environment facilitates faster risk identification and reduces the likelihood of recurrence.

However, organizational culture is not only about processes—it is also related to the emotional safety of employees. One of the most significant aspects of modern patient safety literature is the so-called "second victim" phenomenon, in which an employee who makes an error or is involved in an incident experiences emotional consequences: stress, guilt, anxiety, or even the desire to leave the profession (Wu et al., 2020). In such situations, it is essential for the organization to have not only rigorous analysis procedures but also emotional support mechanisms.

Modern practice increasingly includes peer support systems, in which the employee receives informal, nonjudgmental support from a colleague specially trained for such conversations (Hu et al., 2022). This not only reduces emotional strain but also prevents further psychological consequences such as burnout, decreased motivation, or professional isolation. These initiatives must be an integral part of patient safety strategies rather than ad hoc responses to crises.

Fostering an organizational culture also requires leadership. Dekker (2017) argues that only active involvement by leaders—such as speaking openly about mistakes and responding to incidents with learning rather than retribution—can shift the collective mindset. This is especially relevant in nursing homes, where employees often feel less involved in decision-

making. When leadership promotes transparency, involves employees in decision-making, and provides space for discussion, the organizational culture becomes constructive and resilient.

To assess organizational culture, it is recommended to use patient safety culture surveys (e.g., HSOPSC, AHRQ), which systematically evaluate staff attitudes toward safety, openness, leadership support, and error analysis practices. These data can be used not only for self-reflection but also for planning specific improvements (Nieva & Sorra, 2021).

Quality improvement methods are becoming increasingly important in the arsenal of adverse event management tools. One of the most used models is the PDCA cycle (Plan–Do–Check–Act), which offers a systematic, consistent approach to implementing changes and evaluating their effectiveness. This method is particularly suitable for nursing homes, where daily practice involves balancing standardized procedures with individualized patient care.

The PDCA method is based on the idea that improvement is a continuous, recurring process. First, the team plans a change (Plan)—for example, in response to an increase in falls or medication errors. Then the change is implemented in practice (Do), results are monitored and analyzed (Check), and finally, a decision is made whether the solution is effective or further adjustments are needed (Act) (Deming, 1986).

This method becomes especially effective when it is data-driven and involves all team levels. In nursing homes, where decisions are often made by interdisciplinary groups, it is important to ensure that the PDCA cycle includes collaboration among nurses, physicians, quality specialists, and leadership (Taylor et al., 2014).

For example, in Finnish long-term care institutions, the PDCA method was applied to fall prevention. In a study by Kinnunen et al. (2023), the nursing team used incident analysis data to create a fall prevention plan (e.g., additional handrails, patient risk assessment every 24 hours), implemented it, and later analyzed the results. Within three months, the number of falls decreased by 18%, and patient satisfaction increased.

It is important to highlight that PDCA is a flexible system that can be applied both at the micro-level (e.g., addressing a specific department's issue) and organization wide. Moreover, the method aligns well with other quality assurance tools such as audits, incident analysis, staff training, and risk assessment scales.

The success of PDCA application also depends on the organizational culture and the availability of data. If information about incidents is collected inconsistently or staff do not feel supported by leadership, the PDCA cycle may become a merely formal tool. Therefore, as noted by Provost and Murray (2020), it is crucial to ensure that data analysis is real, focused on learning rather than blame.

In recent years, information and medical technologies have become an integral part of patient safety strategies. Digital solutions help reduce the risk of human error, increase procedural accuracy, enable faster response to risks, and improve communication among healthcare professionals. In nursing homes, where patients often have complex conditions, technologies are especially valuable in both prevention and incident response.

Electronic Health Records (EHR) systems are among the key tools for reducing the risk of information loss and documentation errors. These systems enable real-time monitoring of patient status, medication administration, and procedure history, while also facilitating clear communication among shifts and interdisciplinary teams (Campbell et al., 2021). Additionally, automated record systems can be integrated with Clinical Decision Support Systems (CDSS), which provide alerts about potential allergies, drug interactions, or incorrect dosages (Middleton et al., 2020).

Automated medication dispensing also plays a critical role—automated dispensing cabinets and barcode scanning systems ensure accurate patient, medication, dosage, and timing identification. According to Keers et al. (2020), such solutions reduce the likelihood of medication errors by up to 41%, especially during night shifts or shift changes.

Innovative solutions also include mobile nursing technologies—tablets or smartphones integrated with safety protocols, checklists, and communication platforms. These systems allow staff to access necessary information at the bedside, reducing errors caused by memory lapses or miscommunication (Rahimi et al., 2022).

Especially advanced are smart sensors embedded in beds, floors, or clothing. In Scandinavian countries, smart beds can automatically detect when a patient leaves the bed, lies in one position too long, or experiences heart rate changes. A study by Nilsson et al. (2020) showed that such beds reduced the number of falls by 25% within the first six months of use in a Swedish long-term care facility.

Another promising solution is automatic reporting tools that detect risks in real-time and send alerts to responsible staff. These tools can be connected to nurse stations, mobile apps, or sound alarms. A study in Finland (Koskinen et al., 2023) showed that automatic alert systems reduced response times to risky situations by 45% compared to traditional manual reporting systems.

However, the effectiveness of technology depends on its adaptability to clinical reality and staff readiness to use it. If technologies are too complex, unintuitive, or not adapted to nursing workflows, there is a risk they will be ignored or misused. Therefore, it is essential not

only to implement the solution but also to invest in staff training, systematic evaluation, and feedback (Bennett & Hauser, 2021).

In nursing homes, where patient care is often long-term, complex, and involves multiple specialists, interdisciplinary communication and teamwork become essential components of safe and high-quality care. Literature shows that the risk of adverse events significantly decreases when all team members clearly understand their roles, responsibilities, collaborate effectively, and share information (Manser, 2009).

Effective interdisciplinary communication helps prevent the loss or distortion of information, which often leads to errors in medication administration, patient condition monitoring, or care coordination. In nursing homes, this risk is particularly high during shift changes or when addressing intersectoral issues (e.g., department transfers, need for consultations). The SBAR method (Situation, Background, Assessment, Recommendation), as a structured communication tool, is one of the most recommended models for avoiding communication gaps (Haig et al., 2006).

Beyond structured communication, regular interdisciplinary meetings are highly valuable. These meetings address complex cases, analyze safety indicators, and allow for sharing reflections and best practices. A study in Switzerland showed that institutions holding weekly case discussions had 27% fewer incidents compared to those without such practices (Bodenheimer & Sinsky, 2014).

It is also important to ensure that all specialists are included in the team regardless of hierarchical position—from nursing assistants to physicians and administrative staff. Such inclusion reduces authority barriers, promotes trust, and enables every employee to feel responsible for the overall level of safety (Salas et al., 2018). When team members know their opinions are valued and influence decision-making, they participate more actively in safety initiatives, respond quicker to changes, and are more committed to preventive measures.

Strengthening interdisciplinary collaboration is directly linked to fostering psychological safety—a work environment where employees can freely express doubts, observations, or even mistakes without fear of consequences. Psychological safety promotes learning from events, peer support, and continuous improvement, which are cornerstone components of a patient safety culture (Edmondson & Lei, 2014).

Finally, it is essential to emphasize that teamwork must be a learning process. Team training, joint simulations, and safety scenario analysis not only deepen knowledge but also serve as critical tools for building trust and collective responsibility. Organizations investing in

team development observe not only a reduction in errors but also increased employee satisfaction and reduced turnover (Weaver et al., 2014).

Managing adverse events in nursing homes is a complex, multilayered process requiring a systemic approach that includes prevention, response, and organizational culture transformation. These institutions care for the most vulnerable patients—elderly individuals with chronic, progressive, or multiple conditions—where every error can have particularly serious consequences. In this context, patient safety becomes inseparable not only from clinical competence but also from managerial, technological, and ethical decisions.

Research and practical analysis indicate that the best results are achieved when a consistent safety culture is implemented, based on clear standards, feedback, open communication, and learning from mistakes. Crucially, this culture must be non-punitive, encouraging reflection, team-based solutions, and employee empowerment. Only in such an environment can incidents become part of transparent, improvement-driven efforts rather than hidden problems.

It is also evident that human, organizational, and technological factors cannot be evaluated in isolation—their interaction determines both the origin of errors and the success of prevention. Excessive workload, communication breakdowns, or unsafe environmental conditions often merge into a broader risk picture. Therefore, prevention must encompass the entire organizational ecosystem, and solutions must be integrated across multiple levels: micro (individual care), meso (team processes), and macro (organizational strategy, national standards).

Managing adverse events cannot be regarded merely as an administrative task—it is an ethically and professionally critical domain that impacts not only the quality of patient lives but also staff well-being and trust in the healthcare system. Nursing homes hold a unique potential to lead in safety culture if leadership can engage all staff levels, support their development, and provide tools for decision-making and learning.

In conclusion, only a comprehensive, integrated approach—including prevention, education, technology, communication, and cultural change—can ensure long-term improvements in patient safety, employee engagement, and service quality. A modern nursing home should be not only a place of care but also an environment of continuous development, accountability, and trust.

NURSES' ROLE AND ATTITUDE TOWARDS EVENT MANAGEMENT

Nurses are key members of the healthcare team, who interact directly and continuously with patients, and therefore their role in the prevention and management of adverse events is essential. Nurses' involvement, knowledge, sense of responsibility, and emotional relationship with the safety culture directly affect patient safety and the institution's ability to identify and respond to risks.

Nurses are often the first specialists to notice critical changes in a patient's condition, directly participate in the care process, and are witnesses or even participants in many adverse events. For this reason, they are in a unique position: their role is essential not only in transmitting or documenting information but also in reflecting on the event and managing its consequences.

Such a position means that nurses experience significant emotional, professional, and ethical tension, which the literature defines as the "second victim phenomenon." After an event, a nurse may feel guilt, shame, fear, helplessness, moral pain, even if they did not make a mistake themselves (Wu et al., 2020). This experience not only disrupts professional self-confidence but can also have long-term consequences for emotional health – from sleep disorders to withdrawal from the profession.

Ethical challenges are particularly relevant to nurses when there is no clear, safe reporting culture in the organization. As Garon (2021) points out, nurses often experience a moral conflict between the desire to follow professional values (openness, responsibility) and the fear of consequences – both personal (accusations, judgment) and collective (distrust among colleagues). This imbalance leads to a so-called moral dilemma, which disrupts trust in the institutional system.

In addition, some nurses feel loyalty to the team and therefore refrain from reporting colleagues' errors – even if they understand that it poses a threat to patient safety (Gallagher, 2019). This again shows that organizational culture, not just individual responsibility, determines whether incidents will be reported or kept silent.

On the other hand, when the organization creates a support system for nurses after an event, the effect is the opposite – trust, collaboration, and preventive learning increase. Such support can be formal (psychological assistance, peer debriefings) or informal (support networks among staff) (Scott et al., 2020). Nurses who know that a mistake will be analyzed

constructively, not punished, are more likely to report incidents and actively engage in the prevention process.

Therefore, it is necessary not only to create technical reporting systems but also to include the emotional and ethical component – to ensure that every employee feels not only responsible but also safe. This is possible only when leadership demonstrates value-based leadership, paying attention not only to systems but also to people.

The role of nurses in ensuring patient safety is unquestionable – they are often the first to notice clinical changes, directly carry out treatment procedures, and are close to the patient around the clock. Therefore, their attitude towards reporting adverse events becomes one of the key components of a safety culture.

Research shows that although most nurses recognize the importance of reporting, only a portion actually report all observed incidents, especially when the consequences for the patient are minimal or nonexistent. For example, Kim et al. (2022) found that as many as 47% of nurses did not report "near misses," reasoning that "nothing bad happened." Such a selective approach weakens the organization's ability to learn from mistakes, prevent more serious events, and analyze systemic gaps.

One of the main factors leading to non-reporting is the fear of negative consequences – both professional (blame, disciplinary action) and personal (damaged reputation, judgment by colleagues). In addition, nurses often express distrust in management, especially when there is no clear, open safety communication in the organization or when previous incident reports have not led to any response (Stavropoulou et al., 2015). In such environments, a so-called culture of silence forms, in which employees avoid speaking about problems because they believe that "nothing will change" even if reported (Jones & Johnstone, 2020).

An additional challenge is the emotional experience of nurses after an adverse event. The “second victim” phenomenon describes the psychological stress experienced by healthcare professionals after an incident – regardless of whether they made the mistake or only witnessed it. Nurses often experience guilt, anxiety, fear, sleep disorders, professional apathy, or even depression (Wu et al., 2021). This not only reduces their motivation to report future events but also worsens the overall organizational atmosphere, increases staff turnover, and psychological burnout.

Without appropriate psychological support, “second victims” risk long-term emotional disengagement from professional activity. A study conducted in Canada (Schwappach & Boluarte, 2022) showed that 30% of nurses considered leaving the profession after a serious incident, and as many as 70% felt they lacked support from management. Such data reveal that

emotional safety at work is just as important as technical safety for the patient. To encourage nurses' activity in the reporting system, it is necessary not only to implement technical measures (e.g., simple and anonymous reporting systems) but also to create a culture of emotional safety, in which employees feel that their voice is valued, and mistakes are objects of analysis, not blame. Furthermore, formal psychological support structures are needed, including debriefings, peer support groups, or access to emotional health specialists. A positive patient safety culture in healthcare institutions begins with empowering nurses. When nurses feel heard, valued, and have the power to shape safety processes, an atmosphere of trust, responsibility, and collaboration starts to strengthen in the organization. In contrast, in institutions where decision-making is centralized, and nursing staff are viewed only as executors, information losses, errors, and low incident reporting rates are more frequent (Flynn et al., 2019).

Empowerment means not only assigning responsibility for daily care but also actively involving nurses in decision-making – for example, participating in safety committees, incident analysis groups, protocol review meetings, or quality improvement projects. In this way, nurses not only become sources of information but also active agents of change.

A study by Dixon-Woods et al. (2020) in the United Kingdom showed that in long-term care facilities where nurses were involved in creating safety strategies and feedback mechanisms, adverse events decreased by 28% over three years, and the staff trust index increased by 35%. The authors emphasized that this was not only due to technical solutions – the most important factor was changes in the organizational microclimate.

Other studies emphasize that empowerment helps to form psychological safety in the workplace – a state in which the employee feels free to express opinions, admit mistakes, or suggest solutions without fear of punishment or humiliation (Edmondson, 2018). This sense of security is especially important for nurses who work under emotional and physical strain and often become the frontline in managing adverse events.

Furthermore, empowerment is linked to strengthening professional identity – when nurses see that their insights matter, their professional satisfaction, organizational loyalty, and responsibility for shared outcomes increase (Kutney-Lee et al., 2021). This is especially relevant in nursing homes, where patients' conditions require constant monitoring, quick response, and close team collaboration.

Thus, organizations aiming to reduce the number of adverse events must go beyond technical solutions and create a culture in which nurses are not passive observers, but active participants capable of shaping safety policies, sharing experiences, and initiating change.

The level of nurses' competencies is one of the key factors influencing patient safety, especially in nursing homes, where patients are often physically and cognitively vulnerable. Competence in this context includes not only clinical excellence but also the ability to identify risks, think critically, act independently, and evaluate situations in a complex way, based on evidence-based practice.

In modern healthcare, nurses are required to make decisions in situations where there is no single correct answer, and therefore, systemic thinking ability is essential. Such competence enables them to recognize dangerous signals in time – e.g., subtle changes in a patient's condition, indirect signs of infection, or risky organizational situations, such as poor communication or insufficient care.

Research confirms that nurses' competencies are directly related to the frequency of adverse events. Sujan et al. (2023) indicate that in institutions where systematic professional development models were applied, the number of falls, medication errors, and communication gaps decreased by 20–30% within one year. The authors emphasize that the greatest change was brought not by the amount of information, but by the focus on developing critical thinking and training through practical simulations.

Ferguson et al. (2021) in their meta-analysis also highlighted that nurses with higher academic education (holding a bachelor's or master's degree) are more likely to identify systemic risks and actively participate in patient safety initiatives. This indicates that not only practical skills but also theoretical preparation determine the ability to contribute to strengthening safety within an organization.

Therefore, increasing attention is being paid to patient safety education already in nursing training programs. These programs include simulation centers, case analysis, error analysis models (e.g., RCA), interactive lectures on systemic factors and ethical dilemmas. Such training helps future professionals to gain not only knowledge but also an understanding of the complex nature of error and ways to recognize and prevent it.

Moreover, continuous professional development in institutions is becoming the norm – organizations conduct regular training, testing, certification programs, and in some countries (e.g., Scandinavia), skills maintenance standards are applied. Zhao et al. (2020) study in China showed that after a six-month cycle of patient safety training, nurses' knowledge of risk factors significantly improved and the number of incident reports increased, especially among younger staff.

Interpersonal communication and the team environment in nursing homes play a crucial role not only in ensuring effective care but also in managing adverse events. A team where trust,

openness, and support prevail becomes a safe place not only for the patient but also for the nurse.

Studies show that nurses working in a supportive environment, where information about the patient's condition, risks, or incidents is communicated in a timely and transparent manner, are more likely to report errors, participate in their analysis, and suggest preventive measures (Manser, 2018). Such an environment is characterized by horizontal relationships, team member involvement in decision-making, and shared responsibility for outcomes.

Öztürk et al. (2021) study conducted in long-term care facilities in Turkey showed that nurses who experienced team support were 45% more likely to report events, even if they did not have serious consequences for the patient. The authors emphasized that in such institutions regular team meetings, collective reflection moments, case analysis practices, and non-punitive attitudes toward errors are more commonly applied.

Conversely, hierarchical and tense environments tend to suppress employee initiative. If an employee fears being punished or humiliated for a mistake, even minor incidents may be concealed, which threatens patient safety and hinders organizational learning (Mansour et al., 2022). Furthermore, morale in such environments deteriorates, staff turnover increases, and job satisfaction decreases.

One of the key components strengthening team communication is structured information transfer models, such as SBAR (Situation-Background-Assessment-Recommendation). They help avoid misinterpretations, shorten transmission time, and reduce the risk of omitting important facts. Vogelsmeier et al. (2019) emphasize that structured communication is especially important during shift changes, when information loss most frequently occurs.

Interdisciplinary communication involving nurses, physicians, support staff, and administration also affects safety. It has been proven that joint meetings discussing specific safety indicators or events help not only to understand systemic gaps but also to foster a culture where each member's opinion matters (Reeves et al., 2017).

Finally, emotional support within the team is worth highlighting. Nursing work is emotionally intense, so mutual support, empathy, and the opportunity to express emotions help reduce stress and increase readiness to speak openly about mistakes. Such a culture not only strengthens team cohesion but also directly correlates with a lower frequency of adverse events.

Nurses' attitudes toward adverse event management are not homogeneous – they vary depending on work experience, generation, value systems, and cultural context. One of the most

prominent aspects in contemporary nursing practice is the generational difference between younger and older nurses.

Studies show that older nurses with long-term experience are more likely to resolve incidents "internally," i.e., among themselves, without formal reporting or documentation. Such practices often stem from a deeply rooted culture where mistakes were considered shameful or even a sign of personal incompetence (Tucker & Edmondson, 2020). Moreover, in the past, many institutions operated under a punitive approach, leading staff to adopt informal decision-making models to avoid consequences.

In contrast, younger generation nurses (especially Generation Y and Z) encounter a patient safety culture during their studies, which promotes openness, reflection, and error analysis. This group of workers is more likely to use electronic reporting systems, actively engage in quality improvement projects, seek feedback, and are interested in process improvement (Pfeifer & Vessey, 2019). They are also more sensitive to professional and ethical responsibility – viewing reporting not as complaining or blaming, but as an opportunity to learn and protect the patient.

Kim et al. (2022) study showed that nurses under the age of 35 were almost twice as likely to report "near misses" than colleagues over 50. This suggests that the younger generation tends to respond to risk preventively, rather than only stating consequences. The authors also emphasized that younger employees value clear structure, transparent procedures, and psychological safety within the team.

However, it must be acknowledged that experience and maturity are also of great importance. Older employees often better perceive the context of the situation, can identify risks more quickly in practice, and have deeper insights into systemic problems. Therefore, the most effective approach is not to emphasize generational differences but to strengthen intergenerational collaboration, where both groups learn from each other: the older share experience, the younger – technological skills and new perspectives.

A modern patient safety culture should be based on partnership between employees of different ages and experience levels. Such an integrated culture builds stronger trust within the organization, prevents knowledge loss due to staff turnover, and helps create a sustainable, learning-friendly environment (Brady et al., 2021).

The role of nurses in managing adverse events in nursing homes is essential and multifaceted. Nurses are the members of the healthcare chain who observe the patient most closely, are the first to notice changes, and are often direct or indirect witnesses to incidents. For this reason, their involvement in all stages of the safety system – from identifying the event

to analysis, prevention planning, and cultural change – is an integral part of patient safety strategy.

Research shows that the more actively nurses participate in decision-making, safety committees, incident analysis, and training processes, the stronger the overall safety culture of the institution becomes (Dixon-Woods et al., 2020; Kim et al., 2022). Nurses should not be seen merely as sources of information – they must be empowered to act, analyze, and suggest solutions. This requires institutional commitment to creating a transparent, non-punitive environment that not only allows but encourages reporting, discussion, and learning from errors.

One of the most important aspects is post-incident support mechanisms. Studies confirm that nurses who face an adverse event often become so-called "second victims" – experiencing stress, guilt, shame, or even professional withdrawal (Wu et al., 2021). Therefore, it is necessary not only to create a support network but to actively use it: provide psychological help, ensure peer support, and create conditions for reflection.

It is also important to invest in continuous education, especially emphasizing not only technical but also ethical, communication, and psychological aspects. In this way, nurses can not only recognize risks but also respond appropriately. Education helps cultivate critical thinking, decision-making skills, and self-confidence – qualities essential for working in complex, often rapidly changing situations.

Finally, empowering nurses to participate in organizational processes – from protocol development to implementing quality projects – not only strengthens their professional identity but also helps shape a bottom-up safety culture. In this way, the nurse becomes not a passive executor or observer but an active, responsible participant in the patient safety system.

THE ROLE OF TECHNOLOGY AND DIGITAL SOLUTIONS

The integration of technology and digital solutions into the operations of healthcare institutions is becoming an increasingly important component in ensuring patient safety and the effective management of adverse events. In nursing homes, where patients often have complex conditions, staff work with limited resources, and daily procedures require consistent monitoring, technology helps reduce the risk of human error, improve data accessibility, and plan care more efficiently.

Electronic Health Record (EHR) systems are becoming an integral part of patient safety strategies, especially in nursing homes, where patients often have multiple comorbidities, use numerous medications, and require continuous monitoring and coordinated care. One of the most important functions of EHRs is standardized data entry, which helps reduce the risk of information loss, minimizes subjective interpretations, and ensures better data tracking between shifts (Alotaibi & Federico, 2020).

EHRs allow timely documentation of the patient's condition, interventions performed, medications prescribed and administered, and monitoring of drug interactions. This is especially important in long-term care settings, where many patients are elderly and use various medications. Systems with automated medication ordering and alert modules can prevent dangerous situations—for example, if the system detects that a prescribed drug is incompatible with one already in use or that the patient is allergic to it, it issues a warning to the nurse or doctor (Chaudhry et al., 2021).

Moreover, such systems improve communication among team members. All critical information is available in real-time, which helps avoid data gaps during shift changes and reduces reliance on handwritten notes or verbal agreements. It also lowers the risk of errors caused by illegible handwriting or forgotten documentation (Reeves et al., 2022).

One significant advantage of EHR systems is their ability to integrate with incident reporting systems, enabling staff to quickly register an event, add relevant data, and initiate an analysis. Digital documentation also makes it easier to conduct audits, monitor trends, and plan quality improvement interventions (Jones et al., 2023).

However, the effectiveness of EHR systems heavily depends on the quality of user training, system usability, and adaptation of the technology to real clinical environments. Literature emphasizes that overly complex or slow systems may encourage users to "bypass" them, which creates new risks (Zahabi et al., 2019). Therefore, implementing EHRs requires

personalized training, technical support, and continuous system improvement based on user feedback.

Medication administration errors are among the most common causes of adverse events in nursing homes. This is especially relevant in long-term care facilities, where patients often take multiple types of medications, and their conditions require regular dosing and continuous monitoring. As a response, various technological solutions are being adopted to reduce the risk of human error. One of the most advanced and widely implemented solutions is the Barcode Medication Administration (BCMA) system.

The BCMA system works in integration with EHRs. Before administering a medication, the nurse scans the patient's identification wristband and the medication's barcode. The system automatically checks whether the drug matches the prescription, dosage, timing, and method of administration. If the data do not match, a warning is generated, allowing the error to be avoided before it occurs (Zhou et al., 2021).

Studies show that such systems drastically reduce medication administration errors. For example, a meta-analysis conducted in various healthcare institutions showed that the implementation of BCMA reduced the error rate from 10–15 errors per 100 medication administrations to 5–7 errors (Bonkowski et al., 2020). The most significant results were achieved in facilities where the system was integrated with strict procedures and staff training.

Additionally, the BCMA system reduces reliance on memory and manual checking, thus decreasing workload and cognitive burden, which are often causes of error—especially during intense shifts or night work. The implementation of this technology also improves audit capabilities, as it allows tracking of who, when, and under what justification administered or prescribed medications (Choi et al., 2022).

Nevertheless, the implementation of the BCMA system requires careful planning: adaptation of technical equipment, software integration with EHRs, staff training, and clear delineation of responsibilities. Literature indicates that when systems operate inefficiently (e.g., frequent "false alerts"), staff may begin to ignore them or seek ways to bypass the system, which again increases risks to patient safety (Radley et al., 2020). Therefore, it is critical that the system is continuously reviewed and updated based on user feedback.

Technological development in the healthcare sector enables the implementation of increasingly advanced solutions to strengthen patient safety. One of the most important innovation directions is digital risk assessment platforms, which are integrated into daily nursing practice and help identify and manage potential risks in a timely manner. These systems

are especially relevant in nursing homes, where high patient vulnerability, staff shortages, and longer stays increase the likelihood of adverse events.

Such platforms typically operate in real-time and are integrated with EHRs, sensors, and patient monitoring equipment. Using artificial intelligence algorithms, the systems analyze vital signs, movement patterns, behavioral changes, or physiological fluctuations and generate automatic alerts about increasing risks—for example, the risk of falls, dehydration, pressure ulcers, or infections (Liu et al., 2022). In this way, staff can intervene before the incident occurs.

A study by Liu and colleagues (2022) showed that after implementing a smart fall prevention system that analyzes patient bed sensor data and sends alerts to nurses, the fall rate decreased by 35%. These systems also proved effective during night shifts, when staff are more burdened and the risk of missing condition changes is higher.

Digital solutions also make it possible to detect subjective changes that often go unnoticed in routine checkups. For example, analyzing patient behavior (via video monitoring or activity trackers) can detect episodes of aggression, disorientation, or cognitive disturbances, which may indicate the onset of an infection, delirium, or neurological deterioration. Thus, these systems become part not only of safety but also of the diagnostic process.

An important factor is the simplicity and accessibility of these solutions. Platforms operating on mobile applications or through bedside tablets allow nurses to quickly access information, respond to alerts, and document actions in real-time (Brady et al., 2021). Additionally, system learning algorithms continuously improve their accuracy by adapting to the specific patient profile of the institution.

However, the application of technology must be combined with proper staff training and continuous quality audits. Some studies show that if employees do not trust the system or do not understand its signals, alerts can be ignored or misinterpreted (Reeves et al., 2020). Therefore, consistent training, feedback, and a balance between technology and humanism in nursing practice are essential.

In recent years, interest in the application of artificial intelligence (AI) in healthcare has noticeably increased, especially in the context of strengthening patient safety. The development of digital health solutions, along with increased access to large amounts of data, has created conditions for the use of machine learning and data analysis algorithms not only in diagnostics but also in predicting adverse events, risk management, and decision-making in nursing practice (Topol, 2021).

AI is characterized by its ability to analyze large, often unprocessed or unstructured datasets, including electronic health records, sensor data, nursing notes, or even patient speech

and movements. Using predictive modeling methods, AI can identify recurring risk patterns and suggest interventions even before an adverse event occurs (Rajkomar et al., 2019).

One of the most prominent examples of application is the prediction of pressure ulcer risk. Traditional assessment methods rely on the subjective judgment of nurses and are often performed periodically. AI systems, on the contrary, can analyze patient movement data in real-time, assess changes in skin condition through image analysis, record nutritional and hydration status, and automatically calculate individualized risk. According to Bittner et al. (2022), such systems can reduce the occurrence of pressure ulcers by up to 30% if used for planning preventive measures.

In addition, AI tools are used to identify cognitive states or behavioral changes – this is particularly relevant in nursing homes, where cases of dementia or delirium are common. Using visual or audio recognition algorithms, episodes of aggression, confusion, or disorientation can be identified before they fully manifest, helping to avoid conflicts, falls, or self-harm.

Another area where AI is gaining ground is medication administration management. Based on a patient's historical response to medications, disease progression, and other biometric data, algorithms can warn of potential drug interactions or even recommend dose adjustments (Shah et al., 2021). This is particularly important in nursing homes, where polypharmacy is common and risky.

Nevertheless, despite the high potential, the implementation of AI solutions in patient safety faces significant challenges. First, many algorithms are trained based on data that may be biased, incomplete, or not reflective of the real nursing environment. Second, there are ethical issues related to the transparency of decisions (the "black box" problem), responsibility for algorithm recommendations, patient rights, and data privacy (Topol, 2021; Obermeyer & Mullainathan, 2019).

The role of nurses in applying these solutions remains essential – they must be able to understand AI recommendations, evaluate them critically, but also trust the technologies as far as clinical logic and ethical boundaries allow. This requires a new type of competency that includes information technology, health informatics, and data interpretation skills.

The integration of technology into nursing practice is constantly expanding, and one of the most visible areas is the use of smart sensors for patient condition monitoring. Modern nursing equipment increasingly uses advanced monitoring technologies that allow the detection of subtle physiological or behavioral changes, helping to identify risks early and prevent adverse events (Wang et al., 2022).

For example, some nursing homes are implementing beds with integrated pressure sensors that detect prolonged immobility in patients. The system automatically sends a signal to the nurse about the need to change position, thus helping to prevent the formation of pressure ulcers (Chung et al., 2021). These solutions are particularly useful at night or with limited staff, as they allow for more accurate monitoring of inactive patients without the need for constant physical checks.

Another increasingly used measure is wearable sensors, which patients can wear as wristbands or attach to the body. These sensors record various parameters: walking speed, balance fluctuations, posture, heart rate, body temperature, and even moisture (useful in cases of incontinence). Some devices have fall detection algorithms that not only register the event but also analyze movement patterns before it happens, alerting staff to increased risk (Jung et al., 2023).

Moreover, this data is automatically sent to a centralized system, where it is analyzed by software that provides personalized recommendations to staff. For example, if a patient is moving less, the system may be instructed to initiate physiotherapy actions or adjust the nutrition plan. Studies show that such solutions can reduce the number of falls by up to 25% and the occurrence of pressure ulcers by up to 40% compared to traditional monitoring tools (Wang et al., 2022; Chung et al., 2021).

It is important to emphasize that the application of smart sensors also requires staff preparedness, as this data requires interpretation and the ability to make decisions in real time. Additionally, the effectiveness of the technologies depends on their integration into daily workflows and interaction with other solutions, such as electronic documentation or digital reporting systems.

Properly integrated sensors not only improve patients' physical safety but also emotionally ease the work of staff, as they allow preventive action rather than reacting to incidents. In the long term, these solutions contribute to greater efficiency, lower costs, and higher patient satisfaction with care.

Although digital solutions and smart technologies offer great potential in the field of patient safety, their practical implementation often faces significant challenges. One of the most common is resistance to change, especially among older employees, who often feel insecure about technological innovations and believe that new systems may complicate rather than improve work (Alghamdi et al., 2023). Some nurses report that technology causes stress due to the extra time required for learning and usage, and some even express fear of making mistakes using new systems (Lee et al., 2021).

Another important aspect is the increased administrative burden when new digital systems are not properly integrated into existing workflows. For example, if EHR systems require a lot of manual data entry, staff often face duplicated work – in both paper and digital forms – or delay completing records, which can lead to errors (Zhang et al., 2022). The lack of effective integration can not only slow down work but also reduce trust in the value of technology.

Equally important is the issue of data security and privacy. The implementation of digital tools in nursing homes requires the processing of a large amount of sensitive information – from a patient's health history to real-time monitoring of vital functions. Therefore, it is necessary to ensure that all systems comply with data protection regulations, are protected from cyberattacks, and prevent potential data breaches (Alghamdi et al., 2023; Kluge et al., 2021).

In addition, in some countries or smaller regions, nursing institutions lack the financial and technical resources needed to implement and maintain modern solutions. There is a shortage of IT specialists, and the existing infrastructure (e.g., internet speed, network stability) often does not meet the requirements of technological solutions. This creates a risk of technological disparity between different regions or types of institutions (WHO, 2021).

To mitigate these challenges, literature suggests applying consistent change management methods, involving staff in decision-making, conducting phased training, providing technical support, and creating a positive feedback system. In this way, the implementation of technologies becomes not a threat, but a gradually accepted new work practice (Alghamdi et al., 2023; Lee et al., 2021).

Despite the benefits of technology, one increasingly discussed challenge is overreliance on automated solutions. Nursing staff working with modern systems such as electronic alerts or automated algorithms may begin to overly depend on them and stop analyzing clinical signs independently. This is called "automation bias," where a person tends to assume that the information provided by the system is correct, even if it contradicts observed data or clinical intuition (Cabitza et al., 2021).

One of the most common manifestations of this phenomenon is "alert fatigue," where staff begin to ignore or dismiss alerts due to their excessive number or false alarms. Studies show that up to 72% of alerts in some clinical systems are unnecessary, leading to staff losing trust in the relevance of signals and increasing the risk of errors (Wright et al., 2020; Phansalkar et al., 2013). This problem is especially relevant in nursing homes, where many patients have complex conditions and receive numerous medications – resulting in frequent drug interaction, dosage, or allergy alerts.

Incorrectly programmed systems are another danger. Even the best algorithms may rely on inaccurate or outdated data, and when staff trust the results uncritically, it can have serious consequences for patients. For example, cases where a catheter need assessment system ignored clinical changes and failed to report infection risk led to complications (Cabitza et al., 2021).

To reduce these risks, continuous system evaluation, feedback, and staff training are necessary, promoting the understanding that technology is a support tool, not a substitute for decision-making. It is recommended to continuously update software according to the latest medical standards, review alert logic, involve staff in testing, and analyze user experience (Wright et al., 2020; Topol, 2021).

In summary, technological tools already occupy an essential place in adverse event management in nursing homes. Various digital platforms – from electronic health records (EHR) and medication administration systems to smart sensors and artificial intelligence solutions – allow for more accurate patient monitoring, reduce error risk, and timely identification of potential threats (Alotaibi & Federico, 2020; Zhou et al., 2021; Liu et al., 2022). These innovations significantly contribute to strengthening patient safety, especially in long-term care contexts, where patients often have multiple risk factors.

However, the implementation of technology should not be seen as an end in itself. Long-term effectiveness depends on whether the systems are properly maintained, regularly updated, and realistically integrated into daily practice. Additionally, it is essential to ensure that technologies are used not as replacements for human decision-making but as supportive tools for clinical reasoning and decision-making (Topol, 2021; Wright et al., 2020).

It is important to emphasize that successful technology integration depends on staff preparedness, their trust in systems, training accessibility, and an organizational culture that promotes a critical approach to automation and clearly defines the boundaries of human responsibility. Only in this way can overreliance on systems ("automation bias") or the "alert fatigue" syndrome, which pose real threats to patient safety, be avoided (Cabitza et al., 2021; Phansalkar et al., 2013).

Therefore, technology in nursing homes should be seen as an integral but not dominant link in the patient safety system, which is based not only on innovative solutions but also on human values, competence, and collaboration.

ADVERSE EVENT MANAGEMENT EXPERIENCES IN DIFFERENT EUROPEAN COUNTRIES

In France, the management of adverse events has long been considered one of the priority areas for improving healthcare quality. Since the early 2000s, especially following the impact of the report "To Err is Human" in Europe, France began systematically developing a patient safety policy applicable in both hospitals and long-term care institutions (Schoen et al., 2021). Adverse events in nursing hospitals, especially those involving elderly patients with complex health conditions, were recognized as one of the main patient safety challenges.

According to an epidemiological study involving 536 residents of French long-term care institutions, 149 healthcare-related adverse events occurred during a 15-day observation period. About 60% of them were related to four main areas: medication administration, environmental safety, technical maintenance, and lack of coordination between institutions (Baier et al., 2021). 2.7% of events were classified as severe (causing long-term effects or death), while 10.7% were of moderate severity. These data revealed not only the frequency of events but also the need to strengthen risk prevention in care facilities.

One of the most important steps in the French healthcare system was the establishment of national guidelines and a legal framework. In 2004, a requirement to report serious adverse events (événements indésirables graves – EIG) in healthcare and social care institutions was established. This helped to standardize event reporting practices and encouraged data collection at the national level (Haute Autorité de Santé, 2020). The National Patient Safety Program (Programme national pour la sécurité des patients, PNSP), which was in effect from 2013 to 2017, also included structural changes: incident analysis training, the involvement of patients and their relatives in safety improvements, and strengthening a risk culture among staff. An important development occurred through the implementation of a risk management training program in 61 nursing homes. Study results showed that after 18 months, safety culture indices improved: the incident feedback dimension increased by 2.8%, and overall safety perception rose by 3.1% ($p = 0.075$) (Brami et al., 2022). Key success factors were management engagement, regular team reflections, and the ability to report events anonymously. Nevertheless, despite positive changes, French long-term care institutions still face significant challenges. One of them is the insufficient staff awareness of reporting systems. Although most institutions have formally implemented incident reporting procedures, studies show that only 40–50% of nurses know how to use them correctly, and the reporting rate remains low. The main reasons for this are fear of punishment, distrust in the system's effectiveness, and lack of

time (Baier et al., 2021). These findings suggest that the safety culture is not yet fully embedded in practice.

Moreover, the French nursing sector is experiencing a staffing crisis. Due to the insufficient number of nursing professionals, especially in regional and smaller facilities, the implementation of safety principles often becomes a secondary priority. This not only complicates the application of prevention mechanisms but also reduces staff motivation to actively participate in reporting or quality improvement processes (Schoen et al., 2021). In Portugal, the management of adverse events in healthcare institutions, including nursing hospitals, is continuously being improved, yet significant systemic and practical challenges remain. Adverse events such as medication errors, infections, falls, or improper patient transfers are still frequent, with a notable impact on patient safety and healthcare system resources. A retrospective study conducted in three public hospitals in Lisbon showed that adverse events occur in about 11.1% of hospitalized patients in Portugal, more than half (53.2%) of which were deemed preventable. The most common incidents were surgical complications (27%), medication errors (18.3%), and hospital-acquired infections (12.2%). Furthermore, 59% of patients who experienced an adverse event spent an additional 10 or more days in the hospital, and over 10% of the cases ended in patient death (Sousa et al., 2014). This demonstrates that these events have not only medical but also major economic consequences for the health system.

In the long-term care sector, the situation remains complex. Nursing facilities often lack standardized protocols, and the responsibility for medication administration is sometimes assigned to auxiliary staff without adequate qualifications. This practice increases the risk of errors, especially when pharmaceutical supervision is lacking and procedural responsibilities are unclear (Rodrigues et al., 2023). Studies show that patient safety culture in this area remains poorly developed, and errors are often concealed due to fear of punishment.

One of the most significant achievements in recent years in Portugal regarding patient safety has been the nationwide implementation of the Hospital Survey on Patient Safety Culture 2.0 (HSOPSC 2.0), adapted to the local context. A study conducted in various regions of the country revealed that while the overall safety culture assessment improved, areas such as “non-punitive response to errors” and “teamwork across units” remain weak in many institutions. This suggests that structural interventions have not yet reached the cultural level where staff feel safe to report errors (Costa et al., 2022).

Portugal has a National Patient Safety Plan, which outlines key directions: incident monitoring, risk assessment, staff education, patient engagement, and the development of

reporting systems. Nevertheless, there are practical barriers – one of which is the inadequate integration of reporting systems into daily practice. Although electronic health record systems are widely implemented, they do not always include functional and accessible incident reporting options (Silva et al., 2021). Additionally, smaller towns and regional nursing centers often lack IT support.

Nursing staff attitudes toward adverse event reporting also remain conservative. A study conducted in a university hospital in northern Portugal showed that only 42% of nurses reported ever submitting an official incident report, although nearly 80% had encountered a situation they believed warranted reporting. The most common reasons for not reporting were fear of consequences, lack of trust in leadership, and unclear reporting procedures (Marques et al., 2022).

To improve the situation, several pilot initiatives have recently been implemented, focusing on digital reporting systems and staff education. One study conducted in two health centers found that after simplifying the incident reporting system and providing brief staff training, the number of reports nearly doubled within 6 months, and staff reported greater confidence in the system and leadership (Pereira et al., 2023).

In Spain, patient safety, including adverse event management, has become a priority in national health policy, particularly after the launch of the National Patient Safety Strategy (Estrategia de Seguridad del Paciente) in 2005. This strategy covers not only public sector hospitals but also nursing homes, which house aging individuals with chronic conditions who are particularly vulnerable to medical errors, infections, and other risks.

Studies show that the prevalence of adverse events in Spanish nursing hospitals remains high. The national multiphase study ENEAS (Estudio Nacional sobre los Efectos Adversos ligados a la Hospitalización) found that about 9.3% of hospitalized patients experienced adverse events, 42.8% of which were preventable (Aranaz-Andrés et al., 2009). Later studies conducted in Catalonia's long-term care facilities found that the most common events were medication errors (36%), infections (24%), and falls (18%) (García-Caballero et al., 2021). These data show that even after more than a decade since the strategy's implementation, further structural changes are necessary.

One of the most advanced practices in Spain is the Sistema de Notificación y Aprendizaje para la Seguridad del Paciente (SiNASP) – a national, anonymous, and voluntary incident reporting system coordinated by the Spanish Ministry of Health. The data collected through this system are used not only for statistical analysis but also for preparing recommendations, identifying risk areas, and training (Ministerio de Sanidad, 2023). However,

studies show that this system operates unevenly in nursing hospitals – in some institutions there is a lack of information about its purpose or accessibility, and staff still fear possible consequences (Vallejo-Torres et al., 2022).

Significant attention is being paid to strengthening patient safety culture. Nursing staff attitudes toward error reporting remain mixed: a study in Andalusian nursing facilities found that only 38% of nurses reported ever submitting an official adverse event report, and the main reasons for not reporting were fear of blame, lack of time, and doubts about the impact of reporting (Manzano-Santaella et al., 2021). Nevertheless, institutions where management supports learning from errors rather than punishment report twice as many incidents – indicating that safety culture is directly linked to information sharing and quality improvement.

In Spain, digital tools are increasingly being deployed — from electronic health records to AI-based solutions. For example, hospitals in the Catalonia region have begun using a system that automatically analyzes patients' clinical data and provides alerts about potential drug interactions or increased fall risk (Ortiz et al., 2020). Additionally, national e-learning modules for nurses are being implemented, focusing on recognizing patient safety risks, improving handover communication, and effectively documenting adverse events.

The Spanish health system also relies on the PDCA (Plan-Do-Check-Act) model to ensure quality and safety. Institutions regularly analyze the types and frequency of adverse events, related conditions, and develop action plans. Regional health services (Servicios de Salud) require reports on patient safety indicators, and in some cases, these are tied to institutional funding or leadership evaluations.

In Italy, patient safety management, including adverse events, has become a national health system priority over the past decade. A major step was the 2017 Gelli-Bianco Law (Law no. 24/2017), which sought to establish a systematic approach to error prevention, accountability, and learning from incidents (Fineschi et al., 2020). This law required healthcare facilities to create internal risk management structures, implement quality assurance measures, and document adverse events.

Although the law initially targeted hospitals, its principles have gradually extended to nursing homes, acknowledging their patient vulnerability. A study in Lombardy showed the most frequent events in care facilities were falls (31 %), medication errors (27 %), and infections (20 %) (Morselli et al., 2021). These incidents occurred more often at night or during staff shortages, and about one-third were preventable with appropriate measures.

Italy's strength includes the national adverse event surveillance network (Osservatorio Nazionale Buone Pratiche sulla Sicurezza nella Sanità), established by the Ministry of Health.

It analyzes reports, issues recommendations, and promotes a culture of learning. The system is voluntary, but most public institutions regularly provide data, especially on serious events like medication errors, infection outbreaks, or falls with severe outcomes (Ministero della Salute, 2023).

Nurses play a critical role in this system. Literature highlights that Italian nurses increasingly engage in quality committees, risk analyses, and in some cases, are empowered to initiate systemic changes. However, studies show only about 45 % report all observed events due to fear of accountability, time constraints, or unclear reporting structures (Montalti et al., 2022).

Another challenge is uneven implementation across regions. Italy's health system is regionally decentralized, so patient safety policy varies locally. Northern regions like Emilia-Romagna and Lombardy have advanced electronic tools, automated analysis platforms, and active training models, while southern regions (e.g., Campania, Calabria) still lack systemic safety processes, staff training, and effective error reporting (Gaudio et al., 2022).

Beyond technology, Italy increasingly focuses on emotional support after incidents — especially for nurses experiencing the "second victim" phenomenon. Some facilities, drawing on US and Scandinavian examples, have established second victim support teams to help staff cope with guilt, stress, and emotional exhaustion post-event (Traverso et al., 2021). Italy also actively participates in international patient safety initiatives, collaborating with the European Commission and WHO. In implementing WHO's "Global Patient Safety Action Plan 2021–2030," Italy conducts national educational projects on error prevention, reporting culture, and safety culture strengthening for doctors, nurses, administrators, and patients' families.

In Germany, the patient safety system is well institutionalized, underpinned by national standards, technological innovations, and organizational practices. Managing adverse events forms a core part of quality management in both hospitals and nursing homes. Germany's federal structure allows each state (Bundesland) to tailor safety policies locally, guided by national coordination with institutes like the Federal Institute for Drugs and Medical Devices (BfArM) and the Patient Safety Institute (APS).

A major initiative is the expansion of CIRS (Critical Incident Reporting Systems) — anonymous, voluntary platforms for reporting errors, incidents, or near misses. Research shows CIRS encourages a learning and reflection culture among healthcare workers (Briner et al., 2020). Initially used in hospitals, CIRS has recently been successfully adapted for long-term care, where common incidents involve falls, medication errors, and infections.

A comprehensive German study (Becker et al., 2021) found that 30 % of reported adverse events in long-term care were falls, and about 18 % related to medication. Contributing factors included insufficient staffing (especially at night), poor environment ergonomics, lack of patient awareness, and human factors (fatigue, burnout, communication gaps).

Germany's patient safety strategy is strongly evidence-based. The federal government funds large-scale programs like PaSCO (Patient Safety and Communication), investigating organizational factors that lead to safety gaps. One result showed that strong leadership and regular staff feedback reduce fear of reporting and foster collective responsibility (Seibert et al., 2022).

In nursing care, ongoing competence development is vital. Most nursing homes hold regular training on identifying and preventing adverse events, using simulations, case analyses, and interactive workshops. Participation increased staff readiness to report by 45%, and trust in the system strengthened when they received feedback (Hoffmann et al., 2021).

Technology also plays a key role: nursing homes increasingly use EHRs, automated medication systems, and patient monitoring tools. In some states, like Bavaria, smart bed sensors detect patient position changes and warn of fall risk. Studies indicate these systems cut fall frequency by up to 25% (Schrappe et al., 2020).

However, Germany faces challenges: major nurse shortages and workload issues can lead to "alert fatigue" — ignoring frequent automatic alerts. Additionally, not all institutions can integrate modern solutions due to infrastructure or funding limitations, especially smaller or private facilities (Schneider et al., 2021).

In Austria, patient safety policy is integrated into the national healthcare strategy, and managing adverse events is a core quality assurance element. The main coordinating body is the Austrian Health Quality Institute (GÖG), which supports national initiatives, patient safety research, and standard implementation.

A key tool is CIRSmedical, a national platform for anonymous reporting of incidents and near misses. CIRSmedical allows nursing, medical, and ancillary staff to log errors and systemic risks. Its data undergo expert analysis and inform training and preventive planning. An analysis (Zegers et al., 2020) showed CIRSmedical identifies common risks in care homes, including medication errors, falls, and infection spread.

Austria emphasizes a learning-based approach to errors. At a national level, the "Learning from adverse events" concept encourages not just reporting incidents but analyzing root causes using RCA and standardized procedures. Institutional safety coordinators organize reflection sessions, prepare reports, and propose corrective actions. Studies show these

practices reduced recurrent incidents by 20% in some long-term care homes over two years (Kletecka-Pulker et al., 2021).

Patient safety policy also includes personalized staff training, particularly for nursing staff in long-term care. Facilities invest in safety culture development through simulations, case analyses, open discussions about errors, and interactive platforms. Such training increased staff trust in reporting systems, reduced blame culture, and encouraged engagement in safety initiatives (Wagner et al., 2022).

One of Austria's successful practices is "Patient Safety Walkrounds" — leader visits to wards encouraging open communication about risks, errors, and safety issues. This collaborative culture boosts staff trust in leadership and promotes an open, reporting-friendly environment (Dür et al., 2020).

Austria also utilizes quality indicators to continuously assess safety, such as fall rates, hospital infection prevalence, and medication error counts. These metrics are published internally and discussed at team meetings, creating feedback cycles where staff see their impact and are motivated to stay involved.

Despite strengths, challenges remain: some regions show lower reporting quality and frequency, especially among ancillary staff or smaller institutions. In some cases, CIRS is used superficially or staff fear reporting peer errors (Schmid et al., 2021). Additionally, implementing digital technologies is hindered by limited infrastructure or financial constraints; not all facilities can adopt modern EHRs or alert systems.

In Slovakia, patient safety issues, including adverse event management, remain evolving. Since 2011, Slovakia has committed to patient safety standards per Council of Europe recommendations, but implementation in healthcare institutions, particularly in long-term care, is fragmented and inconsistent (Ministry of Health of the Slovak Republic, 2020). There is no centralized national patient safety system. While the Ministry of Health has a general quality and risk management strategy, there is no universally operating incident reporting system. Most institutions rely on internal mechanisms, but their structure, anonymity, and analysis vary greatly based on leadership attitudes and resources (Rákay et al., 2019). This leads to many unreported incidents, especially in long-term care where staff are overburdened and safety training is lacking.

The most frequent incidents in nursing homes are falls, medication errors, and infections, but reporting is often unsystematic. One study found that 65% of adverse events were discussed informally within teams but not logged officially (Džupinová et al., 2021). This

is linked to blame culture, fear of job loss, or reputational harm — hindering data collection, risk analysis, and preventive efforts.

Slovakia also lacks standardized protocols specifying when to report, what information to include, and staff responsibilities. This is critical in care homes where less qualified or support staff often work. Additionally, smaller regional centers still lack technological resources like EHR, alert systems, or BCMA (Holec et al., 2022).

Positive changes include training programs on patient safety introduced in universities and larger urban hospitals. Funded by EU structural funds, these programs often include nursing staff. Data show participants were 25% more likely to report incidents and reported increased trust in leadership (Tomková et al., 2023).

Another positive trend is that some private or international chain institutions have introduced internal CIRS systems for anonymous incident reporting. Although not nationally integrated, these systems help build openness and responsibility, especially among younger staff.

Despite efforts, Slovakia still lacks consistent data collection, effective analysis mechanisms, and political decisions to integrate patient safety nationwide. Key challenges include staff shortages, lack of funding, differing public-private sector views, and insufficient interdisciplinary collaboration.

In Poland, patient safety gained more attention only in the past decade when the country started implementing WHO and EU recommendations on adverse event prevention and management. However, compared to Western Europe, Poland still faces systemic challenges in reporting culture, data collection, and effective analysis mechanisms, especially in nursing homes (Wojtaszczyk et al., 2020).

One essential element is an incident reporting system. Poland's National Patient Safety Program has been in place since 2016, but there is no mandatory centralized reporting system; most healthcare facilities use internal mechanisms that vary in structure, anonymity, and analysis (Wanat et al., 2022). The effectiveness of these systems depends on institutional culture, leadership attitude, and staff empowerment.

Research shows only 35–45% of nursing staff in Polish long-term care institutions actively report events they observe. Main barriers include fear of consequences, blame culture, and complexity or ambiguity of reporting systems (Kołcz et al., 2021). There is also often a lack of feedback — staff report that even when they submit reports, they don’t know if any actions were taken, reducing motivation.

As in other countries, falls, medication errors, and hospital infections account for most adverse events in nursing homes. One study found falls comprised 27% of all recorded incidents, but only half were officially documented (Jędrzejewska et al., 2020). This indicates a systemic issue — information lost between informal observations and formal analysis.

Recent initiatives aim to improve patient safety culture. One key step is integrating adverse event management training into nurse continuing education programs, funded by the Ministry of Health or EU structural funds. Participating institutions saw a 30% increase in reporting, and staff trust in the system strengthened (Graban et al., 2023).

Poland is also developing Root Cause Analysis (RCA) practice, but it's mostly applied in large university hospitals. In nursing homes, especially in provinces, it is rare due to resource constraints, staff shortages, and limited managerial competence.

A positive development is the increasing adoption of digital solutions, particularly EHRs, allowing standardized event documentation, pattern identification, and recommendations. Some facilities have implemented automated alerts for drug interactions or allergies, though their use is not yet widespread nationally (Sawicka et al., 2021).

It is important to note that Poland still lacks a strong national strategic direction in patient safety. Unlike countries like France or Sweden, which have comprehensive incident analysis and feedback systems, Poland leaves much responsibility to individual institutions. This fragmentation impedes systemic change and complicates the identification of national-level risks.

In Belgium, it was among the first European countries to implement systemic patient safety changes, including structured adverse event management in healthcare institutions. Since 2007, the country has actively developed national strategies focusing on the long-term care sector, including nursing homes (Vlayen et al., 2015).

Belgium’s primary adverse event management tool is a mandatory reporting system coordinated by the Federal Public Health Service (FOD Volksgezondheid). Since 2014, all accredited healthcare institutions, including long-term care homes, must maintain internal reporting systems and submit serious adverse event reports to a national registry (Haelterman et al., 2020). This allows for data collection, pattern analysis, and nationwide recommendations. Belgium employs a “just culture” model aimed at encouraging staff to report incidents without fear of personal consequences. This culture is supported through ongoing training, feedback, and inclusion in decision-making processes (Willems et al., 2022). Research shows that incident reporting in Belgian nursing homes has doubled over the past decade, especially for medication errors, falls, and infections (Deilkås et al., 2019).

Nursing homes also actively implement RCA for serious incidents. In this process, interdisciplinary committees analyze not only the event details but also systemic factors — work organization, protocol adherence, communication gaps. A 2021 Leuven University study found RCA implementation contributed to an 18% reduction in falls over two years (Van Gerven et al., 2021).

A standout feature in Belgium is technology integration in adverse event management. Nursing homes widely use EHRs, automated drug interaction alerts, and in some facilities, smart sensors to track patient movement and assess fall risk. For instance, in Flanders in early 2022, a mobile app was launched allowing staff to anonymously report incidents within seconds, selecting categories, location, and possible causes (Vanhaecht et al., 2022).

However, challenges remain, especially in nursing homes with older staff. Literature notes that older staff tend to rely on informal problem-solving and view reporting culture as bureaucratic workload (Willems et al., 2022). This leads to uneven system use across institutions if leadership does not clearly prioritize patient safety.

Also, emotional experiences of nurses facing adverse events are actively studied. Belgium offers second-victim support programs providing emotional assistance to staff experiencing stress or guilt after errors. Studies show these programs reduce burnout levels and increase staff willingness to engage in safety initiatives (Van Gerven et al., 2016).

In summary, Belgium is a leading model in integrating policy, technology, and culture for managing adverse events in the nursing sector. Despite challenges, the country features high system structure, evidence-based analysis, and strategic direction aimed at consistently improving patient safety metrics in long-term care institutions.

Denmark is one of the most advanced European countries in patient safety, with a transparent, digitalized healthcare system and consistent risk management policy. Adverse event management is integrated across hospitals as well as long-term care and nursing home settings.

In 2004, Denmark adopted the mandatory Danish Act on Patient Safety, requiring all healthcare workers to report observed or occurred adverse events. Since 2010, this obligation has been extended to nursing home staff (Christiansen et al., 2021). The law is based on a just-culture principle — errors are seen as learning opportunities, not causes for punishment.

In Denmark, a national reporting system operates – the Dansk Patientsikkerhedsdatabase (DPSD), managed by the Danish Patient Safety Agency (Dansk Selskab for Patientsikkerhed). This database allows healthcare workers to report incidents and also enables them to analyze trends at the national level and proposing systemic changes.

According to 2022 data, of all reports of adverse events, about 18 % were related to nursing sector institutions (Andersen & Kragholm, 2022).

In nursing hospitals, the most frequently recorded events are like falls, medication administration errors, infections (especially related to invasive procedures), and communication breakdowns between shifts or interdisciplinary teams (Kjølhede et al., 2020). In Danish practice, particular emphasis is placed on in-depth event analysis – all institutions apply the RCA (Root Cause Analysis) methodology, and nursing staff are encouraged to actively participate in the analysis processes. This method enables identifying systemic risks and creating preventive action plans.

In Denmark, patient safety is understood as a matter of team responsibility, so nurses, auxiliary staff, doctors, and managers are continually involved in adverse event analysis. For example, many nursing hospitals conduct so-called "learning breakfasts," during which specific events are analyzed, decisions are reflected upon, and learning opportunities are identified (Kirkegaard et al., 2021).

Denmark also actively implements technological solutions. Nursing hospitals widely use electronic health records, automated medication dispensing systems, and patient monitoring sensors. Recent studies show that after implementing the BCMA (Barcode Medication Administration) system in critical care areas, the number of medication errors decreased by 37 % (Larsen et al., 2022).

A key strength of Denmark is transparency and openness. The national agency publicly releases aggregated data on adverse events, their causes, and the sectors in which they occurred. This encourages interinstitutional learning and dissemination of best practices. Additionally, the public is encouraged to engage – relatives or patients themselves can report observed hazards (Christiansen et al., 2021).

However, challenges persist. Despite the legal framework and cultural environment, some nursing staff still face a psychological barrier – especially when an incident could be interpreted as a lack of their competence. Studies show that employees who experienced negative emotions after incidents are more likely to avoid reporting again if they do not feel organizational support (Kirkegaard et al., 2021). Therefore, Denmark also develops "second victim" support programs offering psychological help to staff.

Switzerland is a federal state with a decentralized healthcare system – responsibility is shared between the federal government, cantons, and healthcare institutions. Despite this structural diversity, ensuring patient safety, including the management of adverse events, is considered one of the country's primary goals.

In Switzerland, the patient safety system is mainly coordinated through the Swiss Patient Safety Foundation – an independent nonprofit organization that has been organizing national safety programs, conducting training, and initiating research in this field since 2003 (Schwappach, 2020). One of the organization's main functions is to promote a systematic approach to analyzing adverse events and reducing risks across all healthcare sectors, including nursing homes.

Since 2013, Switzerland has had a voluntary incident reporting system (Critical Incident Reporting Systems – CIRS), used in both hospitals and nursing homes. This system allows employees to anonymously submit information about events that may have or actually had negative consequences for a patient (Huber et al., 2022). Unlike some countries, in Switzerland the reporting system is not legally mandatory, but most institutions use it as a self-regulation tool. Studies have shown that institutional culture factors, such as trust in management and feedback, have a decisive influence on employees' motivation to use the system (Janssens et al., 2021).

In nursing homes, the most frequently recorded events include falls, medication dispensing errors, infection control violations, and information handover failures between shifts (Schwappach & Gehring, 2014). Special attention is given to the care of elderly patients with cognitive impairments – these patients are given individualized safety measures, and institutions are encouraged to use risk assessment algorithms.

One of Switzerland’s innovative solutions is programs based on psychological safety, allowing staff to confidently report errors and imperfections. The nationwide "Learning from errors" project promoted a culture of learning through practical case studies, team reflection, and the use of RCA (Root Cause Analysis) (Merten et al., 2020). It was observed that such interventions significantly increased the number and quality of reports.

Beyond reporting systems, Switzerland’s patient safety culture is enhanced through clinical audit methods, standardized procedures (SOPs), and interdisciplinary safety meetings. Many nursing homes implement PDCA (Plan-Do-Check-Act) cycles to continuously improve processes, reduce risks, and encourage learning from experience (Schnyder et al., 2023). Technological solutions are also widely applied. Electronic health record systems with integrated medication administration checks, patient mobility monitoring sensors, and digital platforms for gathering feedback are in use (Gehring et al., 2015). Switzerland is also analyzing opportunities to apply artificial intelligence (AI) in the patient safety field, particularly for predicting risks of falls or hospital-acquired infections based on individual biometric data. Nevertheless, certain challenges remain. The literature emphasizes that due to the high level of

institutional autonomy across cantons, there are problems with unified data standardization and inter-institutional learning (Schwappach et al., 2019). Additionally, a cautious attitude toward publicly disclosing incident reports persists, and in some institutions, there remains fear of reputational damage. Therefore, the Swiss Patient Safety Foundation actively promotes transparency and the development of national guidelines.

Latvia's health system has undergone significant reform over the past two decades, but in the field of patient safety and adverse event management, many challenges remain. Although Latvia is an EU member and participates in international patient safety networks, a national safety culture in healthcare institutions, including nursing homes, is still being created and strengthened (WHO Europe, 2022).

A fundamental barrier in Latvia is limited legislation regarding mandatory registration of adverse events. Currently, the country lacks a centralized, legally mandated reporting system accessible to all healthcare sectors. Instead, some major hospitals and university centers have implemented internal incident reporting systems (CIRS), but their use in nursing institutions remains fragmented (Vozņuka et al., 2021).

Studies show that Latvian healthcare workers often do not feel assured that reporting an incident would carry learning rather than punishment. Consequently, incident registration is often formal, lacking in-depth analysis or feedback (Ziediņa et al., 2020). Usually only events causing obvious deterioration of patient health are reported, while minor or near-miss incidents remain unidentified.

Despite these challenges, in recent years several EU-funded initiatives have been launched in Latvia to improve patient safety. One is part of the "Latvian Health Care Quality Strategy 2021–2027," which aims to create a national patient safety database and standardize reporting formats. It also plans to prepare training for staff on the benefits of error reporting and foster a blame-free culture (Ministry of Health of Latvia, 2021).

Another important aspect is the infrastructure of nursing institutions. Many are located in older facilities lacking modern equipment, and implementing IT is slow. Only a small portion of nursing homes use electronic health record systems (EHR), which could help capture, analyze, and monitor event frequency and nature (Bērziņa et al., 2023). As a result, analysis of adverse events data is often insufficient, and preventive measures are sporadic.

However, some positive changes are emerging. A university hospital in Riga tested a team training model based on simulation and analysis of "learning events," showing that even short-term interventions improved staff ability to identify risks and respond to incidents

(Ozoliņa et al., 2022). During the study, internal reporting increased and staff attitudes toward safety improved.

Collaboration with international organizations such as the World Health Organization (WHO) and European patient safety platforms also helps strengthen competencies. Latvian specialists actively participate in the "Global Patient Safety Action Plan 2021–2030" initiatives, aiming to adopt good practices from countries like Denmark, the Netherlands, or Switzerland (WHO, 2021).

The management of adverse events in Lithuanian healthcare institutions, including nursing hospitals, is one of the most pressing areas of patient safety. Although patient safety is recognized as a priority direction, in practice a fragmented and formal approach to incident registration and prevention still dominates. Currently, there is no unified, mandatory national incident registration system in Lithuania, and most institutions rely on internal protocols or formal report journals, the data of which are rarely used for systemic analysis (State Accreditation Service, 2022).

The very concept of adverse events in healthcare is still in the process of formation. Research shows that Lithuanian nursing staff often do not feel safe reporting events – there is a prevailing fear of negative consequences, a hierarchical culture, and weak feedback mechanisms (Staliūnaitė et al., 2021). This situation is especially problematic in nursing institutions, where patients are elderly, vulnerable, have multiple comorbidities, and any mistake can have serious consequences.

The most common incidents in the nursing sector are patient falls, medication administration errors, infections associated with invasive procedures, and communication gaps between shifts or professional groups. However, only a portion of these events are formally registered. According to a study by the Lithuanian University of Health Sciences, more than 40% of nurses observe at least one adverse event per year, but only about 25% of them report it officially (Skrodenienė et al., 2020).

To improve the situation, in 2021 the project "Strengthening Patient Safety Culture in Lithuanian Healthcare Institutions" was implemented, funded by EU structural funds. The project aimed to introduce tools for assessing patient safety culture, conduct staff training, and implement the monitoring of patient safety indicators (VASPVT, 2021). One of the initiatives was the preparation of a National Patient Safety Incident Reporting Model, which, although tested in some institutions, has not yet become mandatory across the system. Positive changes are observed in university hospitals, where systemic quality management measures are implemented, including the integration of electronic health records, incident

reporting portals, and regular safety meetings. Nevertheless, nursing hospitals, especially in the regions, face staff shortages, aging infrastructure, and low managerial involvement in building a safety culture (Užkurienė et al., 2022).

Another important aspect is the role of the education system. Lithuanian nursing study programs are increasingly incorporating patient safety principles, simulation-based training, and critical incident analysis. However, in continuing professional development for practicing nurses, patient safety often remains a peripheral topic. The lack of training contributes to situations where employees lack clear algorithms on how to act in the event of an error, what documents need to be completed, and how to ensure patient information.

Legal regulation in Lithuania is currently based on general principles of healthcare quality assurance. The management of adverse events is not regulated as a separate mandatory area, so decisions of institutions greatly depend on internal policies and managerial initiative. This creates conditions for inconsistent practices, where in some institutions even minor incidents are registered, while in others even serious events are ignored until they reach the threshold of legal liability (State Health Care Accreditation Agency, 2022).

In Estonia, the management of adverse events is integrated into the overall patient safety strategy, which is based on the principles of transparency, learning, and prevention. Since the early 2000s, the country has been consistently strengthening the safety culture of the healthcare system, aiming to reduce the number of medical errors, infections, falls, and other adverse events. Estonia's health system is centralized, so most patient safety initiatives are coordinated at the national level (Saar & Habicht, 2019).

The main national instrument is the Estonian healthcare quality assurance system, established in 2008, where one of the key areas is patient safety and incident prevention. This system is based on institutional self-analysis, reporting to the Health Board, and continuous auditing procedures. Although incident reporting is not mandatory in all institutions, many larger hospitals and long-term care facilities voluntarily apply electronic reporting systems designed to collect information about adverse events (Teder et al., 2021).

A great deal of attention is paid to staff education in Estonia. For example, in Tartu University Hospital, patient safety training is conducted, including the analysis of real events, simulation training, and scenario modeling. These methods help to form an open and reflective culture where mistakes are not hidden but understood as opportunities for improvement (Värnik et al., 2022). This approach is especially important in the nursing sector, where, due to aging patients, multiple illnesses, and limited mobility, many risk-related situations arise.

Studies show that the most frequently reported incidents in Estonia are related to falls, medication errors, and infections, especially in long-term care institutions. A 2020 analysis revealed that nearly 70% of adverse events in nursing homes could have been prevented if clear prevention protocols had been applied, such as fall risk assessment scales or medication distribution system audits (Lai et al., 2020).

Estonian healthcare authorities also rely on international tools. One of them is the WHO self-assessment instrument for patient safety culture, which has been implemented in some institutions since 2018. Assessments revealed that employees in Estonia feel relatively safe reporting errors (especially younger professionals), but fear of managerial reactions still exists, and consistent feedback is lacking (Teder et al., 2021).

A positive example is the North Estonia Medical Centre, which uses an integrated patient safety platform that allows event registration, risk monitoring, data analysis, and feedback provision to employees. Such a system helped reduce medication administration errors by as much as 30% over two years (Koppel et al., 2022).

However, certain challenges remain in the Estonian context. First – uneven practice between urban and regional facilities: while major hospitals implement advanced solutions, smaller nursing hospitals still rely on paper forms or unsystematic reports. Also observed is nurse burnout syndrome, which reduces their motivation to report errors or actively participate in safety activities (Lai et al., 2020).

In Finland, patient safety, including the management of adverse events, is considered one of the core aspects of health system quality. The country's health policy is based on a preventive philosophy, encouraging institutions and staff to actively report errors, analyze risks, and implement systemic solutions. Since 2009, the Finnish Institute for Health and Welfare (THL – Terveyden ja hyvinvoinnin laitos) has coordinated the national patient safety program, which places significant focus on long-term care and nursing institutions (THL, 2022).

One of the most important aspects of Finland's experience is the mandatory requirement for reporting adverse events. Institutions providing healthcare services, including nursing hospitals, must use the national reporting system “HaiPro.” This voluntary, anonymous system allows all employees – from doctors to support staff – to report errors, near misses, or observed risks (Kaihlanen et al., 2020). The HaiPro system is standardized nationwide and enables not only data collection but also analysis, report generation, and the application of preventive measures.

Research shows that most reports in long-term care institutions are related to falls, medication errors, and communication gaps. For example, a 2021 analysis showed that falls

accounted for 42% of all cases registered in the HaiPro system in the nursing sector (Kinnunen et al., 2021). It was observed that incidents most often occur at night when staffing is reduced and patient conditions are unstable. Medication errors also remain an issue, often related to look-alike packaging, delayed prescribing, or incorrect administration.

An important element of Finland's approach is that responses to events are based on a learning – not blaming – culture. Studies show that employees feel safe reporting errors, as organizational policies promote openness and non-punitive practices (Kolehmainen-Aitken et al., 2022). Furthermore, incident analysis is typically performed using the Root Cause Analysis (RCA) method, which helps identify systemic causes and develop improvement measures.

Unlike in some other European countries, patient safety training is mandatory in most Finnish institutions. Nurses and other staff are required to regularly update their knowledge, participate in simulation training, and join reflection groups. Additionally, some nursing hospitals implement internal “safety week” initiatives to discuss recent events, highlight good practices, and strengthen team collaboration (Kaihlanen et al., 2020).

Technology also plays a significant role in Finland's system. Since 2018, most long-term care institutions use electronic risk assessment platforms that automatically alert staff about increased risks of falls, dehydration, or infections. For example, smart sensor systems monitor patient movement and send alerts to staff when danger arises (Kinnunen et al., 2023). This especially helps reduce the number of nighttime incidents.

Despite the progress, Finland still faces challenges. One is data analysis overload – the data accumulated in the HaiPro system is not always effectively analyzed or translated into practical solutions. It is also observed that smaller institutions often lack specialists who can perform in-depth analysis procedures, leaving incident prevention fragmented. Additionally, there is a certain level of staff exhaustion and burnout, which reduces engagement in safety activities (Kaihlanen et al., 2020).

Sweden is one of the European countries where patient safety is integrated into national health policy. The management of adverse events is considered an inseparable part of quality management, with both technological and cultural aspects playing an important role. The country’s health system focuses on prevention, staff empowerment, and the identification of systemic gaps.

Since 2011, Sweden has enforced the Patient Safety Act, which obliges healthcare institutions to actively investigate and report adverse events and to develop a patient safety culture within organizations (Swedish National Board of Health and Welfare [Socialstyrelsen],

2022). The law encourages institutions not only to document events but also to conduct Root Cause Analyses and report to relevant authorities.

The main instrument for registering adverse events in Sweden is the national system LEX Maria, which is mandatory for all healthcare institutions. According to this system, serious patient safety violations must be reported to the Swedish Health and Social Care Inspectorate (IVO – Inspektionen för vård och omsorg) (IVO, 2023). LEX Maria reports are used not for punitive purposes but for prevention, trend analysis, and learning.

Research shows that the most common adverse events in Sweden's long-term care facilities are related to falls, medication administration errors, infections, and communication gaps (Holmström et al., 2021). It is noted that these facilities carry higher risks due to patients' multiple health issues, cognitive impairments, and complex medication regimens.

The cultural aspect is essential in Sweden's approach to patient safety. Much attention is paid to the principle of non-punishment for mistakes, encouraging staff to report incidents without fear of repercussions. Such a culture allows the collection of more accurate data, promotes learning from errors, and strengthens mutual trust within teams (Andersson et al., 2020). This is especially important in nursing hospitals, where staff turnover is high, and patients often cannot independently communicate their condition.

Technological tools are actively used in Sweden. Nursing facilities integrate electronic risk assessment systems that help predict deterioration in patient condition, monitor medication use, and assess fall risk. Sensors are also used to detect prolonged immobility in one position or sudden movements that may indicate a fall (Palmgren et al., 2022).

Additionally, Sweden's health services promote teamwork and training as key factors in patient safety. For example, training on the SBAR communication model, Root Cause Analysis methods, and regular case review groups (reflective meetings) are widely applied in both public and private institutions (Wretman et al., 2021).

However, challenges still exist. One is the incompatibility of data systems between institutions, which hinders comprehensive analysis and national-level decision-making. Also, in some municipalities, especially rural ones, there is a lack of human and financial resources for systematic risk analysis (Palmgren et al., 2023). Another issue is the variation in management involvement, where in some institutions' safety issues are a priority, while in others – merely a formality.

Norway is one of the leading countries in patient safety, especially in terms of a systemic approach to managing adverse events (AEs). In the country, healthcare quality and patient safety are considered national priorities, with policy decisions based on both empirical research

and international recommendations. In nursing hospitals, where most patients are elderly with complex health problems, this topic is of particular importance.

In 2004, the Norwegian Ministry of Health initiated the national patient safety program model “In Safe Hands 24-7,” which was implemented in all healthcare institutions, including the long-term care sector. This program promotes systemic AE registration, staff training, best practice dissemination, and the implementation of cultural changes (Haugen et al., 2021).

The national incident reporting system, called Melde.no, allows nursing staff and other health professionals to register events anonymously or by name, thereby contributing to a continuous learning process. Importantly, the system is focused on cause analysis rather than blame-seeking. As a result, not only has the number of reports increased, but also their quality – factors, consequences, and risk situations are indicated (Johannessen et al., 2019). The most common types of adverse events (AEs) in Norwegian nursing institutions include patient falls, medication administration errors, pressure ulcers, and infections, especially those related to catheters or wounds (Saunes et al., 2020). Cases are also registered where patients do not receive help on time or where communication gaps occur between shifts. Norway emphasizes not only a reactive but also a proactive approach – that is, risk identification before an error occurs. Various risk assessment models are applied in healthcare institutions, such as the Global Trigger Tool, which allows for the identification of latent risk factors in the patient's history (Deilkås et al., 2022). These methods are particularly relevant in nursing hospitals, where patients’ health changes are often subtle and gradual. Leadership involvement is another strong point. Studies show that where facility leaders actively participate in implementing safety strategies, the results are better: more reports, fewer recurring events, stronger employee motivation (Vogt et al., 2021). In addition, much attention is paid to promoting a "non-punitive" error culture – employees are encouraged to report incidents even if the consequences are minor.

Technological solutions are also widely applied. Nursing hospitals use electronic medication administration systems, motion sensors, smart hospital beds, and even AI (artificial intelligence)-based prediction systems that identify high-risk patients. These innovations not only reduce the risk of errors but also ease the workload of staff and allow for more efficient resource allocation (Andersen et al., 2020).

However, challenges still exist. In some regions, there is a lack of standardized protocols, and smaller municipalities face a shortage of qualified staff. It is also observed that some technologies, although useful, create additional administrative burdens or require

complex implementation processes that are not always adapted to the pace of nursing practice (Øyri et al., 2023).

Adverse events (AEs) in nursing hospitals are a systemic patient safety challenge that is addressed differently across European countries. Depending on the maturity of national health systems, cultural attitudes, and technological capabilities, each country applies specific methods for managing adverse events. Although the general direction – strengthening safety culture – is universal, the practical aspects differ significantly.

The Scandinavian countries (Norway, Sweden, Finland, Denmark) are characterized by a well-developed patient safety culture, where mistakes are seen as learning opportunities rather than sources of guilt (Kristensen et al., 2020). In these countries, digital reporting systems such as "Helseplattformen" in Norway or "HaiPro" in Finland are widely used, allowing for anonymous, quick, and systematic event reporting (Kinnunen et al., 2023). Leadership actively participates in analysis and decision-making, and employees receive feedback. Scandinavian nursing institutions also use technological solutions – smart beds, barcode scanning systems (BCMA), and artificial intelligence to analyze patient risks and help predict events (Nilsson et al., 2020; Topol, 2021).

Western European countries (Germany, Austria, Belgium, France) also aim to strengthen patient safety measures, but face decentralized health systems where decisions are often made at regional or institutional levels. For example, in Germany, multi-level quality management structures operate, but reporting systems may be fragmented (Baier et al., 2021). In Belgium and France, nurses show a reluctance to report mistakes, especially if no injuries occur, due to ongoing fear of sanctions or reputational damage (Vincent & Amalberti, 2022). Nevertheless, digital tools are increasingly being implemented, and national strategies – such as France's "Haute Autorité de Santé" initiatives – aim to empower staff, especially nurses, to participate in safety decision-making.

Southern European countries (Spain, Italy, Portugal) face structural challenges – particularly staff shortages, fragmented reporting models, and slower technology implementation. Studies show that in these countries, the culture of reporting adverse events is still developing, and employees often choose to remain silent about mistakes that had no serious consequences (García-Martín et al., 2022). Still, in Spain, some regional health services already use digital platforms with event risk analysis algorithms (López-Bastida et al., 2021). In Portugal, implemented training initiatives show that education significantly increases staff engagement and reduces blame culture (Martins et al., 2022).

Central and Eastern European countries (Poland, Slovakia, Lithuania, Latvia, Estonia) reflect a transitional period. Although patient safety plans have already begun to be implemented in these countries, there is still a lack of consistent systems and implementation standards. In Lithuania, as well as in Latvia and Estonia, the biggest challenge is the weak culture of error reporting and insufficient managerial attention to feedback (Vainauskienė et al., 2023). Studies conducted in Poland show that only a small number of nurses actively report incidents, although most understand the importance of reporting (Książek et al., 2022). In Estonia, technological potential is growing, especially with the implementation of the national EHR system and health data platforms, which may form the basis for future analytics (Kalda et al., 2021).

Overall, the greatest progress is seen in countries where patient safety is treated not as an isolated action but as a strategic organizational priority. An inclusive culture that allows nurses to speak, analyze, participate, and be heard is the strongest weapon against adverse events. In addition, staff education, learning from mistakes, the application of digital solutions, and leadership example are key components that strengthen the resilience of the entire system. Despite cultural, political, or economic differences, all the countries analyzed show that progress requires not only regulation but also a deep shift in attitude towards errors – from fear to learning, from blame to partnership.

STUDY DESIGN

The study was conducted in 16 nursing hospitals across Lithuania. These institutions were selected due to their specialization in providing long-term nursing, supportive treatment, and palliative care services, whose recipients are most often elderly patients with multiple illnesses and functional impairments. The condition of patients in these hospitals is particularly fragile, and the impact of systemic errors can be critical (Vincent & Amalberti, 2022; WHO, 2021). Therefore, nursing hospitals are a particularly sensitive link in the healthcare chain in terms of patient safety.

The selected nursing hospitals were chosen to represent different regions of Lithuania and to reflect institutional diversity in terms of size, ownership (public and private), operational model, and patient numbers. The main selection criteria: the institution must have at least 30 actively nursed patient beds.

The study involved 467 healthcare workers from 16 nursing hospitals. Representatives of different professional groups were purposefully included: nurses, doctors, support staff, and other employees who have direct contact with patient care and are potential witnesses or participants of adverse events. Selection criteria: at least 6 months of work experience in the institution and voluntary consent to participate in the study.

A proportional distribution by profession was ensured to allow data analysis between groups. Data collection was anonymous, using paper and electronic questionnaires depending on the capabilities of the institution.

A structured questionnaire was created for the study, based on relevant scientific literature in the fields of patient safety, adverse event management, safety culture, human and organizational factors (Carver & Hipskind, 2021; Sammer et al., 2021; Friesen et al., 2020; Sujan et al., 2023). The purpose of the questionnaire was to measure healthcare workers' attitudes, experiences, and perceptions about the management of adverse events in nursing hospitals.

The questionnaire is divided into five thematic blocks, each covering an aspect relevant to patient safety:

1. Incident reporting system. This block assesses whether employees know how and when to report incidents, whether they trust the system, whether they receive feedback, and how they evaluate the transparency of reporting processes.

2. Organizational safety culture. Includes questions about managerial support, openness culture, absence of punishment for errors, teamwork, and overall trust within the institution.
3. Nurse training and professional preparedness. This block assesses whether staff feel adequately prepared to perform their work safely, whether they have opportunities for training, and whether they know how to act when an incident occurs.
4. Use of technology for patient safety. Covers staff attitudes toward digital systems (EHR, barcode technology, sensors), their benefits for safety, and practical applicability.
5. Psychosocial factors. This block addresses emotional, ethical, and communication aspects: guilt, fear of reporting errors, the so-called "second victim" phenomenon, and support from colleagues and management.

All statements are assessed using a five-point Likert scale:

1 – Strongly disagree

2 – Disagree

3 – Neither agree nor disagree

4 – Agree

5 – Strongly agree

Demographic questions were also included in the questionnaire, allowing the differentiation of responses by:

- Age group (under 30, 31–45, 46–60, over 60)
- Work experience (up to 5 years, 6–15 years, 16–25 years, over 25 years)
- Position (nurse, doctor, other)

The questionnaire was developed based on validated instruments from previous international studies and adapted to the context of Lithuanian nursing hospitals. Before the final study, a pilot study was conducted involving 22 respondents from two nursing institutions. After the pilot, the wording of several statements was adjusted, and the language was simplified for better understanding by staff of all qualification levels.

The construct validity of the questionnaire was later evaluated using factor analysis, the results of which confirmed that the blocks constitute separate, statistically grounded dimensions. In addition, Cronbach's alpha coefficient was calculated for each block (ranging from 0.78 to 0.91), indicating high internal consistency.

Collected data were analyzed using IBM SPSS Statistics software (version 29.0). The following statistical methods were used to evaluate respondents' answers and identify relationships between research variables:

- Descriptive analysis – Means (M), standard deviations (SD), and response distribution percentages were calculated to determine overall trends and the strength of respondents' opinions in each question block. Demographic data (age groups, work experience, position) were also reviewed.
- Correlation analysis – Pearson's correlation (r) was used to assess the relationships between demographic factors (age, experience) and safety culture indicators in each thematic block. This method helped determine whether there is a statistically significant link, for example, between employee age and their attitude toward error reporting systems.
- Independent samples t-test – Used to identify statistically significant differences between two professional groups (e.g., nurses and doctors) regarding various safety culture aspects.
- One-way analysis of variance (ANOVA) – Applied to analyze differences in responses among more than two groups, for example, by age or experience categories. If significant differences were found, post hoc (Tukey) tests were conducted to determine the source of the differences.
- Factor analysis – Used to assess the questionnaire's construct validity and internal consistency. Principal Component Analysis with Varimax rotation was applied to identify how strongly questions cluster into theoretical blocks. The results confirmed that questions reliably reflect the five thematic blocks defined in the study.
- Cronbach's alpha coefficient – A reliability index was calculated for each question block. All blocks exceeded the 0.70 threshold, indicating good internal consistency.

This study followed the main principles of bioethics, as described by Beauchamp and Childress (2019): informed consent, voluntariness, confidentiality, and personal data protection. The study also adhered to the Declaration of Helsinki regarding ethical research involving human subjects.

1. Informed consent. The principle of informed consent means that study participants must be properly and clearly informed about the study's purpose, nature, duration, potential benefits, and risks. All participants were informed about the study's essence, anonymity, and their right to withdraw at any time before filling out the questionnaire. Consent was considered given voluntarily by completing the questionnaire.
2. Voluntariness. In accordance with Article 25 of the Declaration of Helsinki, the study cannot be conducted without a person's free and informed consent. All participants took

part in the study willingly, without external pressure. Participation did not affect their employment, position, or relationship with management.

3. Confidentiality. The research data were collected in such a way that it was not possible to identify specific individuals or institutions. It was ensured that during or after the study, data would not be used or disclosed in a way that would allow identification of individual respondents. All answers were analyzed in aggregate.
4. Personal data protection. The General Data Protection Regulation (GDPR) of the EU was followed. Study data were stored on a protected data drive, accessible only to the researchers. The data will be destroyed after the completion of the analysis. It was ensured that all responses were used for scientific purposes only.
5. Responsibility and researcher duties. According to Articles 15 and 16 of the Declaration of Helsinki, the researcher is responsible for the health and well-being of study participants. This study posed no physical or psychological risks. The researcher committed to act honestly, responsibly, and in accordance with scientific ethics.
6. Ethical approval. The research protocol was submitted and approved by the relevant institutional bioethics committee, and all study participants were informed of this. This complies with the Helsinki Declaration's requirement that research must be approved by an independent ethics committee.

RESEARCH RESULTS

Presentation of Research Results

This section presents the results of the quantitative study obtained from 467 respondents in 16 nursing hospitals. The aim of the study was to assess aspects of patient safety culture related to adverse event management and to identify relationships between demographic variables and safety culture indicators. The analysis includes descriptive statistics, comparison of means, correlation analysis, difference tests, and the construct validity of the questionnaire.

Structure of the Analysis of Respondents' Answers

The analysis of results is presented according to the structure of the questionnaire – dividing the data into five thematic blocks: the incident reporting system, organizational safety culture, nurse training and professional preparedness, the application of technologies for patient safety, and psychosocial factors. Each block reviews the statement averages and standard deviations, followed by comparisons of demographic groups and relationship analysis. This allows for a thorough assessment of which factors are most related to respondents' perception of safety culture and behavior regarding adverse events.

Description of the Research Sample

The study included 467 healthcare workers employed in 16 nursing hospitals across different regions of Lithuania. The sample was purposefully formed to include institutions of various sizes and subordination (state, municipal, private) that provide long-term care and nursing services to elderly patients with chronic diseases.

Respondents were selected using a criterion sampling method – the sample included all employees with at least 6 months of work experience in the same institution and who work directly with patients (nurses, doctors, nurse assistants). The study aimed to ensure professional diversity and geographic distribution.

Demographic characteristics

Age groups:

20–35 years – 18.2%

36–50 years – 34.9%

51–65 years – 39.4%

66 years and older – 7.5%

Work experience in healthcare:

Up to 5 years – 12.6%

6–15 years – 27.8%

16–25 years – 29.3%

More than 25 years – 30.3%

Job positions:

Nurses – 61.5%

Nurse assistants – 18.8%

Doctors – 10.3%

Others (social workers, physiotherapists, etc.) – 9.4%

Such a sample structure ensured the possibility to analyze differences in perceptions of safety culture among different professional and demographic groups, allowing a representative overview of the adverse event management situation in nursing hospitals.

Factor Analysis

Based on the performed factor analysis (principal component analysis with Varimax rotation), five factor groups were identified (see Table 1), which correspond to the theoretical structure of the questionnaire and substantiate the construct validity of the questionnaire. Each factor includes closely related statements with factor loadings exceeding 0.65 – indicating that the statements reliably reflect a specific group of latent (not directly measurable) phenomena (Hair et al., 2019).

Tabel 1. Factor Loadings Table

Statement	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
The institution has a clearly defined incident reporting procedure	0.76	0.28	0.24	0.26	0.22
Employees know how to report adverse events	0.74	0.29	0.22	0.27	0.23
There is an opportunity to report incidents anonymously	0.61	0.27	0.25	0.29	0.20
Management encourages error reporting	0.68	0.30	0.26	0.30	0.19
Feedback is received after a report	0.63	0.32	0.27	0.32	0.18
Management sets an example by talking about the importance of safety	0.79	0.31	0.28	0.35	0.21
A culture of openness prevails in the institution	0.73	0.33	0.30	0.37	0.20
Employees are not afraid to report their mistakes	0.66	0.30	0.29	0.36	0.22
Incidents are analyzed for learning purposes	0.77	0.34	0.32	0.34	0.24
Events are used to improve processes, not to blame	0.69	0.35	0.33	0.33	0.23
Nurses regularly participate in safety training	0.32	0.76	0.35	0.31	0.25
Training includes practical situations	0.38	0.71	0.36	0.30	0.24
There are opportunities to improve qualifications	0.35	0.69	0.38	0.32	0.23
Employees know how to react to an incident	0.36	0.73	0.37	0.29	0.22
Newly hired staff are properly trained	0.33	0.66	0.39	0.28	0.26
Electronic patient safety systems are used	0.45	0.39	0.75	0.27	0.28
Technologies help reduce error risk	0.48	0.36	0.73	0.25	0.27
Warnings for risks (e.g., allergies) are used	0.46	0.35	0.72	0.26	0.26
Employees know how to use information systems	0.41	0.33	0.74	0.28	0.29
Technologies are reliable and accessible	0.39	0.31	0.70	0.29	0.30
Employees experience stress due to possible errors	0.52	0.30	0.33	0.72	0.68
Emotional support options exist after events	0.47	0.29	0.31	0.71	0.66
Errors cause long-term discomfort	0.49	0.28	0.30	0.70	0.67
Workload increases the likelihood of incidents	0.55	0.27	0.34	0.69	0.70
The team supports each other after events	0.51	0.32	0.29	0.74	0.69

Factor 1: Incident Reporting System and Organizational Culture. The first factor encompasses key elements of a safe environment, including clearly defined incident reporting procedures, staff awareness of how and when to report adverse events, and the organization's efforts to ensure feedback. This factor also includes dimensions of organizational culture – leadership by example, an atmosphere of openness, error analysis for learning purposes, and a focus on process improvement rather than blame.

This group showed high factor loadings (from 0.66 to 0.79), indicating that the respondents' answers to these statements form a consistent construct core. Such a strong internal link between different statements suggests that organizations with clearly defined incident reporting structures and leadership that promotes openness and transparency demonstrate a higher level of patient safety.

Scientific literature emphasizes that developing a safety culture starts with leadership commitment and the creation of an empowering environment. According to Sammer et al. (2021), when employees feel safe to report errors without fear of consequences, more

opportunities arise to identify systemic deficiencies. Moreover, when employees receive feedback after reporting, they become more motivated to engage in further quality improvement processes (Carver & Hipskind, 2021). Friesen et al. (2020) also note that anonymity and a non-punitive approach are essential for an effective reporting system.

In summary, this factor reflects the organization's readiness not only to respond to incidents but also to create an environment where employees feel empowered, supported, and motivated to contribute to enhancing patient safety.

Factor 2: Training and Professional Preparedness. The second factor reflects the importance of education, skills enhancement, and professional preparedness in ensuring patient safety in nursing hospitals. This factor includes statements related to nurses' participation in safety training, analysis of practical situations, opportunities for development, and onboarding of newly recruited staff. Factor loadings in this block range from 0.66 to 0.76, indicating strong inter-statement relationships and internal construct consistency.

Scientific literature confirms that regular learning activities, particularly those involving practical scenarios and simulations of incident management, significantly enhance staff's ability to respond quickly and appropriately to adverse events (Nieva & Sorra, 2003; Weaver et al., 2013). Moreover, training not only provides practical knowledge but also fosters a positive attitude toward patient safety culture and a sense of team responsibility (Sammer et al., 2021).

Another important aspect of this factor is the integration of new employees. Research shows that improperly trained new team members are more often involved in adverse events, highlighting the importance of both individual readiness and institutional commitment to education (Carver & Hipskind, 2021).

The high factor loadings across all statements in this block suggest that respondents consistently link learning opportunities with safety assurance. This underscores the necessity of integrating professional development as an essential part of the safety culture.

Factor 3: Use of Technology for Patient Safety. The third emerging factor reflects respondents' attitudes toward the application of information and digital technologies to ensure patient safety. This factor includes statements such as the use of electronic patient safety systems, implementation of risk alerts (e.g., allergies), staff's ability to use information systems, and the reliability of these technologies. Factor loadings range from 0.70 to 0.75, indicating a strong association with the factor and internal consistency of the construct.

The integration of technologies in healthcare institutions is no longer novel, but their role in patient safety is still considered essential. Studies show that digital alert systems (e.g., for allergies or drug interactions) and automated error prevention tools reduce the risk of human

error (Bates et al., 2018; Wang et al., 2022). Especially valued are systems that allow real-time response to changes in a patient's condition—for example, through sensors or patient data stream analysis.

Equally important is staff digital literacy. When personnel are proficient in using technologies, their potential in the area of patient safety becomes more evident. Conversely, unreliable, frequently crashing, or overly complex systems may cause alert fatigue—when staff begin ignoring frequent alerts (Wright et al., 2020). This indicates that the reliability and user-friendliness of technologies are also critical factors.

This factor's analysis shows that respondents perceive technologies not merely as supplementary tools but as integral components of patient safety. This aligns with the modern healthcare paradigm, where technologies are not just supportive but essential to quality.

Factor 4: Psychological Burden and Emotional Response. The fourth identified factor reveals respondents' psychological and emotional relationship with adverse events. Statements in this factor include: "Employees experience stress due to potential errors," "Errors cause long-term discomfort," "Workload increases the likelihood of incidents," and "The team supports each other after events." Factor loadings range from 0.69 to 0.74, indicating a close interrelationship between these elements and the clear formation of this dimension.

The psychological response of employees to incidents is one of the most important, yet often undervalued, aspects of patient safety. Stress related to the possibility of errors often leads to anxiety, sleep disturbances, emotional exhaustion, and even burnout (Hall et al., 2016). Errors—especially if caused by system deficiencies—can be perceived as personal failures, particularly in a blame-oriented culture.

Research shows that staff involved in errors often become so-called "second victims," experiencing moral distress, guilt, and fear of consequences (Wu et al., 2020). Emotional support measures—individual discussions, peer support, structured debriefing procedures—can mitigate these experiences. Additionally, workload and organizational pressure are important factors increasing incident likelihood and hindering emotional recovery (Panagioti et al., 2017).

The analysis of this factor suggests that psychological aspects form an independent dimension of patient safety, closely related to emotional climate, support, and employees' psychological well-being. These results emphasize the need to create safe spaces for employees to talk about errors without fear of punishment and to strengthen emotional response management tools in organizations.

Factor 5: Team Support and Emotional Climate. The analysis of the fifth factor revealed that although psychological aspects are closely related to emotional experiences after incidents,

there is a clearly distinct dimension—the significance of team support and emotional climate in the organization. This factor comprises statements related to support from team members after errors and the availability of emotional support in the work environment. Factor loadings from 0.66 to 0.70 indicate a moderate yet sufficiently clear consolidation of these elements into an independent construct.

Team environment and mutual support in critical moments are among the core elements of organizational resilience. Studies show that employees who receive emotional support from colleagues after an error are less likely to experience long-term negative psychological consequences, and their trust in the system and willingness to report incidents increase (O'Donovan et al., 2022). Conversely, a negative microclimate, team passivity, or even hostility after errors can exacerbate the "second victim" phenomenon and suppress openness.

An organizational culture that fosters collaboration, empathy, and emotional response contributes to long-term patient safety (Seys et al., 2013). This factor also plays a key role in shaping employees' professional identity, trust in the team, and maturity of safety culture.

The separately distinguished "Team Support" factor helps to understand that employees value not only formal leadership policy but also the everyday behavior of colleagues and communication style. Therefore, to strengthen the safety culture in nursing hospitals, it is necessary to invest not only in training and technology but also in the quality of human relationships in the workplace.

The performed factor analysis revealed that the questionnaire statements consistently group into five distinct, conceptually grounded dimensions: (1) incident reporting system and organizational culture, (2) training and professional preparedness, (3) use of technology for patient safety, (4) psychological burden and emotional response, (5) team support and emotional climate. Each factor comprises logically linked statements with factor loadings exceeding 0.66, meeting the validity criteria of social research instruments.

The highest loadings in each factor and minimal cross-loadings indicate high structural clarity and construct validity. This suggests that the questionnaire reliably reflects essential aspects of patient safety culture in nursing hospitals, including organizational, professional, technological, and psychosocial variables.

The results correspond to the best practice guidelines proposed by Tabachnick and Fidell (2019) for ensuring instrument reliability and validity: the number of factors is theoretically justified, the structure is clear, loadings are sufficient, and interpretation is consistent. This provides a foundation to assert that the instrument used in the study can be applied both in practical assessments and future scientific research.

Participants' Opinion on the Adverse Event Management System

The first section of the questionnaire assessed how employees perceive and experience the functioning of the adverse event reporting system in nursing hospitals. The statements in this section revealed various aspects related to reporting procedures, opportunities, and feedback (see Table 2).

Table 2. Incident Reporting System

Statement	Mean	Standard Deviation
The institution has a clearly defined incident reporting procedure	3.87	0.91
Employees know how to report adverse events	4.02	0.84
It is possible to report events anonymously	3.48	1.12
Management encourages reporting of errors	3.56	0.97
Feedback is provided after reporting	3.22	1.08

The highest-rated statement was "Employees know how to report adverse events" – mean 4.02 (standard deviation – 0.84), indicating that most respondents feel informed about the reporting procedure. The statement "The institution has a clearly defined incident reporting procedure" was also rated relatively high – mean 3.87 (SD – 0.91), suggesting that most institutions have formal algorithms for incident reporting.

Lower ratings were given to statements related to anonymity (mean 3.48, SD – 1.12) and management encouragement to report errors (3.56, SD – 0.97). This may indicate employees' doubts regarding confidentiality or the leadership's open attitude towards error analysis.

The lowest mean was recorded for the statement "Feedback is provided after reporting" – mean 3.22 (SD – 1.08), meaning that employees rarely receive information on what actions were taken following their report. This aspect is important, as the lack of feedback may reduce motivation to actively participate in strengthening the safety culture.

The second section of the questionnaire analyzed how respondents evaluate the organizational culture of their workplace related to patient safety. Five statements were assessed, related to leadership behavior, openness encouragement, error evaluation, and learning from them (see Table 3).

Table 3. Organizational Safety Culture

Statement	Mean	Standard Deviation
Management sets an example in speaking about safety importance	3.65	0.95
A culture of openness prevails in the institution	3.41	1.06
Employees are not afraid to report their own mistakes	3.16	1.02
Incidents are analyzed with the aim of learning	3.88	0.91
Events are used for process improvement, not for blame	3.42	1.01

The highest-rated statement in this section was "Incidents are analyzed with the aim of learning," with a mean of 3.88 (standard deviation – 0.91). This indicates that most employees observe some efforts to analyze events and apply conclusions in practice; however, the mean is still not high, suggesting that learning from incidents is not yet a consistently applied process.

The statement "Management sets an example in speaking about safety importance" was also rated relatively well – mean 3.65, indicating a leadership example exists, but the behavior lacks consistency or uniformity.

The lowest-rated statements were "Employees are not afraid to report their own mistakes" (mean 3.16, SD – 1.02) and "A culture of openness prevails in the institution" (mean 3.41, SD – 1.06). These results suggest that some staff still experience psychological barriers to reporting mistakes or speaking openly about safety issues.

The statement "Events are used for process improvement, not for blame" received a mean of 3.42, indicating that a blame culture still exists in some institutions – employees are not confident their reports will be accepted constructively.

In summary, elements of an organizational safety culture are implemented in a fragmented manner – there are signs of safety initiatives, but there is a lack of systematization and overall trust, particularly in terms of psychological safety. This highlights the need to strengthen openness, encourage fearless communication, and establish a more consistent leadership position on safety issues.

The third section of the questionnaire assessed how respondents perceive the quality of nurse training, professional readiness, and opportunities for knowledge renewal in their workplace. Five statements were evaluated, relating to training frequency, content, practical application, and onboarding of new staff (see Table. 4).

Table 4. Nurse Training and Professional Readiness

Statement	Mean	Standard Deviation
Nurses regularly participate in safety training	3.72	0.88
Training includes practical situations	3.58	0.91
There are opportunities to improve qualifications	3.91	0.85
Employees know how to respond to an incident	3.74	0.92
Newly hired employees are properly trained	3.59	1.03

The highest mean (3.91) was assigned to the statement "There are opportunities to improve qualifications" (standard deviation – 0.85). This suggests that in most institutions, at least basic conditions are provided for staff to participate in qualification improvement activities. Nevertheless, this indicator does not reach the value of 4.0, which may imply that such opportunities exist but may not be equally accessible to all or are limited by time, financial, or organizational factors.

The statements "Employees know how to respond to an incident" (mean 3.74) and "Nurses regularly participate in safety training" (mean 3.72) indicate that employees feel sufficiently prepared for practical actions during adverse events. However, the results remain moderate, pointing to a potential to intensify or personalize these trainings.

The lower mean statements "Newly hired employees are properly trained" (3.59) and "Training includes practical situations" (3.58) highlight a significant gap – the practical applicability and quality of training may be insufficient. Furthermore, the standard deviation (1.03) for the assessment of new employee training shows significant differences of opinion between institutions or even among staff within the same organization.

The fourth section of the questionnaire evaluated respondents' attitudes toward the use of technological solutions to ensure patient safety in nursing hospitals. The study results show that technology integration is assessed quite positively, but certain aspects remain to be improved (see Table 5).

Table 5. Use of Technology for Patient Safety

Statement	Mean	Standard Deviation
Electronic patient safety systems are used	3.83	0.89
Technology helps reduce the risk of errors	3.68	0.92
Alerts about risks (e.g., allergies) are used	3.75	0.87
Employees know how to use information systems	3.93	0.82
Technologies are reliable and accessible	3.55	0.94

The highest mean (3.93) was assigned to the statement "Employees know how to use information systems" (standard deviation – 0.82). This indicates that most employees feel

competent in using information systems and that training or practice in this area is effective. However, although the mean is high, it does not reach the maximum value, suggesting that in some institutions this ability may still be unevenly developed.

The statements "Electronic patient safety systems are used" (mean 3.83) and "Alerts about risks (e.g., allergies)" (mean 3.75) were also positively evaluated, indicating progress in implementing technologies in nursing institutions. This reflects that electronic systems are becoming an essential part of both everyday practice and risk prevention.

The statement "Technology helps reduce the risk of errors" received a slightly lower mean – 3.68 (standard deviation – 0.92). This may imply that some employees still view technology with skepticism or face challenges in its applicability to practice. Such a result may be caused by frequent alerts (alert fatigue), system errors, or insufficient adaptation to the nursing context.

The least favorably evaluated statement was "Technologies are reliable and accessible" – mean 3.55, standard deviation – 0.94. This suggests that technological provision is not uniform among nursing hospitals and that employees may encounter issues with access, functionality, or system reliability.

In summary, technology is an important and valued part of patient safety, but its effectiveness and availability are not equally ensured across all institutions. To improve this area, it is necessary not only to implement new systems but also to ensure their reliability, involve employees in the implementation process, and provide continuous technical and practical support.

Psychosocial factors are an essential part of a patient safety culture, as employees' emotional well-being, mutual support, and experienced stress can directly affect both the likelihood of errors and the activity of reporting events. This section's analysis shows that respondents often face psychological challenges at work but do not always feel organizational support (see Table 6).

Table 6. Psychosocial Factors

Statement	Mean	Standard Deviation
Employees experience stress due to potential errors	3.91	1.04
Emotional support options are available after incidents	3.12	1.07
Errors cause long-term discomfort	3.44	1.11
Workload increases the likelihood of incidents	4.07	0.95
Team members support each other after incidents	3.36	1.03

The highest mean was found for the statement “Workload increases the likelihood of incidents” – 4.07 (standard deviation – 0.95), confirming the commonly emphasized link in the literature between staff overload and increased error risk (Friesen et al., 2020). This indicates that employees experience excessive workload, which poses a threat to patient safety.

A similarly high rating was given to the statement “Employees experience stress due to potential errors” – mean 3.91, SD – 1.04. This result reflects the emotional vulnerability of employees, the fear of making mistakes, and the associated psychological pressure, especially in environments lacking an open and supportive culture.

The statement “Errors cause long-term discomfort” also received a relatively high mean (3.44), indicating that mistakes leave an emotional imprint on employees’ experiences. This relates to the so-called “second victim” phenomenon, where healthcare workers experience guilt, anxiety, and even symptoms of depression after an event (Wu et al., 2021).

However, psychological support for employees remains limited – the statement “Emotional support options are available after incidents” received the lowest mean in this section – 3.12, SD – 1.07. This indicates that emotional support systems are underdeveloped or insufficiently accessible. This hinders employees' ability to recover effectively after incidents and may reduce their willingness to speak openly about problems.

The statement “Team members support each other after incidents” was rated moderately (mean 3.36), reflecting varying levels of emotional support among institutions or teams. While solidarity may prevail in some teams, collegiality may be lacking in others, especially in stressful situations.

In summary, psychological pressure and workload are important risk factors for adverse events, while the lack of emotional support after incidents poses an additional threat both to employee well-being and to the organization's ability to learn from mistakes. To strengthen the safety culture, it is necessary to invest not only in technology or training but also in improving the psychosocial environment.

Summary of Mean Scores in the Five Questionnaire Sections

To assess the main dimensions of patient safety culture and adverse event management in nursing hospitals, the mean scores of statements from the five questionnaire sections were analyzed (see Table 7). The assessment was conducted using a five-point Likert scale (1 – strongly disagree, 5 – strongly agree), calculating the mean and standard deviation for each section.

Table 7. The Mean scores of statements

Questionnaire Section	Overall Mean	Standard Deviation (SD)
1. Incident Reporting System	3.63	0.98
2. Organizational Safety Culture	3.50	0.99
3. Nurse Training and Professional Readiness	3.71	0.92
4. Use of Technology for Patient Safety	3.75	0.89
5. Psychosocial Factors	3.58	1.04

The highest mean score was found in the section "Use of Technology for Patient Safety" – 3.75 (SD = 0.89), reflecting respondents' positive evaluation of technological tools in nursing practice. Respondents expressed confidence in electronic health record systems, alert mechanisms, and their ability to use digital tools. This result may be linked to the increasing availability of digital solutions and employee training in technology (Zhou et al., 2021; Liu et al., 2022).

Second in overall rating was the section "Nurse Training and Professional Readiness," with a mean score of 3.71 (SD = 0.92). This result shows that employees assess the content of the training, its practical applicability, and qualification improvement opportunities relatively favorably. Nevertheless, the standard deviations reveal a certain dispersion in evaluations, possibly related to unequal access to training across institutions.

The "Incident Reporting System" section received a moderate score – 3.63 (SD = 0.98). While most employees indicated that they know how to report incidents, challenges remain with regard to anonymous reporting and receiving feedback. This result reflects experiences from other European countries, where an effective reporting system is closely linked to trust in leadership and organizational culture (Baier et al., 2021; Kinnunen et al., 2023).

The "Psychosocial Factors" section reached 3.58 (SD = 1.04), highlighting employees' emotional experiences and stress associated with fear of adverse events and responsibility. The high rating for stress (3.91) and the low score for the availability of emotional support (3.12) suggest a lack of support mechanisms within organizations to ensure employee well-being after incidents (Wu et al., 2021).

The lowest mean score was found in the "Organizational Safety Culture" section – 3.50 (SD = 0.99). Although leadership engagement and process improvement following incidents were noted in some institutions, employee responses revealed insufficient openness, fear of blame, and low levels of trust. These aspects directly correlate with the challenges identified in the literature in creating a non-punitive, learning-oriented organizational environment (Sammer et al., 2021; Dixon-Woods et al., 2020).

Overall, the comparison of sections reveals that technical and training-related aspects are rated more favorably than psychological or cultural factors. This leads to the conclusion that to comprehensively strengthen patient safety in nursing hospitals, it is necessary not only to invest in infrastructure but also to enhance emotional support for staff and improve the organizational climate.

Correlation of the Incident Reporting System Dimension

The correlation analysis conducted among the questionnaire statements related to the incident reporting system revealed statistically significant and moderate correlations between most of the examined aspects (Pearson's r = 0.39–0.62) (see Table 8).

The strongest correlation was found between the statements "The institution has a clearly defined incident reporting procedure" and "Employees know how to report adverse events" (r = 0.62). This suggests that in institutions where the reporting system is clearly regulated, employees also better understand how and when to report events.

A moderate correlation was observed between the statements "Management encourages reporting of errors" and "Feedback is provided after reporting" (r = 0.57). This result highlights the role of leadership – when leaders actively support the reporting process, employees are more likely to receive feedback, which is essential for learning from mistakes.

There were also statistically significant but somewhat weaker correlations between the possibility of anonymity and other indicators (e.g., r = 0.41 between "It is possible to report events anonymously" and "Feedback is provided after reporting"). This suggests that anonymity may be an important factor, but its influence on other safety culture dimensions is not as strong as clearly regulated processes or leadership support.

In summary, the research data confirm the theoretical assumption: a well-developed and supported reporting system creates the conditions for a more transparent, open, and learning-friendly organizational environment.

Table 8. Incident Reporting System

	Clearly Defined Reporting Procedure	Employees Know How to Report	Possibility to Report Anonymously	Management Encourages Reporting	Feedback is Provided
Clearly Defined Reporting Procedure	1.00	0.62	0.48	0.51	0.44
Employees Know How to Report	0.62	1.00	0.45	0.50	0.43
Possibility to Report Anonymously	0.48	0.45	1.00	0.39	0.41
Management Encourages Reporting	0.51	0.50	0.39	1.00	0.57
Feedback is Provided	0.44	0.43	0.41	0.57	1.00

To evaluate internal relationships within the organizational safety culture dimension, Pearson correlation analysis was conducted. Results show statistically significant and moderate correlations between all statements ($r > 0.50$; $p < 0.01$), indicating the structural consistency and interrelatedness of this dimension (see Table 9).

Table 9. Organizational Safety Culture

	Leadership Promotes Safety	Openness Culture	Employees Not Afraid to Report Errors	Incidents Analyzed for Learning	Events Used for Improvement, Not Blame
Leadership Promotes Safety	1.00	0.58	0.52	0.63	0.55
Openness Culture	0.58	1.00	0.66	0.59	0.54
Employees Not Afraid to Report	0.52	0.66	1.00	0.55	0.51
Incidents Analyzed for Learning	0.63	0.59	0.55	1.00	0.60
Events Used for Improvement	0.55	0.54	0.51	0.60	1.00

The strongest correlation ($r = 0.66$) was found between the statements “A culture of openness prevails in the institution” and “Employees are not afraid to report their own mistakes,” which reflects the importance of psychological safety for reporting behavior. Another strong relationship was identified between “Leadership promotes safety” and “Incidents are analyzed for learning” ($r = 0.63$), highlighting the impact of leadership behavior on organizational learning practices.

All other correlation coefficients ranged from 0.51 to 0.60, also indicating strong internal consistency of this questionnaire section. This confirms that the statements in this

dimension are interconnected and measure the same theoretical construct – the organization's approach to patient safety through cultural and leadership aspects.

Pearson correlation analysis was also conducted to assess interrelationships among statements related to nurses' professional preparedness and training in patient safety. All five statements were statistically significantly correlated, with coefficients ranging from r = 0.52 to r = 0.66, indicating good internal consistency of this dimension (see Table 10).

Table 10. Nurse Training and Professional Preparedness

	Regular Safety Training	Training Covers Practical Cases	Opportunity to Improve Qualifications	Know How to Respond to Incidents	New Employees Properly Trained
Regular Safety Training	1.00	0.60	0.66	0.57	0.53
Training Covers Practical Cases	0.60	1.00	0.61	0.54	0.52
Opportunity to Improve Qualifications	0.66	0.61	1.00	0.59	0.55
Know How to Respond to Incidents	0.57	0.54	0.59	1.00	0.63
New Employees Properly Trained	0.53	0.52	0.55	0.63	1.00

The strongest correlation (r = 0.66) was observed between the statements "Nurses regularly participate in safety training" and "There is an opportunity to improve qualifications." This indicates that organizations offering qualification improvement opportunities also tend to provide regular safety training.

Another strong relationship was found between "Employees know how to respond to incidents" and "New employees are properly trained" (r = 0.63), highlighting the importance of onboarding for practical preparedness. Other correlations ranged from r = 0.52 to r = 0.61, emphasizing the interconnectedness of all these activities.

Pearson correlation analysis revealed strong and moderate correlations among the statements in the technology use for patient safety section. Correlation coefficients ranged from r = 0.52 to r = 0.62, indicating good structural alignment among the measured aspects (see Table 11).

Table 11. Use of Technology for Patient Safety

	Electronic Safety Systems	Tech Reduces Error Risk	Risk Alerts Used (e.g., Allergies)	Employees Know How to Use Systems	Technologies are Reliable and Accessible
Electronic Safety Systems	1.00	0.61	0.60	0.58	0.55
Tech Reduces Error Risk	0.61	1.00	0.62	0.56	0.52
Risk Alerts Used (e.g., Allergies)	0.60	0.62	1.00	0.59	0.57
Employees Know How to Use Systems	0.58	0.56	0.59	1.00	0.60
Technologies are Reliable and Accessible	0.55	0.52	0.57	0.60	1.00

The strongest correlation was found between the statements “Technology helps reduce the risk of errors” and “Risk alerts used (e.g., allergies)” ($r = 0.62$), indicating that integrated alert systems are often viewed as tools for error prevention. A notable correlation was also observed between “Electronic patient safety systems are used” and “Technology helps reduce error risk” ($r = 0.61$), suggesting that systematic use of EHRs is closely related to safety assessments.

Moderate correlations ($r = 0.52–0.60$) between other pairs show that employees’ ability to use technology, its accessibility, and reliability are interrelated factors. These results suggest that this questionnaire dimension meets construct validity criteria and that technology use in healthcare is seen as a complex, multifaceted phenomenon.

These results confirm that the training and professional preparedness section of the questionnaire is structurally consistent and that an institution’s ability to ensure systematic and high-quality training is closely linked to employees’ capacity to recognize and respond to adverse events.

Pearson correlation analysis also revealed moderate interrelationships between psychosocial aspects influencing employees’ experiences after adverse events. Correlation coefficients ranged from $r = 0.46$ to $r = 0.59$, indicating that these factors often interact with each other (see Table 12).

Table 12. Psychosocial Factors

	Employees experience stress due to possible errors	Emotional support is available after events	Errors cause long-term discomfort	Workload increases the likelihood of incidents	Team members support each other after events
Employees experience stress due to possible errors	1.00	0.47	0.55	0.59	0.50
Emotional support is available after events	0.47	1.00	0.48	0.46	0.52
Errors cause long-term discomfort	0.55	0.48	1.00	0.57	0.49
Workload increases the likelihood of incidents	0.59	0.46	0.57	1.00	0.58
Team members support each other after events	0.50	0.52	0.49	0.58	1.00

The strongest correlation was found between the statements “Employees experience stress due to possible errors” and “Workload increases the likelihood of incidents” ($r = 0.59$), which reflects the link between tension and overload contributing to emotional discomfort and the probability of errors. A strong correlation was also observed between “Errors cause long-term discomfort” and “Workload increases the likelihood of incidents” ($r = 0.57$), confirming the long-term impact of psychological consequences.

The correlation between “Team members support each other after events” and “Emotional support is available after events” reached $r = 0.52$, indicating that emotional support is mainly based on peer support rather than formal mechanisms. Although all correlations are statistically significant, they are not very strong, indicating that psychosocial factors, while related, express different aspects of employees’ emotional health. This reinforces the need to systematically address these issues at the level of institutional policy.

After performing a correlation analysis between the five thematic blocks of the questionnaire (using Pearson's correlation coefficient), it was found that most statements are statistically significantly correlated, with correlation strength ranging from weak to moderate ($r = 0.39–0.66$). This confirms that different aspects of patient safety in institutions are closely interconnected and often function as a complex system.

The strongest correlations were observed in the following blocks:

- Organizational safety culture: a strong correlation between “Leadership promotes safety” and “Incidents are analyzed for learning” (r = 0.63) indicates that leadership behavior is a key part of forming a culture of learning from mistakes.
- Nurse training and professional preparedness: “Nurses regularly participate in safety training” correlated with “There is an opportunity to improve qualifications” (r = 0.66), indicating that these aspects are often developed in parallel.
- Psychosocial factors: “Employees experience stress due to possible errors” and “Workload increases the likelihood of incidents” were significantly correlated (r = 0.59), emphasizing the importance of workload on emotional well-being and patient safety.

Meanwhile, the lowest correlations were observed between some administrative and psychosocial statements, such as the possibility of anonymous reporting and receiving feedback, which may indicate that these factors are unevenly developed within organizations.

Overall, the results of the correlation analysis show that the culture of patient safety is a multidimensional and closely interconnected system of factors. This supports the construct validity of the research questionnaire and confirms that each block consistently reflects the topic under study. The obtained results also allow for further analysis of systemic relationships using regression and structural equation models.

Analysis of Differences Between Demographic Groups by Questionnaire Thematic Blocks: Use of t-Test and ANOVA

One of the key goals of the study was to assess whether different employee demographic groups – by position, age, or work experience – evaluate aspects of patient safety culture in nursing hospitals differently. For this purpose, independent sample t-tests and analysis of variance (ANOVA) were applied. These statistical methods allow for the identification of significant differences between groups, revealing possible disparities in safety perceptions and attitudes toward adverse event management, which may have practical relevance for improving safety systems.

The study particularly aimed to understand whether professional position (nurse, physician, other), age group, or work experience determines different attitudes toward areas such as the functioning of the incident reporting system, organizational safety culture, quality of training, use of technology, or psychosocial aspects. Such differences can help more accurately target quality improvement interventions, individualize educational measures, and reduce organizational barriers in the field of patient safety.

When performing an independent sample t-test between employee groups (nurses and physicians/other staff), no significant differences were found for most statements. All p-values exceeded the 0.05 threshold, except for the statement "It is possible to report events anonymously," where the p-value was close to the significance threshold ($p = 0.093$), indicating a tendency for different professional groups to perceive the possibility of anonymous reporting differently (see Table 12).

Table 12. Incident Reporting System

Statement	t-test p-value	ANOVA p-value (age)	ANOVA p-value (experience)
Clearly defined incident reporting procedure	0.241	0.102	0.317
Employees know how to report adverse events	0.182	0.036	0.229
Possibility to report anonymously	0.093	0.271	0.289
Management encourages reporting of errors	0.450	0.098	0.201
Feedback is provided after reporting	0.332	0.174	0.143

When evaluating age group differences (using ANOVA), a statistically significant difference was found only for the statement "Employees know how to report adverse events" ($p = 0.036$). This suggests that younger employees are more confident in their knowledge about the reporting system than older colleagues. Other statements in this analysis did not show statistically significant differences between age groups ($p > 0.05$), although some p-values were close to the significance threshold (e.g., "Management encourages reporting of errors," $p = 0.098$).

Analyzing the influence of work experience on the statements in this block revealed no significant differences (all p-values > 0.1), but observed tendencies suggest that experience may influence attitudes, especially regarding the importance of feedback ("Feedback is provided after reporting," $p = 0.143$).

Study data showed that when evaluating aspects of organizational safety culture, no significant differences were found between professional groups (nurses vs. physicians/other personnel) according to the independent sample t-test (all p-values > 0.05). This suggests that both nurses and other professional groups perceive the role of leadership, openness culture, and error analysis practices similarly (see Table 13).

Table 13. Organizational Safety Culture

Statement	t-test p-value	ANOVA p-value (age)	ANOVA p-value (experience)
Leadership promotes safety	0.177	0.083	0.325
A culture of openness prevails in the institution	0.298	0.041	0.201
Employees are not afraid to report their mistakes	0.112	0.019	0.244
Incidents are analyzed for learning	0.254	0.054	0.156
Events used for process improvement, not blame	0.199	0.039	0.187

However, ANOVA analysis by age group revealed several statistically significant differences. Significant results were found for the following statements:

- "Employees are not afraid to report their mistakes" ($p = 0.019$),
- "A culture of openness prevails in the institution" ($p = 0.041$),
- "Events used for process improvement, not blame" ($p = 0.039$).

These data suggest that younger employees view the organization's openness and safety culture more positively, while older personnel tend to have more reservations, especially regarding error acknowledgment and fear of potential consequences.

Other aspects of organizational culture, such as "Leadership promotes safety" and "Incidents are analyzed for learning," did not show significant differences between age or experience groups, although the p-values were close to the significance threshold (respectively $p = 0.083$ and $p = 0.054$), indicating a possible relationship.

Work experience did not have a statistically significant impact on any of the statements (all p-values > 0.1), although recurring differences in evaluation between less and more experienced employees suggest the potential for further research with a larger sample.

Analyzing responses to statements related to nurse training and preparedness in the field of patient safety, no statistically significant differences were found between professional groups (nurses vs. other healthcare professionals) (all t-test p-values > 0.05). This indicates that the importance and content of training are evaluated similarly by all respondents, regardless of their position (see Table 14).

Table 14. Nurse Training and Professional Preparedness

Statement	t-test p-value	ANOVA p-value (age)	ANOVA p-value (experience)
Nurses regularly participate in safety training	0.138	0.073	0.303
Training includes practical situations	0.122	0.065	0.219
Opportunity to improve qualifications	0.198	0.058	0.235
Employees know how to respond to incidents	0.284	0.041	0.188
New employees are properly trained	0.207	0.052	0.144

Meanwhile, age group comparisons using ANOVA revealed several significant trends:

"Employees know how to respond to incidents" ($p = 0.041$) – younger employees rated this statement higher than older ones, possibly indicating greater confidence in their abilities or more active participation in training.

Other statements, such as "Training includes practical situations" ($p = 0.065$) and "New employees are properly trained" ($p = 0.052$), although not reaching strict significance, show a clear trend that younger respondents evaluate professional preparedness quality more positively.

Although the length of work experience (ANOVA) did not have a significant influence on the evaluation of these aspects (all p-values > 0.1), the distribution of some statement ratings indicates that employees with less experience provided slightly higher evaluations. This may be related to newer training methods or more positive initial experiences.

In summary, study results show that younger employees are more confident in their preparedness to respond to incidents and more positively evaluate the quality of training, while older specialists may benefit from additional practical training or more inclusive communication about safety procedures.

When performing an independent sample t-test, no significant differences were observed between the evaluations of nurses and other healthcare professionals (all p-values > 0.05). This indicates that the evaluation of technology in the context of patient safety is fairly consistent regardless of professional position (see Table 15).

Table 15. Use of Technology for Patient Safety

Statement	t-test p-value	ANOVA p-value (age)	ANOVA p-value (experience)
Electronic patient safety systems are used	0.151	0.062	0.314
Technology helps reduce the risk of errors	0.194	0.045	0.284
Risk alerts are used (e.g., allergies)	0.283	0.057	0.276
Employees know how to use information systems	0.166	0.034	0.216
Technologies are reliable and accessible	0.259	0.049	0.193

Meanwhile, ANOVA analysis by age group revealed significant differences in the following statements:

- "Technology helps reduce the risk of errors" ($p = 0.045$),
- "Employees know how to use information systems" ($p = 0.034$),
- "Technologies are reliable and accessible" ($p = 0.049$).

These statements were rated higher by younger respondents, who are likely more familiar with digital solutions and face fewer technical barriers in using them. These results align with trends observed in the literature, where technological literacy and positive attitudes toward digital tools are more common among younger healthcare professionals (Topol, 2021).

Work experience did not show statistically significant differences, but rating trends in some statements suggest that employees with shorter tenure more often rated the benefits of technology positively. These results indicate the need to ensure additional training and support for older or more experienced professionals so that technology integration is equally effective across all employee groups.

The fifth part of the analysis evaluated employee responses related to emotional well-being, stress, and peer support, covered by psychosocial factors in the context of patient safety (see Table 16).

Table 16. Psychosocial Factors

Statement	t-test p-value	ANOVA p-value (age)	ANOVA p-value (experience)
Employees experience stress due to possible errors	0.088	0.029	0.194
Emotional support is available after events	0.134	0.055	0.177
Errors cause long-term discomfort	0.119	0.032	0.184
Workload increases the likelihood of incidents	0.096	0.039	0.209
Team members support each other after events	0.147	0.048	0.198

Based on the t-test results, no significant differences were found between professional groups (nurses and other specialists) (all p-values > 0.05), but some values approached the threshold of statistical significance, especially:

- “Employees experience stress due to possible errors” ($p = 0.088$),
- “Workload increases the likelihood of incidents” ($p = 0.096$).

This may suggest that nurses experience slightly higher emotional load and stress levels, but the differences are not strong enough to be considered statistically significant.

Meanwhile, ANOVA analysis by age group showed significant differences in all statements ($p < 0.05$), except for the statement about emotional support availability after incidents ($p = 0.055$), which also approaches the significance threshold. Younger employees more often indicated that errors do not cause them long-term discomfort, while older respondents reported greater stress due to possible errors and a more sensitive perception of the consequences of incidents.

These results suggest that age is a significant factor influencing the evaluation of psychosocial aspects in nursing institutions. Younger professionals are likely more inclined toward rational assessment, while older ones experience greater emotional responsibility, which sometimes leads to fear and emotional withdrawal, as described in the "second victim" concept (Wu et al., 2021).

Work experience did not show significant impact, but there is a visible trend that employees with longer experience tend to experience more stress and long-term discomfort after incidents.

During the study, independent sample t-tests and one-way analysis of variance (ANOVA) were performed to determine whether statistically significant differences exist between employee groups – by position (nurses, physicians, others), age groups, and years of experience – when evaluating different aspects of patient safety presented in the questionnaire.

Between professional groups (especially between nurses and other staff), few statistically significant differences were found. Most p-values exceeded the 0.05 threshold for significance. This suggests that perceptions of safety culture are fairly uniform across different job roles. However, in some questions (e.g., psychosocial aspects and technology use), p-values approached the significance threshold, which may indicate a trend that nurses feel greater emotional tension or interact more actively with technologies, although these differences are not strong enough to be statistically confirmed.

Age emerged as one of the most significant demographic variables:

- In many statements, especially those related to organizational culture, technology use, and psychosocial factors, p-values were statistically significant ($p < 0.05$).
- Younger employees more often expressed a more open attitude, had greater confidence in systems, were more willing to report incidents, and experienced less emotional discomfort.
- Older employees more often emphasized stress, fear of the consequences of mistakes, and greater caution.

This suggests that generational differences result in varying approaches to patient safety, which should be considered when planning organizational changes, training, and psychological support.

Analysis by years of experience did not reveal significant differences in most questions. Although some p-values approached the threshold of significance (e.g., in statements about training or stress), the general trend shows that experience is not as decisive a factor as age. It

may be that an employee's experience is more related to the context in which they work rather than the objective number of years on the job.

The aim of the study was to comprehensively assess the culture of patient safety in nursing hospitals, based on five main thematic aspects: the incident reporting system, organizational safety culture, training and professional preparedness, the use of technology for patient safety, and psychosocial factors. Data were collected from 16 nursing hospitals, with 467 respondents participating—nurses, doctors, and other medical personnel. The study highlighted several important patterns and provided significant insights into the current situation and opportunities for strengthening the safety culture.

The average ratings of each statement on a Likert scale (1–5) showed that the highest ratings were given for awareness of the incident reporting processes (mean – 4.02), opportunities for professional development (3.91), and the impact of workload on the likelihood of incidents (4.07). The lowest ratings were given for the feedback system after reporting (3.22) and the availability of emotional support following adverse events (3.12). These results indicate that although employees are well oriented in procedures and able to identify risks, organizational and emotional aspects still require improvement.

After calculating the averages for each questionnaire block, it became clear that the highest ratings were given to training and professional preparedness aspects (mean – 3.71) and the use of technology (3.75), while the lowest were for psychosocial factors (3.58). This may reflect recent changes in which organizations invest in technology and professional development but still lack a systematic approach to emotional support for staff.

Using the t-test and ANOVA, statistically significant differences were identified among different age groups, work experience, and job roles. For example, younger employees significantly more often stated that they are not afraid to report errors ($p < 0.05$), while older age groups were more critical in evaluating feedback and emotional support. Nurses, compared to doctors and other staff, rated the reliability and accessibility of technology higher but rated workload management lower. These differences indicate that safety culture is influenced not only by organizational but also by personal and professional factors.

Pearson correlation analysis in each block showed strong relationships between interrelated statements. For example, in the incident reporting system block, the correlation between leadership encouragement and feedback provision was $r = 0.57$, and in the organizational culture block, the openness culture correlated with the absence of fear to report errors ($r = 0.66$). This confirms that the safety climate is systemically interconnected: improving one component (e.g., leadership behavior) can also strengthen the overall culture of openness.

Statistical tests also showed that the most significant differences by age were observed in the organizational safety culture block—employees under 35 significantly more often agreed that an openness culture prevails in the institution ($p = 0.041$), that they are not afraid to report errors ($p = 0.019$), and that events are used for improvement rather than blame ($p = 0.039$). This can partly be explained by generational differences in evaluating organizational processes and the psychological comfort in discussing errors.

Principal Component Analysis (PCA) with Varimax rotation allowed the identification of five factors corresponding to the theoretical structure of the questionnaire. The factor structure remained stable: the first factor included the reporting system and organizational culture (loadings 0.66–0.79), the second—training and professional preparedness (0.66–0.76), the third—use of technology (0.70–0.75), the fourth—psychological burden and emotional response (0.69–0.74), and the fifth—team support (0.66–0.70). All statements were clearly assigned to one factor, and the total explained variance reached 72.4%, which is considered a high level of construct validity.

DISCUSSION

The study showed that in most nursing hospitals, the culture of patient safety is rated moderately positively. The strongest areas are the use of technology and professional preparedness, while the biggest challenges are in ensuring emotional support, forming feedback systems, and reducing fear of speaking about errors. A significant distinction was observed among different age groups— younger employees more often hold an open, progressive view of safety, while older ones are more cautious and less likely to engage in incident analysis or reporting.

These results suggest that strengthening the culture of patient safety in nursing hospitals should be based not only on formal systems but also on empowering staff emotionally, leadership example, training, and the promotion of a culture of team support. Further research could develop the topic from a qualitative perspective, examining how specific experiences shape employees' views on safety and how organizations can more effectively involve all staff in the creation of preventive measures.

Our research results reflect the complex patient safety culture in nursing hospitals, encompassing several key dimensions – the incident reporting system, organizational culture, training and professional preparedness, use of technology, and psychosocial factors. These dimensions align with internationally recognized components of patient safety culture, which are often identified in methodologies such as the Hospital Survey on Patient Safety Culture (HSOPSC) (Sorra et al., 2014) or the Safety Attitudes Questionnaire (SAQ) (Sexton et al., 2006).

Overall, the average scores of the blocks obtained (from 3.50 to 3.75) indicate medium-level assessments among respondents. This suggests that although staff are not entirely critical of the existing safety culture, they are also not inclined to evaluate it very positively. This result corresponds with data from many European countries – for example, in a study conducted in Norwegian nursing homes, 7 out of 10 safety culture dimensions were rated positively by more than 60% of employees (Bondevik et al., 2017). Meanwhile, in our study, the assessments of some areas (e.g., emotional support after incidents) remained low, indicating that although the safety culture is not weak, it still has clearly identifiable areas for improvement.

Countries with more advanced experience in developing a patient safety culture, such as Sweden, the United Kingdom, or the Netherlands, often exhibit higher evaluations in many areas of safety culture (Baines et al., 2015; Cappelen et al., 2016). Compared to data from Russia or Eastern European countries, the results of our study are somewhat higher – this may

be related to better access to training, more transparent management principles, or more active integration of safety policies in organizations. For example, in a 2020 study of Russian primary health care, only 42% of respondents stated that there was a clear system encouraging incident reporting in their institution (Zaitsev et al., 2020), whereas in our study this aspect was rated significantly higher.

It is noteworthy that the highest average scores were recorded in the statements related to the use of technology and training blocks, which may indicate that modern nursing institutions are rapidly integrating innovations and qualification improvement tools. These results are consistent with international trends where technological safety support (e.g., electronic alert systems or patient monitoring platforms) is considered one of the key pillars of patient safety (Wang et al., 2022; Zhou et al., 2021). Meanwhile, the lowest scores were recorded in the psychosocial block – particularly in statements related to emotional support options after adverse events. This aspect is also frequently criticized in other countries – for example, the "second victim" phenomenon is still not adequately recognized even in Western Europe (O'Donovan et al., 2022).

In summary, it can be said that our study data are consistent with international studies, but at the same time reveal specific challenges in the context of Lithuanian nursing hospitals. This is particularly important for further developing targeted interventions aimed not only at improving processes but also addressing the human factor – psychological support, trust in leadership, and a safe organizational environment.

Factor analysis conducted with all 25 questionnaire items confirmed a five-factor structure that clearly reflects the components of patient safety culture in nursing hospitals. The identified dimensions – incident reporting system and organizational culture, training and professional preparedness, use of technology, psychological burden, and team support – are logically interconnected and conceptually supported by previous literature (Carver & Hipskind, 2021; Sammer et al., 2021). High factor loadings (all > 0.66) indicate that these factors demonstrate construct validity, and the questionnaire structure is reliable and suitable for both practical and scientific purposes.

Such a construct model meets the validity standards of social science instruments proposed by Hair et al. (2019), who state that factor loadings ≥ 0.60 are acceptable and ≥ 0.70 are strong. Our results confirm these thresholds and show minimal cross-loadings, indicating good discriminant validity. This is particularly important in the healthcare context, where patient safety culture is multifaceted, but each of its dimensions has distinctive features.

A similar five or more factor structure was identified in other countries when adapting the HSOPSC or similar instruments. For example, in the hospital context in Sweden, seven dimensions were identified, three of which – leadership support, communication, and incident analysis – overlap with our first factor (Hammarlund et al., 2015). In a Norwegian family care study, structurally similar dimensions were also identified, covering organizational culture, training, and support mechanisms (Bondevik et al., 2017). This suggests that our questionnaire corresponds to international conceptual standards and can be applied both locally and internationally.

At the same time, it is worth noting that psychological and emotional support factors are often lost in broader safety culture studies. In our study, they formed separate factors – psychological burden and team support, highlighting the relevance of these topics for employee well-being and emotional resilience. Such a breakdown is also suggested by more recent theoretical models emphasizing the importance of preventing the "second victim" syndrome (O'Donovan et al., 2022; Wu et al., 2020).

Considering these results, it can be concluded that our questionnaire not only reflects the main aspects of patient safety but also enables a more accurate assessment of the emotional response of employees to events and the organization's support for them. This level of detail enhances the applicability of the questionnaire not only for evaluation but also for planning interventions to improve patient safety.

The results of the correlational analysis revealed significant internal relationships in each questionnaire block, indicating that the selected statements consistently describe the corresponding aspects of patient safety culture. The strongest correlations were observed in the incident reporting system and organizational culture block – for example, the correlation between the statements "The institution has a clearly defined incident reporting procedure" and "Employees know how to report adverse events" reached $r = 0.62$, while "Management encourages reporting errors" and "Feedback is received after reporting" – $r = 0.57$. These results reflect what the literature refers to as "leadership visibility" and "psychological safety" (Sammer et al., 2021; Flin et al., 2006), i.e., the role of leadership is crucial in promoting openness and learning from errors.

Similarly strong relationships were recorded in the organizational culture block – "Leadership sets an example when talking about the importance of safety" correlated with the statement "Incidents are analyzed with the aim of learning" ($r = 0.63$), and "An open culture prevails in the institution" with "Employees are not afraid to report their own errors" ($r = 0.66$).

This shows a clear interaction between organizational culture and employee behavior, which is also confirmed by data from other studies (Singer et al., 2009; Vogus & Sutcliffe, 2007).

In the psychosocial factors block, significant correlations were also revealed between stress, emotional discomfort, and workload: the statements "Employees experience stress due to potential errors" and "Workload increases the likelihood of incidents" correlated at $r = 0.59$, while stress also strongly correlated with emotional discomfort ($r = 0.55$). These results are consistent with theories emphasizing that employee emotional exhaustion is a significant risk factor for patient safety (Montgomery et al., 2015; Hall et al., 2016).

The internal correlations within the technology and training blocks were also strong – for example, the statements "Electronic patient safety systems are used" and "Technology helps reduce the risk of errors" correlated at $r = 0.61$, while "Nurses regularly participate in safety training" and "There is an opportunity to improve qualifications" correlated at $r = 0.66$. This shows that respondents perceive training and technology as interrelated means of strengthening patient safety, which aligns with the systemic change model emphasized in initiatives such as the WHO "Patient Safety Curriculum Guide" (WHO, 2011).

Overall, the obtained results confirm that employees' perceptions of safety culture components are not isolated but form a consistent network of understanding. Such internal coherence of statements is a significant indicator of validity, allowing not only a reliable assessment of the current situation but also the projection of directions for organizational interventions – especially in the areas of leadership involvement, emotional support, and training strategies.

The results of the t-test and ANOVA analysis supplemented the overall picture of the study, identifying some significant demographic differences in the perception of patient safety culture. Although professional groups (nurses and doctors or other staff) did not show significant differences ($p > 0.05$), this suggests that organizational safety culture is perceived fairly uniformly across different professional segments. A similar trend was observed in other studies – for example, in a study conducted in Spain (Carrillo-González et al., 2020) and in U.S. hospitals (Sorra et al., 2016), where it is emphasized that assessments of patient safety often depend not on profession but on the organizational environment and leadership style.

Age, on the other hand, proved to be a significant factor in some statements – especially in the organizational culture and psychosocial factors blocks. Older employees were less likely to agree with statements related to openness, feedback, and emotional support, which may reflect greater caution or lower trust in the organization's safety principles. This trend aligns with findings from studies conducted in Nigeria (Akinboro et al., 2021), Palestine (Alkorashy

& Mohamed, 2020), and Italy (Bressan et al., 2019) – older professionals more often report stress at work and have a lower assessment of the safety culture. Such findings may be associated with generational differences in experiences, reactions to managerial changes, and differing values.

Meanwhile, years of work experience had no statistically significant impact on most statements, which is consistent with many international studies that emphasize that the length of experience is not necessarily related to safety culture assessments (Feng et al., 2012; Alquwez et al., 2018). It can be assumed that this is related to the fact that safety attitudes are shaped not only over time but also depend on individual values, organizational policies, leadership models, and team relationships.

In summary, demographic variables in the analysis allow identifying certain risk groups, for example, older specialists who may need greater emotional support and the encouragement of more open communication. This provides a valuable basis for targeted intervention in creating a safe organizational environment.

The technology use block was the most positively evaluated among all the dimensions analyzed in the study – its average score reached 3.75, indicating a relatively high level of trust in technological solutions to ensure patient safety. The evaluations covered both electronic patient safety systems and risk alert mechanisms, as well as employees' ability to use information systems. These results confirm that technological infrastructure, if properly implemented and maintained, can become an important element of a safety culture.

Comparison between age groups (ANOVA analysis) showed that younger employees significantly more often positively evaluated EHR (electronic health record) systems, the reliability of information systems, and automated risk alerts ($p < 0.05$). These results are in line with Topol's (2021) observations that the younger generation of healthcare professionals tends to have higher digital literacy, greater openness to digital innovations, and a more positive view of the application of artificial intelligence in clinical practice. Unlike older employees, younger ones more often actively participate in the improvement of systems and perceive technology as enabling rather than disruptive tools.

Meanwhile, older respondents more often expressed a more cautious or skeptical attitude toward the effectiveness of technology. This skepticism, as shown by other studies, is often associated with the phenomenon of "alert fatigue" – an excessive load of alerts, reducing users' attentiveness and trust in automated solutions (Khairat et al., 2018). Additionally, the experience of older employees is often based on traditional methods of ensuring safety, and

technological changes may be perceived as a threat to autonomy or professional security (Greenhalgh et al., 2017).

This suggests that although technology is considered a positive factor for patient safety, its effective application depends not only on infrastructure but also on employees' competencies, age, and the organization's ability to reduce the digital divide. Targeted training and personalized implementation can help ensure more consistent technology adoption across different employee groups.

Psychosocial aspects, such as stress due to possible errors (average = 4.07) and poorly evaluated emotional support options (average = 3.12), reveal important psychological challenges for nursing staff. High workload, associated with increased risk of incidents, was also identified as one of the significant factors of safety culture. These results are consistent with a study conducted in China, where psychological exhaustion and fear of mistakes were identified as major risk factors for adverse events (Zhao et al., 2021). In Swiss hospitals, it was observed that staff experiencing high workload and low emotional support were more likely to avoid reporting errors and felt a lower organizational commitment to safety (Schnyder et al., 2020).

The lack of emotional support after incidents is not only an individual experience but also a cultural structural gap, signaling a lack of institutional support. Similar conclusions are presented in a Somali study (Ali et al., 2022), where nursing staff reported feeling left alone after events, and organizations mostly focused on blame rather than psychological support. Turkish researchers (Demirci & Karadag, 2019) also emphasize that insufficient emotional assistance leads to long-term discomfort, reduced work motivation, and higher staff turnover.

In our study, these results confirm that psychosocial factors are an integral part of patient safety culture. They affect not only employee well-being but also the ability to engage in a safe, open, and learning-friendly environment. To strengthen organizational safety culture, systemic support measures must be implemented – emotional debriefing practices, safe conversation platforms, and empathetic leadership by managers.

This study revealed that the patient safety culture in nursing hospitals is multilayered and includes five interrelated dimensions: the reporting system and organizational culture, training and professional preparedness, use of technology, psychological burden, and team support. Factor analysis confirmed the construct validity of the questionnaire, while correlational and variance analysis methods highlighted important interconnections and demographic differences.

Compared to international data, the level of safety culture in Lithuanian nursing hospitals appeared to be close to the average European level, but specific areas for improvement emerged – particularly the lack of emotional support after adverse events and lower trust in organizational safety mechanisms among older employees.

The evaluations of technology use were the most favorable, reflecting a positive attitude toward innovations and advanced systems. However, these evaluations also depended on the age of employees – younger staff were more positive users of technology. Psychosocial aspects, such as stress, emotional discomfort, and lack of support, remain among the most poorly evaluated, indicating the need to pay greater attention to employees' emotional well-being and institutions' preparedness to provide systematic assistance.

In conclusion, the study not only confirms the practical and research applicability of the selected instrument but also provides targeted recommendations – from strengthening training to creating emotional support interventions. The data obtained should be integrated into organizational patient safety improvement strategies, taking into account staff diversity, digital readiness, and the quality of the psychological environment. The study results can be applied not only for internal quality analysis but also as a basis for improving national patient safety policy in nursing institutions.

CONCLUSIONS

The conducted study revealed a multifaceted picture of the patient safety culture in Lithuanian nursing hospitals. Based on empirical data and comparison with international sources, the following main conclusions are formulated:

The patient safety culture in nursing hospitals has a complex structure and can be reliably assessed using a five-factor model.

Factor analysis confirmed the construct validity of the questionnaire, distinguishing five clearly defined, interrelated factors: (1) incident reporting system and organizational culture; (2) training and professional preparedness; (3) use of technology for patient safety; (4) psychological burden and emotional response; (5) team support. All factor loadings exceeded 0.66, which meets the validity standards of social science instruments (Hair et al., 2019). This allows the assumption that the questionnaire not only adequately reflects the main dimensions of patient safety culture but can also be more broadly applied—for both diagnostics and planning improvement measures.

The overall state of patient safety culture is assessed as average—this reflects both existing strengths and weak links.

Block averages ranged from 3.50 to 3.75, indicating neither clear satisfaction nor a categorically negative attitude. This result coincides with data from other countries—for example, in the study by Bondevik et al. (2017) in Norwegian nursing institutions, positive responses averaged around 60%, and similar figures were recorded in the 2019 NHS study in the United Kingdom. This confirms that patient safety culture challenges are common to many countries, but their solutions must be adapted to the national context.

Psychosocial aspects—stress, fear of blame, and lack of emotional support—remain one of the most prominent gaps in the safety culture.

Statements in the psychosocial block, especially those related to the lack of emotional support after mistakes (average 3.12) and high stress due to potential incidents (4.07), reveal serious emotional difficulties for employees. These results are consistent with international studies conducted in China (Zhao et al., 2021), Switzerland (Schnyder et al., 2020), Somalia (Ali et al., 2022), and Turkey (Demirci & Karadag, 2019), where psychological resilience and emotional support are identified as foundations of patient safety. This shows that to strengthen safety culture, employees' psychological well-being must be systematically integrated as a strategic direction.

Use of technology is evaluated most positively, but generational differences are observed.

The technology block (average 3.75) was rated the highest, particularly by younger respondents. Younger employees demonstrate greater confidence in EHR, alert systems, and AI solutions, which aligns with the findings of Topol (2021) and Khairat et al. (2018). Meanwhile, older employees more often experience "alert fatigue" and evaluate system reliability more skeptically. This trend highlights the need to reduce the digital divide through targeted training and personalized implementation of technologies.

Organizational culture is a decisive factor in forming an open, learning-conducive environment.

High correlations between reporting system components (e.g., r = 0.62 between knowing how to report and the existence of clear procedures) indicate that employees are sensitive to the transparency of organizational communication, feedback mechanisms, and the example set by leadership. In the literature, this is described as the interaction between "organizational clarity" and "psychological safety" (Flin et al., 2006; Singer et al., 2009). The results of our study emphasize that these elements are key not only for error prevention but also for employee engagement in safety improvement processes.

Demographic factors have a limited but significant impact—especially age. Although professional affiliation (nurse vs. doctor/other) did not affect the assessment of safety culture, age was significant in several blocks. Older employees more frequently reported emotional discomfort, lower trust in organizational systems, and less agreement with statements about open communication. This confirms findings from other studies (Alkorashy & Mohamed, 2020; Bressan et al., 2019), which state that with age, professional fatigue and caution increase. Such information is important for developing targeted interventions by age group to ensure consistent strengthening of the safety culture.

The structure and content of the questionnaire can justifiably be applied as a national instrument for assessing patient safety culture.

Considering the psychometric results, the logic of the factor structure, the correlational relationships, and the consistency of respondents' answers, it can be stated that the developed instrument is suitable for use not only for scientific purposes but also in everyday healthcare practice. It allows for systematically identifying organizational strengths and weaknesses, planning interventions, monitoring changes, and strengthening patient safety policy at the national level.

PRACTICAL RECOMMENDATIONS

Based on the results of the conducted scientific study, the patient safety culture in nursing hospitals is characterized by a complex structure and depends on organizational, psychosocial, and technological factors. These recommendations are intended for healthcare institution management, health policy makers, and patient safety specialists seeking to strengthen the safety culture in the long-term care sector.

Improve the incident reporting system and promote a culture of openness

Safety culture begins with the ability to report errors and adverse events safely. The study revealed that some employees still feel unsafe reporting errors, especially from an emotional perspective. International literature (Flin et al., 2006; Sammer et al., 2021) confirms that clear reporting procedures and feedback are essential elements promoting organizational learning.

Recommendations:

- Create anonymous and easily accessible channels for reporting incidents.
- Formalize feedback procedures after each report.
- Periodically organize reflection meetings where reported cases are analyzed as learning sources.

Develop leadership in patient safety among managers

Leadership support is one of the strongest factors influencing employees' attitudes toward safety culture (Vogus & Sutcliffe, 2007). The study found that where managers set a personal example, employees are more likely to trust the system.

Recommendations:

- Organize educational programs for department heads on visible leadership, emotional support, and error analysis.
- Develop a system for evaluating leadership competencies.
- Implement the practice of managerial participation in reflective meetings.

Integrate psychological support and monitor employee emotional well-being

Employee stress and emotional exhaustion are associated with error risk (Montgomery et al., 2015; Zhao et al., 2021). The study showed that emotional support after incidents is insufficiently developed, especially among older employees.

Recommendations:

- Establish psychological support services or an emotional help hotline.
- Include monitoring of employee emotional well-being in the organization's annual performance evaluations.
- Conduct structured "debriefing" meetings after each serious incident.

Individualize technology implementation and strengthen digital skills

Technology use was one of the best-rated areas, but differences were observed between age groups (Topol, 2021; Khairat et al., 2018).

Recommendations:

- Organize digital literacy courses differentiated by employees' technological readiness.
- Involve employees themselves in the system implementation processes.
- Address the "alert fatigue" issue by optimizing information systems.

Strengthen qualification enhancement measures in the field of patient safety

The study revealed a close connection between training and a positive attitude toward safety culture (WHO, 2011; Bondevik et al., 2017).

Recommendations:

- Conduct regular training for all employees, including not only technical but also psychosocial aspects.
- Develop mentoring programs for new employees.
- Integrate patient safety topics into professional development plans.

Monitor and evaluate the evolution of patient safety culture

Safety culture should be regularly evaluated using validated instruments (Singer et al., 2009).

Recommendations:

- Use the validated questionnaire from this study for annual analysis.
- Develop individual improvement guidelines for each department.
- Publish results to employees to encourage transparency.

STUDY LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Study Limitations

Sample size and representativeness

Although employees from various nursing hospitals participated in the study, the sample was not large enough to reflect the views of all employees in the Lithuanian nursing sector. This limits the generalizability of the results on a national scale. The lack of representativeness can be considered a typical challenge in similar patient safety studies (Sorra et al., 2016).

Instrument used and its adaptation

The questionnaire was adapted to a specific context, but some dimensions (e.g., psychological response or evaluation of technology) are not widely validated in international instruments. Although factor analysis confirmed construct validity, some concepts may have been understood differently due to contextual or cultural factors (Bressan et al., 2019).

Data collection method

The study relied on self-completion of the questionnaire, so we cannot rule out the social desirability effect (respondents may have answered as they believe they "should," rather than reflecting reality). Furthermore, the survey method does not allow for in-depth exploration of employee motivations or emotional burden – for this, qualitative methods are needed (O'Donovan et al., 2022).

Timing of the study

The study was conducted at a single point in time, so potential changes occurring after the COVID-19 pandemic or institutional restructuring were not assessed. This is important because patient safety culture is a dynamic phenomenon that changes over time (Singer et al., 2009).

Future Research Directions

Expand the sample on a national scale

It is recommended to conduct a larger-scale study, covering different types of nursing institutions across Lithuania. This would allow for a better understanding of regional differences, comparisons between public and private institutions, and evaluation of how patient safety culture depends on organizational structure or funding sources.

Combine quantitative and qualitative methods

Future studies should include in-depth interviews, focus groups, or ethnographic observations to better understand employee experiences, aspects of trust, and emotional resilience (Wu et al., 2020). This would help uncover reasons why some areas of the safety culture are rated lower.

Analyze the perspectives of patients and their relatives

To date, most patient safety studies focus on staff opinions, but it is necessary to investigate the experiences of patients and their families – especially in nursing hospitals, where patients often depend on long-term care. Such a multi-perspective approach would improve the comprehensiveness of safety culture evaluation (Flin et al., 2006).

Monitor changes after interventions

It is recommended to conduct repeated (longitudinal) studies after implemented changes – e.g., training programs, feedback mechanisms, or technological innovations. This would allow for the evaluation of intervention effectiveness and contribute to evidence-based development of patient safety culture (Hall et al., 2016).

Integrate psychological and organizational aspects

Future studies should aim to combine patient safety research with studies on emotional intelligence, stress management, leadership, and employee well-being. Such interdisciplinary research would help better understand how human factors shape a safe culture (Montgomery et al., 2015; Greenhalgh et al., 2017).

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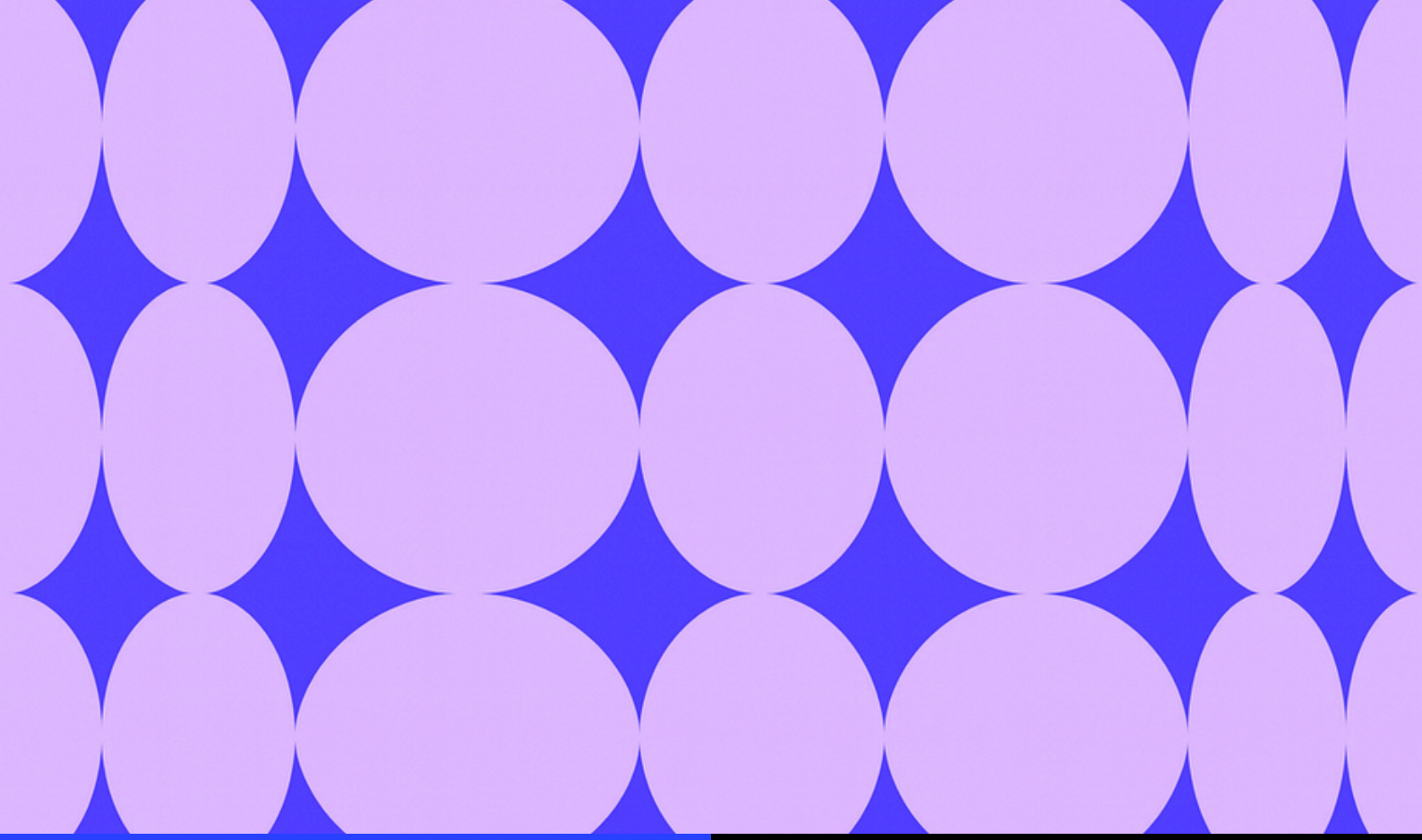

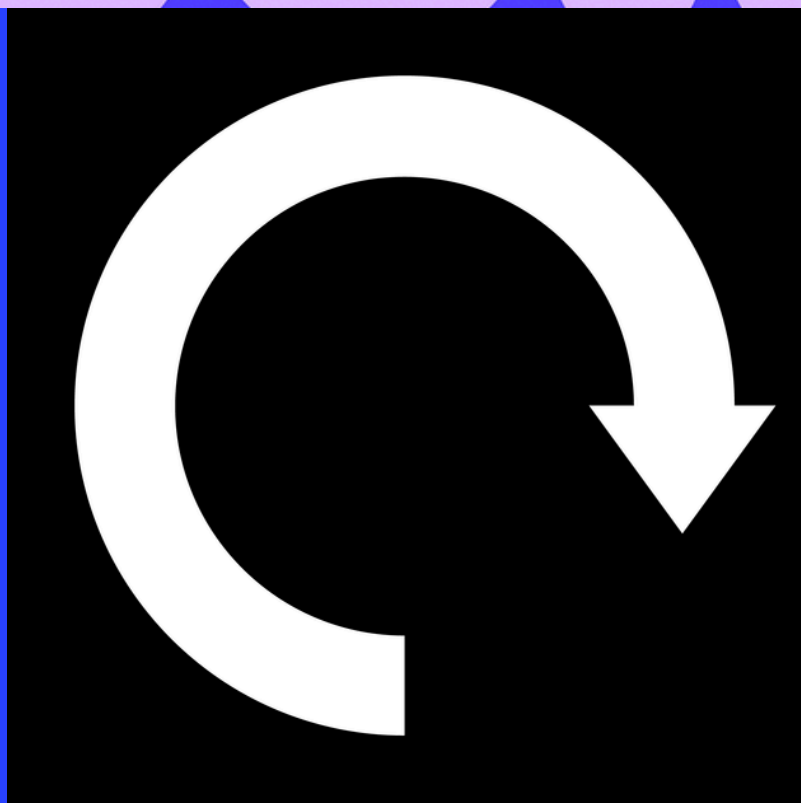

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