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PRELIMINARY ERGONOMIC ANALYSIS OF HEALTHCARE PROFESSIONALS' WORKING CONDITIONS IN A BRAZILIAN UNIVERSITY HOSPITAL EMERGENCY UNIT

ANÁLISE ERGONÔMICA PRELIMINAR DAS CONDIÇÕES DE TRABALHO DE PROFISSIONAIS DE SAÚDE EM UMA UNIDADE DE EMERGÊNCIA DE UM HOSPITAL UNIVERSITÁRIO BRASILEIRO

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ABSTRACT: This study analyzed the working conditions of healthcare professionals in the emergency and urgency unit of a Brazilian University Hospital using a preliminary ergonomic analysis. The method comprised two tools: the Ergonomic Checklist and the Self-Assessment Tool Ergonomics/Human Factors questionnaire. These instruments facilitated the assessment of physical, cognitive, and organizational demands within the occupational environment. The findings highlighted critical ergonomic issues, such as inadequate furniture, excessive noise, and poor lighting conditions. A high level of physical strain was noted due to the intense work pace and constant movement required, while cognitive demands were marked by time pressure, mental overload, and emotional stress. Organizational deficiencies, particularly those related to communication, were also identified as factors compromising task execution and workplace safety. The study underscores the need for ergonomic interventions, including workload adjustments, planned breaks, environmental adaptations, psychological support programs, and improved internal communication strategies. These measures aim to reduce physical and cognitive strain, promote healthier and safer working conditions, and improve the quality of patient care. Moreover, the proposed method can be systematically applied to other hospital units to determine whether the identified demands are specific to the studied unit or indicative of broader systemic challenges within the hospital environment.

KEYWORDS: Hospital environment; Healthcare professionals; Preliminary ergonomic analysis; Occupational health; Occupational safety.

RESUMO: Este estudo analisou as condições de trabalho de profissionais de saúde na unidade de emergência e urgência de um hospital universitário brasileiro, utilizando uma análise ergonômica preliminar. O método compreendeu duas ferramentas: o Checklist Ergonômico e o questionário de Autoavaliação em Ergonomia/Fatores Humanos. Esses instrumentos facilitaram a avaliação das demandas físicas, cognitivas e organizacionais no ambiente de trabalho. Os resultados destacaram problemas ergonômicos críticos, como mobiliário inadequado, ruído excessivo e condições de iluminação precárias. Observou-se um alto nível de esforço físico devido ao ritmo intenso de trabalho e à movimentação constante exigida, enquanto as demandas cognitivas foram marcadas por pressão de tempo, sobrecarga mental e estresse emocional. Deficiências organizacionais, particularmente aquelas relacionadas à comunicação, também foram identificadas como fatores que comprometem a execução das tarefas e a segurança no trabalho. O estudo ressalta a necessidade de intervenções ergonômicas, incluindo ajustes na carga de trabalho, pausas programadas, adaptações ambientais, programas de apoio psicológico e aprimoramento das estratégias de comunicação interna. Essas medidas visam reduzir o esforço físico e cognitivo, promover condições de trabalho mais saudáveis e seguras e melhorar a qualidade da assistência ao paciente. Além disso, o método proposto pode ser aplicado sistematicamente a outras unidades hospitalares para determinar se as demandas identificadas são específicas da unidade estudada ou indicativas de desafios sistêmicos mais amplos no ambiente hospitalar.

PALAVRAS-CHAVE: Ambiente hospitalar; Profissionais de saúde; Análise ergonômica preliminar; Saúde ocupacional; Segurança do trabalho.

1. INTRODUCTION

Quality and safety continue to pose challenges for hospital managers who are tasked with delivering specialized and efficient care in complex and demanding environments. Hospital settings are subject to significant organizational pressures related to workload, such as an increasing number of consultations, acute hospitalizations, and simultaneously treating multiple critically ill patients, alongside shortages of equipment, supplies, and personnel. These factors require healthcare workers to continually adapt to challenging working conditions (Wiig; Fahlbruch, 2019; Sanford *et al.*, 2022).

In emergency hospital settings, these challenges are intensified by the unpredictability and urgency of cases, extended working hours, and a lack of qualified personnel, all of which exacerbate the stress experienced by healthcare professionals (Schwab *et al*., 2016). Professionals in this field face extreme cognitive and emotional demands daily, as they must make rapid, precise decisions under high-pressure situations to save lives. This reality exposes them to physical, biological, chemical, ergonomic, and psychosocial hazards that directly affect their health and well-being (Mondal; Ray, 2023). Moreover, workplace violence in hospitals has increased significantly, particularly in emergency departments, where incidents of aggression are becoming more frequent (Meng *et al*., 2025).

The unpredictability of these factors forces hospital managers to continuously readjust plans and make decisions with limited information, identifying alternative courses of action under uncertain conditions (Hybinett; Härenstam; Ekstedt, 2021). This situation underscores the need for effective risk management strategies to protect both patients and healthcare professionals.

In Brazil, Regulatory Standard 01 (NR01) mandates that, beginning in 2025, organizations must incorporate the identification of psychosocial risk factors into their occupational risk management strategies, alongside addressing physical, chemical, and biological hazards, accident risks, and ergonomic factors (Brasil, 2024). It promotes a comprehensive and preventive approach to worker safety and health, encompassing physical aspects (bodily, physiological, and biomechanical job demands), cognitive aspects (mental workload, problem-solving, and learning), and affective aspects (emotional demands, feelings, and mood) (Pádua; Ferreira, 2020; Maciel *et al*., 2020).

Under NR01, working conditions must also comply with Regulatory Standard 17 (NR17) on ergonomics, which establishes guidelines for adapting work environments to the psychophysiological characteristics of workers to enhance comfort, safety, health, and performance (Brasil, 2022; 2024). Ergonomics provides valuable insights for occupational safety studies (Falzon, 2015), particularly in understanding human interactions with work systems, designing efficient workspaces, and evaluating the impact of processes and organizational structures on job performance (Diniz; Lima; Simões, 2024). This approach aligns with contemporary safety analyses, which highlight that workplace safety vulnerabilities often stem from human and organizational factors (Gilbert, 2020).

Keebler *et al.* (2022) posited that the future of the healthcare sector is poised to be profoundly influenced by demographic aging, the growing utilization of telemedicine, and an increased focus on patient-centered care and satisfaction. These trends highlight the need to integrate ergonomics to bolster the safety and well-being of patients and healthcare professionals. Such integration encompasses a spectrum of strategies, including designing training programs aimed at reducing patient mortality and fostering safe attitudes and practices, strengthening psychological safety within teams, addressing medical errors, creating safer medical tools and devices, and configuring workspaces that support professional performance and safety.

Werner *et al*. (2016) identified the human factors and ergonomics approach as pivotal in improving care transitions within healthcare settings by facilitating a contextual and thorough analysis of associated risks. This method is vital for developing effective, practical, and enduring interventions and underpins risk management in the healthcare industry, which experiences among the highest rates of both accidental and non-accidental absences in Brazil (Brasil, 2024).

In healthcare systems, transdisciplinary teams comprising engineers, physicians, nurses, and other health professionals employ ergonomic methods and tools to examine work environments, devise and evaluate solutions, and improve both the quality of patient care and worker safety. This collaborative effort is crucial for the sustainability of the healthcare system (Fray *et al*., 2015; Podtschaske *et al*., 2018). Research has been extensive in identifying risks inherent in hospital work activities. Vinstrup *et al*. (2024) mapped the physical workload associated with patient transfer tasks, monitoring spinal muscle activity during these tasks with the goal of mitigating the risk of work-related musculoskeletal disorders and enhancing job satisfaction.

Cotrim and Simões (2010) assessed the risk of work-related musculoskeletal

disorders among nurses, stressing the necessity of integrating various assessment methods to garner results that accurately portray the real demands of the work environment. Similarly, Alruwaili *et al*. (2023) explored the prevalence of work-related musculoskeletal disorders among healthcare professionals, elucidating their widespread incidence and detrimental effects on both quality of life and patient care efficiency.

Kurniawidjaja *et al.* (2014) evaluated risk factors for lower back issues, determining that the physical demands of nurses' work shifts in conjunction with workplace conditions can lead to the development of low back pain. Zamani, Joy, and Abbey (2023) investigated how environmental design features affect healthcare staff's safety perceptions within complex hospital systems. This research, engaging clinical and non-clinical healthcare professionals, sought to critically evaluate healthcare environments to identify elements that could potentially compromise both staff safety and patient satisfaction.

Rosso *et al.* (2016) conducted an ergonomic work analysis using a comprehensive toolset to inspect working conditions. The initial steps involved identifying potential problems, followed by selecting tools that enabled a detailed examination of these issues. Sönmez, Yilmaz, and Karabay (2025) assessed psychosocial and ergonomic risks in hospital settings, utilizing validated scales to measure physical and mental health, absenteeism, work performance, ergonomic conditions, job satisfaction, and perceived psychological safety among professionals. Their findings emphasized that psychological safety and ergonomic conditions play crucial roles in fostering safe environments for both patients and healthcare workers, thereby enhancing overall hospital performance.

Along the same lines, Silva *et al.* (2025) employed the System Analysis Tool to appraise ergonomic conditions in a hospital emergency and urgency unit, illustrating how a structured, systems-oriented approach can expose the interplay between physical, organizational, and human factors that underlie occupational risks in such settings.

The studies reviewed reveal a gap in the application of ergonomic tools and methods for assessing risks associated with work routines, including accidental, ergonomic, or psychosocial risks. Integrated approaches are essential for gaining a comprehensive understanding of the work context, as they enable a more precise identification and interpretation of risks in the hospital environment, thereby ensuring the safety of healthcare professionals (Lovely *et al.*, 1995). Zamani, Joy, and Abbey (2023) highlighted the growing need for research that deepens our understanding of healthcare professionals' safety perceptions and the role of the physical environment in promoting safer hospital settings.

In a previous study conducted by members of the present research team, Silva et al. (2025) investigated the ergonomic conditions of the same university hospital emergency unit, using data obtained through the Ergonomic Checklist and SATEH questionnaire to support the application of the System Analysis Tool (SAT) methodology, focusing on identifying systemic ergonomic problems and proposing improvement strategies. Building upon this previous investigation, the present study provides a complementary and more detailed preliminary ergonomic analysis (PEA) of healthcare professionals' working conditions. The PEA enables a systematic assessment of the nature and demands of work activities, contributing to the identification of potential ergonomic and psychosocial risks and

supporting the planning of preventive measures (Brasil, 2022). By examining the results of both instruments in greater detail, this study seeks to deepen the understanding of physical, cognitive, and organizational demands in the hospital environment, providing additional evidence to support occupational health and safety improvement strategies.

The PEA enables one to combine various techniques to evaluate working conditions, allowing for adjustments based on the specific characteristics of each occupational setting. Its implementation was outlined in NR17 for instances where work must be adapted to the psychophysiological characteristics of professionals due to the nature and content of the activities. The PEA uses qualitative, semi-quantitative, and quantitative approaches, or a combination of these methods, particularly during the hazard identification phase of the occupational risk management process.

Given these considerations, this study aimed to analyze the working conditions of healthcare professionals in the emergency and urgency unit of a university hospital in Brazil through a PEA. The analysis developed in our study combined an ergonomic checklist based on NR17 with the Self-Assessment Tool for Ergonomics/Human Factors (SATEH) questionnaire, adapted from Kragt and Van Avort (1995). The checklist facilitated the preliminary identification of potential ergonomic demands in the work environment, while the SATEH complemented this analysis by capturing workers' perceptions across three ergonomic domains (i.e., physical, cognitive, and organizational), providing a more in-depth understanding of the critical issues previously identified using the checklist.

The approach proposed by this study represents an opportunity to broaden the application of these tools, which are seldom used in scientific research, demonstrating their potential to contribute to ergonomic analysis and the enhancement of working conditions in environments characterized by high variability, time pressure, and significant health and safety risks to both professionals and patients.

2. METHODS

This research was conducted via field surveys at the emergency and urgency unit of a university hospital. It employed two tools for the PEA of healthcare professionals' working conditions: the Ergonomic Checklist and the SATEH questionnaire. The two datasets were collected within the same broader investigation described by Silva et al. (2025); this article provides a more detailed account of the checklist and SATEH responses.

The Ergonomic Checklist, based on NR17 on Ergonomics (Brasil, 2022), was developed by the authors to collect sociodemographic data and assess workers' perceptions of the work environment. This data encompassed age, gender, work shift, and occupation. In terms of perceptions of the work environment, participants evaluated nine aspects: physical environment, layout, workflow, furniture/equipment, environmental lighting, environmental noise, temperature, communication, and interpersonal relationships. Each aspect offered three response options, depicting various characteristics and working conditions. The checklist was reviewed by a specialist in occupational safety and ergonomics, as reported by Silva et al. (2025). This expert appraisal should not be confused

with a formal psychometric validation.

The checklist aimed to preliminarily characterize the work environment from an ergonomic perspective. Employed with an exploratory and descriptive purpose, it sought to identify potential inadequacies in the physical, organizational, and relational aspects of the hospital setting. Its application facilitated the rapid and effective identification of critical ergonomic issues, laying the groundwork for the subsequent stages of the study. The findings enabled the structured application of a second instrument, geared towards a more detailed investigation of the ergonomic aspects deemed most relevant or critical.

Data collection occurred between September 2022 and January 2023, involving 80 workers, which represented two-thirds of the 120 healthcare professionals in the emergency unit. The target population comprised all health professionals (n = 120) working in the unit. A simple random sampling strategy was adopted, randomly selecting participants from the specified target population (Gil, 2002). Inclusion criteria included direct work in the emergency unit, presence in the unit throughout the data collection period, and voluntary written informed consent. Exclusion criteria were absence due to medical, maternity, or vacation reasons.

Of the 80 health professionals sampled, 62 (77.5%) were women and 18 (22.5%) were men, reflecting the typical demographic profile of hospital health workers and corroborating previous studies indicating a female predominance in this sector (Costa *et al*., 2013; Sampaio *et al.*, 2010; Filus *et al.*, 2018; Passos *et al.*, 2022). Concerning age distribution, 69 participants (86.25%) were under 50 years old, whereas 11 (13.75%) were aged ≥ 50.

The emergency unit's work organization followed a 12-hour shift system, split into two periods: 7:00 am to 7:00 pm and 7:00 pm to 7:00 am, with exceptions for professionals on 6-hour daily shifts. Among the respondents, 41.25% worked night shifts, and 58.75% worked day shifts. Occupational distribution included nurses (23.75%), nursing technicians (33.75%), physicians (5%), psychologists (1.25%), and other professionals (36.25%), the latter comprising receptionists, security personnel, medical interns, pharmacists, pharmacy technicians, and secretarial technicians.

The SATEH questionnaire was then used to complement the ergonomic work situation assessments. It was developed in the 1990s by the industrial department of Philips to assist organizations in evaluating the adequacy of production systems according to user needs. As an ergonomic health and safety self-assessment tool, SATEH was initially validated through studies at Philips factories in Belgium and the Netherlands (Stoppels, 1995).

Based on a structured questionnaire, SATEH assesses the alignment between the work environment and workers, identifying strengths, weaknesses, and areas for improvement (Kragt *et al*., 2001). It enables workers to report their perceptions of the work environment in three domains: physical, cognitive, and organizational, while also gathering sociodemographic data. The physical domain examines physical workload and environmental factors; the cognitive domain addresses mental workload; and the organizational domain reviews tasks and communication. The hospital-context version used

here contains 39 scored items covering those domains, with their wording provided in Supplementary Material 1. No new construct-validity or test–retest analysis was performed as part of the present descriptive study.

The questionnaire categorizes each aspect into a set of criteria evaluated by workers using a five-point Likert scale, which ranges from 1 “not at all” to 5 “extremely.” This facilitates a quantitative analysis of the environment’s physical, cognitive, and organizational components. The collected sociodemographic data included age, gender, work shift, length of time working in healthcare, length of time working in the emergency unit, and occupation, employing the same sampling strategy and criteria as the Ergonomic Checklist.

The SATEH was applied in March 2023, covering a sample of 40 individuals out of the 120 health professionals in the unit, being 37 (92.5%) women and 3 (7.5%) men. Regarding the age distribution, 36 participants (90%) were under 50 years old, while 4 (10%) were ≥50 years old. Participants’ occupations varied, including nurses (17.5%), nursing technicians (37.5%), doctors (15%), nutritionists (5%), and others (25%). This last category included receptionists, security guards, medical residents, pharmacists, and pharmaceutical technicians.

The difference in sample size between the two instruments is attributed to methodological and operational factors. The Ergonomic Checklist, a shorter, more direct, and exploratory tool, was more readily accepted by professionals, allowing for broader sample coverage. Conversely, the SATEH, due to its more extensive and demanding nature, required more time and concentration to complete, resulting in lower participation. This limitation is particularly relevant in the context of the emergency unit, where professionals face an intense, dynamic, and unpredictable routine, with limited time during the workday to engage in research activities. Additionally, the short data collection period, as defined by the research schedule, also impacted the final number of responses.

Cronbach’s alpha was calculated to estimate the internal consistency of the analyzed SATEH items, yielding a value of $\alpha = 0.712$ based on the available complete-item response matrix (Supplementary Material 2). This coefficient provides an estimate of the degree of interrelatedness among the analyzed items in the study sample. However, Cronbach’s alpha alone does not establish the instrument’s validity, unidimensionality, or temporal stability. Therefore, its interpretation was restricted to the internal consistency observed in the analyzed dataset.

The data were analyzed using descriptive statistics, including absolute and relative frequencies, mean scores, and the distribution of responses across the Likert scale. Depending on the variable and the analytical approach, percentages were calculated either from the frequency of responses or from the relative distribution of aggregated Likert scores. In the latter case, percentages represent the proportional contribution of each response category to the aggregated scores rather than the proportion of participants selecting that category. These distinctions were considered in the presentation and interpretation of the results, with the corresponding analytical approach identified where applicable.

3. RESULTS

3.1 ERGONOMIC CHECKLIST

The Ergonomic Checklist questions were classified into three main categories: (i) physical space, addressing the physical environment, layout, workflow, and equipment; (ii) environmental variables, focusing on lighting, noise, and temperature; and (iii) organizational aspects, examining communication and interpersonal relationships (Figure 1).

Factors related to the physical space received predominantly negative evaluations from participants. Only 5% of healthcare professionals considered the physical environment to be adequate. Similar negative ratings were given to aspects such as furniture/equipment, layout, and workflow, with a mere 7.5% of workers finding the furniture and equipment satisfactory.

Frequent reports included a lack of equipment, deteriorated or damaged devices, and inadequate maintenance, particularly stretchers, chairs, wheelchairs, and mechanical ventilators. Notably, four out of the six mechanical ventilators designated for patients with respiratory difficulties were non-functional and had not been repaired. This highlights significant institutional challenges in both preventive and corrective maintenance, emphasizing the necessity for ongoing investments in infrastructure modernization.

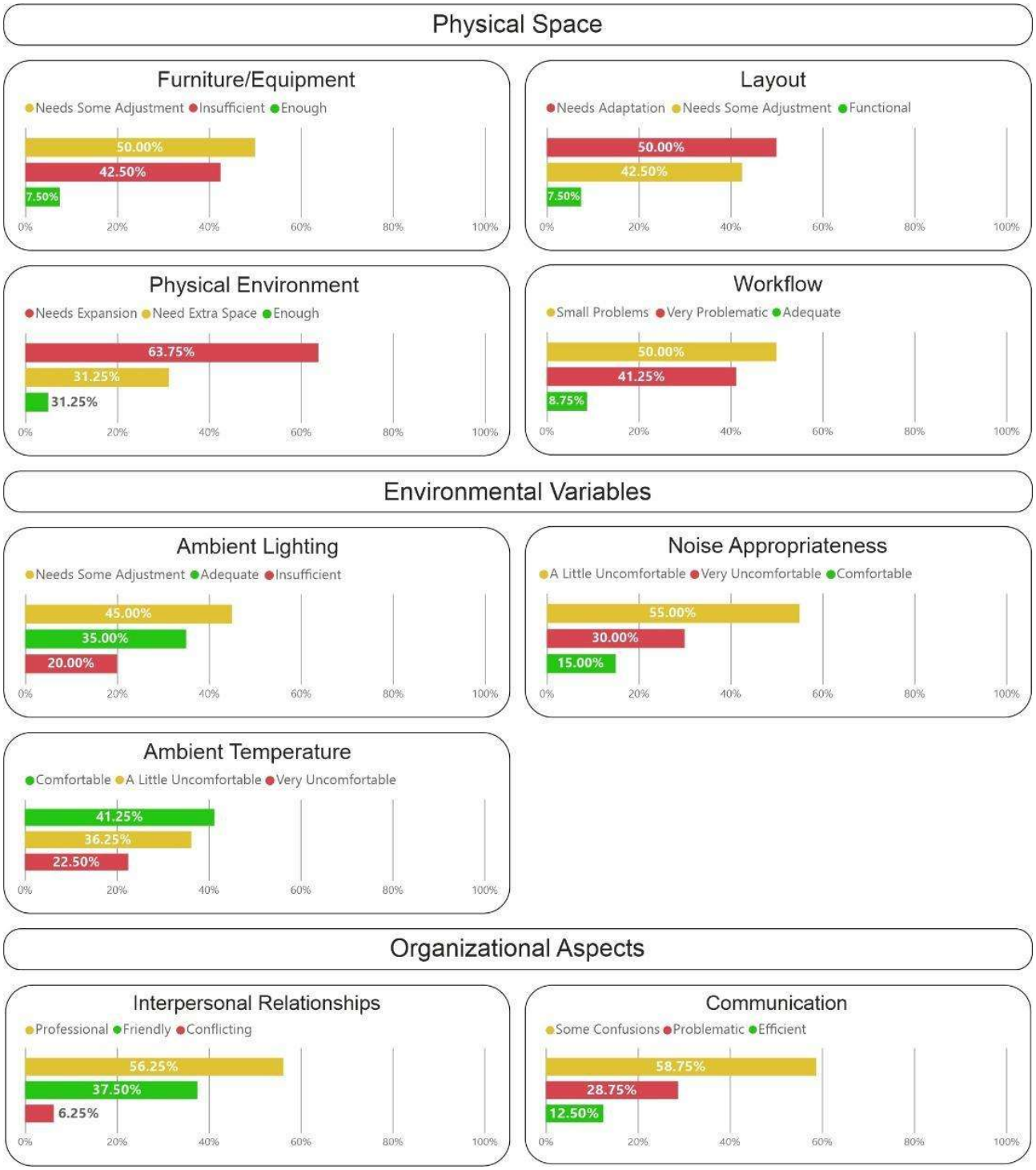
The results for the environmental variables category indicated noise as a major source of discomfort for workers. Over half of the participants (55%) rated noise as “somewhat uncomfortable,” while 30% classified it as “very uncomfortable.”

Regarding ambient lighting, 35% of workers stated that it “needs some adjustment,” and 20% considered it “insufficient.” In contrast, ambient temperature was predominantly perceived positively, with 41.25% of workers rating it as “comfortable.” However, a significant proportion found the temperature “somewhat uncomfortable” (36.25%) or “very uncomfortable” (22.5%).

Interpersonal relationships in the workplace appeared to be largely positive. A majority of respondents (56.25%) described their interactions as professional, while 37.5% characterized them as friendly, suggesting a collaborative atmosphere. Nonetheless, 6.25% reported conflicting relationships and, despite being a relatively low percentage, it may signal specific areas requiring attention.

Communication was identified as a critical issue. Only 12.5% of respondents rated it as “efficient,” while 58.75% indicated that communication “causes some confusion,” and 28.75% considered it “problematic.” These findings suggest significant communication barriers that may compromise process efficiency and professional understanding.

Figure 1 – Results from the application of the Ergonomic Checklist.



Source: Authors, 2025.

3.2 SATEH QUESTIONNAIRE

The SATEH results were divided into three categories: (i) physical domain, which covers the assessment of physical workload and environmental factors; (ii) cognitive domain, focusing on the evaluation of mental workload; and (iii) organizational domain, encompassing task analysis and communication.

The analysis of the physical domain reveals that tasks in the emergency unit are highly dynamic, necessitating significant movement from professionals to execute tasks. This demonstrates an inverse relationship between dynamic and static work evaluations, with 75% of participants assigning scores of 1 or 2 for static work, whereas 80% rated dynamic work with a score of 4 or 5.

Various variations in work positions, such as bending the trunk or stretching during activities, were also observed. A total of 67.5% of professionals assigned a score of 4 or 5, further emphasizing the dynamic nature of their tasks. Moreover, energy expenditure and perceived fatigue showed parallel patterns of high ratings throughout the work shift, with values of 69.23% and 77.5%, respectively. These descriptive percentages do not constitute a correlation test. Lastly, the original chart reported 89.7% in the higher work-pace rating categories (4 or 5). The overall average work pace score was 4.28 on the Likert scale, underscoring the high-intensity demands within the unit.

Three key aspects of the environmental factors were identified: two negative and one positive. These factors were environmental noise adequacy, perceived environmental comfort, and cleaning services. Approximately 50% of the participants assessed environmental noise adequacy negatively, rating it 1 or 2. Similarly, 50% of professionals rated perceived environmental comfort as inadequate, assigning it a score of 1 or 2. Figure 2 presents the results of the physical domain analysis.

The cognitive domain evaluates mental workload by considering decision-making, the variability between intellectual and physical activities, time pressure, required concentration levels, stress, and attention demands. The data indicate that decision-making imposes a significant mental workload, with score-aggregated shares of 42.68% for rating “5” and 43.90% for rating “4”, demonstrating substantial cognitive effort throughout the workday. The difference between intellectual and physical activities was also noteworthy, with 52.5% of workers perceiving it as significant. Time pressure was rated as high, with 40% of workers rating it as “5” and another 40% as “4,” reflecting the demanding nature of work in emergency and urgency units. Similarly, with regards to the level of attention required, 45% of respondents assigned a “5” and 42.5% a “4.” The necessary degree of focus showed a similar trend, with an average rating of 4.53. Stress levels were also high, with an average of 4.33, indicating a high perceived stress level among workers.

Figure 2 – Results from the application of the SATEH questionnaire in the physical domain.



Source: Authors, 2025.

Figure 3 presents the results of the cognitive domain analysis. The analysis of task execution within the organizational domain covered daily operations, functional versatility, skill variability, and work pace. The perception of daily task execution was largely positive, with aggregated chart values of 57.89% for response “4” and 19.74% for response “5”, which should not be interpreted as verified participant frequencies. This indicates a high level of satisfaction with their ability to complete planned activities. Additionally, the average rating for work speed was 4.10 on a 5-point scale, suggesting that employees consider task execution to be efficient and within acceptable timeframes.

Figure 3 – Results from the application of the SATEH questionnaire in the cognitive domain.

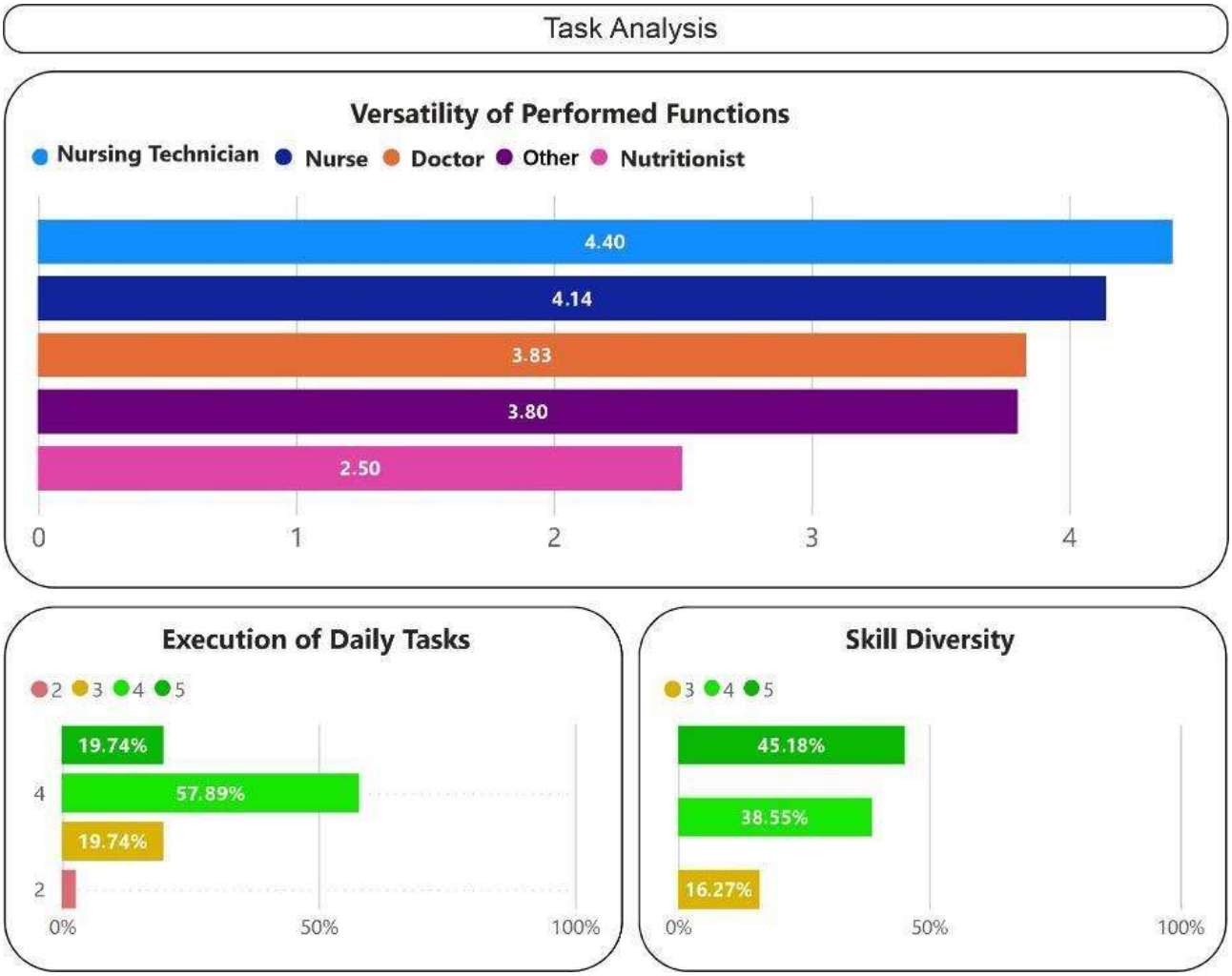


Source: Authors, 2025.

The versatility showed variation across professional groups, indicating that some groups experience greater flexibility in their roles, while others view their roles as more specialized or restricted. This variation may be due to differences in job requirements and flexibility across different professions. The diversity of skills was also seen positively, with 45.18% for category “5” and 38.55% for category “4” as aggregated percentages, underscoring the varied skill sets needed in emergency and urgency units.

The analysis of organizational communication, also assessed within the organizational domain, focusing on the effectiveness of communication channels. The findings indicated a mostly negative perception, with 55% of professionals rating the communication channels a “2” or “1,” pointing to a significant deficiency in adequate tools for effective information exchange. The overall average score was 2.55 on a 5-point scale, indicating widespread concern over the adequacy of communication channels to meet workplace demands. These reports suggest the need to examine possible implications for efficiency and safety; neither outcome was measured directly in this study. Figure 4 presents the results of the organizational domain analysis.

Figure 4 – Results from the application of the SATEH questionnaire in the organizational domain.

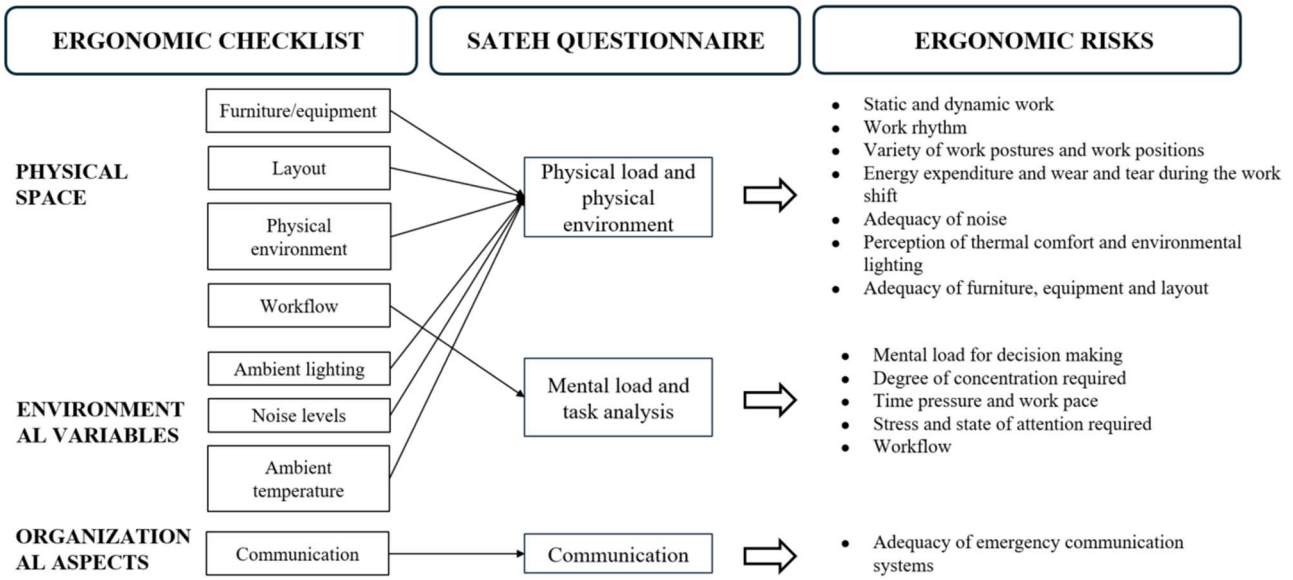


Source: Authors, 2025.

4. DISCUSSION

The findings identify perceived weaknesses in the emergency unit's physical environment; potential implications for patient safety require further direct investigation. Figure 5 delineates the elements that were initially identified via an ergonomic checklist and subsequently explored through the SATEH questionnaire. This comprehensive analysis culminated in the identification of primary ergonomic risks in the emergency and urgency unit. These include physical and cognitive overload, inadequacies in the physical environment, and communication systems failures.

Figure 5 – Ergonomic risks identified in the emergency and urgency unit through an integrated analysis.



Source: Authors, 2025.

Professionals assessed factors such as the physical environment, furniture/equipment, layout, and workflow, all of which received notably low ratings, underscoring the inadequacy of the workspace. Pompermaier *et al.* (2023) noted that hospital emergency environments frequently exhibit deficiencies in physical structure, environmental quality, layout, process flow, and communication between professionals and patients. These issues are particularly concerning, given that a well-designed physical space is fundamental for the efficiency and safety of hospital operations, although the present survey did not establish whether the reported inadequacies led to clinical errors or health outcomes.

Regarding the analysis of environmental variables, noise emerged as a critical factor that can negatively affect the well-being and concentration of professionals, compromising efficiency and safety in performing tasks. In emergency settings, noise can disrupt activities, impede communication, induce stress, and lead to issues such as sleep disorders, aggression, reduced performance, memory decline, occupational burnout, and intentions to resign (Folsher *et al*., 2015; Tang *et al*., 2024). Professionals particularly sensitive to noise have reported higher levels of physical complaints and reduced productivity (Welch *et al*., 2022).

Moreover, factors such as average noise levels, peak sounds, equipment alarms, staff conversations, cleaning activities, and overhead paging have been shown to deteriorate well-being and adversely affect patient sleep quality (Yang; Zhou, 2024). In contrast, behavioral, acoustic, and technical interventions have demonstrated effectiveness in promoting staff well-being, increasing productivity, and reducing noise perception, physical complaints, and observable behavioral changes among professionals and patients (Hendriks *et al*., 2024).

In the analysis of lighting, professionals perceived it as insufficient or in need of adjustments to prevent interference with tasks requiring high visual precision. Such adjustments may support task performance, but their effects on errors or safety were not measured here. While temperature was viewed as less critical, adjustments to satisfy the diverse thermal needs of professionals could ensure greater comfort during their workday.

Soto-Castellón *et al.* (2024) suggested that environmental conditions, especially noise and lighting, increase the mental workload of professionals in hospital emergency rooms. Conversely, Schenkel *et al.* (2024) asserted that personalizing sensory and motor spaces can enhance the well-being of professionals in hospital emergency and urgency units, improving familiarity with the environment and organizational performance. Additionally, Gharaveis *et al.* (2019) highlighted that the design of the physical environment not only impacts team well-being but also facilitates immediate, efficient, and effective patient care.

Bosh *et al.* (2023) described how stressors in emergency departments, contributing to burnout, reduced productivity, lower care quality, increased medical errors, and higher rates of absenteeism and turnover, can be mitigated by adapting the physical environment to promote the well-being of healthcare professionals. Such adjustments could also benefit organizational aspects, such as the flow of processes and activities. Emergency unit activities, being predominantly dynamic, require intense movement for task execution and involve excessive cognitive load for decision-making and rapid actions, amplifying the stress perceived by professionals.

The multifaceted nature of hospital demands, combined with task overload and the rapid pace required for daily activities, may be associated with safety risks in the literature, but the present study did not measure error occurrence. Monfaredi *et al.* (2021) stated that the most common errors in emergency departments pertain to actions, verifications, selections, and communication.

Communication emerged as a significant issue in the analysis of organizational aspects, with many respondents identifying it as a source of confusion and problems. This points to substantial barriers in information exchange, attributable to either inefficient communication channels or a lack of adequate training. Whether such perceived problems affected continuity of care or errors in this unit remains to be established.

Healthcare professionals who also engage in research often perceive communication as a relatively isolated exchange of information. However, viewing communication as a linear process overlooks the specific contexts that may compromise both patient and professional safety (Nugus *et al*., 2017). Therefore, effective communication is essential for maintaining trust between professionals and patients, managing information flow, and responding efficiently to crises (Ekayanthi *et al*., 2024). It should be explored at both individual and managerial levels to identify barriers impacting tasks, professional relationships, and organizational trust (Anand *et al*., 2024).

A recent report by the Great People Ecosystem (2025) on people management trends revealed that internal communication was the main challenge in the job market in 2024. Specifically, in the healthcare sector, internal communication was ranked second, only

behind mental health issues. This highlights a challenge that must be addressed to foster a more efficient, collaborative, and healthy work environment. Investing in effective internal communication strategies is crucial in healthcare, where accurate and swift communication is essential for patient safety. Such strategies should include the adoption of technologies that facilitate information exchange and the promotion of an organizational culture that prioritizes continuous dialogue. Regular training on interpersonal communication and the implementation of standardized information exchange protocols are also advisable. Additionally, introducing technological solutions, such as integrated electronic medical records and secure communication applications among professionals, can help mitigate inconsistencies and enhance team efficiency.

This research underscores the nature of professional activities in hospital emergency and urgency units, which are conducted in a highly dynamic and multifaceted environment (Nunes; Vergara, 2024). These tasks not only require the execution of multiple simultaneous functions—such as rapid responses to critical situations, decision-making under pressure, and continuous adaptation to changing patient conditions (Alves *et al.*, 2024), but also entail a responsibility for patient safety. This places a significant emotional and cognitive burden on professionals, requiring high levels of concentration, resilience, and stress management (Neto; Xavier; Araújo, 2020). These factors, combined with the intense pace and constant pressure to maintain care quality, directly impact the performance and physical and mental health of workers. This highlights the necessity for ergonomic and organizational interventions aimed at enhancing working conditions and ensuring safety for all parties involved.

5. CONCLUSIONS

This study contributes by analyzing the working conditions of healthcare professionals in the emergency unit of a university hospital through a preliminary ergonomic analysis. The application of the Ergonomic Checklist and the SATEH tools facilitated the identification of critical aspects related to the physical, cognitive, and organizational demands faced by professionals in this occupational environment. Its specific contribution is the item- and domain-level descriptive account of data from the same research project that informed the SAT-oriented report by Silva et al. (2025).

The results demonstrate the need for ergonomic interventions that can minimize the negative impacts of the environment on activity execution. Recommendations include workload adjustments, planned breaks, psychological support programs, and modifications to the environment's layout. Improvements in noise, lighting, communication channels, and work organization are strongly advised to reduce adverse effects and foster conditions that enhance performance and well-being. The possible benefits of these proposed actions require prospective evaluation and cannot be inferred directly from the present self-reported data. Furthermore, the method employed in this study can be systematically applied across different hospital units to determine whether the demands identified in the emergency and urgency unit are unique to it or extend to other areas of the institution, potentially indicating

systemic issues within the hospital environment.

Studies akin to ours contribute to the characterizing and understanding of working conditions, particularly in emergency units where physical, cognitive, and organizational demands are exceedingly high. They help in identifying ergonomic and organizational risks that affect the safety of healthcare professionals and the quality of patient care. This information supports the development of guidelines for ergonomic interventions, promoting safer and more efficient work environments, and bolstering institutional policies focused on occupational health.

In fact, this study provides a solid foundation for hospital managers to improve processes and infrastructure, thereby reducing the physical and cognitive strains on healthcare workers. The findings offer practical insights for companies and healthcare institutions aiming to optimize team performance and minimize occupational hazards, creating a more sustainable and human-centered work environment. The results reinforce the importance of continuous training for leadership development. Such investments are crucial for fostering more effective internal communication and strengthening the organizational climate and culture, leading to collaborative and safer work environments in line with the principles of organizational ergonomics and worker well-being.

Lastly, our findings also encourage further research on ergonomics and occupational safety, underscoring the value of a transdisciplinary approach to hospital management emphasizing the importance of additional studies on ergonomic interventions focused on improving the design of workspaces in emergency units and their impact on mitigating psychosocial factors in the occupational environment. Although conducted in a single emergency unit of a university hospital, the findings cannot be generalized to other hospitals without further study. They may nonetheless inform locally adapted assessments in comparable emergency settings.

5.1 LIMITATIONS AND RECOMMENDATIONS FOR FUTURE STUDIES

The study was conducted in the emergency unit of a Brazilian university hospital, whose ergonomic and organizational conditions are strongly influenced by complex and unpredictable care flows, multidisciplinary teams, and the availability of work-related resources. Although the data collection was limited to a single unit, excluding other emergency units or the hospital at large, the method employed is a significant contribution to hospital ergonomics research. It offers a model that is both applicable and adaptable to different institutional settings, potentially supporting future studies aiming to explore the relationship between the physical environment, work organization, and healthcare professionals' health in various contexts.

Among the study's limitations is the disparity in participant numbers between the methodological tools used. The Ergonomic Checklist was applied to 80 professionals, whereas the SATEH questionnaire involved only 40 participants. Despite the instrument's acceptable internal consistency (Cronbach's $\alpha = 0.712$), the small sample size may have limited the statistical potential to detect differences between groups. Consequently, this

potentially limited the identification of specific limitations in detecting certain patterns or problems, especially those related to cognitive and organizational factors. Thus, the absence of significant complaints in these domains should be interpreted with caution, as more subtle differences may have gone unnoticed.

Another limitation pertains to the inherent biases of self-report questionnaires, including social desirability and selective memory among participants. Such biases could lead to the overestimation or underestimation of personal experiences, thus affecting the accuracy of the collected data. Variability in understanding and interpreting the questions can also introduce response variability. These biases may either inflate discomfort scores or minimize complaints, especially in institutionally valued roles. It remains unclear to what extent the observed differences reflect genuine perceptions or are merely measurement tools (i.e., distortions or systematic errors introduced by the self-report instruments). To mitigate these effects, future research should employ a triangulation of methods, combining questionnaires with direct observations and structured interviews. Furthermore, the study did not record actual care errors, patient-safety outcomes, or independently observed levels of occupational exposure.

These limitations restrict the precision of some interpretations and the transferability of the findings. Rather, they underscore opportunities for methodological refinement in subsequent research, particularly those aiming to generalize findings or inform ergonomic interventions at a broader healthcare policy level. Future studies could benefit from enlarging the sample size to enhance the reliability and validity of analyses and conducting more detailed examinations of critical work situations through Ergonomic Workplace Analysis. Integrating qualitative methods like interviews or direct observations would complement self-reported data, reducing potential biases. Expanding the sample size, especially for the SATEH instrument and ensuring broader representation across different functions and shifts would further enhance the statistical foundations of the study. Undertaking multicenter or comparative studies could extend the generalizability of results beyond a singular hospital setting. Additionally, incorporating inferential statistical analyses could lead to significant differences between professional groups or shifts, thereby providing deeper insights into ergonomic challenges in healthcare settings.

Lastly, recommendations could be more concretely operationalized by linking them to hospital policy structures and offering actionable tools, such as ergonomic checklists or communication protocols. Adopting a longitudinal approach would also facilitate the assessment of the long-term impacts of ergonomic interventions, contributing to a more robust evidence base for sustained institutional change.

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IMAGE USE CONSENT

Not applicable

RESEARCH ETHICS COMMITTEE APPROVAL

This study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina under CAAE no. 39124920.0.0000.0121. All participants provided written informed consent by signing the free and informed consent form, voluntarily agreeing to participate under anonymity and confidentiality.

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The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE

Not applicable

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Supplementary Material 1

ERGONOMIC CHEKLIST

I. General Information:	
Shift:	
Age:	
Male:	Female:

II. Indicate your occupation:		
Nurse	Doctor	Nursing Technician
Laboratory Technician	Radiology Technician	Psychologist
Physical therapist	Nutritionist	Other

III. Regarding your work environment, indicate your perception of: (CIRCLE each choice)		
a. Physical Environment (spatial dimension):		
Enough	Needs extra space	Needs expansion
b. Layout (physical arrangement):		
Functional	Needs some adjustment	Needs adaptation
c. Workflow (people, materials):		
Adequate	Small problems	Very problematic
d. Furniture/Equipment:		
Enough	Needs some adjustment	Insufficient
e. Ambient lighting:		
Adequate	Needs some adjustment	Insufficient
f. Environmental noise:		
Comfortable	A little uncomfortable	Very uncomfortable
g. Ambient temperature:		
Comfortable	A little uncomfortable	Very uncomfortable
h. Communication:		
Efficient	Some confusion	Problematic
i. Interpersonal Relationships (co-workers):		
Amicable	Professional	Conflicting

SELF-ASSESSMENT TOOL ERGONOMICS/HUMAN FACTORS (SATEH)

I. General Information:	
Wing:	Age:
How long have you been working in healthcare?	Male:
How long have you been working in the emergency room at the HU?	Female:

II. Indicate your occupation:		
Doctor	Nursing Technician	Nurse
Nutritionist	Radiology Technician	Psychologist
Physical therapist	Laboratory Technician	Other

III. Regarding your work environment, rate the following criteria from 1 to 5:			Likert Scale				
Gift.	**Aspects**	**Criteria**	1	2	3	4	5
Fis.	1. Physical Load	1.1 Static Work					
		1.2 Dynamic Work					
		1.3 Pace of Work					
		1.4 Variety of Working Posture					
		1.5 Load Lifting					
		1.6 Qty. Job Positions					
		1.7 Energy Expenditure					
		1.8 Job Adequacy					
		1.9 Suitability of Work Tools					
		1.10 Wear and Tear During Work Shift					
	2. Environmental Factors	2.1 Adequacy of Lighting					
		2.2 Noise Adequacy					
		2.3 Vibration Appropriateness					
		2.4 Temperature Adequacy					
		2.5 Adequacy of Reflection of Lights at the Workstation					
		2.6 Adequacy of Cleaning					
		2.7 Adequacy of the Cleaning Service					

		2.8 Feeling of Environmental Comfort					
Cog.	3. Mental Load	3.1 Mental Load for Decision Making					
		3.2 Degree of Concentration Required at Work					
		3.3 Time Pressure					
		3.4 Stress					
		3.5 Variation between Intellectual and Physical Activities					
		3.6 Required State of Attention at Work					
Org.	4. Task Analysis	4.1 Versatility in the Functions Performed					
		4.2 Variability of Skills					
		4.3 Fulfillment of Daily Tasks					
		4.4 Working Speed					
		4.5 Sequence of Work					
		4.6 Degree of Autonomy					
		4.7 Competency Feedback					
Cog.	5. Communication	5.1 Adequacy of Provision of Information					
		5.2 Adequacy of the Amount of Information in the Shift					
		5.3 Adequacy of the Communication Medium in the Emergency					
		5.4 Patient Evolution					
		5.5 Fulfillment of Requests					
		5.6 Adequacy of Data Feed and Information Display					
		5.7 Adequacy of visual contact between workers					
		5.8 Adequacy of Oral Communication					

DATA RELATED TO THE SATEH QUESTIONNAIRE AND DESCRIPTION OF THE CALCULATION OF CRONBACH'S ALPHA COEFFICIENT

$$\alpha = \frac{\mathrm{K}}{K-1}\left[1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right]$$

$$\alpha = Cronbach's\ alpha$$
$$k = Number\ of\ items$$
$$\sigma_i^2 = Variance\ of\ each\ item$$
$$\sigma_t^2 = Variance\ of\ the\ total\ scores\ (sum\ of\ individual\ responses)$$

$$\alpha_{SATEH} = \frac{\mathrm{K}}{K-1}\left[1 - \frac{\sum \sigma_i^2}{\sigma_t^2}\right] = 0.712$$

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Respondent	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	item 17	item 18	Item 19	item 20	item 21	Item 22	Item 23	item 24	item 25	item 26	Item 27	item 28	item 29	item 30	item 31	item 32	item 33	item 34	item 35	item 36	item 37	item 38	item 39
1	1,00	4,00	4,00	2,00	3,00	4,00	5,00	3,00	3,00	4,00	4,00	5,00	3,00	3,00	3,00	5,00	5,00	2,00	4,00	4,00	3,00	4,00	4,00	4,00	5,00	5,00	4,00	4,00	2,00	4,00	4,00	3,00	2,00	2,00	3,00	2,00	2,00	3,00	3,00
2	2,00	5,00	5,00	5,00	3,00	4,00	4,00	3,00	2,00	3,00	3,00	1,00	2,00	3,00	2,00	3,00	3,00	3,00	3,00	5,00	5,00	4,00	4,00	5,00	5,00	5,00	4,00	5,00	2,00	3,00	2,00	3,00	3,00	3,00	4,00	4,00	3,00	4,00	3,00
3	4,00	3,00	4,00	2,00	1,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	4,00	5,00	4,00	5,00	5,00	5,00	3,00	4,00	5,00	5,00	3,00	5,00	3,00	5,00	4,00	5,00	5,00	2,00	2,00	4,00	4,00	4,00	2,00	5,00	4,00	5,00	4,00
4	3,00	3,00	5,00	4,00	1,00	3,00	4,00	3,00	1,00	4,00	4,00	1,00	1,00	5,00	3,00	5,00	5,00	3,00	5,00	5,00	4,00	5,00	3,00	5,00	3,00	5,00	4,00	4,00	3,00	2,00	4,00	4,00	4,00	2,00	4,00	3,00	1,00	4,00	4,00
5	2,00	4,00	5,00	3,00	4,00	2,00	5,00	3,00	2,00	5,00	2,00	1,00	3,00	3,00	3,00	3,00	4,00	2,00	5,00	5,00	3,00	5,00	2,00	5,00	5,00	3,00	3,00	4,00	3,00	3,00	2,00	2,00	3,00	2,00	1,00	4,00	2,00	1,00	1,00
6	1,00	4,00	3,00	3,00	1,00	3,00	4,00	3,00	4,00	4,00	4,00	4,00	3,00	3,00	3,00	4,00	4,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00	4,00	4,00	4,00	5,00	5,00	3,00	5,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
7	2,00	5,00	4,00	5,00	2,00	3,00	4,00	3,00	3,00	5,00	2,00	1,00	2,00	5,00	1,00	4,00	4,00	3,00	4,00	3,00	5,00	4,00	3,00	5,00	5,00	5,00	5,00	3,00	5,00	4,00	2,00	4,00	4,00	4,00	5,00	3,00	4,00	5,00	2,00
9	3,00	3,00	3,00	2,00	1,00	2,00	2,00	2,00	2,00	3,00	3,00	4,00	4,00	4,00	3,00	3,00	3,00	2,00	4,00	4,00	4,00	5,00	3,00	4,00	2,00	3,00	2,00	3,00	3,00	2,00	2,00	2,00	2,00	2,00	1,00	3,00	3,00	3,00	3,00
10	3,00	4,00	4,00	3,00	2,00	3,00	3,00	2,00	2,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00	3,00	3,00	4,00	4,00	4,00	4,00	3,00	4,00	4,00	4,00	3,00	2,00	4,00	2,00	3,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
13	1,00	5,00	4,00	5,00	3,00	2,00	3,00	3,00	2,00	3,00	5,00	2,00	3,00	5,00	5,00	5,00	5,00	3,00	4,00	4,00	4,00	4,00	3,00	4,00	3,00	3,00	4,00	4,00	5,00	3,00	1,00	2,00	3,00	2,00	3,00	4,00	3,00	4,00	4,00
14	2,00	5,00	4,00	5,00	4,00	4,00	5,00	3,00	3,00	5,00	3,00	4,00	4,00	3,00	3,00	3,00	3,00	3,00	5,00	4,00	4,00	4,00	4,00	4,00	5,00	4,00	4,00	4,00	3,00	3,00	2,00	2,00	3,00	2,00	3,00	3,00	2,00	3,00	3,00
16	3,00	3,00	4,00	3,00	4,00	4,00	3,00	3,00	3,00	4,00	2,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00	4,00	3,00	4,00	3,00	3,00	2,00	2,00	3,00	2,00	3,00	2,00	3,00	3,00
17	4,00	3,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00	2,00	4,00	3,00	5,00	3,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	3,00	2,00	4,00	4,00	4,00	3,00	3,00	2,00	3,00	3,00	3,00	3,00	2,00	3,00	2,00	2,00	2,00	3,00
18	2,00	4,00	5,00	4,00	2,00	5,00	4,00	3,00	2,00	5,00	3,00	2,00	2,00	4,00	2,00	3,00	3,00	2,00	5,00	5,00	5,00	5,00	4,00	5,00	4,00	5,00	3,00	3,00	3,00	4,00	3,00	2,00	2,00	2,00	3,00	3,00	2,00	3,00	3,00
19	2,00	4,00	4,00	3,00	4,00	4,00	4,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00	4,00	3,00	2,00	3,00	4,00	4,00	4,00	4,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00	3,00
20	2,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	4,00	5,00	5,00	4,00	1,00	1,00	5,00	4,00	4,00	4,00	5,00	5,00	5,00	4,00	4,00	5,00	4,00	4,00	3,00	5,00	3,00	4,00	3,00	2,00	5,00	2,00	2,00	4,00	1,00	4,00	3,00
21	2,00	5,00	5,00	4,00	4,00	4,00	3,00	2,00	2,00	5,00	3,00	2,00	3,00	3,00	3,00	3,00	3,00	2,00	5,00	4,00	5,00	5,00	4,00	5,00	5,00	4,00	3,00	5,00	4,00	1,00	2,00	2,00	2,00	1,00	3,00	3,00	2,00	3,00	2,00
22	2,00	5,00	5,00	2,00	4,00	4,00	5,00	1,00	3,00	5,00	2,00	1,00	2,00	3,00	3,00	3,00	3,00	2,00	4,00	4,00	3,00	4,00	4,00	4,00	5,00	5,00	4,00	4,00	4,00	4,00	3,00	3,00	2,00	3,00	2,00	2,00	3,00	4,00	4,00
23	2,00	5,00	4,00	5,00	4,00	5,00	5,00	1,00	1,00	5,00	1,00	1,00	1,00	3,00	1,00	3,00	4,00	1,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	4,00	4,00	5,00	1,00	2,00	3,00	1,00	3,00	2,00	3,00	3,00	3,00	3,00	2,00
24	1,00	5,00	4,00	4,00	4,00	4,00	4,00	2,00	3,00	5,00	2,00	1,00	2,00	2,00	1,00	3,00	4,00	2,00	4,00	5,00	4,00	5,00	5,00	5,00	5,00	5,00	4,00	5,00	4,00	3,00	3,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
25	1,00	4,00	4,00	4,00	3,00	4,00	4,00	2,00	2,00	4,00	3,00	4,00	3,00	3,00	3,00	3,00	3,00	2,00	4,00	3,00	3,00	5,00	4,00	5,00	3,00	4,00	3,00	3,00	3,00	3,00	2,00	3,00	3,00	3,00	4,00	4,00	2,00	3,00	3,00
26	2,00	4,00	4,00	4,00	2,00	3,00	3,00	1,00	3,00	3,00	4,00	1,00	1,00	3,00	3,00	3,00	3,00	3,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	4,00	4,00	4,00	1,00	3,00	3,00	2,00	2,00	2,00	3,00	2,00	3,00	3,00
27	3,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	4,00	2,00	4,00	4,00	3,00	3,00	4,00	4,00	3,00	3,00	4,00	3,00	3,00	4,00	4,00	3,00	3,00	2,00	3,00	3,00	3,00	2,00	2,00	3,00	3,00	3,00
28	1,00	5,00	5,00	4,00	3,00	5,00	5,00	1,00	3,00	5,00	3,00	1,00	2,00	4,00	4,00	4,00	5,00	2,00	5,00	5,00	4,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00	4,00	4,00	2,00	3,00	4,00	2,00	4,00	3,00	4,00	3,00	4,00
29	2,00	4,00	4,00	4,00	2,00	4,00	4,00	3,00	3,00	4,00	4,00	3,00	5,00	3,00	4,00	5,00	4,00	4,00	5,00	5,00	5,00	5,00	2,00	5,00	3,00	5,00	3,00	4,00	1,00	4,00	2,00	2,00	2,00	2,00	1,00	3,00	3,00	4,00	4,00
30	2,00	4,00	4,00	4,00	3,00	5,00	4,00	2,00	3,00	4,00	3,00	5,00	4,00	2,00	3,00	2,00	2,00	3,00	4,00	2,00	1,00	4,00	3,00	2,00	4,00	3,00	4,00	4,00	5,00	2,00	4,00	2,00	4,00	2,00	4,00	3,00	3,00	2,00	2,00
31	3,00	4,00	4,00	4,00	4,00	4,00	4,00	2,00	4,00	4,00	4,00	4,00	3,00	5,00	3,00	3,00	3,00	2,00	4,00	4,00	4,00	3,00	4,00	4,00	3,00	3,00	4,00	4,00	1,00	2,00	1,00	2,00	2,00	2,00	4,00	3,00	3,00	4,00	3,00
32	1,00	5,00	5,00	5,00	5,00	5,00	4,00	2,00	2,00	5,00	2,00	2,00	2,00	2,00	2,00	3,00	3,00	2,00	5,00	5,00	5,00	4,00	4,00	4,00	5,00	4,00	3,00	4,00	3,00	3,00	2,00	2,00	2,00	2,00	1,00	3,00	3,00	4,00	4,00
33	1,00	5,00	5,00	5,00	5,00	4,00	4,00	1,00	1,00	5,00	2,00	1,00	1,00	1,00	1,00	3,00	3,00	1,00	5,00	5,00	4,00	5,00	5,00	5,00	4,00	4,00	4,00	5,00	4,00	3,00	2,00	2,00	3,00	3,00	1,00	3,00	3,00	4,00	3,00

34	1,00	5,00	5,00	5,00	5,00	5,00	5,00	1,00	1,00	5,00	2,00	5,00	1,00	1,00	1,00	3,00	3,00	1,00	5,00	4,00	5,00	5,00	4,00	5,00	5,00	5,00	4,00	5,00	4,00	4,00	2,00	1,00	2,00	1,00	1,00	3,00	2,00	3,00	2,00
35	2,00	4,00	4,00	5,00	3,00	5,00	4,00	3,00	3,00	4,00	3,00	3,00	5,00	3,00	3,00	4,00	3,00	4,00	4,00	5,00	5,00	4,00	3,00	5,00	4,00	5,00	5,00	4,00	3,00	5,00	4,00	3,00	3,00	3,00	4,00	3,00	3,00	4,00	4,00
37	1,00	4,00	4,00	4,00	2,00	3,00	3,00	3,00	3,00	4,00	3,00	3,00	2,00	2,00	2,00	2,00	2,00	3,00	2,00	4,00	4,00	4,00	3,00	4,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00	4,00	3,00	3,00	3,00	4,00	3,00	3,00	2,00
38	2,00	5,00	4,00	5,00	4,00	4,00	5,00	3,00	2,00	4,00	2,00	2,00	2,00	3,00	3,00	3,00	3,00	2,00	3,00	4,00	3,00	3,00	3,00	5,00	5,00	4,00	4,00	4,00	4,00	3,00	4,00	4,00	4,00	4,00	3,00	3,00	3,00	3,00	3,00
39	1,00	5,00	4,00	4,00	4,00	4,00	5,00	2,00	2,00	5,00	3,00	2,00	3,00	4,00	3,00	4,00	4,00	2,00	4,00	5,00	4,00	4,00	4,00	5,00	4,00	4,00	4,00	4,00	4,00	3,00	3,00	3,00	3,00	3,00	3,00	4,00	4,00	3,00	3,00
40	2,00	5,00	5,00	4,00	2,00	5,00	4,00	2,00	2,00	5,00	4,00	1,00	3,00	1,00	3,00	4,00	5,00	1,00	4,00	5,00	5,00	4,00	1,00	5,00	4,00	3,00	4,00	4,00	2,00	4,00	2,00	3,00	2,00	2,00	5,00	4,00	3,00	4,00	4,00