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Patients With Multiple Sclerosis and Their Dignity

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Abstract

Introduction. Multiple sclerosis is a chronic, inflammatory, demyelinating, and neurodegenerative disease of the central nervous system with a variable and unpredictable clinical course, affecting approximately 6,500 individuals in the Republic of Croatia. Untreated, the disease irreversibly leads to severe neurological impairment and over time, may cause disability in daily life, potentially resulting in feelings of indignity among patients.

Aim. The aim of the study is to examine the expectations and satisfaction of individuals with multiple sclerosis regarding the respect for their dignity in daily healthcare. Special emphasis was placed on differences regarding the duration of the disease, as well as the method and frequency of therapy application.

Methods. The study included a total of 150 individuals with multiple sclerosis and was conducted at the Neurology Clinic of the University Hospital Centre Zagreb. A hospitalized patients' dignity scale, consisting of 21 questions, was used. The questions assess patients' expectations and satisfaction regarding the behavior of doctors and nurses in the hospital. Satisfaction and expectations of patients were evaluated across four domains: respect for the individual as a human being, personal feelings, independence, and privacy, in relation to the disease duration and the method and frequency of therapy administration.

Results. The results indicate that patients with a disease duration of less than 5 years report higher satisfaction in the domain of independence. There is no statistically significant difference in expectations and satisfaction based on the method of therapy administration, i.e., between patients not receiving any therapy and those receiving therapy in the form of tablets, injections, or infusion solutions. There is no statistically significant difference in the expectations and satisfaction of patients receiving therapy at intervals shorter than 2 weeks compared to those receiving therapy at intervals longer than 2 weeks.

Conclusion. The study suggests that the expectations of patients regarding the mentioned domains, in relation to disease duration, therapy modality and frequency, are met, and their dignity is preserved. Due to the lack of publications on the dignity of patients with chronic diseases in Croatia, further exploration of this topic is recommended.

Introduction

Multiple sclerosis (MS) is a chronic, inflammatory, demyelinating, and neurodegenerative disease of the central nervous system with a variable and unpredictable clinical course, affecting approximately 6,500 individuals in the Republic of Croatia. Untreated MS irreversibly leads to severe neurological impairment, including physical and cognitive decline that impacts the quality of personal and professional life (1). A range of medications is available for this disease, administered in various forms, from tablets to injections and infusion solutions. The type, method, and frequency of therapy administration can influence patients' expectations and satisfaction (2, 3, 4).

Among the most common symptoms are diplopia (double vision), visual impairment, limb weakness, urinary and bowel control disorders, balance issues, and coordination difficulties. The most frequently described movement disorders in MS include restless legs syndrome, tremor, ataxia, parkinsonism, paroxysmal dyskinesias, chorea and ballism, facial myokymia, including hemifacial spasm and spastic paretic hemifacial contracture, tics, and Tourettism (5, 6, 7). These symptoms can gradually lead to disability in daily activities and consequently, to feelings of indignity.

In everyday life, the concept of dignity is equated with self-respect. Being treated with dignity means being treated with respect and considered worthy of others' respect. Losing dignity means feeling that one's value as a person has been irreparably diminished (8). Dignity is promoted when the patient becomes an active participant, when their feelings and thoughts are respected, when the patient's family is involved and listened to, when the patient feels free to provide critical feedback, when healthcare staff can address the patient's shortcomings, and when efforts are made to improve the aesthetic environment. Dignity is not promoted when healthcare staff overpower or dominate patients, when they focus solely on the patient's diagnosis rather than the person, or when healthcare staff and/or family members attempt to impose their own values (9).

There are many ways in which patients' dignity can be compromised in healthcare settings, including rudeness, indifference, dismissal, neglect, intrusiveness, objectification, restriction, labeling, contempt, discrimination, aversion, deprivation, and assault. Situations such as patient care, maintaining privacy, physical examinations, patient introductions, cases where the nurse and patient are not of the same gender, mixed wards, or neglecting to cover the patient's body can all contribute to this (10, 11).

The Act on the Protection of Patients' Rights in the Republic of Croatia stipulates that during examinations, treatments, and especially during the provision of personal care, patients have the right to conditions that ensure privacy. The protection of patients' rights is based on the principles of humanity and accessibility. The principle of humanity is realized by ensuring respect for the patient as a human being, safeguarding their physical and mental integrity, and protecting their personality, including respect for their privacy, worldview, and moral and religious beliefs. According to this law, patients' rights include the right to co-decision, the right to information, the right to accept or refuse specific diagnostic or therapeutic procedures, the right to access medical documentation, the right to confidentiality, the right to maintain personal contacts, the right to voluntarily leave a healthcare facility and the right to privacy (12).

For the perception of dignity, it is crucial that the patient-nurse collaboration is seen as well-functioning and characterized by trust. The behavior of nurses and respect for patient autonomy are critical aspects of care that significantly contribute to preserving dignity (13).

Multiple sclerosis is a progressive disease, with physical and cognitive limitations becoming increasingly pronounced over time. In the early years following diagnosis, patients are often more mobile, less dependent on others' assistance, and still actively adapting to their new life situation. During this period, they tend to have higher levels of hope, self-confidence, and a greater need for affirmation of personal dignity, which may result in higher expectations of healthcare providers and greater sensitivity to their approach and behavior. Conversely, with longer disease duration (5 years or more), many patients experience a decline in functional status, are more frequently exposed to hospital treatment or continuous care, and face physical dependence on others. As a result, their expectations regarding dignity may decrease, possibly due to adaptation to the reality of the disease, emotional resignation, or loss of faith in the healthcare system. Additionally, long-term ex-

perience with various forms of healthcare may lead to deeper insight into systemic shortcomings, which can contribute to lower satisfaction levels (14, 15).

Given the complexity of multiple sclerosis symptoms, it is important to understand how different methods of therapy administration may affect patients' subjective perception of dignity in daily care. Today, there are various therapeutic options for treating multiple sclerosis, differing in frequency of administration (some medications are indicated for use at intervals longer than 2 weeks, eliminating the need for daily administration) and method of administration (e.g., oral tablets do not require hospital visits, which may impact patients' satisfaction with dignity compared to medications administered via injections or infusions in a hospital setting). These factors can significantly shape the patient's experience, including their sense of autonomy, support, and respect in interactions with healthcare professionals. This study aims to contribute to a better understanding of how medical aspects of treatment can have broader psychosocial implications for individuals living with multiple sclerosis. Based on this, the research objective, problem, and hypotheses have been formulated.

Aim

The aim of this study is to examine the expectations and satisfaction of individuals with multiple sclerosis regarding the respect for their dignity in daily healthcare. In line with the main objective, three research problems have been formulated with corresponding hypotheses:

1. **Problem**: To investigate whether there are differences in expectations and satisfaction with dignity in daily care between participants who have had multiple sclerosis for less than 5 years and those who have had the disease for 5 years or more. **Hypothesis 1**: Participants who have had multiple sclerosis for 5 years or more report lower satisfaction and lower expectations regarding respect for dignity in daily care compared to those who have had the disease for less than 5 years.

2. **Problem**: To examine differences in expectations and satisfaction with dignity in daily care based on the method of therapy administration. **Hypothesis 2**: Participants receiving oral therapy report higher expectations and greater satisfaction regarding respect for dignity in daily care compared to those receiving therapy via injections or infusions.

3. **Problem**: To investigate whether there are differences in expectations and satisfaction with dignity in daily care between participants receiving therapy at intervals shorter than 2 weeks and those receiving therapy at intervals longer than 2 weeks. **Hypothesis 3**: Participants receiving therapy at intervals longer than 2 weeks report higher expectations and greater satisfaction regarding respect for dignity in daily care compared to those receiving therapy at intervals shorter than 2 weeks.

Methods

Participants

A cross-sectional study was conducted on a sample of 150 participants at the Neurology Clinic of the University Hospital Centre Zagreb over a period of 3 months. The inclusion criterion for completing the questionnaire was a confirmed diagnosis of multiple sclerosis for all participants who were receiving treatment at the Neurology Clinic at the time of the study. The study included 32 men (21.3%) and 118 women (78.7%). The age range varied from 18 to 67 years, with 84 participants (56%) aged between 18 and 39 years, 59 participants (39.3%) aged between 40 and 59 years, and 7 participants (4.7%) older than 60 years.

Regarding disease duration, participants were divided into two groups: 64 participants (42.7%) had been diagnosed with multiple sclerosis for less than 5 years, while 86 participants (57.3%) had the disease for 5 or more years. This division is based on relevant clinical and psychosocial changes typically occurring during disease progression, as well as findings from previous studies indicating that patients'

expectations and perceptions of care quality and dignity in treatment change over time (14, 16).

Based on the method of therapy administration, participants were divided into four groups: 46 participants (30.7%) were not receiving any therapy, 29 participants (19.3%) were receiving therapy in the form of tablets/capsules, 39 participants (26%) were receiving therapy via injections, and 26 participants (24%) were receiving therapy via infusions.

Regarding the frequency of therapy, participants were divided into two groups: 53 participants (51%) received therapy at intervals shorter than 2 weeks, and 51 participants (49%) received therapy at intervals longer than 2 weeks.

Instrument

For the purposes of this study, the publicly available Inpatient Dignity Scale (IPDS) was used (17). The questionnaire contains a total of 21 statements and measures two main dimensions: A) patients' expectations regarding dignity and B) satisfaction with dignity. Each of these dimensions is covered by four subscales: (1) respect for the individual as a human being, (2) respect for personal feelings and time, (3) respect for privacy and (4) respect for patient autonomy.

Participants were tasked with assessing their expectations regarding various aspects of care in a hospital setting and their level of satisfaction with the current state. Based on personal experience, participants rated each statement on a scale from 1 to 5 (Likert scale), first indicating their expectations and then their satisfaction with the conditions related to the specific aspect of care. To measure expectations, a Likert scale ranging from 1 (no expectations) to 5 (high expectations) was used, while satisfaction was measured using a Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied). Examples include: *"Respects me as a human being," "Maintains eye contact during conversation,"* and similar statements.

In a sample of 363 participants in Singapore, the scale's authors established satisfactory reliability, with Cronbach's alpha coefficients for the satisfaction dimension ranging from 0.72 (privacy subscale) to 0.90 (respect for the individual subscale). For the expectations dimension, alpha reliability coefficients were also satisfactory, ranging from 0.72 (privacy subscale) to 0.88 (respect for the individual subscale) (17). In our sample, satisfactory reliability was confirmed, ranging from 0.79 for *the Respect for Privacy* subscale to 0.89 for *the Respect for the Individual as a Human Being* subscale.

All participants signed an informed consent form before completing the questionnaire and were free to withdraw from the study at any time. The completion of the questionnaire was anonymous, and participants' personal information was not used in the study. Participant data were used solely for research purposes.

Ethics

This study received approval from the Ethics Committee of the University Hospital Centre Zagreb, Class: 8.1-22/55-2, Number: 02/013 AG.

Statistics

Statistical data analysis was conducted using the SPSS v.24 software (Statistical Package for the Social Sciences). Descriptive analysis was used to summarize the results. For comparing the means of two groups, a t-test was employed for quantitative variables, while analysis of variance (ANOVA) was used to compare more than two groups. Prior to applying the t-test and ANOVA, the assumptions for conducting these tests were verified.

For the t-test, the normality of variable distributions between groups was assessed using the Kolmogorov-Smirnov test, where p-values greater than 0.05 indicate no significant deviation from a normal distribution. For all tested variables, p-values were >0.05, confirming that the normality assumption was met. Homogeneity of variances was tested using Levene's test, where p-values greater than 0.05 indicate equal variances between groups. For all variables except one, Levene's test was not significant. A significant Levene's test was found for the variable *Respect for the Individual as a Human Being* (expectation) ($F(3, 146) = 5.05$; $p = 0.002$), indicating a violation of the homogeneity of variance assumption. Due to this violation, the Kruskal-Wallis test, an appropriate non-parametric test, was used to compare multiple independent groups for this variable. The Kruskal-Wallis test was chosen as it allows for the comparison of medians across three independent groups without assuming normal distribution or homogeneity of variances. The interpretation of the results includes, in addition to textual explanations, tabular presentations.

Results

In accordance with the first research problem, differences in expectations and satisfaction with dignity in daily care were examined between participants who have had multiple sclerosis (MS) for less than five years and those who have had MS for five years or more (Table 1).

The results of the independent samples t-test showed no statistically significant differences between the two groups in most of the examined dimensions, including overall satisfaction with dignity (M1 = 4.63, SD1 = 0.56; M2 = 4.56, SD2 = 0.59; t = 0.71; p = 0.476) and overall expectations (M1 = 3.96, SD1 = 0.86; M2 = 3.89, SD2 = 1.00; t = 0.44; p = 0.663).

The only dimension where a statistically significant difference was found relates to satisfaction with respect for autonomy, where participants who have had multiple sclerosis for less than five years report-

ed significantly higher satisfaction (M = 4.70, SD = 0.59) compared to those who have had the disease for five years or more (M = 4.44, SD = 0.88; t = 2.17; p = 0.032).

Other individual dimensions, both for satisfaction and expectations, did not show statistically significant differences between the groups (p > 0.05), although the mean values were generally slightly higher in the group with less than five years of disease duration.

Within the framework of the second research problem, differences in expectations and satisfaction with dignity in daily care were examined in relation to the mode of therapy administration among individuals with multiple sclerosis. Four groups of patients were compared: a) those not receiving therapy, b) those receiving oral tablets, c) those receiving injections and d) those receiving infusions. Data analysis was conducted using one-way analysis of variance (ANOVA). It was expected that participants receiving oral therapy would express higher expectations and greater satisfaction regarding respect for dignity in daily care compared to those receiving therapy via injections or infusions.

Table 1. **Comparison of Patients by Disease Duration (t-test)**						
	Ill for less than 5 years (N=64)		**Ill for more than 5 years (N=86)**		**t-test**	
	M	**SD**	**M**	**SD**	**t**	**p**
Patient satisfaction regarding dignity	4.63	0.56	4.56	0.59	0.71	0.48
Patient expectations regarding dignity	3.97	0.87	3.92	1.01	0.35	0.73
Respect for a person as a human being (satisfaction)	4.71	0.52	4.63	0.64	0.8	0.43
Respect for a person as a human being (expectation)	4.33	0.89	4.18	1.08	0.93	0.35
Respect for personal feelings and time (satisfaction)	4.55	0.64	4.53	0.6	0.2	0.84
Respect for personal feelings and time (expectation)	3.5	1.14	3.46	1.2	0.22	0.83
Respect for autonomy (satisfaction)	4.7	0.59	4.44	0.88	*2,17	**0.03**
Respect for autonomy (expectations)	4.05	1.21	4.09	1.18	-0.23	0.82
Respect for privacy (satisfaction)	4.65	0.81	4.62	0.71	0.26	0.80
Respect for privacy (expectation)	4.01	1.1	4.06	1.18	-0.3	0.76
Overall score on the scale (satisfaction)	4.65	0.54	4.58	0.57	0.75	0.45
Overall score on the scale (expectation)	3.96	0.86	3.89	1	0.44	0.66

Note: A – MS diagnosed less than 5 years ago, B – MS diagnosed 5 or more years ago; * p < 0.05

The results indicate that no statistically significant differences were found among the groups in overall satisfaction with respect for dignity in daily care (F = 0.069; *p* = 0.976) or in overall expectations regarding respect for dignity in daily care (F = 1.874; *p* = 0.137). In addition to the absence of differences in overall satisfaction and expectations regarding dignity, no differences were found in individual dimensions: respect for the person as a human being, respect for privacy, respect for autonomy, or respect for personal feelings and time (*p* > 0.05).

The third research problem focused on examining differences in expectations and satisfaction with dignity in daily care between individuals receiving therapy for multiple sclerosis at intervals shorter than 2 weeks and those receiving it at intervals longer than 2 weeks. The analysis was conducted using an independent samples t-test, with results presented in Table 2.

The results indicate that no statistically significant differences were found between the two groups in overall satisfaction levels (M1 = 3.97, SD1 = 0.88; M2 = 3.75, SD2 = 1.07; t = 1.15; *p* = 0.253) or in overall expectations (M1 = 4.58, SD1 = 0.53; M2 =

4.62, SD2 = 0.61; t = -0.39; *p* = 0.699). Although the mean values for expectations and satisfaction were slightly higher for most individual dimensions among participants receiving therapy at shorter intervals, these differences were not statistically significant (*p* > 0.05).

Discussion

The first objective of the study was to investigate whether there are differences in expectations and satisfaction with dignity in daily care between individuals with multiple sclerosis (MS) who have been diagnosed for less than 5 years and those who have been diagnosed for 5 years or more. It was hypothesized that the mode of therapy administration would be associated with levels of satisfaction and expectations regarding respect for dignity in care. Although the results for most dimensions were consistent

Table 2. **Comparison of patients based on the frequency of therapy**						
	Intervals shorter than 2 weeks		Intervals greater than 2 weeks		t-test	
	M	SD	M	SD	t	*p*
Patient satisfaction regarding dignity	4.56	0.54	4.61	0.63	-0.39	0.697
Patient expectations regarding dignity	4	0.87	3.76	1.09	1,24	0.219
Respect for a person as a human being (satisfaction)	4.67	0.55	4.68	0.66	-0.06	0.954
Respect for a person as a human being (expectation)	4.32	0.88	4.01	1.23	1,49	0.139
Respect for personal feelings and time (satisfaction)	4.49	0.6	4.56	0.64	-0.58	0.566
Respect for personal feelings and time (expectation)	3.45	1.09	3.34	1.23	0.51	0.612
Respect for autonomy (satisfaction)	4.49	0.85	4.47	0.83	0.12	0.903
Respect for autonomy (expectations)	4.21	1.09	3.89	1.19	1.41	0.16
Respect for privacy (satisfaction)	4.11	1.13	3.87	1.21	1.06	0.29
Respect for privacy (expectation)	4.58	0.76	4.7	0.61	-0.89	0.376
Overall score on the scale (satisfaction)	3.97	0.88	3.75	1.07	1.15	0.253
Overall score on the scale (expectation)	4.58	0.53	4.62	0.61	-0.39	0.699

with expectations (lower mean values in the group with longer disease duration), a statistically significant difference was found only in the dimension of autonomy. A review of the professional literature in the field of nursing regarding dignity in MS patients reveals a limited number of studies, with most available studies based on small patient samples and qualitative designs. The results of our study, based on a sample of 150 participants, indicate that patients with less than 5 years since diagnosis report greater satisfaction in the domain of autonomy, specifically regarding their preserved independence, compared to those with a disease duration of 5 years or more. Given that multiple sclerosis is a progressive disease that can gradually lead to disability, these results are expected. The reason lies in the characteristic gradual progression of the disease over time. When autonomy is preserved, patients are more satisfied and consequently, their dignity in daily life is maintained. The results of our study pertain to patient dignity in hospital settings, specifically the behavior of medical staff toward patients, indicating that greater patient autonomy requires fewer interventions by nurses during their hospital stay, leading to higher patient satisfaction, preserved identity and dignity. This is supported by a study by Podolinska L. and Čap J. on the impact of multiple sclerosis on patient dignity, which involved 8 participants and used semi-structured interviews. Their findings suggest that MS can lead to reduced dignity and identity, but acceptance of the disease, resilience to its consequences and a sense of still being useful can help patients maintain their dignity (18). Our study presents results concerning patient dignity in hospital settings through the behavior of medical staff; however, other factors from the social environment, such as unemployment, which may threaten patients' dignity, should also be considered (19).

The second objective of the study was to examine differences in expectations and satisfaction with dignity in daily care based on the mode of therapy administration. Although it was expected that the mode of therapy administration would be associated with levels of satisfaction and expectations regarding respect for dignity in care, the analysis did not reveal statistically significant differences among the groups. The results of our study indicate no statistically significant differences in expectations and satisfaction among patients based on the mode of therapy administration, whether they are not receiving

any form of therapy or are receiving therapy in the form of tablets, injections, or infusions. These results are somewhat unexpected, as medications in the form of tablets and injections can be self-administered by patients at home, whereas infusions require administration in a day hospital, which demands additional effort from patients, particularly if they lack autonomy or are employed and requires extra time for hospital visits, as noted by other authors (4). The results may be influenced by legal regulations on patient rights protection in force in the Republic of Croatia. Patient dignity can be compromised in various situations during healthcare delivery in hospitals, as mentioned earlier. Nurses, during the provision of healthcare, also educate MS patients on the administration of medications at home. The approach and communication of nurses, as well as the mode of medication administration, can affect patients' self-esteem. Our results suggest that the frequency of therapy administration does not impact their dignity.

Additionally, it is possible that the perception of dignity is influenced by other factors, such as individual characteristics of participants, experiences with healthcare professionals, level of functionality or psychosocial support. Therefore, it is recommended to include additional variables in future research to more precisely determine the relationship between therapeutic approaches and the perception of dignity in care.

The third research problem aimed to investigate whether there are differences in expectations and satisfaction with dignity in daily care between participants receiving therapy at intervals shorter than 2 weeks and those receiving therapy at intervals longer than 2 weeks. Although it was expected that participants receiving therapy at shorter intervals would have higher expectations and greater satisfaction regarding respect for dignity in daily care compared to those receiving therapy at longer intervals, the analysis did not show statistically significant differences between the groups. It is possible that the frequency of therapy administration itself is not a decisive factor in shaping the perception of dignity in daily care, but rather that it is formed under the influence of other individual, organizational, and communication factors. Future research should consider the qualitative aspects of therapeutic encounters and experiences with care providers to gain a deeper understanding of the dynamics between therapeutic protocols and the perceived quality of care.

One limitation of this study is related to the sample size and its availability within a single institution, which may limit the generalizability of the results to the broader population of individuals with multiple sclerosis. Additionally, the use of a self-assessment questionnaire may be subject to the influence of the participants' current health status on their responses. It should also be noted that the assessment of dignity is based on perceptions during hospitalization, while experiences in outpatient or home settings were not included. This study did not include data on employment status, level of disability, or cognitive status of participants.

It is recommended that future research include a larger and more heterogeneous sample from different regions and healthcare institutions, as well as an expansion of methodology with qualitative approaches to further illuminate the personal experiences of patients. It would also be beneficial to consider longitudinal studies to track the development of expectations and satisfaction over time, in line with disease progression and changes in healthcare.

Conclusion

This study examined the expectations and satisfaction of individuals with multiple sclerosis regarding the respect for their dignity in daily healthcare. The dignity of MS patients was explored across four domains: respect for the person as a human being, personal feelings, autonomy, and privacy, in relation to disease duration, mode and frequency of therapy administration. The results indicate that the dignity of patients is preserved in terms of the behavior of medical staff in hospital settings.

The topic of patient dignity is significant and primarily linked to the clinical practice of nurses, yet it remains under-researched in the Republic of Croatia. It is recommended to conduct further studies on the dignity of individuals with multiple sclerosis in smaller hospitals and social environments.

The behavior of medical staff influences the preservation of patients' dignity and it is recommended for clinical practice to conduct research on interventions that contribute to and enhance the dignity of individuals with MS and other chronic diseases in the Republic of Croatia.

Author contributions

Conceptualization and methodology (AB, BM); data curation and formal analysis (AB, BM); investigation and project administration (AB); and writing – original draft and review & editing (KH). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgments

Not applicable.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not for-profit sectors.

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Roma in the Healthcare System: Experiences of Healthcare Professionals

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Abstract

Introduction. The Roma community faces numerous challenges in accessing health services, including language barriers, discrimination, low health literacy, and social exclusion.

Aim. The aim of the research was to examine the experiences of health professionals in treating Roma patients, with a focus on communication, cultural differences, and access to health services. Special emphasis was also placed on the presence of antigypsyism in the healthcare system.

Methods. The research was based on a qualitative-descriptive design. The sample included 15 healthcare workers with experience in treating Roma patients, primarily from the Dolenjska region. Data were collected through semi-structured individual interviews conducted between November and December 2024. The results were analyzed using thematic analysis.

Results. Thematic analysis identified four themes: (1) Cultural characteristics of the Roma community, (2) Healthcare of Roma, (3) Interpersonal relationships between healthcare workers and Roma, (4) Communication with Roma. The results show that language barriers, low health literacy, and cultural differences are the main challenges in the treatment of Roma patients. Healthcare workers highlighted the use of "Roma helpers" – cultural mediators, communication adaptations, and educational workshops as successful strategies**.**

Conclusion. The research highlights the importance of intercultural competences for improving healthcare for the Roma community. Healthcare professionals identified key strategies for addressing antigypsyism, such as patience, building trust, involving Roma cultural mediators, and organising targeted workshops. These strategies align with current guidelines, as they are based on respect, inclusion, and co-design of services with the Roma community. The findings can contribute to the development of tailored programmes that promote inclusion and reduce health inequalities.

Introduction

The Roma are an indigenous people originating from the northwestern part of India. They began arriving in Europe in the 13th century and are today the largest ethnic minority, with around six million living in EU Member States, most of whom are citizens of these countries (1). In Slovenia, the Roma have settled mainly in three regions: Dolenjska, Gorenjska, and Prekmurje (2). According to the census, 3,246 people identified themselves as Roma, and 3,834 as speaking Roma as their mother tongue, although the actual number is estimated at 8,000-10,000. They live both autochthonously and in larger cities such as Maribor, Velenje, and Ljubljana (2). Almost half of the Roma population is under 18 years old, while the proportion over 65 is low, indicating a shorter life expectancy. This is linked to lifestyle, frequent illness, and inadequate healthcare (2).

The Roma have historically faced discrimination, high poverty rates, and limited access to healthcare, education, and employment. Roma women experience additional gender-based discrimination and violence (3), leading to further social exclusion. Key issues include poor housing and informal settlements without access to electricity or water, which directly impacts health (4). These conditions, combined with limited healthcare access, contribute to poorer health outcomes. Discrimination within the healthcare system further worsens the situation. Roma children often lack access to education and frequently do not complete primary school. In some schools, performance among Roma pupils is particularly low, reflecting a lack of support and adapted programs. The Roma community also faces systemic discrimination, referred to as antigypsyism, which hinders access to legal protections and social support (5).

Specific research on Roma health is limited, geographically narrow, and often based on small samples (1). A significant issue is the exclusion from health insurance: 55% of Roma are not covered by the national system (1). Research on risk factors for non-communicable diseases has shown significantly worse health indicators among the Roma, including high unemployment, low physical activity, high obesity rates, and the influence of strong cultural factors combined with negative attitudes from the majority population (2).

As societies become more culturally diverse, healthcare systems must adapt to maintain quality and safety for all. This requires the development of intercultural competencies that enable professionals to work effectively in diverse environments (6). These competencies include basic cultural knowledge, integration into everyday practice, and critical self-reflection. Healthcare professionals are frequently exposed to cultural differences, and without adequate knowledge, this can result in ineffective care (6, 7). Health inequality refers to measurable, value-neutral differences in health between individuals or groups (8). Zaletel-Kragelj (9) identifies three main causes: unequal socio-economic conditions, unequal access to healthcare, and differences in the quality of the living environment.

Although legally protected, the Roma community still faces significant practical barriers to accessing healthcare. These include socio-economic disadvantages, cultural differences, and stigmatization. The Strategy for Pomurje MoST – Analysis of vulnerability and health inequalities in local communities study identifies the Roma as a vulnerable group affected by socio-economic determinants (10, 11).

Language barriers, cultural diversity, and lack of trust are frequently cited by healthcare professionals as key challenges (12). They report frequent misunderstandings, reliance on family members for interpreting, and a lack of professional interpreters (13). Cultural beliefs influence treatment acceptance. Some patients, for instance, refuse procedures like caesarean sections for religious reasons (14). Low health literacy leads to delayed care-seeking and poorer health outcomes (15). Healthcare professionals often struggle to motivate Roma patients to adhere to long-term therapies (15).

Many Roma also lack basic resources such as medications, transportation, or proper nutrition (13). NIJZ data indicate that many Roma are unaware of basic procedures (e.g., how to book an appointment), which 47% of healthcare professionals perceive as a major barrier (16). There are also reports of discrimination and distrust in the healthcare system, which reduce its effectiveness (17). Roma patients may expect preferential treatment (e.g., walk-in visits without appointments), which clashes with established procedures (18).

Improving the situation requires cultural competence training for healthcare workers (19), and customized preventive health programs (10).

One of the goals of the National Health Literacy Strategy 2025–2035 is to empower the population of Slovenia by ensuring access to clear, understandable, reliable, and culturally appropriate health information. Investing in the strengthening of health literacy among vulnerable individuals can significantly contribute to reducing health inequalities. It is therefore the responsibility of healthcare professionals to provide clear and comprehensible information, tailored to target audiences, with particular emphasis on vulnerable groups (20). Healthcare professionals possess valuable insights into the challenges faced by Roma patients, and their experiences are crucial for enhancing care quality. Although some barriers are already documented, there is a lack of in-depth research into the real-world experiences of healthcare providers. This study aims to partially address that gap (21).

Aim

A preliminary review of the domestic and international literature revealed a limited number of studies focusing on the experiences of healthcare professionals in treating Roma patients. Therefore, the purpose of this study was to gain an in-depth understanding of these experiences. We aimed to explore how healthcare workers perceive the challenges they face and the strategies they employ to improve care for the Roma community. We specifically focused on communication, cultural differences, and access to healthcare services. Special attention was also given to antigypsyism in the healthcare system, as perceived by healthcare professionals, and its effect on the quality and fairness of care.

Research Objectives

1. To identify the experiences of healthcare professionals in treating Roma patients, particularly in terms of communication, cultural differences, and access to healthcare services.
2. To explore the challenges faced by healthcare workers and how they perceive and experience these challenges.

3. To examine the strategies used by healthcare professionals to improve the quality of healthcare for Roma patients.

Central Research Question

What are the experiences of healthcare professionals in dealing with Roma patients regarding communication, cultural differences, and access to healthcare services?

Methods

The research used a qualitative descriptive methodology.

Instrument

Data were collected using semi-structured individual interviews. The key feature of this method is that the researcher prepares guiding questions in advance, which serve as orientation during the interview but remain flexible. This approach allows for the development of a dialogical relationship between the interviewer and the interviewee, enabling an in-depth understanding of the participant (22).

The interview guide was based on a review of the relevant literature (George et al., 2018) and aligned with the research objectives. It consisted of fifteen open-ended questions divided into four sections: (1) experiences, (2) cultural differences, (3) challenges and obstacles, and (4) strategies for addressing challenges.

Sample Description

The study employed a purposive sample of 15 healthcare workers with experience in providing care to the Roma population. Inclusion criteria included age and direct professional contact with Roma individuals. The sample consisted of 14 women and 1 man, aged 23 and 45 years.

Efforts were made to include various healthcare professional profiles to obtain a comprehensive view of their experiences in working with the Roma community.

Most participants held nursing degrees, with one having additional specialized qualifications. Participants were employed across different healthcare institutions in the Dolenjska, Primorska, and Prekmurje regions, with the majority coming from Dolenjska.

No participants from the Roma community were included in the sample.

Research Process and Statistics

The research was conducted between October 2024 and January 2025. Interview sessions were held in November and December 2024, either in quiet physical locations or via the Zoom application. Open-ended questions and sub-questions had been prepared in advance.

Healthcare workers were contacted through professional networks, colleagues, and acquaintances. A total of seven healthcare institutions and organizations in eastern Slovenia were approached. Participants were invited via email, where they were also informed about the purpose, process, and goals of the study. All participants provided informed consent, and signed consent forms were collected. Confidentiality and anonymity were assured for all participants.

Interviews were audio-recorded using a mobile phone or Zoom, and the recordings were stored in a password-protected file. The interviews lasted between 15 and 45 minutes. Ethical considerations were strictly observed throughout the research process.

Table 1. **Identified themes and sub-themes**		
Topic	Subtopic	Code
Recognized cultural characteristics of the Roma community	Roma culture	Cultural influence on behavior Social structure (patriarchy) Cultural customs (celebrations, care for the dying) Intercultural differences between Roma and Slovenians
	Roma lifestyle	Hygiene conditions in the community Unhealthy lifestyle Children and youth in the Roma community Breastfeeding and childbirth in Romani culture Housing conditions Differences between Roma settlements
	Fears in the Roma community	Common fears of Roma Fear of disease and the healthcare system
	Peculiarities in raising children	The role of grandparents in upbringing Early parenthood
Medical treatment of Roma	Treatment forms and preferences	Alternative treatment methods Confidence in medicines Type and method of treatment
	Understanding medical instructions	Difficulty understanding instructions Mutual assistance in language understanding Ways to provide health instructions Differences in understanding between different social classes
	Access to health services	Improving access to healthcare Strategies for obtaining treatment (including blackmail) Feeling of unequal treatment Not knowing how to access services Ingenuity and system adaptation
	Health promotion among Roma	The role of health education Lack of interest in prevention Focus on curation The role of girls in sex education Awareness strategies

Audio recordings were transcribed using an unfocused transcription method and analyzed using thematic analysis (24). First, the transcripts were thoroughly reviewed, and open coding was conducted. The codes were then grouped into broader subthemes, which were further categorized into larger thematic groups that formed the final thematic structure. The analysis followed an inductive approach. The study adhered to the principles of the Helsinki-Tokyo Declaration (25) and the Code of Ethics in Health Care in Slovenia (26).

Results

Through thematic analysis, we identified four themes: (1) Cultural characteristics of the Roma community, (2) Health care of Roma, (3) Interpersonal relationships between health professionals and Roma, and (4) Communication with Roma (Table 1).

Table 1. **Identified themes and sub-themes**		
Topic	**Subtopic**	**Code**
Interpersonal relationships between healthcare professionals and Roma	Experiences with Roma	Negative experiences Positive experiences Humorous/funny experiences
	Interpersonal relationships	Roma attitudes towards healthcare workers Relatives' attitude towards healthcare Doctors' attitude towards Roma patients
	Cooperation with the Roma community	Strategies for improving collaboration Collaboration with family members Cooperation with Roma representatives Building trust
	Contact with Roma and their family members	Involving relatives in treatment Presence of family members during contacts with healthcare professionals Regularity of contacts Seasonal presence of Roma (e.g. in summer)
	Education	Educational level of Roma The need for additional knowledge of healthcare professionals about Roma Desire for intercultural knowledge Burnout and decline in motivation among healthcare workers
	Systemic and behavioral barriers	Inappropriate behavior (non-compliance with agreements, failure to follow rules) Lack of motivation and cooperation Resistance to institutions (e.g. CSD) Conflicts and disagreements
Communication with Roma	Communication stakeholders and its characteristics	Communication with the patient Communication with family members Communication within the Roma community Use of the Slovenian language
	Challenges and obstacles in communication	Lack of knowledge of the Romani language Verbal aggression Nonverbal differences in communication "Unreachability" of patients
	Strategies for improving communication	Approaches adapted to Roma patients The role of a cultural mediator

Cultural Characteristics of the Roma Community

The interviewed healthcare workers often emphasized that Roma culture is deeply intertwined with daily life, which directly influences their attitudes toward health and healthcare services. As one participant noted: "I think it has a very strong influence. They have some of their own principles and beliefs, and you can hardly move them." (MS8). These principles are sometimes expressed as superstitions or symbolic actions that hold particular significance. For instance, some Roma patients would place a scarf under the head of a hospitalized relative, believing it brings good luck. When the scarf was removed for practical reasons, family members felt offended: "… saying that this brings bad luck." (MS8).

Family roles in the Roma community are clearly defined and often patriarchal, which also shapes communication in healthcare settings. One interviewee described a situation where, despite questions being addressed to a woman or child, the husband always responded: "In any case, the husband answers the questions." (MS3).

Respect for Roma culture was identified as crucial for effective collaboration. Healthcare professionals who make an effort to understand and engage with their world are often met with appreciation: "If I am invited to an event, of course I will come. I think it is respectful of us to make an effort." (MS13). Such gestures build trust and help to dismantle prejudice.

The interviews also revealed significant disparities in living conditions within the Roma community. While some live in well-maintained homes, others reside in makeshift shelters without basic infrastructure: "Some don't even have drinking water, their bathrooms are not well-maintained… they wash themselves with purchased water or outside in streams." (MS12). These conditions affect both hygiene and access to healthcare.

Unhealthy lifestyles are also common, particularly among the youth. Smoking begins at an early age, and diets often include fast food and sugary drinks: "They spend a lot of money on fast food, hamburgers… they drink a lot of sugary drinks." (MS12).

Another important cultural aspect is the fear of healthcare services, especially dentists, as well as illness and pain in general. This fear is rooted in cultural narratives and past negative experiences: "It

seems that there is a fear of illness, even when they are very sick, they trust us and do not object." (MS8).

One particularly notable feature of Roma culture is the prominent role of grandparents, who often raise the children due to very early parenthood. Young parents, often teenagers, are still developing their identities and are not yet ready for full responsibility: "So I think what grandmothers and grandfathers say is that it is like a law for them." (MS12). This generational caregiving affects how children view authority and institutions.

Medical Treatment of Roma

Healthcare professionals frequently observe that Roma patients are very receptive to medication. Many perceive treatment primarily as the receipt of medicine, while other forms of care, such as counselling or lifestyle changes, are less prioritized: "If we tell them that this is a medicine, that it will cure them, that's great for them. They are very enthusiastic about drug treatment. Everything helps them." (MS11).

Sometimes, medication is shared more widely than intended: "If they get Ventolin, for example, the whole family uses it." (MS11). While some professionals mention the use of alternative treatments like ointments and herbal remedies, others say Roma patients generally trust conventional medicine more: "They are very fond of asking for sprays, tablets, painkillers…" (MS12). This coexistence of traditional and official medicine reflects a desire for quick and practical solutions.

A major barrier to effective treatment is limited understanding of medical instructions. Patients often return with the same issues due to unclear communication or poor comprehension: "They come back for treatment several times for the same things." (MS5). These issues often stem from a lack of Slovenian language skills and low literacy levels: "If I write them instructions on how to brush their teeth, they tell me that they have no one at home who can read them." (MS12).

There are differing opinions about access to healthcare. Some professionals cite systemic barriers such as lack of insurance and avoidance of preventive care: "Mothers don't take their children to various clinics… they only bring their children if they are sick." (MS1). Others note that despite obstacles, Roma families often find resourceful ways to access care: "Even if

they don't have the language, a telephone or transport. They will come without anything. Or they will arrange for several Roma families to come in one van." (MS11).

Prevention is often neglected in favor of curative treatment: "They don't come to the parent school or the referral clinic." (MS12). They usually respond to preventive measures only when a problem has already developed. This is not due to ignorance but results from a combination of low health literacy, mistrust, and life circumstances shaped by poverty.

Interpersonal Relationships Between Healthcare Professionals and Roma

Healthcare workers described mixed experiences with Roma patients. Some reported positive cooperation: "I haven't had any bad experiences so far. I feel like they have integrated into our system." (MS6). Others mentioned challenges, often attributed to fear, cultural misunderstandings, and differing expectations: "The experiences are quite difficult … but they are quite considerate, except for the instructions regarding treatment." (MS8).

Roma attitudes toward healthcare staff are often shaped by the quality of the relationship: "If I am nice to them… they behave nicely in return." (MS1). Patience and respect were emphasized as key to fostering collaboration: "Patience. I have developed that." (MS10). Effective strategies include informal outreach and direct community engagement, which help build trust: "They respect that we don't invite them through official channels… when they see that, everything is a little easier." (MS11).

Employing Roma assistants or cultural mediators was also noted as extremely helpful: "Now they have started to employ Roma in the day centre… it makes our work easier." (MS12).

Family plays a central role in Roma healthcare experiences: "If someone gets sick, the whole family comes with them." (MS12). "We work with grandmothers and grandfathers every day… even more than with parents." (MS11).

Many healthcare workers admitted a lack of training on Roma culture and communication: "We have too little education when it comes to Roma." (MS12). Although some expressed motivation to improve, they also reported burnout due to slow progress: "I tried really hard last year… over time, it wears off a little." (MS13).

Other challenges included inconsistent documentation and spontaneous behavior: "When they want something, they want it as soon as possible." (MS11), "30, 40 people come to visit at the same time." (MS1).

Despite these challenges, the interviews highlighted that mutual respect and adaptability lead to positive outcomes.

Communication with Roma

All interviewees agreed that communication is central to effective collaboration with the Roma community. Healthcare workers observed that Roma often have their own style of expression, which differs from standard Slovenian: "They have their own way of communicating… if you adapt to them, you get closer to them." (MS1).

While communication typically takes place in Slovenian, it is often dialectal or includes slang, which can lead to misunderstandings: "We communicate in Slovenian, without any problems." (MS6). "When they don't have a day off, they will communicate in their own language and will only understand what they want to hear." (MS11).

Children and mothers in particular often struggle with language comprehension: "They have their own slang … mom doesn't understand either." (MS15). Healthcare workers often adapt their approach in real-time: "You develop a strategy, you adapt, on the fly." (MS3). Creating a sense of acceptance is also seen as crucial: "It is a way to make them feel accepted." (MS4). "Roma assistants" or cultural mediators play a vital role in facilitating communication and resolving misunderstandings: "If there is a problem or disagreement, we have a Roma assistant." (MS12). These mediators translate not only language but also cultural context, making them indispensable to successful communication. Ultimately, healthcare workers find that communication with Roma is possible, but it demands patience, cultural sensitivity, and flexibility.

Discussion

The research provides an in-depth examination of the experiences of healthcare professionals in treating Roma patients, highlighting key challenges related to communication, access to healthcare services, and cultural differences. The findings align with existing research that identifies similar issues and suggests solutions for improving healthcare for this socially marginalized group. Other authors (19, 21) report comparable challenges in working with Roma communities, namely, difficult communication, mistrust, and a poor understanding of the unique cultural needs of Roma families. Roma individuals face healthcare barriers at the level of service users, service providers, and institutions. A lack of access to interpreters or cultural mediators is also frequently noted. Roma are identified as a vulnerable population, particularly Roma children (22).

This culturally diverse ethnic minority has specific needs related to healthcare and requires targeted, culturally sensitive care to reduce health inequalities (21). When healthcare is not culturally appropriate, it can lead to cultural distress and marginalization (19).

One of the most frequently reported challenges is communication. Healthcare professionals often cite the need for language adaptation, as some Roma individuals do not speak Slovenian fluently or use distinct slang. Similar observations are found in the work of Mustajbašić (13) and Lipovec Čebron (16), who argue that language barriers reinforce social exclusion and contribute to indirect antigypsyism within institutions. Interviewees pointed to the use of Roma assistants, community involvement, and individualized approaches as effective strategies for improving communication. These strategies are consistent with Ušaja et al. (18), who emphasize the importance of intercultural communication. Such practices represent an important step toward overcoming antigypsyism by involving Roma as active partners rather than passive recipients of healthcare services.

The research also found that Roma often have limited access to health services due to lack of insurance, insufficient information, and mistrust of the system. Similar barriers are identified by Žagar et al. (1) and George et al. (12), who stress the systemic nature of Roma exclusion. Mistrust toward institutions, rooted in historical abuses and neglect of Roma realities is a clear manifestation of antigypsyism in healthcare. Despite these challenges, interviewees also highlighted the agency and resilience of many Roma individuals who actively seek to access services. This resourcefulness, also documented by Hrženjak et al. (17), illustrates the strength of community and counters passive stereotypes often associated with antigypsyism.

Cultural differences play a significant role in the quality of care. Interviewees mentioned varying beliefs about treatment, which are frequently misinterpreted as non-compliance. Komidar (7) warns that a lack of intercultural competence is not neutral, it can reinforce discrimination and deepen the divide between institutions and users. Additionally, the research revealed low levels of health literacy among Roma, posing another barrier to equitable and effective care. This is supported by findings from Belovič et al. (2) and Bajraktarević et al. (15), who emphasize the influence of educational and social deprivation on health outcomes.

Healthcare professionals cited patience, building trust, the use of Roma cultural mediators, and organizing workshops as key strategies. These practices align with recommendations for combating antigypsyism, as they are grounded in respect, inclusion, and co-creation of services with the Roma community. A key contribution of this research is its insight into how everyday practices of healthcare professionals can either reinforce or challenge antigypsyism. In this way, the study reinforces the notion that combating antigypsyism is not solely a political or educational issue, but a responsibility shared by every institution and individual within the system.

Despite the significance of these findings, the research has limitations that affect the generalizability and transferability of its results. The first limitation is the sample size, the study is based on interviews with only 15 healthcare workers, which limits broader generalization. The sample in this study was gender-imbalanced, with a significant predominance of female participants. This imbalance represents a limitation, as it may influence the perspectives expressed in the findings. Future research should aim for a more balanced gender representation to ensure that both male and female viewpoints are adequately reflected. Moreover, the sample was geographically confined to the Dolenjska region, where healthcare professionals may have specific experiences that differ from those

in other parts of Slovenia. Another key limitation is the exclusive focus on the perspective of healthcare professionals, without including the voices of Roma as direct users of healthcare services. As a result, the study primarily reflects an institutional view of the barriers, while the lived experiences of Roma remain underrepresented. The qualitative nature of the research, while valuable for gaining deeper insight into individual experiences, does not allow for quantitative comparisons across groups or regions. Lastly, potential response bias must be considered, as participants may have presented themselves or their work environments in a more favorable light.

The study highlights the importance of improving communication, addressing systemic barriers, and enhancing health literacy to ensure better healthcare for Roma communities. It recommends additional training for healthcare workers in cultural competence, the inclusion of Roma assistants in healthcare institutions, and the development of tailored programs to expand access to services and promote health within Roma populations.

Conclusion

Research on healthcare professionals' experiences treating Roma revealed that communication barriers, systemic exclusion, and cultural differences are key challenges that can lead to poorer quality healthcare. Language barriers and low health literacy often hinder collaboration, reinforcing "antigypsy" patterns of inequality. However, some interviewees reported successful strategies such as the use of cultural mediators ("Roma helpers"), building mutual trust, and educational activities, which suggest potential for improvement. These approaches go beyond technical solutions, they represent concrete measures against antigypsyism by building trust, eliminating prejudice, and bridging the gap between the community and the healthcare system.

For practical application, we propose the systematic inclusion of Roma cultural mediators in health institutions, mandatory training on cultural competence and recognition of antigypsyism for healthcare workers, the development of accessible and culturally adapted

health prevention programs, and the strengthening of health literacy in cooperation with the Roma community. Future research should include Roma voices, assess the long-term effects of anti-discrimination strategies, and more comprehensively address the systemic roots of antigypsyism in Slovenia.

Through awareness, inclusion, and shared decision-making, we can together create a more equitable healthcare system for all - free from prejudice and discrimination.

Information about the origin of the article

The article was written for the course Transcultural Nursing and Global Health at the Master's Degree in Nursing at the Faculty of Health Sciences Izola.

Author contributions

Conceptualization: (MP, DL, AK, DP); Data Curation: (DL, AK, DP); Formal Analysis: (DL, AK, DP); Investigation: (DL, AK, DP); Methodology: (AK); Project Administration: (DL); Resources: (DP); Supervision: (DL, MP, SB); Writing – Original Draft: (DL, AK, DP, MP, SB); Writing – Review & Editing: (DL, AK, DP, MP, SB). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgements

Funding

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Demographic Predictors of Health Literacy Among Hospitalized Patients

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Abstract

Introduction. One definition of health literacy describes it as the ability to access, understand, and evaluate health information with the aim of preserving and improving health. Limited health literacy represents a significant but unequal burden in different parts of the world. The results of many previous studies have found that older age, lower education level, and poor socioeconomic status significantly contribute to lower health literacy.

Aim. The objectives of this study were to examine health literacy among hospitalized patients, investigate differences in health literacy according to sociodemographic variables, and identify sociodemographic predictors of health literacy.

Methods. The research was conducted as a cross-sectional study. The study included adult hospitalized patients in the Požega General County Hospital in the period from July to October 2020. The criteria for inclusion in the study were as follows: respondents older than 18 years of age, respondents hospitalized in hospital wards, respondents who speak and understand the Croatian language, respondents voluntarily participating in the study.

A questionnaire containing demographic data was used as a research instrument, while the second research instrument was the Croatian version of the SAHLCA-50 functional health literacy test. A health illiterate person is one who had 42 or fewer correct answers.

Results. A total of 173 (34.6%) respondents had adequate health literacy, whereas 327 (65.4%) showed inadequate health literacy. Women were more likely to have adequate health literacy than men. Of the total of 289 (58%) women, 118 (68%) showed adequate health literacy (p = 0.001). Respondents aged 61 and older were significantly less health literate than younger respondents (p < 0.001). Age ≥61 was the strongest predictor of health illiteracy (OR = 8.17). Other significant predictor included completed primary school (OR = 113.3), incomplete primary school (OR = 550.8) and being retired rather than employed (OR = 6.54). Those respondents living in the city (101; 58%) p < 0.001) and those who were married, 128 of them (74%) (p < 0.001), were more likely to have adequate health literacy. Regarding the number of children, respondents without children or with only one child had higher health literacy than those with more children (p < 0.001).

Conclusion. In the study, we identified demographic factors that are significantly associated with health literacy levels. Future research should focus on longitudinal designs to determine the causes, outcomes, and consequences, as well as the possible impact of health status on changes in health literacy. This data can be used to develop effective public health strategies that take into account the diverse needs of different population groups. Public health interventions should particularly target men, people from rural areas, older people, and those with lower levels of education to improve their health literacy and ensure equitable access to health information.

Introduction

Health literacy is a concept that combines knowledge in the field of literacy and health, both of which are important determinants of overall well-being. Therefore, health literacy is the basis of good functioning, and has a direct impact on individual's ability to manage their own health and that of the wider community (1). In recent decades, health literacy has been highlighted as an important topic worldwide, especially for the prevention of chronic diseases (2). Inadequate health literacy has been linked to poorer disease management, non-adherence to treatment recommendations, frequent hospitalizations, and improper use of prescribed medications by patients or caregivers (3). Limited health literacy represents a significant but unequal burden in different parts of the world. Unfortunately, the research conducted so far shows a worrying proportion of insufficient health literacy of the population. A survey conducted in eight European countries found a low level of health literacy in as many as 47% of the population (4). The phenomenon of insufficient health literacy in Europe is significant and poses a challenge to public health (5). The results of many previous studies have shown that older age, lower level of education and poor socioeconomic status are significant predictors of low health literacy (6-9). Gender differences in health-related attitudesas well as the use of health services have been repeatedly documented (10-13). While there is great interest in studying health literacy worldwide due to its direct impact on the health of individuals and society as a whole, research in Croatia in this area is insufficient and has been conducted on subpopulation groups (14-15). Thus, the study by the Croatian Institute of Public Health on the mental health literacy among educational workers showed that more than half of the respondents (57,6%) did not recognize that the described case indicated a depressive disorder (16). A national survey conducted by Bobinac et al. showed that the level of health literacy in the Croatian population is on the borderline between problematic and adequate, with older people, people with lower education and lower incomes achieving worse results (17). These results confirm the importance of further research into health literacy in Croatia. In order for healthcare providers and policymakers to act effectively to raise

health literacy levels, it is essential to identify the various factors influencing health literacy before planning health information access activities and designing adequate interventions (18).

Aim

The objectives of this study were to:

- Examine health literacy among hospitalized patients.
- Investigate differences in health literacy according to sociodemographic variables.
- Identify sociodemographic predictors of health literacy.

Methods

The research was conducted as a cross-sectional study. The study included all adult hospitalized patients at the Požega General County Hospital during the period from July to October 2020.

The inclusion criteria were as follows: respondents aged 18 or older, patients hospitalized in hospital wards, individualss who speak and understand the Croatian language, and individuals who voluntarily agreed to participate in the study. The exclusion criteria were: cognitive impairments, vision and/or hearing difficulties, illiteracy, unconsciousness, confirmed COVID-19 infection, or suspected COVID-19 infection.

A total of 500 participants took part in the study, of whom 289 were women (57.8%) and 211 were men (42.2%). The largest age group consisted of participants aged 61 years and older, numbering 278 (55.6%).

Instruments

Demographic questionnaire – This section was specifically designed for the purposes of this study and in-

cluded seven items (gender, age, place of residence, marital status, number of children, education level, and employment status). All questions were closed-ended, and respondents could select one of the provided answer options.

Short Assessment of Health Literacy for Croatian Adults – 50 items (SAHLCA-50) – The Croatian version of the SAHLCA-50 functional health literacy test, which has been analyzed and validated, was used (19). The questionnaire consists of fifty closed-ended items. For each question, participants could choose one of three response options: "Correct," "Incorrect," or "I don't know." The total score represents the sum of all correct answers and can range from 0 to 50. Health literacy level was treated as a dichotomous variable. Scores of 42 or higher were classified as adequate health literacy, while scores of 41 or lower indicated low health literacy. The reliability of the SAHLCA-50 was 0.91 (19).

Ethics

The research was conducted after the approval of the Ethics Committee of the Požega General County Hospital (Reg. No.: 02-7/1-1/1-4- 2020). All participants were previously informed in detail about the aim and nature of the research, and after receiving the necessary explanations, they provided written informed consent. The research was conducted anonymously.

Statistics

Categorical variables were summarized using absolute and relative frequencies, and differences between groups were assessed using the chi-square (χ^2) test with adjusted residual analysis. The normality of the distribution for continuous variables (health literacy) was evaluated using the Shapiro–Wilk test, which indicated that the variable was not normally distributed. Continuous data are presented as medians with interquartile ranges (IQR). Homogeneity of variance was also not confirmed; therefore, nonparametric tests were applied in subsequent analyses. Comparisons between two independent groups were performed using the Mann–Whitney U test, while comparisons involving more than two independent groups were conducted using the Kruskal–Wallis test followed by Conover's post hoc test. The impact of multiple predictors on the likelihood of health literacy was examined through logistic regression (both univariate and multivariate, stepwise selection). All p values were two-

tailed, and statistical significance was set at Α = .05. Analyses were performed using MedCalc® Statistical Software, version 20.111 (MedCalc Software Ltd., Ostend, Belgium) and IBM SPSS Statistics for Windows, Version 23.0 (IBM Corp., Armonk, NY, 2015).

Results

The study was conducted on 500 hospitalized patients, of which 211 (42.2%) were men and 289 (57.8%) were women. There were 278 (55.6%) respondents aged 61 and over. A total of 293 (58.6%) respondents lived in rural areas, and 313 (62.6%) were married (Table 1).

Table 1. Basic characteristics of the subjects (N = 500)

	n (%)
Gender	
Men	211 (42.2)
Women	289 (57.8)
Age groups	
up to 30 years	67 (13.4)
31 - 40	54 (10.8)
41 - 50	35 (7)
51 - 60	66 (13.2)
61 years and older	278 (55.6)
Whereabouts	
Village	293 (58.6)
Town	207 (41.4)
Marital status	
Married	313 (62.6)
Cohabiting	23 (4.6)
Living alone	65 (13)
Widowed	99 (19.8)
Number of children	
No children	79 (15.8)
One child	88 (17.6)
Two children	189 (37.8)
Three or more children	144 (28.8)
Level of education	
Incomplete primary school	82 (16.4)
Primary school	106 (21.2)
Secondary education	244 (48.8)
Higher education	29 (5.8)
Higher education or above	39 (7.8)
Employment status	
Employed	137 (27.4)
Unemployed	84 (16.8)
Occasionally employed	4 (0.8)
Retired	275 (55)

Note: n – number of participants; % – percentage

Table 2. Differences in SAHLCA-50 scores compared to respondent characteristics (N = 500)

	Me (IQR) SAHLCA-50	U/H (df)	p
Gender			
Men	36 (25 – 42)	25902.50	**0.004**
Women	39 (26 – 45)		
Age groups			
up to 30 years	44 (39 – 47)		
31 - 40	44 (39 – 48)		
41 - 50	43 (34 – 46)	123.4 (4)	**< 0.001**
51 - 60	41 (36 – 44)		
61 and older	28 (22 – 39)		
Marital status			
Married	39 (30 – 45)		
Cohabiting	36 (29 – 43)	55.5 (3)	**< 0.001**
Living alone	37 (26 – 44)		
Widowed	25 (19 – 35)		
Number of children			
No children	40 (33 – 45)		
One child	42 (29 – 46)	27.7 (3)	**< 0.001**
Two children	38 (25 – 43)		
Three or more children	31 (22 – 41)		
Level of education			
Incomplete primary school	22 (18 – 26)		
Primary school	26 (22 – 34)		
Secondary education	41 (36 – 45)	246.1 (4)	**< 0.001**
Higher education	45 (41 – 48)		
Higher education or above	47 (44 – 49)		
Employment status			
Employed	43 (38 – 47)		
Unemployed	41 (33 – 45)	113.3 (3)	**< 0.001**
Occasionally employed	43 (33 – 45)		
Retired	28 (22 – 39)		

Note: Me – Median; IQR – Interquartile range; p – Statistical significance; CI – Confidence interval; U – Mann–Whitney U test value; H – Kruskal–Wallis test value; df – Degrees of freedom

To determine differences in health literacy according to sociodemographic variables, the Mann–Whitney U test and the Kruskal-Wallis test were used. There was a significant difference in health literacy scores across several sociodemographic groups. Women were significantly more health-literate than men (U = 25902,50, p = 0.004). Respondents aged 61 years and older had significantly lower health literacy scores than all younger age groups (H(4) = 123.4, p < 0.001). Widowed respondents demonstrated significantly lower health literacy than those who were married, cohabiting, or living alone (H(3) = 55.5, p < 0.001). Participants with three or more children had lower health literacy than those with fewer children, while respondents with one child scored higher than those with two children (H(3) = 27.7, p < 0.001). Regarding education, respondents with a university degree or higher scored significantly higher than those with secondary, primary, or incomplete primary education (H(4) = 246.1, p < 0.001). Finally, retired respondents had significantly lower health literacy than employed and unemployed respondents (H(3) = 113.3, p < 0.001) (Table 2).

The results of the SAHLCA-50 test showed that the median total health literacy score was 37 (IQR = 25-44). To determine differences in the distribution between health-literate and health-illiterate participants, a χ^2 test was used. The analysis revealed a statistically significant difference (χ^2(1) = 47.43; p < 0.001), with a significantly higher number of health-illiterate participants in the sample (n = 327; 65.4%) (Table 3).

The χ^2 test analysis showed that all examined sociodemographic variables (gender, age, place of residence, marital status, number of children, education, and employment status) were significantly associated with the level of health literacy (p ≤ 0.001 for all). The strongest associations were observed for education, age, and employment status. Adjusted residual analysis (Table 4) revealed that participants with higher health literacy were significantly more likely to be women, younger, urban residents, married, have fewer children, possess higher education, and be employed. In contrast, individuals with lower health literacy were more frequently men, older, rural residents, widowed, have more children, possess lower education, and be retirees (Table 5).

Logistic regression was conducted to identify predictors of health literacy based on several sociodemographic factors among hospitalized patients. The bivariate regression analysis indicated that age, education, and employment status had the strongest effects. Respondents aged 61 years and older were significantly less likely to be health-literate compared to those aged up to 30 years (OR = 8.17, 95% CI [4.55-14.68]). Participants with completed primary education (OR = 113.3, 95% CI [32.5-395.18]) or unfinished primary education (OR = 550.8, 95% CI [62.01-4892.6]) were markedly less likely to be health-literate compared to those with a university degree or higher. Additionally, retired respondents were less likely to be health-literate than employed respondents (OR = 6.54, 95% CI [4.14-10.34]) (Table 5).

Discussion

The results of this study indicate that women, individuals with higher education, married respondents, those with fewer children, residents of urban areas,

Table 3. **Levels of health literacy according to the SAHLCA-50 test and differences between health-literate and health-illiterate participants**			
Health literacy			
	Health literate	Health illiterate	Altogether
		Me (IQR)	
Total health literacy score	45 (43 – 48)	29 (22 – 37)	37 (25 – 44)
		n (%)	χ^2 (df)	p
Categorized health literacy	173 (34,6)	327 (65.4)	47.432 (1)	**<0.001**

Note: Me – Median; IQR – Interquartile range; n – Number of participants; % – Percentage; p – Statistical significance; χ^2 – Chi-square value; df – Degrees of freedom.

Table 4. **Distribution of respondents according to health literacy in relation to basic characteristics (N = 500)**				
Number (%) of respondents				
Health literate (n = 173)	**Health illiterate (n = 327)**	**Altogether**	χ^2 **(df)**	*p*
Gender				
Men	55 (32)	156 (48)	211 (42)	11.748 (1)	**0.001**
Women	118 (68)	171 (52)	289 (58)		
Age groups				
up to 30 years	43 (25)	24 (7)	67 (13)		
31 – 40	34 (20)	20 (6)	54 (11)		
41 – 50	21 (12)	14 (4)	35 (7)	91.824 (1)	**< 0.001**
51 – 60	25 (14)	41 (13)	66 (13)		
61 years or older	50 (28.9)	228 (69.7)	278 (55.6)		
Whereabouts				
Village	72 (42)	221 (68)	293 (59)	31.443 (1)	**< 0.001**
Town	101 (58)	106 (32)	207 (41)		
Marital status				
Married	128 (74)	185 (57)	313 (63)		
Cohabiting	9 (5)	14 (4)	23 (5)	20.985 (3)	**< 0.001**
Living alone	20 (12)	45 (14)	65 (13)		
Widowed	16 (9)	83 (25)	99 (20)		
Number of children				
No children	33 (19)	46 (14)	79 (16)		
One child	48 (28)	40 (12)	88 (18)	27.697 (3)	**< 0.001**
Two children	60 (35)	129 (39)	189 (38)		
Three or more children	32 (18)	112 (34)	144 (29)		
Level of education				
Incomplete primary school	1 (1)	81 (25)	82 (16)		
Primary school	6 (3)	100 (31)	106 (21)		
Secondary education	111 (64)	133 (41)	244 (49)	158.375 (4)	**< 0.001**
Higher education	21 (12)	8 (2)	29 (6)		
Higher education or above	34 (19.7)	5 (1.5)	39 (7.8)		
Employment status				
Employed	82 (47)	55 (17)	137 (27)		
Unemployed	37 (21)	47 (14)	84 (17)	76.135 (3)	**< 0.001**
Occasionally employed	3 (2)	1 (0)	4 (1)		
Retired	51 (29)	224 (69)	275 (55)		

Note: n – Number of participants; % – Percentage; p – Statistical significance; ² – Chi-square test value; df – Degrees of freedom

Table 5. **Prediction of the probability of health illiteracy (bivariate regression analysis), N = 500**					
Factor	ß	Wald	p	OR	95% CI
Gender (M)	0.67	11.59	**< 0.001**	1.96	1.33 – 2.88
Age (up to 30)					
31 – 40	0.05	0.02	0.89	1.05	0.50 – 2.22
41 – 50	0.18	0.17	0.68	1.19	0.52 – 2.77
51 – 60	1.08	8.98	**0,003**	2.94	1.45 – 5.95
61 years or older	2.1	49.4	**< 0.001**	8.17	4.55 – 14.68
Place of residence (city)	-1.07	30.5	**< 0.001**	0.34	0.23 – 0.5
Marital Status (Married)					
Cohabiing	0.07	0.03	0.87	1.08	0.45 – 2.56
Living alone	0.44	2.29	0.13	1.56	0.88 – 2.76
Widowed	1.28	18.6	**< 0.001**	3.59	2.01 – 6.41
Number of children (without children)					
One child	-0.51	2.7	0.1	0.59	0.32 – 1.1
Two children	0.43	2.46	0.12	1.54	0.89 – 2.65
Three or more children	0.92	9.19	**0.002**	2.51	1.38 – 4.55
Level of education (university degree and above)					
Higher education	0.95	2.25	0.13	2.59	0.75 – 8.97
Secondary education	2.09	17.89	**< 0.001**	8.15	3.08 – 21.5
Primary school	4.73	55.1	**< 0.001**	113.3	32.5 – 395.18
Incomplete primary school	6.31	32.07	**< 0.001**	550.8	62.01 – 4892.6
Employment status (employed)					
Unemployed	0.64	5.18	**0.02**	1.89	1.09 – 3.28
Occasionally employed	-0.69	0.36	0.55	0.49	0.05 – 4.9
Retired	1.87	64.9	**< 0.001**	6.54	4.14 – 10.34

Note: p – statistical significance; ß – regression coefficient; OR – odds ratio

and employed individuals demonstrate higher levels of health literacy compared to men, those with lower education, unmarried respondents, parents with more children, rural residents, and retirees. These differences can be explained by a combination of social, educational, and lifestyle factors.

Women and married individuals are often more involved in managing family health, communicate more frequently with healthcare providers, and are more exposed to health-related resources (3, 20–23), while individuals with higher education possess stronger cognitive, communication, and digital skills (20, 24, 25). Empirical evidence consistently shows a significant association between lower levels of education and poorer health literacy, with educational status recognized as a key determinant of health literacy

(26). These findings confirm that better-educated individuals are more capable of understanding and internalizing health information, and that education represents a fundamental prerequisite for health literacy (27).

The analysis also revealed that age and employment status are strong predictors of health literacy. Older participants, particularly those aged over 60, exhibited significantly lower health literacy compared to younger groups. This result can be explained by lower formal education levels among older generations, reduced digital competence, age-related cognitive changes, and limited access to modern health information sources. These findings are consistent with previous research showing that older age is associated with a higher risk of low health literacy (3, 37, 38).

Employed participants demonstrated higher health literacy than unemployed and retired individuals. A possible explanation is that those who are employed have more opportunities for social interaction, easier access to information, and more developed skills for managing their own health. In contrast, retirees and unemployed individuals may experience social isolation and lower motivation to actively seek health information, which can lead to poorer health literacy.

A smaller number of children and living in urban areas were also associated with higher levels of health literacy, which can be explained by better access to health and digital resources, more developed infrastructure, and more available time for health-related activities (31, 32). The study also found higher health literacy among married participants, which is consistent with previous research (33–36). This finding can be explained by reduced motivation and a lack of social and emotional support among divorced or widowed individuals, or by marriage serving as a possible protective factor.

These findings align with international literature showing a strong association between health literacy, education, age, gender, urban living, and social support (3, 37, 38). Systematic reviews emphasize that rural populations often exhibit lower health literacy due to limited access to health information, weaker digital infrastructure, and lower socioeconomic resources. However, local context and cultural factors may modify these general trends (39).

Conclusion

This study identified demographic factors that serve as key determinants of health literacy. The greatest impact on health literacy was observed among respondents aged 61 years and older, followed by educational attainment—where completion of only primary school significantly contributed to health illiteracy—and employment status, with retirees showing notably lower literacy levels.

As the research was conducted among hospitalized patients, the generalizability of the findings to the wider population may be limited. Hospitalized indi-

viduals may display a distinct health literacy profile due to acute health conditions, frequent interactions with healthcare professionals, and direct exposure to medical information.

In practical terms, these findings underscore the need for targeted educational and public health interventions aimed at groups with lower health literacy—particularly men, single individuals, those with lower education, rural residents, and parents with larger families. Such programs should include components of digital education, access to reliable health information, communication strategies tailored to varying literacy levels, and mechanisms to strengthen social support and family involvement in health management.

Future research, especially longitudinal and interventional studies, is needed to establish causal relationships and to evaluate the effectiveness of targeted interventions designed to improve health literacy among vulnerable populations.

Author contributions

Conceptualization (BL, TJ, MM, SHČ); Methodology (BL, TJ, MM, TP); Investigation (BL, ŽJ, BD, BAM); Writing—original draft preparation (TJ, LJOŠ, DD, IV); Writing—review and editing (IV, TJ, MM, BL). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgments

Funding

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Understanding Factors of Exercise Motivation: Simplification of the Exercise Motivation Inventory-2 (EMI-2)

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Abstract

Introduction. Physical inactivity represents a major public health concern, contributing to the development of numerous chronic diseases.

Aim. The aim of this study was to simplify the Exercise Motivation Inventory-2 (EMI-2) using exploratory and confirmatory factor analysis in order to identify a new, meaningful factor structure that effectively explains the underlying motives for physical activity among university students.

Methods. The study was conducted on 1,304 students of the University of Zagreb (65.7% female). The Croatian version of the EMI-2 questionnaire was employed, comprising 54 items designed to assess various intrinsic and extrinsic motives for exercise, which in the original English version are grouped into 14 factors. Data were analyzed using exploratory factor analysis (EFA) to identify latent factors, followed by confirmatory factor analysis (CFA) to verify the factor structure. Reliability was assessed using Cronbach's alpha coefficient.

Results. The exploratory factor analysis initially identified eight factors; however, the scree plot suggested a three-factor solution encompassing psychological, social, and health-related motives for exercise. The simplified model demonstrated high internal consistency (Cronbach's alpha: psychological motives = 0.934; social motives = 0.919; health motives = 0.922). The confirmatory factor analysis confirmed the validity of the model with acceptable fit indices (CFI = 0.92; NFI = 0.91; IFI = 0.92), while regression analysis indicated that these factors significantly predicted students' leisure-time physical activity.

Conclusions. The simplified version of the EMI-2 provides a reliable and valid tool for assessing motives for physical activity, particularly within the student population. Simplifying the factor structure facilitates its use in both research and practical settings, supporting the development of targeted intervention programs aimed at promoting physical activity. The findings highlight the importance of psychological, social, and health-related motives in understanding and improving physical activity behaviors. Future research should examine the applicability of this model across different populations to confirm its universal relevance.

Introduction

Physical inactivity is a major public health issue, with substantial evidence demonstrating its contribution to the development of numerous chronic diseases and conditions. Recognition of the health and functional risks associated with a sedentary lifestyle has led to a wide range of recommendations in favor of regular physical activity. Current World Health Organization (WHO) public health guidelines (1) for adults aged 18–64 years recommend at least 150 minutes of moderate-intensity physical activity per week, or 75 minutes of vigorous activity. Moreover, aerobic activities should be performed in bouts of at least 10 minutes. For additional health benefits, WHO advises adults within this age range to increase moderate-intensity physical activity to 300 minutes per week, or vigorous activity to 150 minutes per week. Strength exercises involving major muscle groups should be performed at least twice per week. Individuals who engage in physical activity more frequently obtain additional benefits, and alongside aerobic exercise they are advised to include strength and flexibility training at least twice weekly. Such activity further assists in maintaining normal body weight, improving muscular strength and endurance, and preserving physical function, thereby increasing the likelihood of long-term adherence to regular physical activity (2).

Research findings indicate that physical inactivity represents a serious threat to health, functional ability, and quality of life, ranking among the three leading causes of morbidity, mortality, and disability worldwide—alongside smoking and inadequate diet (3, 4). According to recent WHO data (5), nearly one-third (31%) of adults worldwide, approximately 1.8 billion individuals, failed to meet recommended physical activity levels in 2022. These findings point to a concerning upward trend, with physical inactivity increasing by approximately 5% between 2010 and 2022. The situation in Croatia is particularly alarming: as Bartoluci and Škorić (6) report, only around 17% of people are sufficiently active, while Greblo and colleagues found that 59% of Croatian adults do not engage in physical activity at all (7).

Although it might be expected that young adults, particularly university students, are the most physically active population, studies consistently show that students worldwide often fail to meet minimum daily activity recommendations, and that activity levels decline during the transition from secondary school to university (8, 9). A study from Portugal revealed that students walked more and spent less time sitting during the workweek, whereas weekend activity decreased, especially among female students (10). Croatian students also exhibit low activity levels, with participation varying by sociodemographic factors (11, 12, 13). Students recognize the importance of exercise but often do not practice it sufficiently (14, 15). Thus, targeted interventions to increase physical activity are needed, particularly among female students (12, 16).

Given the importance of physical activity and its positive effects on psychophysical health, it is essential to identify the factors that predict engagement in physical activity. The decision to initiate, and even more so to maintain, regular exercise is strongly influenced by psychological factors, with motivation being among the most important (17).

Self-Determination Theory (SDT) is a comprehensive theory of human motivation and personality, developed through traditional empirical research, that emphasizes the importance of intrinsic resources for personality growth and behavioral self-regulation (18). Due to functional and experiential differences between self-motivation and external regulation of behavior, much of SDT research has focused on distinguishing and understanding different types of motivation that drive behavior at any given moment.

According to SDT principles, physical activity may be driven by both intrinsic and extrinsic factors. Intrinsic motivation refers to behavior performed for the inherent enjoyment and satisfaction derived from the activity itself. In contrast, extrinsic motivation characterizes behavior undertaken to achieve external outcomes, such as tangible rewards, avoidance of punishment, or the pursuit of recognition, status, or praise. From the SDT perspective, intrinsic motivation reflects a deeply rooted desire to apply and develop one's skills and capacities (18). Such motivation is connected to the increasing demands of the environment and the individual's ability to cope with those challenges. However, in the context of physical activity, intrinsic motivation alone may not be sufficient to initiate action; rather, the activity must also be enjoyable, offering a sense of pleasure and fun—features that fundamentally characterize intrinsically motivated activities. Indeed, one of the primary reasons people cite for engaging in exercise is that it is interesting, challenging, and enjoyable (Frederick & Ryan, 1995; as cited in 19).

At the same time, many sports and physical activities are predominantly influenced by extrinsic motivators. In such cases, individuals participate not because they inherently enjoy the activity, but because they derive some external benefit—whether in the form of athletic achievement, improved health, enhanced appearance, or maintenance of physical fitness. For most individuals, participation in physical activity reflects a combination of intrinsic and extrinsic motives, underscoring the importance of acknowledging extrinsic motivation when designing strategies to promote engagement in exercise (19).

Teixeira et al. (20) conducted a systematic review of 66 empirical studies and concluded that autonomy support, competence, and relatedness significantly contribute to motivation for physical activity. For example, when individuals feel they have control over their exercise (autonomy) and experience a sense of achievement (competence), they are more likely to sustain participation. Furthermore, social support and a sense of belonging enhance motivation to engage in exercise.

Interventions based on SDT that are designed to foster autonomy, competence, and relatedness have proven effective in increasing physical activity levels. Such interventions often include personalized exercise programs that allow individuals to select preferred activities, set their own goals, and receive continuous support from trainers or peer groups (20, 21).

Research has also shown that students motivated by intrinsic reasons, such as health concerns, are more likely to engage regularly in physical activity (22). In comparison, women more frequently report extrinsic motives, while men more often emphasize health-related benefits (22). Additionally, cultural contexts and educational policies may significantly influence student motivation, as illustrated by studies conducted in China (23).

Measuring motivation for exercise and physical activity is therefore a crucial step toward the ultimate goal of developing effective intervention programs to increase physical activity. One of the most widely used instruments for assessing exercise motivation is the Exercise Motivations Inventory-2 (EMI-2), developed by David Markland and David K. Ingledew in 1997 (24). The EMI-2 was designed to capture a broad spectrum of motives for physical activity participation, comprising 51 items across 14 scales that assess intrinsic and extrinsic motives, including social recognition, health pressures, and body-related motives. The EMI-2 has been widely applied in re-

search on psychological aspects of exercise and has proven to be a reliable and valid tool for understanding why individuals engage in physical activity (24).

Aim

Given the complexity of the motivational structure reflected in the original EMI-2, the aim of this study was to employ exploratory and confirmatory factor analyses to derive a meaningful factor structure that reduces the number of factors while effectively capturing the underlying motives for exercise. This approach follows Markland's (25) suggestion that, due to practical limitations of analyses involving large numbers of motivational factors, grouping variables into a smaller set of latent constructs can provide both practical and theoretical clarity.

Methods

The study was approved by the Research and Ethics Committee of the Faculty of Kinesiology, University of Zagreb. Following the approval, authorization for data collection was obtained from each of the 10 faculties where the research was conducted in 2018. At each faculty, a designated contact person (most often the Vice-Dean for Research) proposed one or more course instructors, depending on the required number of students and the year of study, within whose classes the research could be carried out. After receiving consent from the respective instructors, data collection was conducted at the beginning of the agreed class session. Students present at that time were invited to participate, and completion of the questionnaire lasted approximately 20–30 minutes.

Participation was voluntary. Before completing the questionnaire, students were informed that refusal to participate would have no negative consequences for their studies or their relationship with the instructors, and conversely, that participation would not be financially compensated. They were also informed that by completing the questionnaire they consented

to take part in the study and that their participation is completely anonymous.

The study sample consisted of 1,304 students enrolled at the University of Zagreb, originating from ten faculties that cover five scientific fields. Of the total sample, 857 participants were female students (65.7%), and 447 were male students (34.3%). The mean age of participants was 20.72 years, with the largest subgroup comprising students aged 19 years.

The sampling was quota-based with regard to the scientific fields represented at the University of Zagreb. All scientific fields were included, with the exception of the humanities and the arts. The distribution of participants across fields closely corresponded to that reported by the Croatian Bureau of Statistics (26).

Instrument

Croatian Version of the EMI-2 Questionnaire (24, 27)

The questionnaire consists of 54 items that represent fourteen potential motives for exercise. These are: weight control, illness avoidance, revitalization, appearance, social pressure, stress management, health, strength, enjoyment of exercise, affiliation, medical prescription, competition, agility, and challenge. Items are formulated to address the question of why a person exercises or would exercise, with responses provided on a five-point Likert scale (1 = not at all true for me; 5 = very true for me). According to Vlašić et al. (27), Cronbach's alpha coefficients demonstrated satisfactory internal consistency across all 14 motivational dimensions ($0.61 < \alpha < 0.83$). Markland and Ingledew (24) developed the original Exercise Motivation Inventory from the perspective of Self-Determination Theory, initially attempting to categorize motives as either intrinsic or extrinsic. However, it was later shown that certain motives may be considered intrinsic or extrinsic depending on the individual's perspective. Consequently, a strict dichotomy was not established, although some groups of motives are clearly predominantly intrinsic (e.g., enjoyment of exercise, affiliation), while others are predominantly extrinsic (e.g., social pressure).

Statistics

For data processing and analysis in this study, the statistical programs IBM SPSS Statistics 23 and Amos Graphics were employed. The method of analysis used in Amos was maximum likelihood estimation, which is considered the most appropriate approach in most cases, particularly when the normality of the distribution of analyzed variables is violated (28).

Results

The common-factor analysis aimed to establish a meaningful factor structure that would group exercise motives in a more parsimonious manner. Initially, eight factors with eigenvalues greater than 1 were extracted, but the rotated factor solution could not be meaningfully interpreted. Therefore, the scree test was used as the criterion for factor retention, a graphical method that clearly demonstrated that three factors accounted for substantially more variance than the remaining factors (see Figure 1).

Subsequently, a new factor analysis was conducted with three predefined factors. The analysis of loadings for individual exercise motives on the three factors revealed that all three items belonging to the agility-related motives, as well as all three items from the health enhancement group, did not clearly load on any of the factors and were therefore excluded from further analysis. Consequently, a new factor analysis was performed on the remaining 48 manifest variables (i.e., motives). After rotation of the factor axes, the following factor structure was obtained (Table 1).

When analyzing the item content in relation to their loadings on individual factors, it becomes evident that the first factor is saturated with exercise motives related to enjoyment, revitalization, stress prevention, challenge, and strength enhancement. These can be classified as psychological motives, and accordingly, this factor was labeled "psychological motives for exercise." Strength enhancement somewhat diverges conceptually; however, it still represents a positive motive in which an individual seeks self-improvement and greater strength—an aspect that may be interpreted not only in a physical but also in a psychological sense. Thus, the first factor is designated as *psychological motives for exercise*.

The second factor is saturated with motives related to social recognition, competition, social pressure,

and affiliation, and was therefore labeled *social motives for exercise*. The third factor is saturated with motives related to appearance enhancement, weight control, and the prevention of health problems, and was labeled *health motives for exercise*.

Markland (25) notes that, due to the practical limitations of analyzing a large number of motivational factors, it is reasonable to group variables into a smaller number of latent constructs, especially when high internal consistency coefficients are obtained. Nevertheless, this approach inevitably reduces the level of detail and limits the precision of information on participants' exercise motivation.

Cronbach's alpha reliability coefficients for the three newly created scales (latent variables) were satisfactory: 0.75 for social motives, 0.78 for health motives, and 0.886 for psychological motives.

To verify the factor structure obtained through exploratory factor analysis, a confirmatory factor analysis was performed in AMOS, separately for each higher-order factor. For clarity, factor loadings for each factor are presented individually in the following figures; however, the analysis was carried out as a single integrated model including all manifest and latent variables of exercise motives.

Figure 2 presents the loadings of the manifest and latent variables underlying the construct *psychological motives for exercise*. It can be observed that, among the manifest variables, the lowest loadings were obtained for "Because I enjoy exercising" (0.61), belonging to the *enjoyment* factor, and "Because it gives me space to think" (0.59), belonging to the *stress prevention* factor. At the higher-order level, the lowest loading within the *psychological motives for exercise* factor was observed for the *strength* factor (0.59).

With regard to the factor loadings of the manifest and latent variables underlying the *social motives for exercise* (Figure 3), it can be observed that the lowest loadings were obtained for the manifest variables "To fit in with society" (0.50) and "Because others encourage me to do so" (0.63). Both belong to the *social pressure* factor, whose overall factor loading was low (0.35), indicating a weak association with the higher-order *social motives for exercise* factor.

In the part of the confirmatory model related to the *health motives for exercise* (Figure 4), the lowest loadings were found for the manifest variables "To maintain my figure" (0.74) and "To avoid heart disease" (0.76), which belong to the factors *weight control* and *prevention of health problems*, respectively. The latter showed the weakest association (0.43) with the higher-order factor.
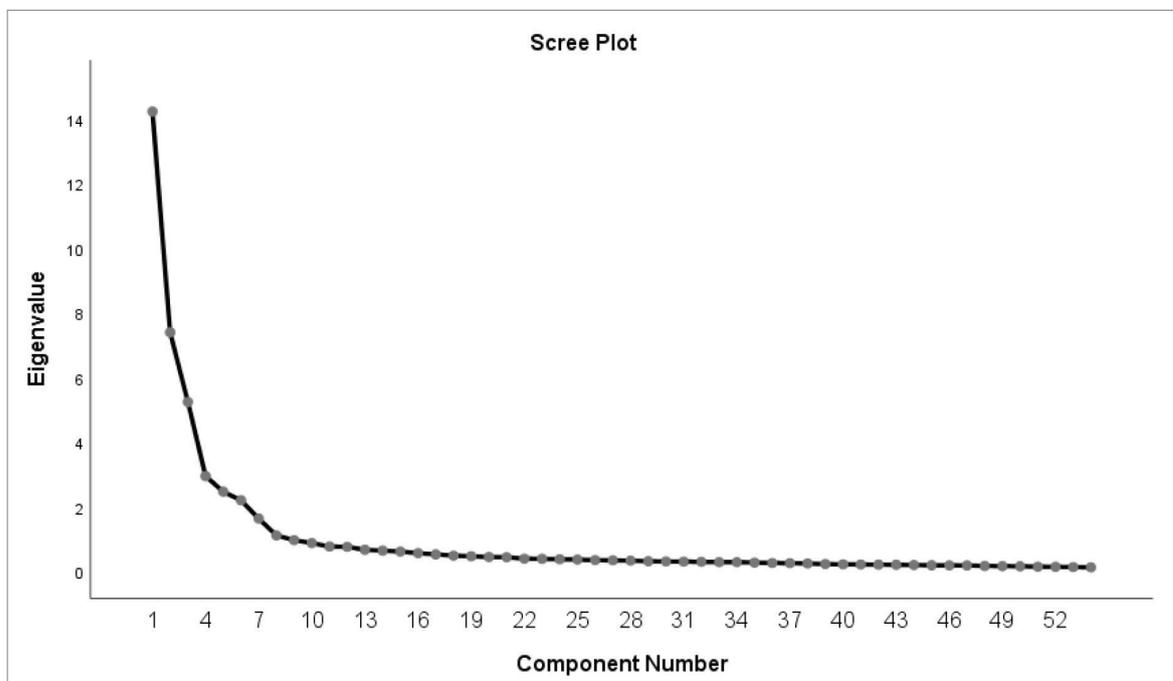
Figure 1. **Scree plot of eigenvalues of the factors extracted from the EMI-2 questionnaire**

Table 1. **Rotated factor matrix of the modified Croatian version of the EMI-2 questionnaire and reliability of the retained components**

Items	Factors		
	1	2	3
Because I enjoy exercising. (enjoyment)	0.790		
Because exercising itself makes me feel happy. (enjoyment)	0.787		
Because I consider exercise refreshing. (revitalization)	0.779		
To relieve tension. (stress prevention)	0.775		
Because I feel best when I exercise. (enjoyment)	0.771		
Because it helps me reduce tension. (stress prevention)	0.750		
Because it helps me cope with stress. (stress prevention)	0.735		
To 'recharge my batteries.' (revitalization)	0.724		
Because I feel good afterwards. (revitalization)	0.704		
To develop my skills. (challenge)	0.662		
Because it gives me goals to achieve progress. (challenge)	0.659		
To improve my own standards. (challenge)	0.643		
To face personal challenges. (challenge)	0.625		
To develop my muscles. (strength)	0.571		
Because it gives me space to think. (stress prevention)	0.567		
Because I enjoy the effort. (enjoyment)	0.556		
To increase endurance. (strength)	0.549		
To become stronger. (strength)	0.530		
To increase my strength. (strength)	0.528		
To compare my abilities to others. (social recognition)		0.709	
Because I enjoy competing in physical abilities. (competition)		0.707	
To receive recognition for my achievements. (social recognition)		0.694	
Because I enjoy competing. (competition)		0.687	
Because I like trying to win in physical activities. (competition)		0.684	
To please other people. (social pressure)		0.658	
To achieve what others cannot. (social recognition)		0.655	
To fit into society. (social pressure)		0.652	
Because others expect it from me. (social pressure)		0.624	
Because I find physical activity fun, especially when it involves competition. (competition)		0.597	
Because others demand it from me. (social pressure)		0.590	
Because people don't leave me another choice (i.e., they push me to do it). (social pressure)		0.573	
To prove myself to others. (social recognition)		0.567	
To make new friends. (socializing)		0.520	
Because others encourage me to do it. (social pressure)		0.471	
To have fun in activities with others. (socializing)		0.457	
To enjoy the social aspects of exercising. (socializing)		0.441	
To spend time with friends. (socializing)		0.421	
To have a good figure. (appearance)			0.834
To improve my appearance. (appearance)			0.834

Items	Factors		
	1	**2**	**3**
To maintain my figure. (weight control)			0.818
Because it helps me look better. (appearance)			0.768
To look more attractive. (appearance)			0.754
Because it helps me control my body weight. (weight control)			0.735
Because exercise helps me burn calories. (weight control)			0.724
To lose weight. (weight control)			0.670
To avoid health problems. (prevention of health issues)			0.418
To avoid heart diseases. (prevention of health issues)			0.396
To avoid diseases. (prevention of health issues)			0.393
Eigenvalue	**12.873**	**6.396**	**5.246**
% of Variance Explained	**26.820**	**13.325**	**10.230**
Cronbach α Coefficient	**0.886**	**0.751**	**0.781**

Table 1. **Rotated factor matrix of the modified Croatian version of the EMI-2 questionnaire and reliability of the retained components**
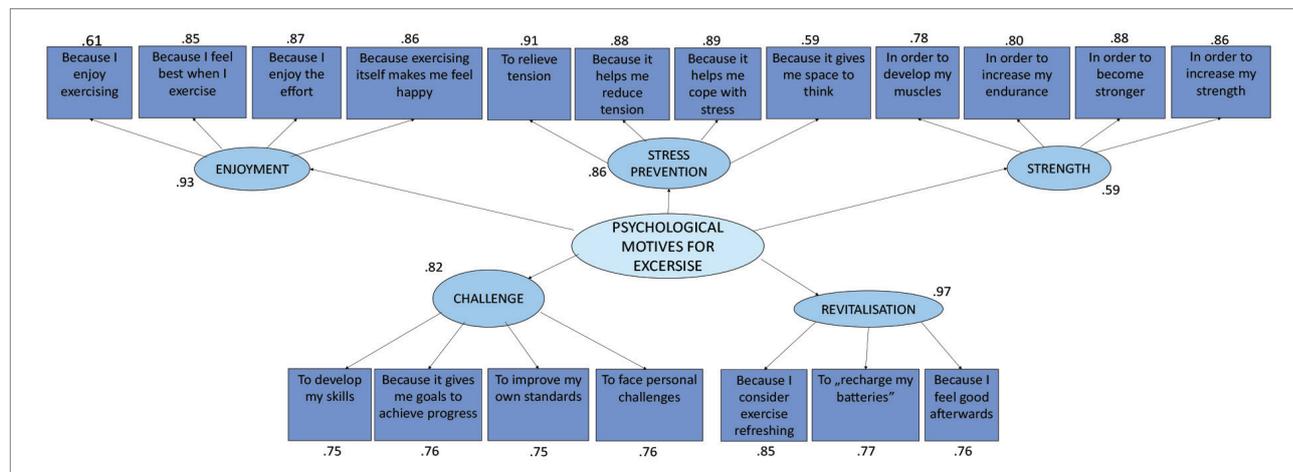
Figure 2. **Confirmatory factor analysis of psychological exercise motivation variables**
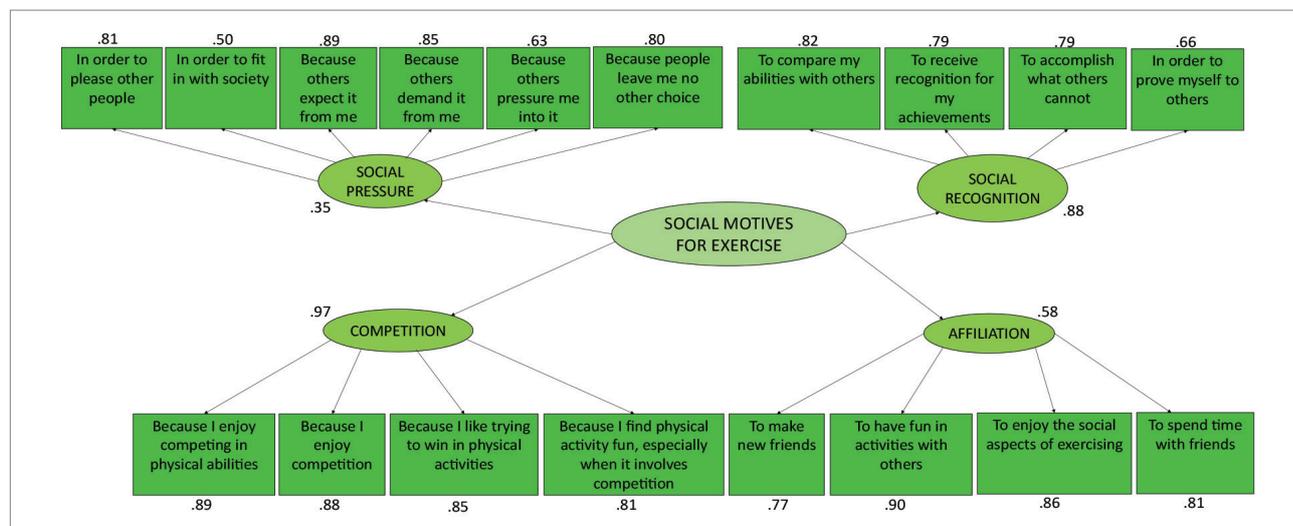
Figure 3. **Confirmatory factor analysis of social exercise motivation variables**
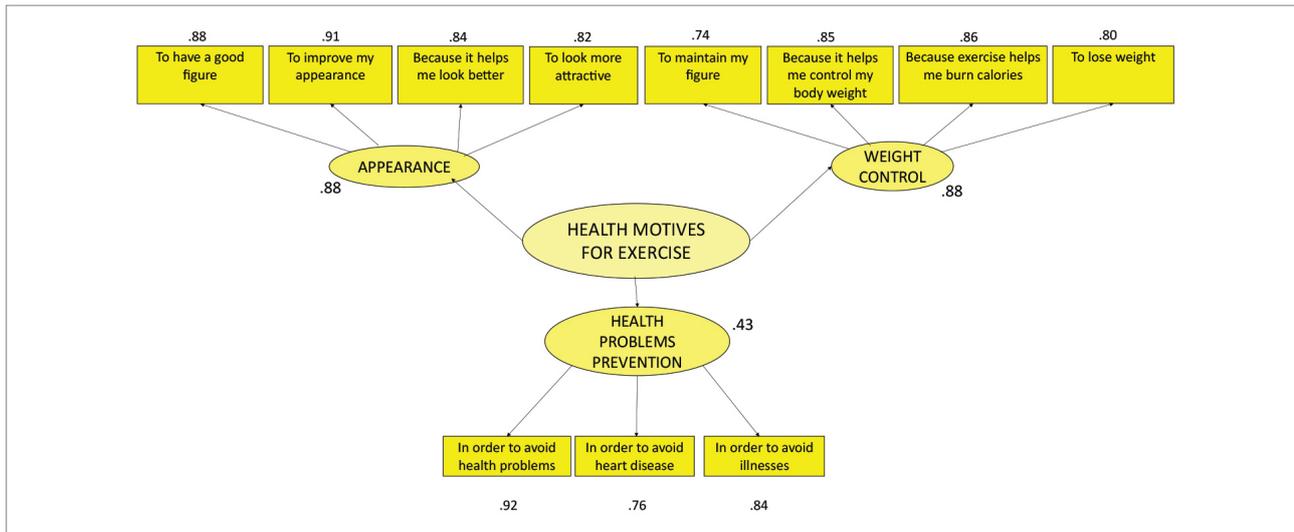
Figure 4. **Confirmatory factor analysis of health exercise motivation variables**
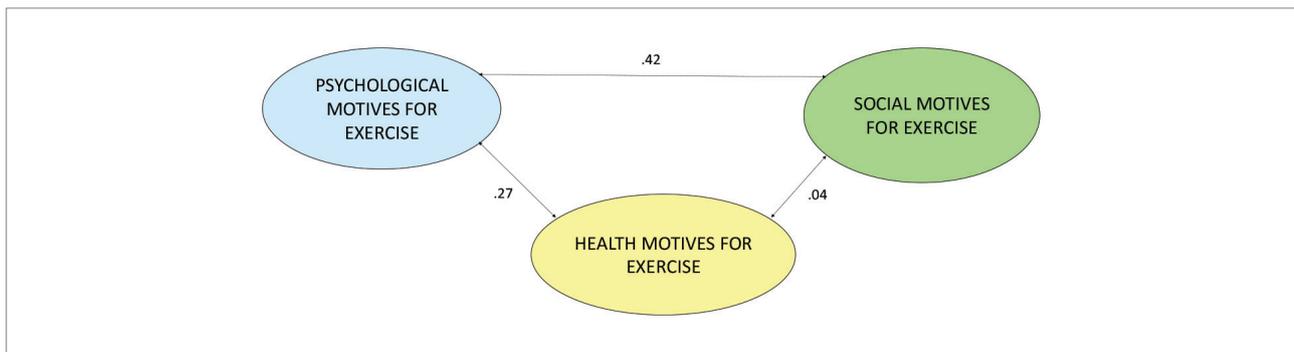
Figure 5. **Correlations between psychological, social, and health exercise motivation factors**

Table 2. **Fit indices of the higher-order exercise motivation model**

χ^2	df	p	χ^2/df	CFI	NFI	IFI	RMSEA	90% confidence interval	PClose
5814.650	1065	0.000	5.46	0.898	0.878	0.898	0.059	0.057-0.060	0.000

Regarding the correlations between higher-order factors (Figure 5), the strongest positive correlation was observed between psychological and social motives for exercise (r = 0.42, $p < 0.01$), followed by the correlation between psychological and health motives (r = 0.27, $p < 0.01$). Finally, the weakest and almost negligible correlation was recorded between social and health motives for exercise (r = 0.04, $p > 0.05$).

Lastly, the model fit indices for the higher-order confirmatory model of exercise motives (Table 2) indicat-

ed the need for model refinement. While a significant chi-square value is expected with such a large sample size and therefore provides limited information about model fit, the relative χ^2 (chi-square/df ratio) should ideally be below 5, and the CFI, NFI, and IFI indices should exceed 0.90. Additionally, the RMSEA value indicative of a good model fit should be below 0.05.

Although all values were borderline, in the next step we excluded the variables that showed the lowest loadings with the higher-order factors, in order to ex-

amine whether this would improve the quality of the model. After their exclusion, total number of manifest variables kept in the model was 32.

Regarding the part of the model related to *psychological motives for exercise* (Figure 6), the manifest variables "Because I enjoy exercising" (0.61), which belonged to the *enjoyment* factor, and "Because it gives me space to think," which belonged to the *stress prevention* factor, were removed. In addition, the *strength* factor was excluded, as it not only showed the lowest loading but also had the weakest

conceptual connection to the group of psychological motives for exercise. After these exclusions, all factor loadings exceeded 0.75.

In the part of the model concerning *social motives* (Figure 7), the manifest variable "To prove myself to others," belonging to the *social recognition* factor, and the latent variable *social pressure* were removed. The resulting loadings of manifest variables were all above 0.73, with the lowest loading observed for the *affiliation* factor.
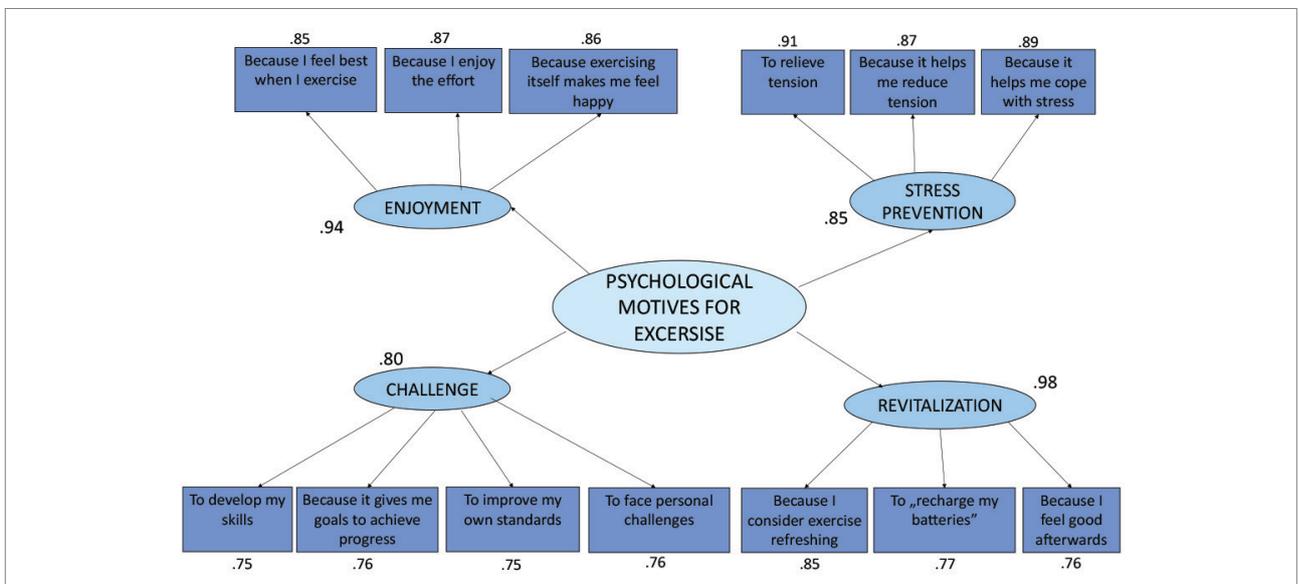
Figure 6. **Confirmatory factor analysis of modified psychological exercise motivation variables**
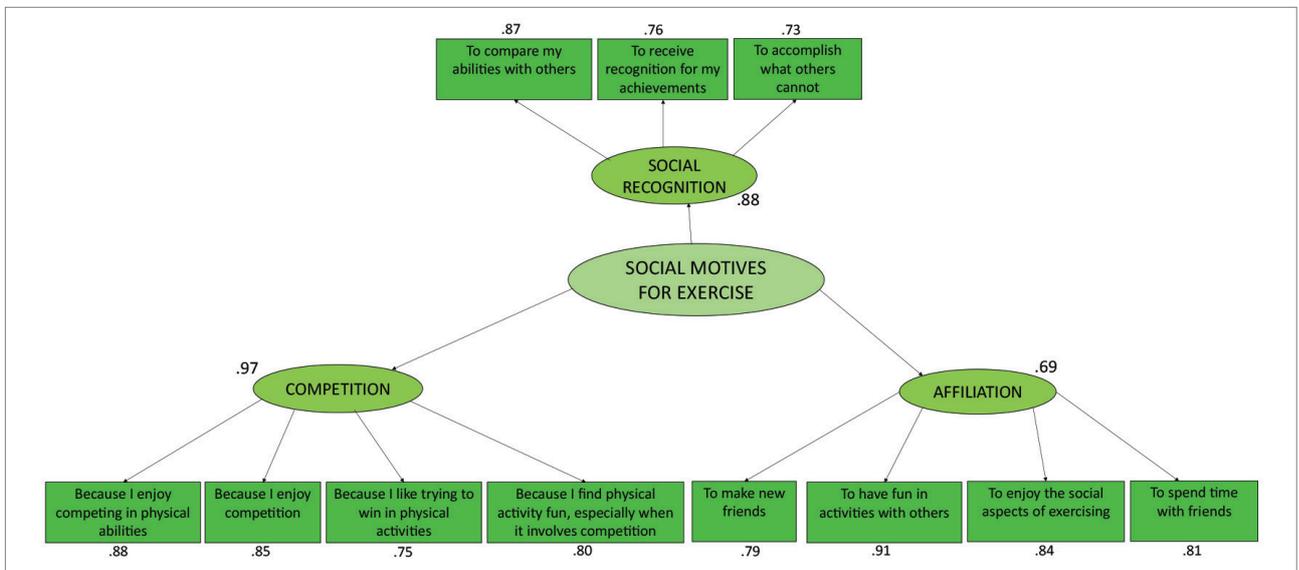
Figure 7. **Confirmatory factor analysis of modified social exercise motivation variables**
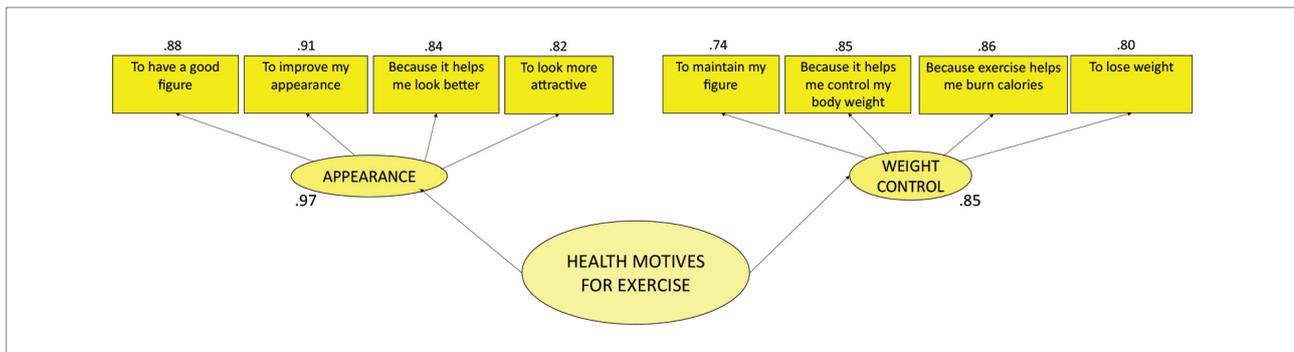
Figure 8. **Confirmatory factor analysis of modified health exercise motivation variables**
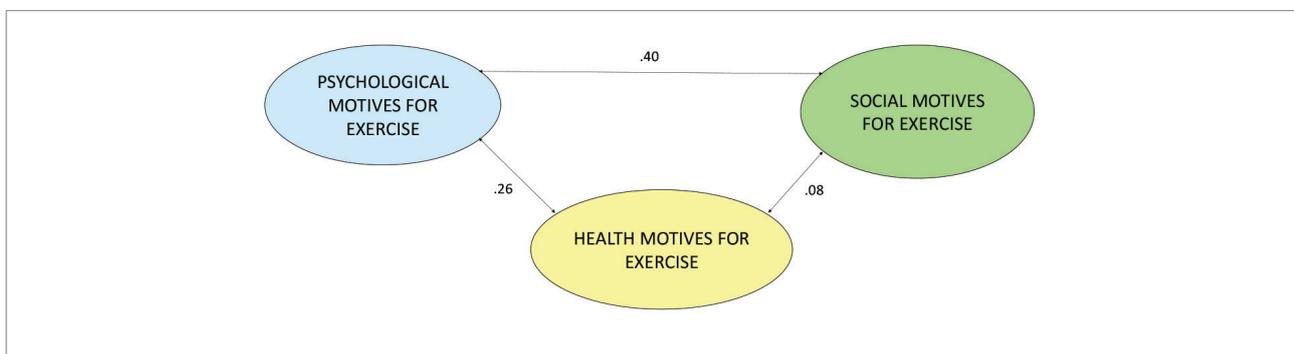
Figure 9. **Correlations between psychological, social, and health exercise motivation factors after model modification**

From the part of the model related to *health motives* (Figure 8), the factor *prevention of health problems* was excluded, as it showed the weakest association with the higher-order factor. This step further simplified and strengthened the higher-order model of exercise motives.

Simplifying the model did not substantially affect the correlations between higher-order factors (Figure 9). The strongest correlation remained between the factor representing psychological motives and that representing social motives (r = 0.40, *p* < 0.01), while the weakest correlation was between social and health motives (r = 0.08, *p* > 0.05).

What was of primary interest was the change in mod-

el fit indices after simplification. As shown in Table 3, the simplified model demonstrated better fit.

Although the χ^2 statistic, relative χ^2 (χ^2/df), and RMSEA (> 0.05) remained slightly above traditionally stricter thresholds, these indices are sensitive to sample size and model complexity. In most real-world applications, SEM models often exceed these cut-offs without undermining overall validity. On the other hand, relative fit indices such as CFI, NFI, and IFI measure the improvement of the model compared to the "null" or independent model. The obtained values (CFI = 0.92, NFI = 0.91, IFI = 0.92) surpass the conventional cut-off (≥ 0.90), indicating a good level of fit with the expected data pattern.

Table 3. **Fit indices of the modified higher-order exercise motivation model**									
χ^2	df	*p*	χ^2/df	CFI	NFI	IFI	RMSEA	90% confidence interval	PClose
2807.660	456	0.000	6.15	0.927	0.914	0.927	0.063	0.061-0.065	0.000

Finally, the reliability of the higher-order factors created in this way was tested (Table 4). Despite the reduced number of manifest variables, the reliability of all three higher-order factors proved to be very high and satisfactory.

Table 4. **Reliability of the modified higher-order exercise motivation variables**		
Variable	Psychological motives for exercise	Social motives for exercise	Health motives for exercise
Cronbach α	0.934	0.919	0.922

Discussion

The finding of a moderate positive correlation between psychological and social motives suggests that these two categories of motivation tend to support one another. Students who exercise because they enjoy it, feel better afterward, or use it to manage stress are also more likely to value social elements such as recognition, shared activity, or affiliation. This pattern aligns well with Self-Determination Theory, which emphasizes that motivation is strengthened when needs for competence, autonomy, and relatedness are jointly satisfied. In this case, the internal satisfaction associated with exercise seems to complement the social dimension, creating a mutually reinforcing motivational framework. Such interplay helps explain why students who are psychologically motivated often remain engaged in social contexts of physical activity as well.

Based on the conducted analysis, it is evident that the 54 manifest variables from which the authors of the EMI-2 questionnaire initially extracted 14 latent variables can validly be reduced, through factor analysis, to three latent variables representing groups of social, psychological, and health-related motives. The three obtained latent factors (social, psychological, and health motives), derived from 32 kept manifest variables, demonstrated high internal consistency, indicating the stability and reliability of this model.

In research focusing on motivation and other psychological variables in sport, the importance of simplified questionnaires with fewer manifest variables has become increasingly apparent. Such questionnaires reduce respondents' cognitive load, resulting in more accurate and reliable data. Overly complex questionnaires, on the other hand, may confuse participants and create ambiguities during responding, which can ultimately lead to less precise results (29).

Studies also show that reducing the number of variables allows for more accurate measurement of current motivational states rather than only stable traits, thereby making these instruments more useful across diverse contexts (30). This approach encourages more intuitive and quicker responses, which increases the precision of the results. Measuring motivation is of great importance, as it enables coaches, psychologists, and researchers to understand the key drivers of physical activity. Based on such assessments, personalized programs can be developed to encourage long-term participation, particularly through interventions that support autonomy, competence, and relatedness (20).

Moreover, the simplified structure facilitates data analysis and interpretation, which is particularly beneficial for applied research and for working with populations outside academic settings. In practical terms, shorter and clearer questionnaires can be more easily integrated into routine evaluations in sports clubs, healthcare institutions, or educational settings, thereby enhancing their utility for coaches, teachers, and other professionals.

Although research exclusively on students represents a certain limitation of the study, as motives may change throughout the lifespan, the results of this study may serve as a foundation for future research aimed at exploring specific intervention strategies based on dominant motivational factors.

Conclusion

The simplified version of the EMI-2 questionnaire provides a reliable and valid tool for measuring motives for physical activity, particularly within the context of the student population. This version facilitates easier application in both research and practical

settings and supports the development of more effective programs aimed at promoting physical activity. Future research could further examine the applicability of this structure across different populations and contexts, thereby confirming its universality and practical value.

Author contributions

Conceptualization and methodology (JB, RB); data curation and formal analysis (JB, IT); investigation and project administration (JB, RB); and writing – original draft and review & editing (JB, RB, IT). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest

Acknowledgments

Not applicable.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not for-profit sectors.

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Assessing the Personality Traits of Mid- and Senior-Level Nurses: Insights Derived from the Dominance–Influence–Steadiness–Conscientiousness (DISC) Behavioral Model

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Abstract

Introduction. Understanding personality tendencies, communication patterns, leadership competencies, and motivational styles among nurse leaders is essential for strengthening managerial effectiveness and improving patient care outcomes. Mapping these traits provides insight into both the strengths and the developmental needs of nursing leadership within complex healthcare environments.

Aim. To examine the Dominance–Influence–Steadiness–Conscientiousness (DISC) behavioral traits of middle- and senior-level nurse managers working in a private healthcare institution.

Methods. A descriptive cross-sectional study was conducted with 186 nurse leaders. Data on demographic characteristics, DISC behavioral tendencies, and key leadership competencies were collected using an online questionnaire. Descriptive statistical analyses were performed using SPSS to evaluate leadership-related behavioral patterns.

Results. Conscientiousness emerged as the most prevalent dominant DISC trait (54.8%), particularly among Nurse-in-Charge roles (45.6%). Communication competencies demonstrated strong factual grounding (42.4% very high). System-aligned and systematic decision-making approaches were also prominent (44.6% very high). Management competencies showed high performance in strategic planning and work discipline (44.08%). However, rapid decision-making under pressure was identified as a significant challenge, with 44.6% scoring very low in this domain.

Conclusion. The findings indicate that nurse leaders possess strong conscientious, structured, and strategic characteristics that support effective leadership. Nonetheless, targeted development is needed in rapid decision-making under pressure and in self-motivation. Addressing these gaps through structured leadership development programs may enhance managerial effectiveness and contribute to improved patient care and organisational outcomes.

Introduction

Effective nursing management and leadership play a critical role in shaping patient outcomes, improving staff well-being, and supporting the operational efficiency of healthcare organisations. Nurse managers—particularly those in middle and senior leadership roles—serve as essential intermediaries between clinical practice and administrative decision-making. Understanding their behavioural tendencies is therefore crucial for cultivating work environments that enhance staff satisfaction, organisational communication, and patient safety (1-6).

The Dominance–Influence–Steadiness–Conscientiousness (DISC) behavioural model, developed by William Moulton Marston in the 1920s, categorises behavioural tendencies into four domains: Dominance (D), Influence (I), Steadiness (S), and Conscientiousness (C) (7-10). Widely used in organisational psychology, the DISC model supports improvements in leadership effectiveness, interpersonal communication, and team functioning (7). In healthcare settings, aligning leadership responsibilities with behavioural strengths may reduce job stress, improve efficiency, and increase job satisfaction—particularly in high-pressure environments such as hospitals (11).

Conscientiousness—characterised by accuracy, reliability, and attention to detail—is especially important in nursing leadership, where accountability and precision are essential (12-14). Leaders who demonstrate conscientious behavioural tendencies often contribute to cultures of safety and quality, positively affecting team performance and patient outcomes (4). Interpersonal traits such as Influence also support leadership effectiveness by enhancing motivation, engagement, and communication within teams (11,13,15).

Personality assessments, including the DISC model, are increasingly used to inform leadership development initiatives. Targeted educational programmes can be designed around the behavioural patterns of nurse leaders, enabling organisations to strengthen decision-making, communication, and motivational competencies (16). For example, individuals with high Steadiness may benefit from training in rapid decision-making under pressure (12). Additionally, linking personality traits with transformational or transactional leadership styles may help organisations identify and develop individuals best suited for leadership roles (11,12,17,18).

Personality traits also influence ethical leadership behaviours, which play a vital role in shaping organisational culture, employee morale, and retention (13,19). Ethical, consistent leadership strengthens trust and contributes to a positive work climate, reinforcing the importance of understanding leaders' behavioural patterns (4,20,21).

Understanding the full spectrum of DISC behavioural profiles—not only conscientiousness—provides valuable insight into how different personality tendencies align with the characteristics required for effective leadership in healthcare settings (7-9,22). Previous research demonstrates that personality assessments such as the DISC model can effectively identify an individual's strengths, developmental needs, and optimal areas of contribution, enabling organisations to deploy leaders in ways that maximise their impact within teams (23–26).

Despite growing international interest in behavioural leadership assessments, limited research has examined DISC behavioural tendencies among nurse leaders in Türkiye. Understanding the distribution of DISC profiles in this population is essential for designing effective leadership development strategies tailored to local healthcare contexts. Identifying behavioural strengths and limitations can also support competency planning, workforce development, and improvements in organisational leadership structures.

This study provides the first comprehensive examination of DISC behavioural tendencies among mid- and senior-level nurse managers in Türkiye. By linking DISC profiles with behavioural, communication, decision-making, managerial, and motivational competencies, the study offers new insights into leadership patterns within Turkish nursing management. These findings inform future leadership development programmes and contribute to the limited body of evidence on behavioural leadership models in Turkish healthcare settings.

Aim

This study aimed to:

1. Identify the dominant DISC behavioural characteristics of nurses in mid-level and senior management roles.
2. Evaluate their behavioural, communication, decision-making, managerial, and motivational competencies, and explore how these align with their DISC profiles.

Methods

Study Design and Setting

This descriptive cross-sectional study was conducted between 1 and 31 May 2021 within a large private healthcare group in Türkiye, comprising 16 hospitals and 4 medical centres. The Dominance–Influence–Steadiness-Conscientiousness (DISC) behavioural assessment is routinely administered in this institution as part of its annual leadership development programme for Nurses in Charge, Nurse Managers, and Nurse Educators. The study was carried out during the COVID-19 pandemic, a contextual factor that may have influenced managerial workload, stress levels, and leadership behaviours.

Study Population and Sampling

The target population included all middle- and senior-level nurse managers employed in the participating facilities during the study period. Due to the limited size of the managerial workforce and the exploratory nature of the study, no formal sample size calculation was conducted. Instead, a census sampling approach was used, inviting all 280 eligible managers to participate. A total of 186 managers completed the survey, yielding a response rate of 66.4%.

Eligibility Criteria

The inclusion criteria were:

1. Employment in a middle or senior nursing management role (e.g., Nurse in Charge, Department Manager).
2. A minimum of one year of experience in a leadership position.

The exclusion criteria were:

1. Acting leadership roles of less than six months.
2. Extended leave during the study period.

Variables and Hypothesis

The primary variable of interest was the distribution of DISC behavioural profile types—Dominance, Influence, Steadiness, and Conscientiousness. Predictor variables included age, gender, education level, professional nursing experience, managerial experience, and prior leadership training.

Based on existing research and institutional observations, it was hypothesised that Conscientiousness would be the most common dominant DISC style among nurse leaders and that associated leadership competencies would reflect systematic, collaborative, and evidence-based behaviours.

Instruments

1. DISC Behavioral Assessment

The DISC Behavioral Assessment used in this study is a standardised and licensed psychometric instrument consisting of 28–40 forced-choice items that evaluate behavioural preferences across four major domains:

1. *Dominance (D):* assertiveness, decisiveness, competitive orientation
2. *Influence (I):* sociability, enthusiasm, persuasion
3. *Steadiness (S):* patience, empathy, cooperation
4. *Conscientiousness (C):* accuracy, analytical thinking, structured work style

Instrument details (added per statistical reviewer requirements):

- *Version:* DISC Classic 2.0 (institutional licensed version)
- *Publisher:* PeopleKeys® / DISCinsights®
- *Language:* Turkish professionally translated version
- *Scoring method:* Ipsative forced-choice scoring generating dominant and secondary profiles
- *License:* Used under institutional leadership development authorization

Instrument Validity and Reliability

The DISC model is widely validated internationally, with published Cronbach alpha coefficients typically ranging from 0.72–0.87 across behavioural domains. However, due to the ipsative scoring structure, internal consistency measures (e.g., Cronbach's alpha) cannot be meaningfully calculated for this dataset, which aligns with psychometric standards for forced-choice assessments.

2. Competency Mapping Questionnaire

A structured 40-item competency questionnaire developed by the institution's Nursing Services Directorate was used to evaluate leadership competencies in five domains:

1. *Behavioural Competencies*: Extroversion, individuality, entrepreneurship, positive thinking, logical prioritisation, adaptability, rule adherence, quality orientation, systematic planning, guidance and support, risk aversion, and stability maintenance.

2. *Communication Competencies:* Evidence-based communication, active listening, persuasive ability, audience engagement, and maintaining conversational relevance.

3. *Decision-Making Competencies:* Data-based analysis, independent judgment, system-aligned decision-making, optimal option selection, and rapid decision-making under pressure.

4. *Management Competencies*: Strategic vision, initiative, authority establishment, stress management, calculated risk-taking, innovation adoption, long-term planning, teaching-based delegation, work discipline, team motivation, inspiring leadership, and empathy.

5. *Motivation Style Competencies*: career planning, provision of social support, creation of a positive environment, and fostering team inclusion.

The tool reflects organisational competency expectations for nurse leaders, though it does not have published psychometric validation—an issue acknowledged as a limitation.

Data Collection

Data were collected through a secure online platform and included:

1. The standardised DISC Assessment
2. The institutional competency questionnaire

Recruitment and Administration

- Invitations were distributed electronically through official institutional channels.
- Participation was voluntary, and informed consent was obtained electronically.
- No identifiable personal data were collected.
- All participants completed the DISC application under standardised institutional conditions.

Bias Reduction Measures

- Use of a validated, standardised DISC tool
- Uniform administration procedures across all facilities
- Census recruitment to minimise selection bias
- Predefined data analysis plan to avoid selective reporting

The online format enabled participation from managers across all 4 medical centres and 16 hospitals, ensuring broad representation.

Ethics

The study adhered to the ethical principles of the Declaration of Helsinki-2013 (27). Although formal ethics committee approval was not required due to the institution's internal assessment policies, several ethical safeguards were implemented:

- Written informed consent was obtained from all participants.
- Institutional approval was secured for conducting the study and disseminating the findings.
- All data were anonymised and stored confidentially.
- Participants were informed of their right to withdraw at any stage without penalty.

These measures ensured that participant rights, privacy, and welfare were upheld throughout the research process.

Statistics

Due to the descriptive and exploratory nature of the research, statistical analyses were limited to frequencies, percentages, means, and standard deviations. Although inferential statistics are referenced in some literature, they were not used in this study; interpretations rely strictly on descriptive findings. SPSS v25 was used. A sensitivity analysis excluding incomplete DISC results confirmed that findings remained unchanged.

Results

Table 1 summarises the socio-demographic characteristics of the participating nurse leaders. The majority of respondents were female (75.3%), and most held undergraduate (38.7%) or postgraduate degrees (21.5%). The workforce was highly experienced, with 78.5% reporting more than 61 months of professional experience. In terms of departmental distribution, nearly half worked in inpatient units (43.0%), followed by Nurse Specialist roles (18.8%) and outpatient services (13.4%). Most participants held the position of Nurse in Charge (81.2%), indicating strong representation from frontline leadership roles.

The average age of participants was 37.13 years (range: 27–48 years), reflecting a mature and experienced leadership cohort.

Table 1. **The Socio-Demographic Characteristics of The Nurses**		
Gender	**n**	**%**
Female	140	75.3
Male	46	24.7
Education	**n**	**%**
High School	58	31.2
Associate degree	16	8.6
Undergraduate	72	38.7
Postgraduate	40	21.5
Work Experience	**n**	**%**
0-12 Months	7	3.8
13-36 Months	16	8.6
37-60 Months	17	9.1
61 Months and Over	146	78.5
Department	**n**	**%**
Inpatients	80	43.0
Nurse Specialist	35	18.8
Outpatients	25	13.4
Intensive Care Units	16	8.6
Emergency Services	12	6.5
Operating Room	10	5.4
Position	**n**	**%**
Nurse in Charge	151	81.2
Education and Development Nurse	18	9.7
Manager	17	9.1
Total	**186**	**100.0**

Table 2 presents the distribution of dominant DISC behavioural traits across the 186 participating nurse leaders. Conscientiousness (C) was the most prevalent dominant trait overall, reported by 54.8% of the sample. This pattern was especially pronounced among Nurses in Charge, 45.6% of whom demonstrated a primarily conscientious profile. Managers also showed a notable inclination toward conscientiousness (5.37%).

Influence (I) emerged as the second most common trait, particularly among Nurses in Charge (12.8%) and Education and Development Nurses (3.76%). Steadiness (S) and Dominance (D) were comparatively less frequent across all leadership groups. Overall, Conscientiousness remained the consistently dominant behavioural style across all managerial positions (Table 2).
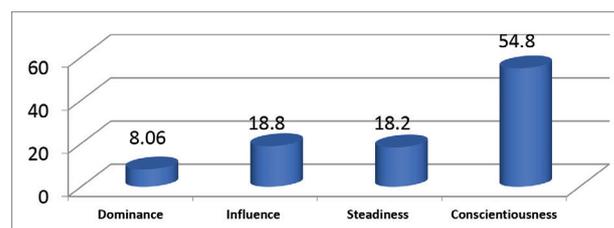
Graphic 1**. DISC Personality Distribution of Nurses**

Table 3 presents the distribution of general behavioural characteristics among the participants. Most traits—such as efficiency orientation, assertiveness, charisma, persistence, friendliness, precision, and consideration—clustered predominantly within the normal range, indicating generally balanced behavioural patterns among nurse leaders.

A notable exception was independence, where 44.6% of participants scored very low, suggesting a preference for collaborative or system-dependent working styles. Patience and tolerance demonstrated predominantly high levels, while sharing emerged as an exceptionally strong trait, with 44.6% of respondents scoring very high.

Self-motivation showed a downward tendency, with 37.6% of participants reporting low levels. Observation and awareness were distributed mainly within the normal range, though a meaningful proportion achieved high scores.

Overall, the findings suggest a largely well-balanced behavioural profile among nursing leaders, while highlighting distinct tendencies in areas such as in-

Table 2. **DISC Personality Distribution of Nurses**								
The Most Dominant Factor	Manager		Nurse in Charge		Educational Development Nurse		Total	
	n	%	n	%	n	%	n	%
Dominance (D)	1	0.53	10	5.37	4	2.14	15	8.06
Influence (I)	4	2.14	24	12.8	7	3.76	35	18.8
Steadiness (S)	2	1.07	32	17.1	0	0	34	18.2
Conscientiousness (C)	10	5.37	85	45.6	7	3.76	102	54.8
Total	17	9.1	151	81.1	18	9.6	186	100.0

Table 3. **The General Behavioral Competencies Distribution of Nurses**											
The general behavioral competencies	Very Low		Low		Normal		High		Very High		Group	
	n	%	n	%	n	%	n	%	n	%	Average	SS(±)
Efficiency Orientation	20	10.8	39	21	100	53.8	18	9.7	9	4.8	Normal	0.94
Self-Motivation	49	26.3	70	37.6	47	25.2	14	7.5	6	3.23	Low	1.02
Independence	83	44.6	42	22.6	51	27.4	7	3.7	3	1.6	Very Low	1.009
Assertiveness	59	31.7	39	20.9	68	36.6	15	8.06	5	2.7	Normal	1.08
Charisma, Impressiveness	41	22.04	50	26.9	65	34.9	23	12.4	7	3.8	Normal	1.08
Persistence	12	6.4	38	20.4	110	59.1	21	11.3	4	2.1	Normal	0.8
Friendliness, Friendship	8	4.3	18	9.7	101	54.3	37	19.9	22	11.8	Normal	0.94
Patience, Tolerance	7	3.8	14	7.6	46	24.7	63	33.9	56	30.1	High	1.07
Sharing	3	1.6	7	3.8	48	25.8	45	24.2	83	44.6	Very High	1
Being Considerate	7	3.8	18	9.7	70	37.6	48	25.8	43	23.1	Normal	1.06
Precision, Attention to Detail	5	2.7	15	8.06	68	36.5	37	19.8	61	32.7	Normal	0.93
Awareness, Observation	4	2.15	20	10.7	108	58.06	42	22.5	12	6.45	High	1.07

dependence, self-motivation, and interpersonal generosity (Table 3).

The evaluation of communication competencies demonstrated substantial variation across different skill areas. Grounding in facts emerged as a notable strength, with 42.4% of participants scoring very high, reflecting a strong reliance on evidence and data in communication. In contrast, competencies related to influence and attracting attention were more evenly distributed, with most respondents scoring within the normal (34.9%) or low (26.8%) ranges. Speaking by listening similarly showed a predominance of normal scores (38.1%). Maintaining relevance presented a balanced distribution, with 36.02% rated as normal and 32.7% rated as very high. Overall, while factual communication is a key strength, other communication competencies–such as influence, attentive listening, and relevance–were more evenly balanced among participants (Table 4).

Decision-making competencies revealed additional patterns. Paying Attention to Data was most frequently rated as normal (36.02%), followed closely by very

high (33.3%). Independent decision-making also fell predominantly within the normal range (38.1%), indicating moderate autonomy. Notably, both Decision-Making in Parallel With the System and the Ability to Choose the Best Result showed the strongest performance, with 44.6% of respondents rated as very high, suggesting strong alignment with organisational processes and optimal outcome selection. Conversely, Quick Decision-Making Under Pressure showed substantial challenges, with 44.6% of participants scoring very low, indicating difficulty with rapid decisions in high-pressure situations (Table 4).

Motivation style competencies also displayed distinct tendencies. Career planning emerged as the strongest motivational domain, with 44.08% scoring very high. Supporting social opportunities showed a balanced distribution, with most respondents scoring normal (34.9%). Creating a warm and positive environment demonstrated a pronounced concentration in the normal range (72.5%), indicating this style is widely and consistently used. Finally, ensuring team inclusion showed high engagement, with substantial proportions scoring in the high (34.4%) and very high (30.1%) categories, underscoring strong tendencies toward team-oriented motivational behaviours (Table 4).

Table 5 summarises the distribution of management competencies among the participants. Awareness of the Big Picture was strongest in the high category, with 38.1% of respondents demonstrating strong strategic awareness. Taking the Initiative was most commonly rated as normal (42.4%), while Establishing Authority showed a pronounced concentration in the normal range (73.1%), indicating consistent but moderate levels of authoritative leadership.

Competencies related to stress and risk showed clear challenges. Combating Stress was predominantly rated as very low (33.3%), and Risk-Taking also demonstrated a strong very low distribution (45.1%), suggesting a cautious approach and a potential need for development in resilience and calculated risk behaviour.

In contrast, competencies reflecting forward planning and organisational discipline were notably strong. Being Open to Innovation was most frequently rated as high (38.1%), and Long-Term Strategic Planning and Business Discipline both had the highest concentration in the very high category (44.08%), indicating a strong strategic orientation and structured work approach among nurse leaders. Delegating by Teaching

showed the highest proportion in the normal range (37.6%), suggesting this competency is generally well-developed but with room for enhancement.

In interpersonal and motivational leadership domains, Adding Excitement to Work had the highest proportion in the normal category (36.5%). Effective Speaking and Leadership also clustered primarily in the normal range (34.9%). Notably, Establishing an Emotional Bond with the Team demonstrated strong relational leadership capacity, with high (33.8%) and very high (30.6%) scores, indicating a substantial emphasis on empathy and emotional connection within management practices (Table 5).

Discussion

This study aimed to identify the dominant DISC behavioural tendencies of mid- and senior-level nurse leaders and examine how these traits relate to key leadership competencies. The findings revealed a mature and experienced nursing leadership cohort, predominantly female, with strong educational backgrounds and extensive professional and managerial experience. Such a profile aligns with previous research highlighting the association between leadership self-efficacy, a positive work environment, and readiness to assume formal leadership responsibilities (28). This suggests that the organisational context provides a suitable foundation for leadership capacity development.

The predominance of Conscientiousness (C) across leadership roles is consistent with the literature describing this trait as essential for nursing management, given its strong association with accuracy, accountability, and systematic work habits (28). Conscientious leaders are known to support safety culture, structured decision-making, and quality performance—elements that are critical in complex healthcare environments. The presence of Influence (I) as the second most common trait indicates the value of interpersonal and motivational behaviours, which are central to leadership approaches such as transformational leadership (2,13,29–31). In contrast, lower representation of Steadiness (S) and Dominance (D) reflects a less confrontational and

Table 4. Communication, The Decision-Making, and The Motivation Style Competencies Distribution of Nurses

Communication Competencies	Very Low		Low		Normal		High		Very High		Mod	SS(±)
	n	%	n	%	n	%	n	%	n	%		
Grounding in Facts	9	4.8	11	5.9	52	27.9	35	18.8	79	42.4	Very High	1.17
Influence, Attract Attention	40	21.5	50	26.8	65	34.9	23	12.3	8	4.3	Normal	1.09
Speaking by Listening	8	4.3	18	9.6	71	38.1	47	25.2	42	22.5	Normal	1.07
Maintaining Relevance	6	3.2	15	8.06	67	36.02	37	19.8	61	32.7	Normal	1.1
The decision-making competencies	n	%	n	%	n	%	n	%	n	%	Mod	SS(±)
Paying Attention to Data	5	2.6	13	6.9	67	36.02	39	20.9	62	33.3	Normal	1.07
Independent Decision-Making	42	22.5	65	34.9	71	38.1	7	3.7	1	0.5	Normal	0.86
Decision-Making in Parallel with the System	3	1.6	6	3.2	49	26.3	45	24.1	83	44.6	Very High	0.99
Ability To Choose the Best Result	3	1.6	6	3.2	49	26.3	45	24.1	83	44.6	Very High	0.99
Under Pressure, Quick Decision-Making	83	44.6	42	22.5	51	27.4	7	3.7	3	1.6	Very low	1.009
The motivation style competencies	n	%	n	%	n	%	n	%	n	%	Mod	SS(±)
Career Planning	8	4.3	4	2.1	54	29.03	38	20.4	82	44.08	Very high	1.1
By Supporting Social Opportunities	41	22.04	50	26.8	65	34.9	23	12.3	7	3.7	Normal	1.08
By Creating a Warm, Positive Environment	5	2.6	15	8.06	135	72.5	29	15.9	2	1.07	Normal	0.62
By Ensuring That They are Part of The Team	6	3.2	14	7.5	46	24.7	64	34.4	56	30.1	High	1.05

more collaborative leadership style, resonating with the relational and team-focused nature of nursing practice (32).

The distribution of general behavioural characteristics showed predominantly normal levels across most domains, indicating a balanced leadership group. Strengths such as patience, tolerance, and attention to detail are particularly relevant to roles requiring emotional regulation and meticulous oversight. However, the low levels of self-motivation and independence among some leaders point to areas where additional organisational support could be beneficial. Research highlights that intrinsic motivation, resilience, and self-efficacy influence engagement, satisfaction, and performance, particularly in high-stress clinical environments (1,30,33,34). This aligns with the present findings, suggesting opportunities to strengthen confidence and autonomous decision-making through targeted development.

Communication competencies showed clear strengths in factual, evidence-based communication, which supports high-quality clinical practice and interdisciplinary coordination (34). Competencies such as influence, attentive listening, and maintaining relevance, however, demonstrated more balanced distributions, indicating variability that may benefit from focused communication training. Effective communication remains one of the strongest predictors of collaboration, team cohe-

Table 5. **The Management Competencies Distribution of Nurses**											
	Very Low		Low		Normal		High		Very High		
The management competencies	n	%	n	%	n	%	n	%	n	%	Mod	SS(±)
Awareness Of the Big Picture	9	4.8	30	16.1	51	27.4	71	38.1	25	13.4	Low	1.06
Taking The Initiative	34	18.2	34	18.2	79	42.4	35	18.8	4	2.1	Normal	1.04
Establishing Authority	3	1.6	27	14.5	136	73.1	15	8.06	5	2.6	Normal	0.6
Combating Stress	62	33.3	59	31.7	45	24.1	16	8.6	4	2.1	Very low	1.04
Risk-Taking	84	45.1	42	22.5	52	22.9	6	3.2	2	1.07	Very Low	0.9
Being Open to Innovation	42	22.5	66	35.4	71	38.1	6	3.2	1	0.5	Normal	0.8
Long-Term Strategic Planning	3	1.6	6	3.2	51	27.4	44	23.6	82	44.08	Very High	0.9
Delegating By Teaching	1	0.5	7	3.7	70	37.6	61	32.7	47	25.2	Normal	0.8
Business Discipline	4	2.1	6	3.2	49	26.3	45	2.4	82	44.08	Very High	1.01
Adding Excitement to Work	58	31.1	39	20.9	68	36.5	15	8.06	6	3.22	Normal	1.09
Effective Speaking and Leadership	41	22.04	50	26.8	65	34.9	23	12.3	7	3.7	Normal	1.08
Establishing An Emotional Bond with The Team	6	3.22	13	6.9	47	25.2	63	33.8	57	30.6	High	1.04

sion, and patient safety (35,36), underscoring the importance of reinforcing these competencies.

Decision-making profiles reflected strong alignment with systematic, data-oriented approaches, as evidenced by high scores in paying attention to data and system-parallel decision-making. These tendencies reflect a structured cognitive style that is well suited to the requirements of clinical leadership (36). However, the significant difficulty reported in quick decision-making under pressure suggests an area for improvement. Crisis decision-making, rapid risk assessment, and adaptive leadership skills are essential during periods of uncertainty or urgent clinical needs. Literature supports that transformational leadership behaviours and supportive work environments can enhance rapid decision-making and critical thinking (37,38), pointing to a potential direction for leadership development initiatives.

Motivation-related competencies revealed strong tendencies in career planning and team inclusion, indicating a forward-looking mindset and commitment to maintain-ing cohesive teams—both known predictors of engagement and retention (1,30,39,40). More balanced ratings related to social support suggest individual differences in how leaders cultivate social environments. Enhancing structured social opportunities may strengthen cohesion, morale, and workplace culture, aligning with evidence that supportive environments improve satisfaction and organisational commitment (16,41).

Management competencies demonstrated noteworthy strengths in strategic planning, business discipline, and awareness of the broader organisational context, reflecting a strong strategic orientation among nurse leaders (11,42,43). However, lower scores in areas such as risk-taking, stress management, and initiative indicate developmental needs in adaptive and proactive leadership domains. These competencies are essential for navigating organisational change, leading innovation, and supporting staff in dynamic clinical environments (6,8). Enhancing such competencies through structured leadership training, mentorship programmes, and resilience-building interventions could address these gaps.

Overall, the findings portray a highly competent and conscientious nursing leadership group with notable strengths in structure, planning, factual communication, and strategic vision. However, important growth areas remain, particularly in rapid decision-making under pressure, self-motivation, risk-taking, and stress management. Addressing these areas through targeted leadership development and competency-based training programmes could enhance leadership effectiveness and organisational performance. Continued research into behavioural leadership patterns and competency development among nurse leaders will be essential for informing organisational policy, shaping leadership pathways, and supporting high-quality patient care.

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the research was conducted within a single private healthcare group and may not fully represent nurse leaders working in other organisational structures or public-sector settings, which limits generalisability. The data were collected through an online, self-report format, which may introduce response biases, including social desirability and self-enhancement tendencies that can influence personality and competency ratings.

The DISC behavioural assessment used in this study employs an ipsative, forced-choice scoring method, which does not permit traditional psychometric evaluation such as Cronbach's alpha. Similarly, the institutional competency tool lacks published validity and reliability data, which may affect the interpretability and comparability of results.

The cross-sectional design captures behavioural tendencies and competencies at a single time point, preventing assessment of temporal changes or developmental progress. Additionally, data collection occurred during the COVID-19 pandemic, a period characterised by increased workload and stress for nurse leaders, which may have influenced participants' behaviours, self-perceptions, and decision-making competencies.

Future studies should consider longitudinal designs, inclusion of multiple healthcare settings, and the use of psychometrically validated competency instruments to provide a more comprehensive and generalisable understanding of leadership behaviours in nursing.

Conclusion

This study provides a comprehensive overview of the behavioural tendencies and leadership competencies of an experienced nursing leadership workforce. The participants demonstrated notable strengths in conscientiousness, strategic planning, and data-driven decision-making—competencies that are essential for effective leadership and high-quality management in contemporary healthcare settings. The predominance of conscientious behavioural traits indicates a methodical, detail-oriented, and structured approach to leadership, while balanced communication and general behavioural characteristics suggest adaptability and strong foundational interpersonal skills.

Despite these strengths, the findings highlight several key areas for development, including rapid decision-making under pressure, self-motivation, and assertiveness in risk-taking. Addressing these gaps through targeted leadership development programmes, mentorship, and competency-based training has the potential to further enhance managerial effectiveness, strengthen resilience, and support high-performing clinical teams.

As healthcare environments grow increasingly complex, understanding the behavioural foundations of nurse leadership becomes critical. Investing in leadership development that aligns personality tendencies with organisational needs will not only support individual growth but also contribute to improved patient outcomes, stronger team dynamics, and sustainable organisational performance.

Funding

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From Call to Diagnosis: Improving Stroke Triage in the Medical Dispatch Unit

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Abstract

Introduction. This study aimed to assess current stroke triage practices in the Medical Dispatch Unit (MPDJ) using the Croatian Emergency Call Reception Index, in order to identify areas for improvement in dispatcher training and caller awareness.

Methods. A retrospective analysis was conducted using data from the e-Hitna system of the Zagreb County Emergency Medical Institute for the year 2023. Triage categories "Headache" (A.18) and "Altered consciousness/paralysis" (A.25) were analyzed in relation to confirmed stroke diagnoses based on ICD-10 codes (G45–G45.9, I60–I69.9). Statistical analysis included chi-square and Welch's t-test.

Results. A statistically significant association was found between the triage category "Altered consciousness/paralysis" and confirmed stroke diagnosis (χ^2 = 11.82; p < 0.001). Many stroke patients were initially categorized under non-specific symptoms. No significant sex difference was observed in triage allocation $(p$ = 0.9508), while women were significantly older than men (p < 0.001).

Conclusion. Findings highlight the need for enhanced dispatcher education and public awareness on stroke symptoms. Improvements in stroke recognition protocols and follow-up with clinical outcomes are recommended to ensure more accurate and timely prehospital triage.

Introduction

The Medical Dispatch Unit (MPDJ) plays a critical role in the prehospital emergency care system, particularly in the recognition and triage of stroke cases. Stroke is a time-sensitive emergency in which every minute from the onset of symptoms to medical intervention can significantly impact patient outcomes (1). Dispatchers in the MPDJ serve as the first point of contact with emergency medical services, and their ability to recognize symptoms and make accurate triage decisions determines the speed of medical response and the eventual clinical outcome (2). Recognition of stroke during an emergency call is based on the assessment of symptoms described by the caller. The dispatcher must then quickly determine the urgency level and appropriate type of response (1). The effectiveness of this process can greatly influence the availability of reperfusion therapies, such as thrombolysis and mechanical thrombectomy, which are time-sensitive and require immediate intervention (3).

Furthermore, research indicates that public awareness of stroke symptoms significantly affects the timeliness of seeking medical help. Studies conducted in the United States and Canada have shown that public education campaigns can increase the proportion of individuals who recognize symptoms and promptly contact emergency services (4,5). Although early recognition of symptoms is considered crucial for timely hospital arrival, numerous challenges exist in practice regarding the identification of stroke signs among the general public. A British study showed that some citizens misinterpret or fail to recognize basic symptoms despite awareness campaigns such as the FAST test (6). A systematic literature review also highlights significant disparities in stroke knowledge among the general population, which affects response times and emergency call activation (7).

Therefore, the aim of this study was to examine the association between selected dispatch triage criteria and final stroke diagnoses in the Medical Dispatch Unit, to describe the distribution of stroke-related triage codes with respect to age, sex and caller type, and to identify potential areas for improving stroke recognition during emergency calls.

Theoretical Framework: Triage and Classification of Emergency Medical Calls

The Medical Dispatch Unit uses structured triage systems to ensure standardized and efficient assessment of call urgency. Since 2011, Croatia has implemented the Croatian Emergency Call Reception Index, developed based on the model of the Norwegian Index for Emergency Medical Assistance (8). This index defines the criteria and categories for emergency medical calls and ensures a uniform classification methodology across all counties (8,9). In contrast to strictly algorithmic systems such as the Medical Priority Dispatch System (MPDS), the criteria-based approach used in the Croatian Index allows dispatchers greater flexibility in decision-making based on symptoms reported by the caller (10). Studies conducted in Norway show that criteria-based triage systems can predict the need for emergency medical interventions with high specificity, though sometimes with limited sensitivity (11).

Methods and Protocols for Stroke Recognition

Various standardized protocols are used to recognize stroke during emergency medical calls. The most commonly used include the Advanced Medical Priority Dispatch System (AMPDS) and the Medical Priority Dispatch System (MPDS), while in Europe, national indexes such as the Danish Index and the Norwegian Index are also applied (3). Additionally, targeted stroke assessment tools such as the FAST test (Face-Arm-Speech-Time) and the Cincinnati Prehospital Stroke Scale enable rapid evaluation of neurological deficits (3,4). It is important to distinguish the criteria-based approach, such as the Croatian Emergency Call Reception Index, from strictly protocol-driven systems like MPDS or AMPDS. While the criteria-based approach allows dispatchers more discretion in interpreting and making decisions based on the caller's description of symptoms, protocol-driven systems are based on pre-defined algorithms that must be followed consistently without deviation. This flexibility in criteria-based systems introduces greater subjectivity and variability in triage decisions, which may lead to under-recognition of certain conditions, including stroke. Research shows that using structured protocols can improve stroke recognition rates (12). For example, the Madrid-Direct protocol, specifically developed for stroke, demonstrated improved outcomes in early identification and routing of patients to appropriate healthcare facilities (12). However, these protocols are not flawless - their sen-

sitivity ranges from 41% to 83%, while positive predictive values vary between 24% and 88% (1,12).

Challenges in Stroke Recognition

Dispatchers face numerous challenges in their work, including limited information available during calls, variability in symptom presentation, and caller uncertainty. They often have very limited time for assessment, and uncertainty in symptom recognition may result in incorrect triage decisions (2). Moreover, research has shown that dispatchers without medical training have a lower stroke recognition rate compared to those with a healthcare background (10). Although classic stroke symptoms are well known (e.g., unilateral weakness, speech disturbances), it is important to emphasize that stroke may also present with less specific symptoms such as dizziness, nausea, confusion, or general weakness. These atypical symptoms pose a particular challenge for dispatchers, especially when callers are not adequately informed or are unaware of the importance of accurately describing symptoms during the call. In practice, this highlights the necessity of educating not only dispatchers but also the general public, in order to reduce missed stroke cases during the early, critical phase of emergency calls. An additional problem is the lack of feedback to dispatchers regarding patient outcomes. Studies have shown that providing such feedback can significantly improve triage accuracy (13).

Overview of Previous Research

An analysis of previous studies indicates that the sensitivity of stroke recognition among dispatchers is relatively low and ranges from 18% to 83% (12). For example, a study conducted in Copenhagen found that only 66% of strokes were recognized during emergency calls, with a low positive predictive value (~30%) (14). Dispatcher education has proven to be one of the key factors in improving stroke recognition. A study conducted in the United Kingdom showed that specialized training increased the stroke recognition rate from 63% to 80% (15).

Stroke triage within the Medical Dispatch Unit represents a crucial step in the prehospital management of patients, and its effectiveness directly influences patient outcomes. Standardized protocols, dispatcher education, and public awareness campaigns about stroke are essential for improving symptom recognition and optimizing the allocation of emergency medical service resources. Nonetheless, further research is needed to develop more accurate triage tools and enhance the decision-making processes of dispatchers.

Aim

This study aimed to assess current stroke triage practices in the Medical Dispatch Unit (MPDJ) using the Croatian Emergency Call Reception Index, in order to identify areas for improvement in dispatcher training and caller awareness.

Methods

Study Design

This study was conducted as a retrospective analysis of data collected via the *e-Hitna* system for the period from January 1 to December 31, 2023. This one-year period was chosen to enable a comprehensive analysis that accounts for potential seasonal variations in the incidence of emergency medical conditions, including fluctuations in the occurrence of stroke throughout the year. It is important to note that, as of March 27, 2024, a revised version of the Croatian Emergency Medical Call Reception Index has been implemented, with restructured triage criteria that may affect data comparability in future analyses. In the revised Index, several criteria within chapters A.18 and A.25 were reworded, regrouped and assigned different urgency levels, which limits direct comparability of triage patterns before and after this change. For this reason, the year 2023 was selected for analysis to ensure consistency within a single triage framework, enabling uniform interpretation of the data. The study analyzed data from the Medical Dispatch Unit (MPDJ) of the Emergency Medical Institute of Zagreb County, aiming to examine the association between selected triage criteria and final diagnoses.

Data Source

The data used in this research were extracted from the *e-Hitna* system and include all emergency calls received by the MPDJ during the observation period. General call statistics were analyzed (number, type, urgency level), along with assigned triage chapters

according to the Croatian Emergency Medical Call Reception Index. Particular attention was given to data within the following two triage categories:

- Chapter 18: Headache (triage criteria A.18.01 – A.18.07)
- Chapter 25: Altered consciousness/paralysis (triage criteria A.25.01 – A.25.09)

The analysis included all criteria within these predefined ranges (A.18.01–A.18.07 and A.25.01–A.25.09), as they represent the core high-priority triage codes routinely used in MPDJ practice for the recognition of potentially time-critical neurological presentations. Criteria outside these ranges (A.18.08–A.18.10 and A.25.10–A.25.11) were not included, as they correspond to infectious, abdominal, metabolic, traumatic or other non-neurological presentations and therefore fall outside the analytical scope of this study. A detailed overview of all included and excluded criteria, together with justifications, is provided in Supplementary Table S1.

For each observed triage criterion, the primary patient diagnoses were analyzed in detail according to the International Classification of Diseases (ICD-10) for each call and correlated with the selected triage criteria. Cumulative data were also reviewed regarding the type of caller (family member, healthcare professional, bystander) in relation to the selected triage criteria, with the aim of evaluating the potential influence on triage card selection. As caller type data are not available at the individual ICD diagnosis level, this analysis was limited to the triage category level.

Subsequently, the patients' primary diagnoses were analyzed based on the following ICD-10 codes:

- G45–G45.9 – Transient ischemic attacks
- I60–I69.9 – Cerebrovascular diseases (stroke, intracerebral and subarachnoid hemorrhage, stroke sequelae)

Patient diagnoses were reviewed using medical records, and the triage criteria selected at the time of the emergency call, together with the intended purpose of the dispatch, were subsequently examined. Although patients typically do not call for themselves, and symptoms are interpreted by the caller, an analysis of age and gender differences among patients with stroke was conducted to identify potential variations in triage patterns. The focus of the research remains on the analysis of reported symptoms and their influence on triage card selection.

Ethics

The research was conducted in accordance with applicable ethical principles and data protection regulations. The data used in the analysis were extracted from the *e-Hitna* system without access to any personally identifiable patient information. All records were anonymized prior to analysis and processed exclusively in aggregate form.

According to Croatian national regulations and institutional policy, retrospective analyses of fully anonymised operational EMS data that do not involve direct contact with patients or any influence on patient care are exempt from the requirement for formal ethics committee approval. The dataset used in this study meets all criteria for this exemption.

Written permission for the use of e-Hitna system data for scientific purposes was obtained from the Director of the Emergency Medical Institute of Zagreb County. The study was conducted in compliance with GDPR and the principles of the Declaration of Helsinki.

Statistics

Statistical analysis was performed using descriptive statistical methods to present the distribution of triage categories, the frequency of specific symptoms, and the age distribution of patients. Differences between categorical variables were analyzed using the chi-square test (χ^2), while differences in means between two independent groups were assessed using Welch's t-test due to potential inequality of variances between groups. For contingency tables with small expected cell counts, Fisher's exact test was additionally calculated to verify the chi-square results. The level of statistical significance was set at $p < 0.05$. Descriptive analyses were conducted using Microsoft Excel (with the Analysis ToolPak add-in), while inferential statistical tests (χ^2 test and Welch's t-test) were calculated using the online tool Social Science Statistics (https://www.socscistatistics.com/tests/).

Results

General Statistics of Received Calls

During the observed period from January 1 to December 31, 2023, the Medical Dispatch Unit (MPDJ) of the Emergency Medical Institute of Zagreb County received a total of 60,120 calls. These calls were categorized into four main groups: interventions, consultations, other calls, and nuisance calls (as shown in Table 1).

Table 1. **Categories of calls received by MPDJ ZZHM ZŽ in 2023**		
Type of Call	**Number of Calls**	**Percentage (%)**
Interventions	26 927	44.79%
Consultations	12 199	20.29%
Other	20 767	34.54%
Nuisance	227	0.38%
Total	**60 120**	**100.00%**

The majority of calls resulted in emergency medical interventions (n = 26,927; 44.79%), while consultation calls totaled 12,199 (20.29%). Other calls—including administrative and non-urgent medical inquiries—accounted for 34.54% (n = 20,767). Nuisance calls, such as prank or inappropriate calls, made up 0.38% of the total (n = 227).

Urgency Level of Intervention Calls

In 2023, out of the 26,927 calls that led to medical interventions, the highest proportion was classified as Priority II (yellow category), accounting for 59.81% of all interventions (n = 16,105). Priority I (red category), which denotes life-threatening conditions, was assigned in 31.46% of cases (n = 8,471). Priority III (green category), which includes less urgent conditions, comprised 8.73% of all interventions (n = 2,351), as shown in Table 2.

Most calls were assigned Priority II (yellow category), indicating a high urgency level, though not immediately life-threatening. At the same time, the significant share of Priority I (red category) calls suggests that over one-third of patients were assessed as being in a life-threatening condition already during emergency call triage.

Table 2. **Distribution of urgency levels for intervention calls in 2023**			
Priority	**Category (Color)**	**Number of Calls**	**Percentage (%)**
Priority I	Red	8,471	31.46%
Priority II	Yellow	16,105	59.81%
Priority III	Green	2,351	8.73%
Total	–	**26,927**	**100.00%**

Distribution of Intervention Calls by Triage Chapters

The analysis of intervention call distribution according to selected triage chapters from the Croatian Emergency Call Reception Index reveals significant differences in the frequency of individual categories, as shown in Table 3. The highest number of intervention calls was recorded under the category "Unclear Problem" (n = 6,586; 24.47%), which includes calls where symptoms are not clearly defined but still require medical assessment. This was followed by "Respiratory Disorders" (n = 3,995; 14.83%) and "Chest Pain / Heart Disease" (n = 2,508; 9.31%), highlighting a high proportion of patients presenting with potential cardiovascular and respiratory emergencies. Within the scope of particular interest for this study, the category "Altered Consciousness / Paralysis" included 1,974 calls, while "Headache" was the leading symptom in 278 cases. These categories are crucial for analyzing the association between triage criteria and final diagnoses of cerebrovascular incidents.

Table 3. **Distribution of intervention calls by triage chapter in 2023**		
Triage Chapter	**Number of Calls**	**Percentage (%)**
Unclear Problem	6,586	24.47%
Respiratory Disorders	3,995	14.83%
Chest Pain / Heart Disease	2,508	9.31%
Abdominal / Back Pain	2,330	8.65%
Psychiatry / Suicide	1,294	4.81%
Altered Consciousness / Paralysis	1,974	7.33%
Wounds / Fractures / Minor Injuries	1,521	5.65%
Convulsions	451	1.67%
Headache	278	1.03%
Other Chapters	5,990	22.24%
Total	**26,927**	**100.00%**

The results highlight the need to improve stroke symptom triage. The relatively low proportion of calls categorized under "Altered Consciousness/Paralysis" and "Headache" in comparison to the actual incidence of cerebrovascular events indicates potential shortcomings in recognizing key stroke symptoms during the emergency call phase.

Association Between Triage Categories and Stroke Diagnosis

The association between triage criteria and primary stroke diagnoses was analyzed across a total of 278 calls categorized under the triage chapter "Headache" (A.18.01 – A.18.07) and 1,974 calls within the chapter "Altered Consciousness/Paralysis" (A.25.01 – A.25.09). From the total number of calls within these triage chapters, only those meeting the stroke-relevant criteria listed in Supplementary Table S1 were included in the analysis, while calls assigned to nonspecific or non-neurological criteria within A.18 and A.25 were excluded.

Within the "Headache" chapter (Table 4), 26 out of 278 calls met specific criteria (A.18.01 – A.18.07). Among these, a stroke diagnosis was confirmed in 2 cases (7.69%), while in the remaining 24 cases (92.31%) other diagnoses were established.

In the "Altered Consciousness/Paralysis" chapter (Table 4), 1,154 of the 1,974 received calls involved specific criteria (A.25.01 – A.25.09). Of these, 1,120 calls with assigned final diagnoses coded according to ICD-10 were analyzed. Stroke (ICD-10 codes: G45–G45.9, I60–I69.9) was confirmed in 461 cases (41.16%), while other diagnoses were established in 659 cases (58.84%). The difference of 34 calls (between the number of observed criteria and analyzed diagnoses) arose from cases for which no ICD-10 diagnosis was subsequently recorded.

The higher prevalence of primary stroke diagnoses within the "Altered Consciousness/Paralysis" chapter compared to the "Headache" chapter suggests that headache alone is not a sufficiently specific predictor of stroke. The relatively low proportion of confirmed strokes in the "Headache" category (7.69%) compared to "Altered Consciousness/Paralysis" (41.16%) indicates the potential overestimation of headache severity as a primary indicator of stroke during emergency medical calls.

Statistical Analysis of the Association Between Triage Categories and Stroke Diagnosis

A Chi-square test, as shown in Table 5 and Table 6, was conducted to examine the association between the initially selected triage chapters ("Headache" and "Altered Consciousness/Paralysis") and the primary diagnosis of stroke. The results indicated a statistically significant difference between the two categories (χ^2 = 11.82; p < 0.001), confirming that patients triaged under "Altered Consciousness/Paralysis" were significantly more likely to receive a primary diagnosis of stroke compared to those initially categorized under "Headache".

Yates' correction, which reduces the likelihood of overestimating values in tests with small sample sizes, also showed a statistically significant difference (χ^2 = 10.47; p = 0.001).

The association between triage category and final stroke/TIA diagnosis remained statistically significant when tested with Fisher's exact test (p < 0.001).

Table 4. **Distribution of stroke diagnoses according to triage criteria**					
Triage Criteria	**Calls Meeting Triage Criteria**	**Transient Ischemic Attacks (G45–G45.9)**	**Cerebrovascular Diseases (I60-I69.9)**	**Other ICD-10 Diagnoses**	**Total ICD-10 Diagnoses Analyzed***
Headache (A.18.01 – A.18.07)	26	0	2	24	26
Altered Consciousness/ Paralysis (A.25.01 – A.25.09)	1,154	101	360	659	1,120
*The difference between the total number of calls meeting triage criteria (1,154) and those with analyzed ICD-10 diagnoses (1,120) is due to missing diagnoses in some cases.					

Table 5. **Distribution of stroke diagnoses by triage criteria**			
Triage Criteria	**Stroke (G45-G45.9, I60-I69.9)**	**Other ICD-10 Diagnoses**	**Total**
Headache (A.18.01 – A.18.07)	2	24	26
Altered Consciousness/Paralysis (A.25.01 – A.25.09)	461	659	1,120
Total	**463**	**683**	**1,146**

Taken together, these results confirm a strong association between triage chapter and stroke diagnosis, highlighting challenges in recognizing stroke in patients reporting headache as their primary symptom during emergency medical calls.

Table 6. **Chi-square test results for association between triage criteria and stroke diagnosis**		
Statistical Test	**Value**	**p-value**
Chi-square (χ^2)	11.82	< 0.001
Chi-square with Yates' correction	10.47	0.001

The primary diagnosis of stroke was confirmed considerably more often in patients triaged under the "Altered Consciousness/Paralysis" chapter, while it appeared significantly less frequently in the "Headache" category.

These results indicate that headache as a primary symptom of stroke is relatively rarely confirmed as an accurate indicator, whereas "Altered Consciousness/Paralysis" proves to be a much more reliable predictor. This suggests that, in cases where headache is the main symptom, there may be an overestimation of its severity, while in other cases stroke may go unrecognized if additional neurological symptoms—such as paralysis or altered consciousness—are absent.

Education of dispatchers and the general public on recognizing atypical symptoms of stroke could contribute to more accurate urgency assessment and reduce the risk of stroke being overlooked during emergency medical calls.

Association Between Selected Triage Criteria and Stroke Diagnosis

The association between primary diagnoses indicative of possible stroke (ICD-10: G45-G45.9, I60-I69.9) and selected triage criteria within the chapters "Headache" (A.18.01 - A.18.07) and "Altered Consciousness/Paralysis" (A.25.01 – A.25.09) was analyzed. The results were compared with other triage criteria not directly associated with suspected stroke (Table 7-9).

Among the calls resulting in a primary stroke-related diagnosis, the "Headache" and "Altered Consciousness/Paralysis" criteria were selected in 463 cases. Of these, 101 cases were diagnosed as transient ischemic attack (G45-G45.9), and 362 as cerebrovascular diseases (I60-I69.9).

In the group of calls where other triage criteria were applied, a primary stroke diagnosis was assigned in 356 cases, of which 78 were classified as transient ischemic attack (G45-G45.9) and 278 as cerebrovascular diseases (I60-I69.9).

Table 7. **Distribution of stroke diagnoses by selected and other triage criteria**		
Stroke Diagnosis	**Headache and Altered Consciousness/ Paralysis Criteria**	**Other Triage Criteria**
Transient Ischemic Attacks (G45-G45.9)	101	78
Cerebrovascular Diseases (I60-I69.9)	362	278
Total	**463**	**356**

Statistical Analysis of the Association Between Selected Triage Criteria and Stroke Diagnosis

A chi-square test was used to examine the association between the selected triage criteria ("Headache" and "Altered Consciousness/Paralysis") and the final stroke diagnosis. The statistical significance of the difference between two groups of tri-

Table 8. **Distribution results based on selected triage criteria and final stroke diagnosis**			
Triage Criteria Used in MPDJ	**Confirmed Stroke**	**No Stroke Diagnosed**	**Total**
Headache/Altered Consciousness/Paralysis	463	683	1,146
Other Criteria	356	25,359	25,715
Total	**819**	**26,042**	**26,861**

age criteria was analyzed: selected criteria ("Headache" and "Altered Consciousness/Paralysis") versus all other triage criteria.

The results of the chi-square test showed an extremely high level of statistical significance (χ^2 = 5649.92; p < 0.001), clearly indicating a significant difference between the choice of triage criteria and the final diagnosis of stroke. Notably, 356 patients (43.5%) out of a total of 819 confirmed stroke diagnoses were not initially identified by dispatchers using specific criteria ("Headache" or "Altered Consciousness/Paralysis"), but were assessed using other, less specific criteria.

Table 9 confirms a highly statistically significant difference between the selected triage criteria ("Headache" and "Altered Consciousness/Paralysis") and other criteria in relation to the assignment of a final stroke diagnosis (p < 0.05).

These findings highlight the urgent need for further dispatcher training on the early recognition of stroke symptoms, as well as a review and enhancement of existing triage criteria to improve stroke detection accuracy during emergency medical calls.

Analysis of Criteria Associated with Stroke Diagnosis

An additional analysis was conducted to examine the triage criteria selected in cases where the final primary diagnosis was a stroke (ICD-10 codes: G45–G45.9, I60–I69.9). The aim of the analysis was to identify the most frequently used triage criteria and to explore potential discrepancies in symptom perception between callers and emergency medical dispatchers.

Table 10 presents the distribution of triage criteria used for patients who were ultimately diagnosed

Table 9. **Chi-square test results for association between selected triage criteria and stroke diagnosis**		
Statistical Test	**Value (χ^2)**	***p*-value**
Chi-square (χ^2)	5649.92	< 0.001
Chi-square with Yates' correction	5636.73	< 0.001

Table 10. **Most Frequently Used Triage Criteria in Confirmed Stroke Diagnoses**			
Criterion	**Description**	**Calls (I60-I69.9)**	**Calls (G45-G45.9)**
A.05.08	Suspected red criterion (no additional data immediately available)	44	15
H.25.03	Sudden confusion/somnolence without known cause	27	11
H.25.04	Prolonged confusion/somnolence	24	1
H.05.01	Exhausted patient (unreliable/unclear data)	22	1
A.01.03	Unconscious adult, breathing	20	4
H.25.05	Sudden paralysis, rapidly resolves	19	11
H.05.10	Other yellow criterion (no appropriate criterion available in the Index)	15	8
H.05.06	Sudden dizziness with apparent physical weakness	14	6
H.05.09	Suspected yellow criterion (no additional data immediately available)	9	1
A.27.02	Severe difficulty breathing	7	1
A.05.09	Other red criterion (no appropriate criterion available in the Index)	5	2
A.09.04	Chest pain or discomfort – with breathing difficulty	4	1

Table 11. **Nonspecific Criteria Used in Confirmed Stroke Cases**			
Criterion	Description	Calls (I60-I69.9)	Calls (G45-G45.9)
A.05.02	Conscious, weakness and near-syncope	1	1
H.14.06	Immunosuppression and fever	2	1
H.23.09	Back pain, partial loss of sensation in the legs	0	1
H.05.12	Communication difficulties and unclear situation	1	1
A.27.03	Barely able to speak due to breathing difficulty	1	2

with either cerebrovascular disease (I60–I69.9) or transient ischemic attack (G45–G45.9).

The most frequently used criteria for patients with a primary stroke diagnosis include those related to loss of consciousness (A.01.03), general signs of severe medical condition (A.05.08), and nonspecific symptoms such as confusion or dizziness (H.25.03, H.05.06). These findings suggest that stroke symptoms are often not recognized in their early stages and highlight the need for additional education of both callers and dispatchers.

Differences in Stroke Symptom Recognition

The analysis also showed that in some cases, callers reported nonspecific symptoms such as exhaustion, shortness of breath, or chest pain, which may result in insufficient suspicion of stroke during triage. Criteria such as "Sudden dizziness" (H.05.06) or "Sudden confusion/somnolence" (H.25.03) were found to be relatively common in cases of confirmed cerebrovascular disease but are not necessarily specific to stroke (as shown in Table 11).

The results of the analysis highlight a discrepancy between the symptoms reported by callers and the confirmed stroke diagnoses. The most commonly used criteria relate to general signs of severe medical conditions, whereas specific stroke symptoms such as paralysis or speech loss were reported in fewer cases.

Callers sometimes focus on symptoms that are most subjectively noticeable to them, while stroke-specific symptoms may remain unreported or unrecognized.

These findings indicate the need for additional education on stroke symptom recognition among individuals calling emergency medical services. Timely recognition of key symptoms can improve patient outcomes and reduce the risk of delayed treatment.

Gender and Age Analysis of Triage Criteria

Gender and age analyses were conducted exclusively on patients with a confirmed stroke diagnosis (ICD-10: G45–G45.9, I60–I69.9). Within this subset of 819 patients, the triage criteria selected by dispatchers were examined to determine whether gender or age influenced the categorization of symptoms within the Croatian Emergency Call Reception Index. To assess the association between gender and assigned triage criteria, a chi-square (χ^2) test was performed using observed and expected values. Data from 419 men and 400 women were analyzed, as presented in Table 12.

The p-value from the χ^2 test was 0.951, indicating no statistically significant difference between men and women in the allocation of triage criteria ($p > 0.05$). These results suggest that gender does not influence the assignment of triage codes within the Croatian Emergency Call Reception Index, pointing to consistency in dispatcher assessment.

Table 12. **Distribution of triage criteria by gender in patients with confirmed stroke (n = 819)**			
Triage category	Male (n = 419)	Female (n = 400)	Total
Headache (A.18.01–A.18.07)	1 (0.2%)	1 (0.3%)	2 (0.2%)
Altered consciousness/paralysis (A.25.01–A.25.09)	234 (55.9%)	227 (56.8%)	461 (56.3%)
Other criteria	184 (43.9%)	172 (43.0%)	356 (43.5%)
Total	**419**	**400**	**819**

Table 13. **Age Differences by Gender**			
Gender	Mean Age	Standard Deviation (SD)	Number of Cases (n)
Male (M)	71.10	11.61	419
Female (F)	76.46	12.81	400

In addition to the gender distribution analysis, an age-related comparison was conducted (Table 13). It was found that female patients were, on average, older than male patients (M = 76.46, SD = 12.81 vs. M = 71.10, SD = 11.61). A Welch's t-test confirmed that the difference was statistically significant (t = –6.26, p < 0.001), indicating that female stroke patients were significantly older than their male counterparts.

Given the statistically significant age difference between genders, the finding is clinically relevant from an epidemiological perspective; however, it is unlikely to directly influence dispatcher decision-making, as triage assessments are based solely on caller-reported symptoms rather than patient demographics.

Discussion

The results of this study confirmed the importance of timely and accurate stroke triage within the Medical Dispatch Unit (MPDJ), highlighting key challenges in recognizing stroke symptoms based on information provided by the caller. Given that patients often do not call for themselves, but rather a third party reports the symptoms, the role of the dispatcher becomes crucial in decision-making based on the Croatian Emergency Call Reception Index. The study showed that certain triage criteria more frequently correlate with stroke diagnoses. However, in as many as 43.5% of stroke patients, the initial triage did not fall under the "Headache" or "Disturbance of Consciousness/Paralysis" categories but was classified under other, less specific criteria. This finding suggests the need to improve dispatcher assessment accuracy and optimize triage processes through further training for both dispatchers and the general public.

Dominant Triage Criteria in Stroke

Analysis of triage criteria distribution showed that stroke patients were most frequently categorized under the chapter "Disturbance of Consciousness/Paralysis" (A.25), with some cases classified under "Headache" (A.18), even though headache has rarely been shown to indicate stroke. This may point to imprecise symptom interpretation by either the caller or the dispatcher. A similar pattern was reported by Wenstrup et al. (3), who noted that structured triage protocols offer high specificity but variable sensitivity. This means that some symptoms may be misclassified, potentially resulting in missed stroke recognition and delays in patient care.

It is particularly noteworthy that patients assigned criteria such as "Sudden speech difficulties" (A.25.05) and "Sudden paralysis, rapidly returning to normal" (H.25.05) had a significantly higher likelihood of being diagnosed with stroke compared to those initially reporting only a headache. This distribution of triage criteria highlights the need for more precise communication during calls and additional dispatcher education to identify subtle, less pronounced and noticeable signs of neurological deficit, even when not explicitly recognized by the caller as stroke symptoms.

Misinterpreted Symptoms and Triage Challenges

One of the key findings of this research is that some patients later confirmed to have suffered a stroke were initially triaged under unrelated categories such as "Unclear problem" or "Headache." This suggests that the information obtained during the call may be subjectively interpreted by the caller, making accurate dispatcher assessment more challenging. Additionally, inter-dispatcher variability in evaluating certain symptoms may further influence triage decisions. Jamtli et al. (2) report that dispatchers often face limited information during emergency calls, and their interpretation of symptoms can depend on their experience, training, and the clarity of the caller's description. In

addition to dispatcher-related factors, caller characteristics - such as the clarity of symptom descriptions, emotional state and level of health literacy - may substantially influence how stroke symptoms are communicated and interpreted during the call.

Studies have shown that the sensitivity of stroke recognition by dispatchers ranges from 18% to 83% (14), which aligns with this study's findings, where certain symptoms were not identified as indicative of stroke. A particular challenge lies in the fact that stroke symptoms can be atypical or non-specific, making correct triage decisions more difficult. For example, in some cases, callers reported symptoms such as dizziness, confusion, or chest pain—symptoms not necessarily considered stroke-related by dispatchers but which ultimately led to a cerebrovascular diagnosis.

Gender and Age Differences in Reported Symptoms

The results of the chi-square test (χ^2 = 0.005, p = 0.951) showed no statistically significant difference in the allocation of triage criteria between male and female patients. The notably high p-value further supports the conclusion that the patient's gender does not influence the dispatcher's decision when categorizing stroke within the Croatian Emergency Call Reception Index. These findings are consistent with previous research showing that dispatchers primarily base their decisions on the symptoms described by the caller rather than on the patient's demographic characteristics (4).

However, it is known that women more frequently present with atypical stroke symptoms such as nausea, faintness, and general weakness, which can make early recognition in the prehospital phase more difficult (16). Since dispatchers lack visual contact with the patient, their assessment fully relies on the information provided by the caller. This can lead to variability in symptom descriptions and potentially to underestimation of atypical stroke presentations in women. Although the results of this study did not indicate a significant difference in triage categorization by gender, further research is needed to examine whether unconscious bias may influence the triage assessment of symptoms in men and women.

The analysis of age differences revealed a statistically significant disparity between male and female patients (t = -6.26, p < 0.001). The average age of

stroke patients was 71.10 years for men and 76.46 years for women, indicating that women tend to experience stroke at an older age. This pattern aligns with previous research suggesting that women are more likely to suffer strokes later in life, a trend attributed to longer life expectancy, delayed exposure to vascular risk factors, and differing hormonal influences (17). However, given that dispatchers do not see the patient and rely entirely on caller-reported symptoms, this age difference is unlikely to have a direct impact on real-time triage decision-making. In the context of emergency calls, the caller's interpretation and communication of symptoms represent a far more influential factor than demographic characteristics of the patient.

Nevertheless, since patients most often do not call emergency services themselves, and symptoms are typically reported by a third party, the key factor in stroke recognition is not necessarily the patient's age but the way in which the caller describes the symptoms. These findings are consistent with the claims of Jamtli et al. (2), who emphasize that the caller's subjective interpretation of symptoms can have a greater impact on dispatcher decisions than the patient's clinical presentation itself.

Limitations of the Study

Due to the retrospective design, the analysis was limited to data available within the *e-Hitna* system. This means it was not possible to control for the accuracy or completeness of symptom descriptions provided by callers during emergency calls. The subjective interpretation of symptoms by callers can significantly influence the dispatcher's final triage decision, which constitutes an important methodological limitation. Furthermore, the study did not include follow-up of hospital diagnoses or clinical outcomes, which would allow for a more accurate assessment of triage decision validity. Future studies should consider linking MPDJ data with final hospital diagnoses and patient outcomes to enable a more detailed evaluation and potential improvement of existing triage protocols. An additional limitation concerns the unequal size of the analysed groups, particularly the small number of cases in the Headache category compared with Altered Consciousness/Paralysis and other triage codes. This imbalance may reduce statistical power for some comparisons and increase the uncertainty around effect estimates, despite the use of appropriate tests (e.g., Welch's t-test and Fisher's exact test) to account for

these differences. In addition, multivariable modelling techniques, including logistic regression, could not be applied. Essential predictor variables such as age, sex and caller-related characteristics were available only for patients with confirmed stroke diagnoses, and not for the full set of emergency calls. Applying regression under such constraints would compromise the validity and interpretability of the results. For this reason, the analysis was limited to descriptive statistics and bivariate tests, which were methodologically appropriate given the structure of the available data.

Methodological Implications

The findings of this study may serve as a foundation for improving prehospital stroke triage within MPDJ operations. Identifying the most frequently used triage cards and comparing them with primary diagnoses provides insight into potential gaps in recognizing stroke during emergency medical calls. The results highlight the need to educate not only dispatchers but also the general public about stroke symptoms and the importance of clear, timely communication during emergency calls.

Practical Implications and Recommendations

The findings of this study point to several key areas for improving stroke recognition in Medical Dispatch Units. First and foremost, dispatcher training should include specialized modules focused on identifying atypical stroke symptoms such as dizziness, nausea, and transient confusion. In addition, enhancing communication strategies—for example, through the implementation of specific questions regarding neurological deficits—could improve triage accuracy. In practice, dispatcher training should incorporate simulation scenarios based on real-life cases involving atypical stroke presentations. For example, workshops where dispatchers listen to real emergency call recordings and then discuss the appropriateness of the triage decisions made could significantly improve their ability to recognize atypical symptoms.

Furthermore, dispatchers should receive regular feedback from hospital staff on the final diagnoses of patients they triaged. This would enhance their clinical judgment and support continuous quality improvement.

Further research should examine the effectiveness of educational interventions and the potential imple-

mentation of additional diagnostic algorithms within medical dispatch systems, in order to reduce the number of unrecognized strokes. Additionally, raising public awareness about stroke symptoms could decrease the number of inaccurate symptom presentations, thereby facilitating the work of dispatchers.

Final Thought

Stroke triage within the Medical Dispatch Unit is a complex process in which callers and dispatchers—not patients—play a central role. The findings of this study demonstrated that certain triage criteria are more frequently associated with confirmed stroke diagnoses, while others remain underrecognized. These insights underscore the need to improve dispatcher education and communication strategies in order to enhance out-of-hospital stroke recognition and ensure timely intervention for affected patients.

Conclusion

The analysis provided insight into how stroke-related symptoms are categorized during emergency medical calls and highlighted the crucial role of dispatchers in early recognition. Triage criteria within the chapter "Altered Consciousness/Paralysis" (A.25) were most strongly associated with confirmed stroke diagnoses, whereas headache-related criteria rarely indicated stroke. A considerable proportion of stroke cases were initially assigned to less specific triage chapters, underscoring the challenges posed by caller-reported symptoms and the complexity of identifying neurological deficits in the prehospital phase.

These findings point to the need for enhanced dispatcher training focused on recognising atypical and unspecific stroke presentations, as well as continued public education to improve the accuracy of symptom reporting during emergency calls. Strengthening communication strategies, together with systematic feedback from hospital outcomes, may contribute to more accurate triage and reduce the likelihood of missed strokes. Improving dispatcher competencies and public awareness represents a key step toward optimizing prehospital stroke pathways and supporting timely intervention.

Author contributions

Conflict of interest

Acknowledgments

Funding

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Supplementary file

	Table S1. **Included triage criteria from Chapters A.18 and A.25 (with justification)**			
Chapter	**Code**	**Description**	**Included**	**Justification**
A.18	A.18.01	Ne reagira na protresanje i pozivanje	Yes	Included in analytical scope (A.18.01–A.18.07)
A.18	A.18.02	Abnormalno ili otežano disanje	Yes	Included in analytical scope
A.18	A.18.03	Iznenadna jaka, neuobičajena glavobolja	Yes	Included in analytical scope
A.18	A.18.04	Glavobolja + mučnina	Yes	Included in analytical scope
A.18	A.18.05	Glavobolja + paraliza	Yes	Included in analytical scope
A.18	A.18.06	Glavobolja + otežani govor	Yes	Included in analytical scope
A.18	A.18.07	Glavobolja + smušenost	Yes	Included in analytical scope
A.18	A.18.08	Temp >38.5 ℃ + ukočen vrat	No	Infectious etiology; outside analytical scope
A.18	A.18.09	Temp >38.5 ℃ + osip	No	Infectious etiology; outside analytical scope
A.18	A.18.10	Konvulzije	No	Seizure-related; outside analytical scope
A.25	A.25.01	Ne reagira na pozivanje	Yes	Included in analytical scope (A.25.01–A.25.09)
A.25	A.25.02	Otežano disanje	Yes	Included in analytical scope
A.25	A.25.03	Iskrivljenje lica	Yes	Included in analytical scope
A.25	A.25.04	Gubitak snage u ruci/nogi	Yes	Included in analytical scope
A.25	A.25.05	Poteškoće u govoru	Yes	Included in analytical scope
A.25	A.25.06	Smetenost; sumnja na moždani udar	Yes	Included in analytical scope
A.25	A.25.07	Nagla jaka glavobolja	Yes	Included in analytical scope
A.25	A.25.08	Slabost pri svijesti	Yes	Included in analytical scope
A.25	A.25.09	Hladni i oznojeni	Yes	Included in analytical scope
A.25	A.25.10	Abdominalna bol	No	Non-neurological; outside analytical scope
A.25	A.25.11	Ubrzan puls; slabost	No	Non-neurological; outside analytical scope

Enhancing Information Sharing Between Health Workers and Families in Critical Care: User Experience

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Abstract

Introduction. Family members of Intensive Care Unit (ICU) patients often face emotional distress from limited access to patient information. The SI RINDU mobile application was developed to bridge this gap by providing real-time updates on patient status and care.

Aim. This study aimed to evaluate the user experience of family members using the SI RINDU application.

Methods. An exploratory user experience study was conducted over a 14-day period in January 2025 at the Intensive Care Unit of a regional hospital in Semarang, Indonesia. A total of 20 family representatives of Intensive Care Unit patients who used the SI RINDU application participated. User experience was assessed using the User Experience Questionnaire (UEQ), which measures six dimensions: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty.

Results. All six dimensions recorded mean scores above 0.8, indicating a generally positive user experience. The highest scores were in Attractiveness (1.592), Novelty (1.538), and Efficiency (1.513), suggesting that users appreciated the application's design, usefulness, and innovation. Stimulation (1.263) and Dependability (1.188) were also rated positively. However, Perspicuity scored lower (1.125), reflecting some challenges with interface clarity and usability. Benchmark analysis categorized most dimensions as "Good" or "Above Average," with Perspicuity rated "Below Average."

Conclusion. The SI RINDU application provides a promising tool for enhancing family engagement and emotional support in Intensive Care Unit settings through effective digital communication. While users generally responded positively, improvements in interface clarity and navigation are recommended to enhance accessibility and overall user satisfaction.

Introduction

The Intensive Care Unit (ICU) is a vital part of the healthcare system, treating patients with critical or life-threatening conditions. In the ICU, patients receive intensive care supported by advanced technology, complex medical interventions, and strict, continuous monitoring protocols (1,2). While these facilities are designed to improve the chances of recovery, the closed, high-intensity environment of the ICU often has psychosocial consequences, not only for patients but also for their families (1,3).

One of the main challenges in ICU care is limited family access to patients and information regarding their condition. Limited visitation and strict isolation protocols, particularly in the context of a pandemic or nosocomial infection, often leave families feeling marginalized in the care process. This communication gap has been shown to increase stress, anxiety, and the emotional burden on families, who feel a loss of control and clarity regarding their loved one's condition (4,5). In fact, this uncertainty in information often leads to a decline in family quality of life and dissatisfaction with overall hospital services (6,7).

In the context of critical care, the need for accurate, consistent, and up-to-date information is a crucial aspect in supporting family emotional well-being. Effective communication has been recognized as a key element of a family-centered care model, where active family involvement in understanding the patient's condition is considered to increase satisfaction, collaborative decision-making, and trust in the medical team (8). Research by Białek (2021), confirms that providing structured information on a regular basis can reduce anxiety and increase families' sense of calm and confidence in facing critical situations. However, there is a perception gap between families and healthcare professionals, particularly nurses, regarding the type and frequency of information deemed important to convey (10). Nurses often focus on clinical aspects, while families require a more comprehensive and ongoing understanding of the patient's condition.

To address these communication challenges, digital transformation in healthcare has opened up innovative opportunities through the development of the Hospital Management Information System (SIMRS) (11,12). One SIMRS-based application specifically designed to increase family involvement in ICU patients is the Integrated Daily Information System (SI RINDU). SI RINDU provides real-time information on the patient's general status, current diagnosis, supporting test results, and treatment plan, which families can access digitally (13). This innovation aims to improve communication, satisfaction, and emotional support for families of ICU patients. The application is expected to bridge the information gap between medical personnel and families and provide a more optimal sense of involvement, reassurance, and emotional support (14–16).

Given the crucial role of digital applications in improving service quality, user experience evaluation is crucial to ensure the application is effective, easy to use, and meets the emotional and informative needs of users.

Aim

This study aims to explore in-depth the experiences of ICU patient families in using the SI RINDU application, employing the User Experience Questionnaire (UEQ) instrument to assess aspects of usability, efficiency, information clarity, and visual appeal. The results of this study are expected to provide recommendations for system optimization, while enriching the literature related to digital innovation in supporting communication and the well-being of patient families in the ICU environment.

Methods

This study employed an exploratory user experience evaluation design using the User Experience Questionnaire (UEQ) to assess how family members of ICU patients perceive the SI RINDU mobile information system. The study was conducted at the Intensive Care Unit (ICU) of RSD K.R.M.T. Wongsonegoro, Semarang, Indonesia, over a 14-day period from January 2 to January 16, 2025.

Participants were recruited using simple random sampling. Inclusion criteria included: (1) being the designated family representative of an ICU patient; (2) actively receiving SI RINDU updates; and (3) owning an Android smartphone capable of running the application. A total of 20 participants met these criteria and consented to participate. Although modest in size, the sample is considered adequate for exploratory user experience research, as previous studies suggest 20–30 respondents are sufficient for valid interpretation using UEQ (17).

The study population during the 14-day period consisted of 45 family representatives who were actively using the SI RINDU application. The simple random sampling method was chosen to minimize potential bias from specific usage patterns or initial enrollment periods, resulting in a sample size of N=20, which is considered adequate for exploratory UEQ testing. The questionnaire was administered to the participants in person at the hospital's waiting room after they had used the application for at least 7 days. To ensure anonymity, participants filled out the paper-based questionnaire independently in a private corner, and the forms were immediately sealed in an envelope without collecting identifying personal data, thereby maintaining strict confidentiality. The 20 participants consisted of 8 (40%) men and 12 (60%) women. The average age of the respondents was 45.2 years (SD = 12.5). Their relationship to the patient was primarily the spouse (n = 10, 50%), followed by the adult child (n = 6, 30%), and the parent or sibling (n = 4, 20%).

Instrument

The UEQ instrument, developed by Laugwitz et al. 2008 (18), consists of 26 items in the form of semantic differential pairs, assessing six dimensions: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty. The instrument's reliability and validity have been confirmed through prior usability evaluations (17). Each item presents two opposing adjectives (e.g., "annoying" vs. "enjoyable") and is rated on a 7-point Likert scale (ranging from -3 to +3, resulting in a total score range of -3 to +3 for each scale). The mean scores for each dimension are calculated, with values ranging from -3 (extremely negative) to +3 (extremely positive). For example, the Perspicuity scale consists of 4 pairs of adjectives, including "easy to learn" vs. "difficult to learn," and measures the user's perception of interface clarity and ease of understanding. The Attractiveness scale also consists of 6 pairs (e.g., "unpleasant" vs. "pleasant").

Ethics

This study involved family members of patients who voluntarily completed a questionnaire. Written informed consent was obtained from all participants. At the time the study was conducted, there was no institutional ethics committee available; nevertheless, the research was carried out in accordance with the ethical principles of the Declaration of Helsinki. Participant confidentiality and anonymity were strictly maintained.

Statistics

Responses were analyzed using the official UEQ Data Analysis Tool (Excel-based), available from www.ueq-online.org, which calculates mean scores, standard deviations, confidence intervals, and benchmark-based interpretations for each scale dimension.

Results

The study involved 20 participants who evaluated the SI RINDU application using the User Experience Questionnaire (UEQ). All six UEQ dimensions had mean scores greater than 0.8, indicating a generally positive user experience. The highest mean scores were observed for Attractiveness (1.592), Novelty (1.538), and Efficiency (1.513) (Table 1). Figure 1 presents the mean scores for each of these dimensions.

As shown in Figure 1, the bars represent mean scale scores, ranging from -2 to +2. The color background indicates the interpretation range: Green (positive user experience), Yellow (neutral/borderline), and Red (negative user experience). All mean scores were in the positive (Green/Yellow) range.

A benchmark comparison was also conducted using the UEQ tool. The results are shown in Table 2.

As shown in Table 2, the SI RINDU application demonstrated "Good" performance. The "Comparison to benchmark" column refers to the classification of the SI RINDU results relative to a large dataset of results. The 5 categories of classification are Excellent, Good, Above Average, Below Average, and Bad, indicating the percentile rank of the product's score against the benchmark distribution.
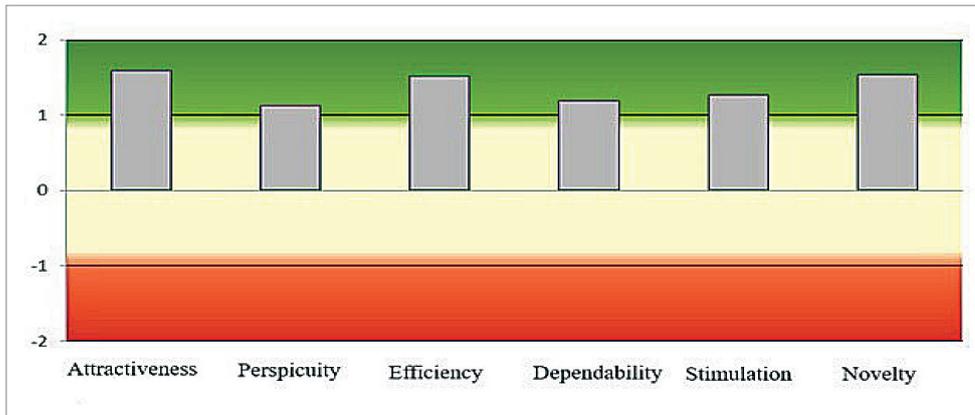
Figure 1. **Mean scores across six dimensions of the User Experience Questionnaire (UEQ)**

Discussion

This study aimed to explore the user experience of the SI RINDU application as perceived by family members of patients admitted to the ICU. The findings suggest that the application delivers a generally positive user experience across all six dimensions of the User Experience Questionnaire (UEQ), with all mean values exceeding the threshold of 0.8, indicating satisfactory usability and engagement.

The highest score was obtained in the Attractiveness dimension (M = 1.592), reflecting a strong positive impression of the application's visual appeal and overall design. Prior research has established that first impressions play a critical role in shaping long-term user evaluations of digital interfaces (19,20). Visual aesthetics, interface simplicity, and layout coherence have been shown to influence users' initial trust and willingness to engage with digital health platforms. The strong performance in this dimension suggests that SI RINDU successfully captures users' attention and fosters positive perceptions from the

Table 1. Descriptive statistics and score ranges for UEQ dimensions (N = 20)					
Scale	**Mean**	**Std. Dev.**	**N**	**Minimal Score (Sample)**	**Maximal Score (Sample)**
Attractiveness	1.592	0.951	20	–0.50	3.00
Perspicuity	1.125	1.231	20	–1.25	3.00
Efficiency	1.513	0.982	20	–0.75	2.75
Dependability	1.188	0.743	20	–0.50	2.50
Stimulation	1.263	1.011	20	–1.00	2.75
Novelty	1.538	0.871	20	–0.75	2.75

Table 2. UEQ Benchmark Comparison			
Scale	**Mean**	**Comparison to benchmark**	**Interpretation**
Attractiveness	1.59	Good	10% of results better, 75% of results worse
Perspicuity	1.13	Below Average	50% of results better, 25% of results worse
Efficiency	1.51	Good	10% of results better, 75% of results worse
Dependability	1.19	Above Average	25% of results better, 50% of results worse
Stimulation	1.26	Above Average	25% of results better, 50% of results worse
Novelty	1.54	Good	10% of results better, 75% of results worse

outset, which is particularly crucial in emotionally charged environments such as the ICU.

In addition, high scores were observed in the Efficiency (M = 1.513) and Novelty (M = 1.538) dimensions. These results highlight the application's ability to provide streamlined access to relevant information and its innovative features that address user needs in a novel way. In the context of critical care, where timely and accurate information is essential for family members' emotional and cognitive processing, these attributes are particularly valuable. Efficient navigation and up-to-date content can facilitate informed decision-making, reduce anxiety, and promote a sense of inclusion in the care process.

The Stimulation (M = 1.263) and Dependability (M = 1.188) dimensions also received favorable ratings, indicating that users found the application both engaging and reliable. These findings are consistent with literature suggesting that emotionally supportive and technically dependable digital platforms can enhance user confidence and long-term engagement (18). The ability of the application to stimulate interest and reinforce user trust underscores its potential for sustained use in high-stress healthcare environments.

However, the lowest mean score was recorded in the Perspicuity dimension (M = 1.125), categorized as "below average" in UEQ benchmark classifications. This indicates some difficulty among users in understanding how to navigate the application, interpret its content, or interact with its interface. Such issues may stem from a lack of onboarding support, the use of unfamiliar medical terminology, or suboptimal interface intuitiveness. Addressing these usability barriers is critical, especially considering the diverse digital literacy levels among users. Improving clarity through intuitive design, simplified language, and user-centered instructional materials could significantly enhance accessibility and overall experience.

Although the sample size was relatively small (n = 20), the study remains methodologically sound for an exploratory assessment. As noted by Schrepp 2023 (17) and Laugwitz et al. 2008 (18), sample sizes ranging from 10 to 30 participants are sufficient for early-stage user experience evaluations using the UEQ, particularly when the goal is to obtain descriptive insights to inform future development.

These findings underscore the importance of integrating end-user perspectives into the design and evaluation of digital health interventions. In ICU settings where direct communication is limited by clinical constraints and emotional stressors, mobile information systems like SI RINDU offer an effective alternative for enhancing transparency, strengthening trust, and improving family satisfaction with care. Further iterations of the application should prioritize enhancing clarity and ensuring inclusivity across different user demographics to maximize its impact in critical care environments.

In addition to the user experience dimensions already analyzed, the emotional support aspect provided by the SI RINDU application also deserves special attention. The emotional involvement of patients' family members in the care process is often hampered by restrictions on physical visits in the ICU. Therefore, the presence of an application that can bridge the need for information and emotional support is crucial. Improving access to clinical information and responsive digital communication can reduce emotional stress and increase family satisfaction with intensive care services (2,21). In this context, SI RINDU has the potential to be an instrument that is not only technically functional but also contributes to users' emotional well-being.

Furthermore, it is important to consider the long-term sustainability of the application. A successful initial implementation should be followed by a continuous improvement strategy based on user feedback. For example, personalization features such as notification settings, language preferences, and access to interaction history can increase the relevance and user experience of the application (22). Integration with the hospital's electronic medical record (EMR) system can also improve the comprehensiveness of information, making SI RINDU an integral part of the hospital's digital ecosystem.

Regarding data security and privacy, which is crucial due to the potential for integration with the Electronic Medical Record (EMR) system (23), the application utilizes a multi-layered security approach. Access for family members is strictly controlled through credentials provided by the hospital after verifying their relationship to the patient, ensuring single sign-in access for the designated family representative only. Further development will include robust 2-Factor Authentication (2FA) options and encryption protocols to guarantee the confidentiality and integrity of patient information both within and outside the hospital network.

Further evaluation should also include the application's impact on indirect clinical indicators, such as reduced family stress, communication efficiency, and satisfaction with ICU services. Furthermore, the application of universal design principles is crucial to ensure accessibility for various user groups, including the elderly, people with disabilities, and those with low digital literacy, so that the application can provide maximum inclusive benefits in critical care settings (21,24).

Conclusion

This study demonstrates that the SI RINDU mobile application provides a positive user experience among family members of ICU patients, particularly in terms of attractiveness, efficiency, and novelty, while perspicuity requires improvement. The findings highlight the potential of digital health tools to strengthen communication and support in critical care settings. It is recommended to enhance interface clarity, adopt user-friendly design for diverse digital literacy levels, integrate personalization features, and link the system with hospital records. Further studies with larger populations are needed to confirm the broader impact of SI RINDU on reducing family stress and improving satisfaction.

Author contributions

Conceptualization and methodology (YP, DS); data curation and formal analysis (DS, HM); investigation and project administration (YP); and writing – original draft and review & editing (DS, HM). All authors have approved the final manuscript.

Conflict of interests

The authors declare no conflicts of interest.

Acknowledgments

Funding

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Behind the Sirens: Exploring Job Satisfaction in Zagreb's Emergency Medical Services

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Abstract

Introduction. Emergency medical service (EMS) professionals operate in high-pressure environments, making job satisfaction crucial for workforce retention, mental well-being, and overall service quality. Identifying key determinants of job satisfaction in EMS is essential for optimizing workplace policies and reducing burnout.

Aim. This study aims to examine the relationship between demographic characteristics, education levels, and work experience with various dimensions of job satisfaction among EMS professionals in the Teaching Institute of Emergency Medicine of the City of Zagreb.

Methods. A cross-sectional study was conducted among 176 EMS employees at the Teaching Institute of Emergency Medicine of the City of Zagreb between November and December 2023. Workplace satisfaction was assessed using the Job Satisfaction Survey (JSS), covering nine dimensions: Pay Score, Promotion Score, Supervision, Fringe Benefits, Contingent Rewards, Operating Conditions, Coworkers, Nature of Work, and Communication. Data were analysed using descriptive and inferential statistical methods, including the Mann-Whitney U test, Kruskal-Wallis test, and Spearman's correlation, with a significance threshold of $p < 0.05$.

Results. Overall job satisfaction was predominantly ambivalent (median total JSS 112); 14.2% were satisfied and 2.3% dissatisfied. Men reported higher Nature of Work satisfaction than women ($p = 0.001$). Drivers reported the highest Nature of Work satisfaction ($p < 0.001$), and physicians reported higher Pay satisfaction than drivers ($p = 0.032$). Operating Conditions differed by tenure ($p = 0.008$), but post-hoc comparisons were not significant.

Conclusion. In this sample, overall job satisfaction was not high but largely ambivalent. Priority areas for improvement are Promotion, Fringe Benefits, Contingent Rewards, and Pay, while Nature of Work and Supervision were comparatively higher.

Introduction

Job satisfaction has been described as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences" (1,2). It is a positive emotional state that arises from achieving workplace goals and is influenced by personal experiences, values, and beliefs (3). There is broad agreement among scholars examining the psychosocial aspects of work, supporting Locke's theory from the late 1960s. This perspective suggests that job satisfaction stems from a complex and dynamic interaction between living conditions, labor relations, work processes, and the degree of control workers have over their professional and personal environments (3,4).

From a managerial standpoint, it is considered a crucial factor influencing individual and organizational performance, with a strong connection to the quality of services delivered. (5) Service management coordinates healthcare workers to ensure quality clinical practice and patient safety. Their role is crucial in organizational and emergency planning. (6)

Emergency Medical Service (EMS) plays a crucial role in ensuring timely and effective healthcare interventions in critical situations (7). However, the challenging nature of EMS work, characterized by long hours, high-pressure decision-making, and exposure to emotionally charged incidents, can significantly impact employees' job satisfaction (8). Studies indicate that nearly half of prehospital EMS workers experience moderate to high levels of burnout, with notable differences in stress perception and job satisfaction across professional roles, where physicians report higher satisfaction levels compared to paramedics and nurses (9). In healthcare, job satisfaction is shaped by multiple factors that impact professionals' overall well-being and commitment to their work. Studies have highlighted that gender, age, education level, work experience, workplace conditions, salary, working hours, and career advancement opportunities play a significant role in determining job satisfaction (10). Job satisfaction among EMS professionals is influenced by various workplace factors, with supervisory support being one of the strongest predictors of overall satisfaction (11). Recent research suggests that social identification within the profes-

sional group plays a crucial role in shaping job satisfaction and work engagement among paramedics. Stronger group identification and workplace cohesion have been positively correlated with job satisfaction, particularly among female paramedics who exhibit a higher sense of cognitive centrality in their professional identity (12). Understanding these influences is essential for improving workplace environments, reducing burnout, and enhancing the quality of patient care.

Given the demanding nature of EMS work, it is essential to identify factors influencing job satisfaction to enhance workplace conditions and employee retention. The increasing demands of emergency medical services highlight the need for psychological and physical support systems to enhance job satisfaction and prevent burnout among EMS personnel (11).

This study examines job satisfaction among EMS professionals in Zagreb, focusing on the effects of gender, education, and work experience across various job satisfaction dimensions using the Job Satisfaction Survey (JSS) as the primary tool for assessment (13).

Aim

The study aims to provide actionable insights for improving the work environment and enhancing overall employee well-being in high-stress medical settings by identifying key drivers of satisfaction and dissatisfaction.

Methods

Study Design and Participants

A cross-sectional study was conducted at the Teaching Institute of Emergency Medicine of the City of Zagreb between November and December 2023. All active clinical and non-clinical staff were invited; 176 complete responses were received. The final sample comprised 40 Medical Doctors (MD), 68 nurses, 57 drivers, and 11 other staff (Table 1). Inclusion criteria were current employment at the Institute and age ≥18 years; there were no exclusion criteria beyond incomplete questionnaires. Data were collected using online and paper self-administered questionnaires. The online survey was accessed via a secure link and did not record names, IDs, or IP addresses. Paper questionnaires were returned to staff, and the research team entered paper forms into an electronic database without personal identifiers.

Approval for the study was obtained from the Ethics Committee of the Teaching Institute of Emergency Medicine of the City of Zagreb (approval no. 4641/2023, September 21, 2023).

Instrument

Job satisfaction was measured with Paul E. Spector's 36-item Job Satisfaction Survey (JSS), covering nine facets (4 items each): Pay, Promotion, Supervision, Fringe Benefits, Contingent Rewards, Operating Conditions, Coworkers, Nature of Work, and Communication. Items are rated 1–6 (strongly disagree–strongly agree) (13). Each subscale contains 4 items (range 4–24); the total score (36 items) ranges 36–216. In this sample, internal consistency was α = 0.916 for total and acceptable-to-good for most subscales. We used the official Croatian translation of Spector's JSS, obtained from the author's repository, with permission (14,15). Negatively worded items were reverse-scored (recode = 7 − result), so higher values indicate greater satisfaction. For interpretive categories, we used the absolute approach: after reverse-scoring, mean item ≥4 denotes "satisfied", ≤3 "dissatisfied", and 3–<4 "ambivalent" (mapped to totals: 144–216 / 36–108 / 108–144). (13,15)

Table 1. **Participant characteristics**			
Demographic characteristics		n	%
Gender	Men	129	73.3
	Women	47	26.7
Work experience in years	≤5	56	31.8
	6–10	30	17
	11–20	40	22.7
	21–30	32	18.2
	31–40	16	9.1
	≥40	2	1.1
Occupation	MD	40	22.7
	Nurse	68	38.6
	Driver	57	32
	Other	11	6.3
Education	Lower level	95	54
	Higher level	81	46
Department	Medical	163	92.6
	General Affairs	6	3.4
	Economic & Legal Affairs	4	2.3
	Directorate	2	1.1
	Technical	1	0.6
Supervisory role	Yes	12	6.8
	No	164	93.2

Facet definitions:

- Pay — satisfaction with salary level and fairness of pay.
- Promotion — opportunities for advancement and fairness/transparency of promotion.
- Supervision — quality of immediate supervision (support, competence, fairness).
- Fringe Benefits — satisfaction with benefits (e.g., health insurance, leave, pension).
- Contingent Rewards — recognition and rewards contingent on good performance (e.g., praise, bonuses, awards).
- Operating Conditions — rules, procedures, and "red tape" that make work easier or harder.
- Coworkers — relationships and cooperation with colleagues.
- Nature of Work — intrinsic interest, meaningfulness, and enjoyment of the work itself (not autonomy).
- Communication — flow and clarity of information within the organization.

Statistics

Analyses were performed in Jamovi (v2.6). Continuous variables were assessed for normality with the Shapiro–Wilk test and summarized as median (IQR); categorical variables as n (%). Between-group differences were tested with the Mann–Whitney U test (two groups) and the Kruskal–Wallis test (≥3 groups), with Dunn pairwise comparisons using Holm adjustment when global tests were significant. Associations between satisfaction scores (total and domain-specific) and continuous variables were examined with Spearman's rank correlation (ρ). All tests were two-tailed with $\alpha = 0.05$; correlation magnitudes were interpreted as weak ($|\rho|<0.30$), moderate ($0.30\leq|\rho|<0.70$), strong ($0.70\leq|\rho|<0.90$), and very strong ($|\rho|\geq0.90$).

Internal consistency was excellent for total JSS (Cronbach's $\alpha = 0.916$) and acceptable-to-good for most subscales: Pay 0.734, Promotion 0.823, Supervision 0.796, Fringe Benefits 0.662, Contingent Rewards 0.753, Coworkers 0.670, Nature of Work 0.708, Communication 0.746. Operating Conditions showed low $\alpha = 0.239$ and should be interpreted with caution. Shapiro–Wilk indicated non-normal distributions for most facets (p from 4.4×10^{-6} to 0.041); Coworkers ($p = 0.067$) and Total ($p = 0.058$) were approximately normal.

Results

Job Satisfaction Scores by Sex and Education Level

Of 176 participants, the median age was 40 years; 73.3% were men and 26.7% were women. Women reported higher Pay scores than men (median 11 vs 8, $p = 0.003$), whereas men reported higher Nature of Work scores than women (median 19 vs 16, $p = 0.001$). Participants with higher education reported higher Pay scores (median 10 vs 8, $p = 0.012$), while those without higher education reported higher Operating Conditions (median 14 vs 12, $p = 0.005$) and Nature of Work (median 19 vs 17, $p < 0.001$).

Job Satisfaction Scores by Work Experience

Only Operating Conditions differed by work experience (Kruskal–Wallis H = 15.60, $p = 0.008$), but no pairwise contrasts remained significant after Holm adjustment. No statistically significant differences were found for any other JSS dimension with respect to work experience.

Job Satisfaction Scores by Occupation

Across occupations, significant differences were observed for Pay ($p = 0.031$), Operating Conditions ($p = 0.007$), and Nature of Work ($p = 0.001$) (Table 3). Post-hoc testing showed that Pay was higher in physicians than drivers ($p = 0.032$), while other pairwise comparisons were not significant. For the Nature of Work, drivers scored higher than physicians ($p < 0.001$) and higher than nurses ($p = 0.001$); the nurses vs physicians comparison was not significant after adjustment ($p = 0.078$). For Operating Conditions, drivers scored higher than physicians ($p = 0.048$) and higher than other staff ($p = 0.020$); remaining contrasts were not significant. Total JSS did not differ by occupation ($p = 0.883$).

Job Satisfaction Scores by Department and Supervisory Position

Because non-medical departments were very small, department-level results are presented descriptively. In supervisory status comparisons, supervisors re-

Table 2. **Job Satisfaction Scores by Sex and Education Level among EMS Professionals**						
	Sex			**Higher level of education**		
Dimension	**Male (n = 129)**	**Female (n = 47)**	*p*	**Yes (n = 81)**	**No (n = 95)**	*p*
Pay Score	8 (6–12)	11 (6–13)	**0.003**	10 (8–14)	8 (6–12)	**0.012**
Promotion Score	6 (4–11)	7 (5–10)	0.389	7 (5–10)	6 (4–11)	0.52
Supervision Score	17 (14–20)	17 (15–19.5)	0.732	17 (14–19)	17 (14–20)	0.857
Fringe Benefits	9 (6–11)	10 (7–13)	0.087	9 (5–13)	9 (7–11)	0.655
Contingent Rewards	9 (6–12)	10 (7–12.5)	0.097	9 (5–12)	8 (7–12)	0.068
Operating Conditions	13 (12–16)	13 (11.5–16)	0.592	12 (11–15)	14 (12–16)	**0.005**
Coworkers	16 (14–19)	16 (13.5–18.5)	0.615	16 (14–19)	15 (13.5–19)	0.916
Nature of Work	19 (16–21)	16 (13.5–18)	**0.001**	17 (14–20)	19 (16–21)	**p<0.001**
Communication	14 (10–16)	13 (10–16)	0.864	13 (10–16)	14 (10.5–17)	0.504
Total Score	112 (95–129)	112 (98.5–128.5)	0.73	112 (96–127)	112 (95–130.5)	0.825

Values are median (IQR). Mann–Whitney U for sex/education comparisons. Bold indicates p < 0.05.

Table 3. **Job Satisfaction Scores by Occupation**					
	Occupation				
Dimension	**MD (n = 40)**	**Nurse (n = 68)**	**Driver (n = 57)**	**Other (n = 11)**	*p*
Pay Score	11.5 (8.75–14.25)	9 (6–13)	8 (6–13)	9 (5.5–14)	**0.031**
Promotion Score	7 (5–9.25)	6.5 (5–11)	6 (4–9)	11 (7–15)	0.095
Supervision Score	16 (15–19)	18 (13.75–20)	17 (14–20)	18 (16.5–19)	0.709
Fringe Benefits	9 (5.75–13)	9 (6–11.25)	9 (6–11)	10 (6–13.5)	0.733
Contingent Rewards	10 (7–13.25)	9 (6–11)	8 (5–13)	9 (8–12.5)	0.13
Operating Conditions	12 (11–15.25)	13 (12–15)	15 (13–16)	10 (9–13)	**0.007**
Coworkers	16.5 (14–19)	15.5 (13.75–18.25)	16 (14–20)	15 (12.5–17.5)	0.65
Nature of Work	15.5 (12–18)	18 (15–20)	20 (18–22)	19 (16–22.5)	**0.001**
Communication	13 (11.5–15.25)	12.5 (10–17)	15 (11–18)	12 (9–15)	0.479
Total Score	111 (99–124.25)	114 (93.75–129.25)	112 (98–140)	102 (99.5–122.5)	0.883

Values are median (IQR). Comparisons across occupations use Kruskal–Wallis (two-tailed); Dunn–Holm post-hoc was used when the global test was significant. Bold indicates p < 0.05. MD = medical doctors.

ported higher Nature of Work scores (median 20 vs 18, *p* = 0.024) and higher Total JSS scores (median 122 vs 112, *p* = 0.048) than non-supervisors.

Job Satisfaction Scores by Age

Age showed a weak negative correlation with Operating Conditions (p = −0.222, p = 0.003). No significant correlations were observed for other dimensions, including total satisfaction (p > 0.05).

Discussion

The findings indicate predominantly ambivalent overall job satisfaction, with higher scores for Nature of Work and Supervision, and lower for Promotion, Fringe Benefits, Contingent Rewards, and Pay. These findings align with existing research, which highlights the complex interplay of workplace conditions, compensation structures, and professional development opportunities in shaping job satisfaction among emergency healthcare workers. Aligned with global trends, as-

	Department						Supervisory		
Dimension	Medical (n = 163)	General Affairs (n = 6)	Economic and Legal Affairs (n = 4)	Directorate (n = 2)	Technical (n = 1)	p	Yes (n = 12)	No (n = 164)	p
Pay Score	6.5 (4-11.5)	10 (6.5-13)	8 (6-13)	14.5 (14.25-14.75)	10	0.558	10 (9-15)	9.5 (6-13)	0.144
Promotion Score	11.5 (9.25-13.5)	6 (5-10)	9 (6.5-11.5	15.5 (13.75-17.25)	5	0.124	10.5 (6-12)	6 (5-10)	0.069
Supervision Score	18.5 (17.75-20.25	17 (14-20)	18 (16.5-18.75)	17 (15.5-18.5)	23	0.313	18 (15-20.8)	17 (14-20)	0.159
Fringe Benefits	11 (8.5-14.5)	9 (6-11)	7.5 (4.25-12.25	12.5 (11.75-13.25)	13	0.262	12 (8-13)	9 (6-11)	0.115
Contingent Rewards	12.5 (10.5-15.5)	9 (6-12)	8.5 (8-12.75)	11.5 (10.25-12.75)	11	0.526	10.5 (8.75-13.3)	9 (6-12)	0.171
Operating Conditions	9.5 (8.25-11.75)	14 (12-16)	11 (10-13.5)	13.5 (11.25-15.75)	12	0.37	13 (11.5-17)	13 (11.8-16)	0.804
Coworkers	17 (14.75-19.75)	16 (14-19)	13 (11-15.75)	14	17	0.493	16 (14-18.3)	16 (13.8-19)	0.83
Nature of Work	21 (18.25-23.25)	18 (15-21)	17 (13.75-21)	19.5 (19.25-19.75)	22	0.412	20 (19-22.3)	18 (15-21)	**0.024**
Communication	13.5 (10.75-16.75)	13 (10-16)	12.5 (9.5-14.75)	12 (10.75-14.25)	19	0.75	16 (12.5-17.5)	13 (10-16)	0.116
Total Score	112 (101.25-138.5)	112 (95-129)	100.5 (89.5-117.5)	130.5 (125.75-135.25)	132	0.522	122 (110-134)	112 (94.8-128)	**0.048**

Table 4. **Job Satisfaction Scores by Department and Supervisory Position**

Notes. Values are median (IQR). Department results are presented descriptively only due to very small group sizes; the supervisory comparison uses Mann–Whitney U (two-tailed). Bold indicates p < 0.05.

pects such as Pay, Supervision, and the Nature of work emerged as key determinants of satisfaction (10). However, Operating procedures and Communication challenges were frequently highlighted as sources of dissatisfaction. The findings revealed significant differences in satisfaction levels across gender, education, and years of work experience.

The analysis revealed that women had significantly higher scores in the Pay Score dimension, suggesting a potential perception of greater financial fairness or satisfaction among female employees. This finding may reflect a contextual discrepancy, as prior research often points to lower pay satisfaction. (16) However, in the emergency medicine context, this result might be influenced by specific organizational factors or compensation structures. It is also worth noting that while wom-

en reported higher satisfaction with pay, studies have consistently shown that they face significant challenges in achieving work-life balance in emergency medicine roles, which can negatively impact their overall job satisfaction in other domains. (16) Research suggests that women in healthcare roles often have lower salary expectations than their male counterparts, which may contribute to a greater perception of fairness in compensation despite actual wage disparities. The differences in expectations are influenced by gender norms, career advancement opportunities, and perceived self-worth in the profession. (17,18) This highlights the complex interplay of factors impacting job satisfaction and underscores the importance of considering tangible and intangible aspects of workplace well-being. (19)

Men scored higher in Nature of Work, indicating greater perceived intrinsic meaningfulness and enjoyment of daily tasks, rather than decision-making autonomy. This finding aligns with existing research showing that men and women prioritise different aspects of job satisfaction. Men tend to place greater emphasis on autonomy and job engagement, while women are more likely to value pay equity and workplace support systems (20).

The relationship between work experience and satisfaction with Operating Conditions is also notable. Less experienced employees reported higher satisfaction in this domain, whereas those with longer tenures expressed greater dissatisfaction. This supports the honeymoon-hangover effect proposed by Boswell et al., which suggests that new employees initially experience high job satisfaction due to novelty and optimism. Over time, exposure to workplace challenges leads to decreasing job satisfaction (21). The study also found that older employees reported lower satisfaction with Operating Conditions, which may be linked to greater physical and cognitive demands in EMS roles as professionals age. The findings reinforce the importance of targeted retention strategies, such as professional development programmes and workplace mental health initiatives, to sustain job satisfaction among experienced EMS personnel. Interpretation of Operating Conditions warrants caution given its low internal consistency (α = 0.239) in this sample.

From an occupational perspective, differences in satisfaction across roles within EMS highlight the need for targeted interventions. Differences in Pay satisfaction across occupations likely reflect role-specific remuneration structures within EMS; in our sample MDs reported higher pay satisfaction than drivers, whereas other facets (e.g., Nature of Work) favored drivers. Higher Nature of Work among men and drivers is interpreted as greater intrinsic meaningfulness/enjoyment of daily tasks, not autonomy or decision-making responsibility. The Operating Conditions facet reflects rules, procedures and bureaucratic barriers; the negative association with tenure suggests increasing sensitivity to administrative burden over time. Interventions should prioritise streamlining procedures, rather than mental-health programmes per se, for this facet.

The supervisory role factor also contributed to overall job satisfaction, with supervisors reporting higher satisfaction with both the Nature of Work and total job satisfaction scores. This may be attributed to the enhanced autonomy, leadership opportunities, and sense of accomplishment associated with supervisory positions (22). Additionally, supervisors often have more opportunities for professional development and career advancement, which can further enhance their job satisfaction. Given that supervisory support plays a critical role in job satisfaction, improving managerial strategies and fostering supportive work environments could mitigate stress and enhance workforce retention in EMS (11).

Limitations

While this study provides important insights, several limitations should be acknowledged. The use of convenience sampling may limit the generalizability of findings beyond the Zagreb EMS workforce. Although questionnaires were anonymous and contained no identifying fields, paper-based return within the workplace may have reduced perceived anonymity and introduced social desirability bias. Additionally, the cross-sectional design prevents establishing causal relationships between job satisfaction factors. Future research should explore longitudinal trends in job satisfaction and assess the impact of intervention strategies designed to improve job conditions and well-being. Because part of the data was collected on paper, perceived anonymity may have been lower (particularly if questionnaires were returned directly to staff), which could have influenced responses.

Conclusions

Overall job satisfaction was predominantly ambivalent rather than high, indicating room for improvement but no evidence of uniformly low satisfaction across domains. Satisfaction was highest for Nature of Work and Supervision, and lowest for Promotion, Fringe Benefits, Contingent Rewards and Pay. Men and drivers reported higher Nature of Work; longer tenure was associated with poorer Operating Conditions. These results prioritise interventions in career progression, recognition/remuneration and streamlining procedures.

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Psychological Capital and Empathy Among Nurses in Psychiatric Care

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Abstract

Introduction. Psychological capital is a construct within positive psychology that includes hope, self-efficacy, resilience, and optimism. Empathy is a complex neurobiological, psychological, and social phenomenon. In nursing, empathy is viewed as a multidimensional, dynamic process that is co-created between nurse and patient, dependent on a trusting therapeutic relationship and directed toward the other while remaining self-aware.

Aim. The aim of the research was to examine the empathy and psychological capital of nurses and the relationship between empathy and psychological capital with length of service in the field of psychiatry and completed psychotherapy education.

Methods. A quantitative, nonexperimental study was conducted at the Psychiatric Clinic Sveti Ivan in Zagreb, Croatia. The shortened psychological capital questionnaire (PCQ 12), the Jefferson Scale of Empathy for Healthcare Professionals (JSE-HP), and the sociodemographic questionnaire were used to conduct the assessment among a sample of 67 psychiatric nurses.

Results. The study participants achieved a high level of psychological capital on average (M = 4.80, SD = 0.57) and moderate levels of empathy with relatively higher variability (M = 102.36, SD = 17.14). No statistically significant associations were identified between either psychological capital or empathy and years of psychiatric work experience or psychotherapy education.

Conclusion. The study found that psychiatric nurses demonstrated generally high levels of psychological capital and moderate levels of empathy. No statistically significant associations were identified between these results and either length of work experience in psychiatry or completed psychotherapy education. Future research should explore additional personal and professional variables that may relate to psychological capital and empathy in this population.

Introduction

Organizations operate in environments characterized by constant change, making human capital a critical determinant of their success. In healthcare, human capital is embodied primarily in the knowledge, skills, and experience of healthcare professionals. The National Strategy of the Croatian Healthcare System 2020–2030 identifies improving population health and increasing the quality and accessibility of care as key priorities, both of which depend heavily on the competencies of the nursing workforce (1). Nurses represent the largest professional group in Croatia, comprising 32,765 individuals and 42.6% of all healthcare employees (2). Given this central role, strategic investment in nurses is essential at institutional and policy levels. Understanding the psychological capacities that enable nurses to function effectively—such as psychological capital and empathy—is therefore crucial for workforce planning, staff retention, and sustainable human resource development.

Positive psychology focuses on developing psychological resources that enable individuals and organizations to function effectively (3). Within workplace settings, this approach is reflected in Positive Organizational Behaviour (POB), which emphasizes human strengths that can be measured, developed, and managed to enhance performance and well-being (4). POB identifies four core psychological capacities—hope, self-efficacy, resilience, and optimism—collectively termed psychological capital or HERO (4). Hope is defined as a positive motivational state based on an interactively derived sense of successful agency and pathways (5), self-efficacy reflects an individual's confidence in mobilizing motivation, cognitive resources and actions (6), resilience denotes the capacity to recover from challenges (7), and optimism represents a positive attributional style (8). Psychological capital is conceptualized as a state-like and malleable resource, shaped by contextual and experiential factors and capable of increasing through professional development and targeted training (4).

Empathy is a multifaceted construct whose diverse definitions across philosophy, psychology, and neuroscience contribute to considerable conceptual complexity (9). Within nursing practice, empathy is understood as a multidimensional, dynamic, and re-

lational concept composed of four interrelated elements: (a) a co-creative practice involving both the empathizer and the empathee, (b) an experience that is fundamentally other-directed while maintaining connection with oneself, (c) a bi-directional, interactive interpersonal process requiring continuous attunement and responsivity, and (d) a relational quality that flourishes under conditions of openness, relatability, and trust (10).

Empathic medical care is associated with numerous benefits, including fewer medical errors and malpractice claims, and higher retention of healthcare professionals (11). By using empathic skills, nurses obtain information about patients' subjective health experiences, enabling them to tailor care to individual needs, establish a constructive therapeutic relationship, foster trust, and provide effective support in the recovery process (12, 13).

The existing literature shows mixed results on whether empathy increases or decreases over time in the health professions trajectory (14, 15). Higher levels of empathy among healthcare workers have been found to be associated with higher educational levels, female gender, older age, and more years of work experience in the mental health field (16-19). However, healthcare workers' empathy towards patients decreases when confronted with violent and antisocial behaviour (20). Current systematic reviews indicate that both psychotherapy training and other empathy-enhancing interventions can strengthen and sustain empathic behaviour, but further research is needed to identify which approaches produce durable changes (21-23). Specifically, group analysis education fosters altruism, empathy, cooperation and reflective functioning within therapeutic communities, contributing to positive professional and organizational change (24). Through experiential group learning, trainees develop their therapeutic role, strengthen professional identity, and refine their emotional and relational responses toward themselves, colleagues and patients (24, 25).

Because psychiatric nursing relies heavily on interpersonal attunement and emotional labour, empathy is a foundational competence in this specialty. In light of the relational nature of psychiatric nursing and the unclear effects of psychotherapy training on psychological capital and empathy, we hypothesized that (1) nurses with more years of psychiatric experience would have higher psychological capital and empathy, and (2) nurses who completed psychotherapy education would score higher on both constructs.

Aim

The aim of the research was to examine the empathy and psychological capital of nurses and the relationship between empathy and psychological capital with length of service in the field of psychiatry and completed psychotherapy education.

Methods

Participants

The study sample consisted of nurses employed at the Psychiatric Clinic who voluntarily took part in the study, which was conducted between June 5 and July 7, 2023. In total, 67 nurses participated (N = 67; N_male = 20, N_female = 47), with a mean age of approximately 39 years (M = 38.78, SD = 11.41). Data on education level was missing for one participant. Among the remaining participants, the largest group had completed secondary education (N = 30), followed by higher vocational education (N = 22) and university-level education (N = 14). At that time, the Clinic employed 189 nurses in total, meaning that the participants in this study represent 35% of the nursing workforce.

Instruments

Psychological Capital Questionnaire (PCQ-12)

Psychological capital was measured using the 12-item Psychological Capital Questionnaire (PCQ-12), developed by Luthans et al. (2007) (26). The scale consists of four subscales: self-efficacy (3 items), hope (4 items), resilience (3 items), and optimism (2 items). Each item is rated on a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree). Subscale scores are calculated as the mean of all items within each domain, and the total psychological capital score is obtained as the mean of all 12 items, with higher scores indicating higher psychological capital. The Croatian version of the PCQ-12, used with permission of the validators, has demonstrated solid psychometric properties. Murgić et al. (2018) confirmed the expected four-factor structure and reported satisfactory construct validity and internal consistency

in a Croatian sample (Cronbach's α: self-efficacy = .77, hope = .73, resilience = .68, optimism = .63, total PsyCap = .87) (27). In the present study, Cronbach's alpha for the total scale was .82, and reliability coefficients for the subscales were .83 for self-efficacy, .78 for hope, .79 for resilience, and .66 for optimism, indicating acceptable internal consistency.

Jefferson Scale of Empathy – Health Professionals Version (JSE-HP)

Empathy was measured using the 20-item Jefferson Scale of Empathy – Health Professionals version (JSE-HP) by Hojat et al. (2002) (28). Items are rated on a 7-point Likert scale. After reverse-scoring negatively worded items, all responses are summed to yield a total score ranging from 20 to 140, with higher values indicating greater empathy. Previous research reports internal consistency between α = .78 and .89 (28). The Cronbach's alpha reliability coefficient for the empathy scale obtained in this study was .88, indicating good internal consistency reliability. The Croatian translation by Batrnek and Gašpert was used with permission of the coordinator at Thomas Jefferson University (29).

Sociodemographic Questionnaire

A brief sociodemographic questionnaire collected data on age, sex, education level, total years of work experience, years of psychiatric work experience, and completed psychotherapy education.

Procedure

Participants were recruited through an internal announcement issued by the Nursing Department. Data were collected using paper-and-pencil questionnaires. Participation was voluntary and anonymous; written informed consent was obtained before completion. Questionnaires were returned in sealed envelopes. Ethical approval was granted by the Ethics Committee of the Psychiatric Clinic Sveti Ivan (01-1878/23-2), and procedures adhered to the Declaration of Helsinki.

Statistics

Using the Shapiro-Wilk test to assess normality, a statistically significant deviation from normal distribution was identified for all examined variables except the empathy scale (see Table 1). However, the

skewness and kurtosis coefficients for all variables fell within the range of –1 to +1 (see Table 1), indicating that the use of parametric statistical procedures should not be restricted (30). Descriptive statistics (frequencies, means, and standard deviations) were used to summarize the data. Pearson's correlation coefficient and the point-biserial correlation coefficient were used to test associations between the variables. The use of correlations—including the point-biserial coefficient for dichotomous variables—was selected because the primary aim of the study was to examine relationships between variables, specifically the presence, strength, and direction of these associations within a correlational research design. Although a t-test would yield the same p-value mathematically, the correlational approach was conceptually more appropriate for addressing the research questions. A significance level of 5% was applied when evaluating statistical results. The proportion of missing data for all items of the psychological capital and empathy scales was below 5%; following the scoring guidelines, missing responses were replaced with the participant's mean score on the remaining items of the corresponding scale, in line with the recommended scoring procedures. Data analysis was conducted using IBM SPSS Statistics 20.

Results

Descriptive statistics were calculated for all main variables (Table 1).

The average total number of years of work experience among participants was approximately 18 years (M = 18.34, SD = 11.63), while the average number of years of work experience in the field of psychiatry was about 15 years (M = 14.96, SD = 11.15). Both variables showed very high variability, which is consistent with the observed range of work experience: from one to 45 years in total work experience, and from less than one year to 41 years in psychiatric work experience. Most participants had not completed any form of psychotherapy training (N = 42). All participants who had received psychotherapy education completed training in the psychotherapeutic modality of group analysis (N = 25).

Participants, on average, demonstrated high levels of psychological capital (M = 4.80, SD = 0.57) and moderate empathy, with somewhat greater variability (M = 102.36, SD = 17.14).

To test the first and second hypotheses—whether nurses with more years of psychiatric work experience would show higher psychological capital and empathy—Pearson's correlation coefficient was used. The analysis revealed no statistically significant as-

	W	p	Skewness coefficient	Kurtosis coefficient	M	SD
Table 1. Descriptive parameters of age, total years of work experience, years of psychiatric work experience, psychological capital and its subscales, and participants' empathy (N = 67)						
Age	.94**	.004	0.57	-0.52	38.78	11.41
Total years of work experience	.95**	.006	0.55	-0.48	18.34	11.63
Years of psychiatric work experience	.91**	<.001	0.88	-0.05	14.96	11.15
Psychological capital	.94**	.004	-0.73	0.09	4.80	0.57
Self-efficacy	.92**	<.001	-0.71	0.12	4.81	0.82
Hope	.96*	.033	-0.43	-0.29	4.81	0.74
Resilience	.95*	.012	-0.38	-0.25	4.96	0.70
Optimism	.92**	<.001	-0.89	0.74	4.55	1.08
Empathy	.98	.460	-0.25	-0.12	102.36	17.14

Legend: W – Shapiro-Wilk test, * $p < .05$, ** $p < .01$, M – mean, SD – standard deviation

sociations between years of psychiatric work experience and psychological capital (r = .23, *p* = .063), nor between years of psychiatric work experience and empathy (r = .15, *p* = .226).

To test the third and fourth hypotheses—whether nurses who had completed psychotherapy education would score higher on psychological capital and empathy—the point-biserial correlation coefficient was applied. The results showed no statistically significant associations between psychotherapy education and psychological capital (rpb = –.21, *p* = .087), nor between psychotherapy education and empathy (rpb = –.18, *p* = .138).

Discussion

In our sample, the mean psychological capital score was 4.80 (SD = 0.57), higher than the meta-analytic average for nurses (4.2) (31), though that meta-analysis did not include European samples. Our result was comparable to Italian data for teachers and healthcare professionals (4.6) (32). In Croatia, psychological capital across professions ranges from 3.8 among hospitality workers (33) to 4.85 among teachers and preschool educators (34,35), with healthcare professionals showing similar levels (4.72) (36). These comparisons suggest that care-and education-oriented professions, including nursing, tend to show higher psychological capital, which is consistent with our findings.

Although our hypothesis that nurses with more years of psychiatric experience would show higher overall psychological capital was not supported, one noteworthy exception emerged: years of psychiatric experience were significantly associated with higher levels of optimism, although the correlation was small. This partly aligns with studies reporting higher PsyCap among psychiatric nurses with longer service (37–40), but the weak effect in our sample suggests that only specific components of PsyCap—not the construct as a whole—may be sensitive to accumulated clinical experience. Given that psychological capital is considered a state-like, developable resource, it is plausible that workplace conditions, professional role, and organizational stability may influence PsyCap trajectories more strongly than tenure alone.

A similar pattern was observed for psychotherapy education. Overall PsyCap did not differ significantly between nurses with and without psychotherapy training, a small but significant correlation emerged for the self-efficacy subscale, indicating that nurses who completed psychotherapy education reported slightly higher self-efficacy. To our knowledge, no previous studies have examined whether psychotherapy education increases PsyCap among nurses or other healthcare professionals. Given that psychotherapy training includes processes theoretically aligned with PsyCap development, our hypothesis in this area remained exploratory rather than empirically grounded.

		1	2	3	4	5	6	7	8	9	10
	Table 2. Correlation matrix with intercorrelations of the examined variables (N = 67)										
1	Age	-									
2	Total yrs exp.	.99**	-								
3	Psych. exp.	.90**	.89**	-							
4	Education	-.49**	-.51**	-.47**	-						
5	PsyCap	.29*	.32**	.23	-.21	-					
6	Self-efficacy	.22	.25*	.21	-.29*	.72**	-				
7	Hope	.16	.18	.09	-.07	.84**	.50**	-			
8	Resilience	.18	.19	.10	-.06	.56**	.28*	.23	-		
9	Optimism	.26*	.29*	.25*	-.18	.65**	.19	.50**	.15	-	
10	Empathy	.16	.15	.15	-.18	.32**	.16	.31*	.08	.33**	-

Legend: Overall experience – total years of work experience; Psychiatric experience – years of work experience in psychiatry; Education – completed psychotherapy training (1 = Yes, 2 = No); *p < .05, **p < .01

In our sample, the average empathy score measured by the JSE-HP was 102.36 (SD = 17.14), indicating a moderate level of empathy. This score is lower than those typically reported in JSPE results among physicians and nurses, where averages range from 110 to 113 (41), and lower than the median of 121 (IQR 111–128) reported among Croatian nurses (42).

Research examining the association between work experience and empathy in nursing is mixed. Some studies report that empathy increases with professional experience, including findings among oncology nurses and among mental health nurses with both general and specialized experience (43,44). In contrast, other studies have found no association (45), while several report decreases in empathy over time, particularly among nurses who remain on the same unit and may experience cumulative emotional strain (46). Beyond experience itself, contextual and organizational factors also influence empathy levels. For example, mental health staff in France reported generally high empathy scores, with slightly lower values among psychiatric nurses (20). Ghaedi et al. (47) similarly showed that high workload and stress reduce empathic capacity across clinical settings, although psychiatric nurses tended to exhibit higher empathy compared with nurses in intensive care or emergency departments. Together, these findings suggest that empathy is shaped by a combination of experience, work environment, and emotional demands rather than by tenure alone. Studies examining the perceived importance of psychotherapists' empathy consistently show that clients' subjective experience of being understood strongly predicts long-term therapeutic success (48–50). It is important to highlight that nurses reporting higher compassion fatigue also report higher burnout, and empathic engagement appears to play a significant mediating role in this relationship, effectively amplifying the impact of compassion fatigue on burnout (51, 52). Collectively, the literature indicates that empathy is not a linear function of tenure but a dynamic construct influenced by interpersonal stressors, organizational climate, workload, and emotional demands. Taken together, these findings help explain why our hypothesis—that empathy would be higher among nurses with more years of psychiatric experience and among those with psychotherapy education—was not supported.

Broader factors may also have influenced our results, particularly given the heterogeneity of our sample: we did not distinguish between nurses actively engaged in psychotherapeutic work and those who had completed psychotherapy training but were not practicing, and many nurses' psychotherapeutic skills may be overshadowed by task-focused clinical duties. Another limitation is that empathy and psychological capital may be constrained by organizational conditions, such as staffing ratios, patient acuity, or burnout levels, which were not measured. The relatively small sample size further reduces statistical power and may have limited our ability to detect meaningful associations. The single-site design also restricts the interpretability and generalizability of the findings. In this context, the absence of significant associations in our study likely reflects the complex interplay of systemic and methodological factors rather than the absence of meaningful relationships in principle.

Conclusion

This study examined whether psychological capital and empathy among psychiatric nurses were associated with years of psychiatric work experience and psychotherapy education. Psychological capital was generally high and empathy moderate, but neither showed statistically significant associations with the examined variables. Empathy appears to be a dynamic, context-sensitive construct rather than a linear outcome of tenure. Further research in broader settings is needed to clarify which individual and organizational factors contribute to these capacities in psychiatric nursing.

Author contributions

Conceptualization and methodology (MSK, MG); data curation and formal analysis (MSK, MG); investigation and project administration (MSK); and writing – original draft and review & editing (MSK, MG). All authors have approved the final manuscript.

Acknowledgements

Conflict of Interest Statement

Declaration of Generative AI in Writing

Funding

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Adaptation of the Croatian Version of the Neonatal Infant Pain Scale (NIPS)

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Abstract

Aim. The aim of this study was to adapt the NIPS scale for use in Croatia and to evaluate the content validity and internal consistency of its Croatian version in neonatal care.

Methods. The study was conducted from October 2024 to January 2025 at the University Hospital Rijeka on a sample of 94 healthy newborns, born vaginally or by cesarean section, between 37 and 41 + 6/7 weeks of gestation, and assessed as healthy during first initial clinical examination. Pain was assessed during routine blood sampling for phenylketonuria screening, and assessments were performed by trained nurses. Statistical analysis used descriptive and inferential methods (Wilcoxon test, Friedman's ANOVA, Cochran's Q test) and Cronbach's alpha coefficient.

Results. The Croatian NIPS version showed high internal consistency (Cronbach's α = 0.846). Significant physiological and behavioral responses were recorded before (mean 1.51), during (mean 6.66) and after (mean 2.02) the painful procedure (p < 0.001).

Conclusions. The Croatian NIPS scale proved internal consistency and content validity for neonatal pain assessment. Its implementation could ensure timely recognition and management of pain, thereby reducing potential long-term consequences. The introduction of this tool as a nursing standard for neonatal care would enable timely recognition and relief of pain, reduce the number of painful procedures, and prevent long-term negative consequences of pain.

Introduction

The most common methods of pain assessment in pediatrics are self-assessment (not applicable in the neonatal period), behavioral assessment, and measurement of physiological parameters (1). Behavioral indicators include irritability, tremors, crying, grimacing, body movements, but also pathological calmness, lethargy, sleep disturbances, and loss of appetite. Physiological parameters encompass changes in skin color, variations in heart rate, respiratory rate, blood pressure, and neuroendocrine responses (e.g., cortisol and growth hormone levels) (2). The most reliable assessment is based on a combination of behavioral and physiological indicators, although in practice it is challenging to balance reliability with the time required for assessment (3). Despite its importance, standardized pain assessment scales for newborns are still not used in neonatal care in Croatia.

A review of the available neonatal pain assessment scales identified the NIPS (4) as a particularly valid and reliable instrument, a finding supported by numerous international adaptations and validation studies. Examination of the evidence confirms that the Neonatal Infant Pain Scale is a multidimensional tool with robust psychometric properties, including excellent inter-rater reliability, concurrent validity, construct validity, and predictive validity—features that are essential for accurate pain assessment and for guiding appropriate clinical interventions, especially in comparison with other pain assessment instruments. Furthermore, multiple studies demonstrate the successful implementation of NIPS and highlight its ease of use in routine clinical practice (5-7).

Therefore, as part of the scientific project uniri-iskusni-biomed-23-76, the implementation of systematic procedures for pain assessment and relief is planned as a standard in neonatal care. Special emphasis is placed on introducing the Neonatal Infant Pain Scale (NIPS), which assesses facial expression, crying, breathing patterns, arm and leg movements, and state of arousal (8). In combination with monitoring vital parameters, this scale will enable reliable assessment of pain intensity during medical procedures. This will create the prerequisites for the systematic introduction of all procedures for the prevention, relief, and treatment of pain in newborns in the Republic of Croatia.

Aim

The aim of this study is to adapt Neonatal Infant Pain Scale (NIPS) instrument for pain assessment in newborns, in order to evaluate its content validity and reliability, with the goal to introduce and apply the scale in neonatal care in Croatia.

Methods

Data were collected at the Clinical Hospital Centre Rijeka between October 2024 and January 2025. A total of 94 healthy newborns, delivered either vaginally or by cesarean section, participated in the study. Before the pain assessment procedure, both parents read and signed informed consent and voluntarily agreed to the participation of their newborn in the study. During the study period at the Clinical Hospital Centre Rijeka, a total of 534 healthy newborns were delivered, which represents an 18% response rate.

After the back-translated NIPS had been approved by the author of the original instrument, a panel of expert judges assessed the cross-cultural equivalence between the original and the adapted versions. All modifications made during the translation process resulted in a preliminary version of the NIPS. The expert panel consisted of a professor with expertise in cross-cultural adaptation, a pain management specialist, and a language professional. Each expert received the original instrument, the synthesized forward and back-translated versions, as well as all comments provided by the translators and researchers throughout the adaptation process.

The panel systematically compared all versions of the instrument and evaluated idiomatic, experiential, conceptual, and semantic equivalence. Semantic equivalence was assessed by classifying each item as having "exactly the same meaning," "nearly the same meaning," or "a different meaning" compared with the corresponding item in the original scale. Following this evaluation and consensus discussion, a preliminary final version of the Croatian NIPS was established.

In the second phase of the study, the reliability, and clinical application of the instrument were assessed. Data were collected with the help of three nurses employed at the Clinical Hospital Centre Rijeka, who were asked to apply the scale to a sample of newborns. Prior to using the scale, two researchers trained the nurses on how to apply the scale, assess parameters, and record data in the questionnaire. The sample consisted of newborns undergoing routine blood sampling as part of the National Newborn Screening Program of the Newborn Screening Committee of the Ministry of Health of the Republic of Croatia. Screening is conducted as an organized system of testing for certain congenital diseases in all newborns of a defined population, with the aim of identifying them before they cause adverse health outcomes. As in most countries, newborn screening is a mandatory health protection measure in Croatia. Blood samples for screening are collected between the third and fifth day of life, and no later than the eighth day. Blood is most often drawn from the newborn's heel while still in the maternity ward (9). The inclusion criteria for newborns in the study were: gestational age from 37 + 0/7 weeks to 41 + 6/7 weeks; newborns classified as healthy according to their first clinical examination; Apgar scores of ≥7 at one and five minutes, as lower scores may be associated with alterations in central nervous system pain-processing mechanisms (10). Both vaginally and caesarean-delivered newborns were included, as the study aimed to assess whether there is a difference in pain perception between these two modes of delivery. In addition, the following exclusion criteria were applied: maternal use of opioids, as these substances may cross the placental barrier and cause changes in neonatal nociceptive pathways; maternal use of alcohol or drugs; mother under 18 years of age without a legal guardian present; mother with vertically transmittable infectious diseases such as syphilis, toxoplasmosis, cytomegalovirus infection, mumps, herpes, hepatitis B, and HIV/AIDS; and newborns with visible congenital malformations (9).

Instrument

The Neonatal Infant Pain Scale (NIPS) (4) is a behavioral scale used for pain assessment. It is designed to evaluate procedural pain in newborns. This scale takes into account pain assessment during and after a painful procedure and considers several behavioral indicators for assessing pain in both preterm and full-term newborns. The scale can be used to monitor a newborn before, during, and after a painful procedure, such as venipuncture. The instrument was developed at the Children's Hospital of Eastern Ontario.

The assessment parameters include:

- Facial expression (Q1): relaxed muscles, neutral calm face, grimaces (tense facial muscles, furrowed brows, chin/jaw).
- Crying (Q2): none, whimpering (mild intermittent moaning), and vigorous cry (loud screaming).
- Breathing patterns (Q3): relaxed breathing, changes in breathing.
- Arm and leg movements (Q4 and Q5): relaxed/restrained (no muscle stiffness, occasional random limb movements), flexion/extension (tense, straight, rigid, and/or rapid extension or flexion).
- State of arousal (Q6): sleep/awake (quiet, calm sleep or alert and calm), restless/nervous (awake, restless).

Each parameter is scored from 0 to 2 points, with a total score of 0–2 indicating no pain, 3–4 indicating moderate pain, and a score greater than 4 indicating severe pain (4).

Ethics

The study protocol was approved by the Ethics Committee of the Clinical Hospital Center Rijeka and the Ethics Committee for Biomedical Research of the Faculty of Health Studies, University of Rijeka (Class: 003-05/20-1/08, Reg. No.: 2170-29-02/1-20-02). Written informed consent for participation was obtained from the parents of all children after they had received both oral and written information regarding the study objectives, voluntary participation, ethical considerations, and data protection. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistics

Statistical analyses were performed using Statistica, version 14.1.0.8 (Cloud Software Inc.). Statistical significance was set at $p \leq 0.05$, with 95% confidence intervals. The sample size was determined based on the rule of thumb recommending 10 cases per item. Since the instrument contained six items, a minimum sample size of approximately 60 participants was required. A power/precision calculation with 80%

power and a 5% margin of error indicated a required sample size of 89 participants. Descriptive statistics were used to summarize the data, including mean and standard deviation. For nominal variables, frequencies and percentages were reported. The Kolmogorov-Smirnov test was applied to assess the normality of the data distribution. Since the data were not normally distributed, non-parametric tests were used. The Wilcoxon matched-pairs test was applied for two dependent samples, and Friedman ANOVA for three groups.

Repeated-measures ANOVA was performed for the vital parameters because the data are quantitative, and the Kolmogorov–Smirnov test indicated that they follow a normal distribution. The NIPS questionnaire, on the other hand, yields ordinal data; therefore, a nonparametric ANOVA was used to examine differences in the total score of the six behavioral indicators before, during, and after the painful procedure.

For categorical data with three groups, Cochran's Q test was employed. The reliability of the questionnaires was assessed using Cronbach's alpha coefficients, as well as by calculating the change in Cronbach's alpha if individual items were removed from the respective scale.

Results

The study included a total of 94 healthy newborns delivered via vaginal or cesarean section. General characteristics for the participants are summarized in Table 1. A total of 79.8% of the infants were born at 37+0/7 weeks of gestation, 4.2% at 37 weeks, and 16% after 38 weeks. Apgar scores were recorded at two intervals, with the second measurement being significantly higher than the first ($p < 0.001$).

Vital parameters

To compare heart rate and oxygen saturation before, during, and after the painful procedure, repeated measures ANOVA (RM ANOVA) with Bonferroni post-hoc testing was applied. The results are presented in Table 2.

Table 2. Heart rate and oxygen saturation before, during, and after the painful procedure

	Mean	95% CI	p
Pulse before	124.18	121.34–127.02	
Pulse during	144.15	140.10–148.20	< 0.001
Puls after	148.02	143.58–152.45	
oxygenation before	98.79	98.59–99.01	
oxygenation during	97.55	97.18–97.92	< 0.001
oxygenation after	97.83	97.48–98.17	

Note: 95% CI- confidence interval, **p** - statistical significance

Heart rate and oxygen saturation differed significantly between the pre- and intra-procedure measurements, as well as between the pre- and post-procedure measurements ($p < 0.001$). Changes in respiratory rate were significantly more frequent during the painful procedure ($p < 0.01$).

Behavioral responses

Facial expression (Q1) revealed that 22.4% of newborns grimaced before the procedure, compared to 24.5% after the procedure. During the painful procedure, all newborns exhibited grimacing. Crying (Q2)

Table 1. General characteristics (N = 94)

N = 94	Mean	Min	Max	SD	Z*	p
Apgar 1	9.78	7	10	0.59	3.3	0.001
Apgar 2	9.98	9	10	0.14		
Mass /g	3476.92	2240	4330	481.88		
Body length/cm	50.07	43	55	2.36		

Note: N- number SD- standard deviation *Wilcoxon matched-pairs test **p** - statistical significance

showed significant differences across all time points: 27.7% of newborns cried before the procedure, compared to 51.1% after.

Significant differences were observed across all behavioral assessment parameters (Q1–Q6) when comparing responses before, during, and after the painful procedure (Table 3.)

Figure 1. shows the total score of the six behavioral indicators before, during, and after the painful procedure.

The Friedman ANOVA revealed a significant overall difference ($p < 0.001$). Post-hoc analyses indicated significant differences between the pre-procedure and during-procedure measurements, as well as between the during-procedure and post-procedure measurements. No significant difference was observed between the pre- and post-procedure measurements ($p = 0.068$).

Discussion

The aim of this study was to adapt the Neonatal Infant Pain Scale (NIPS) for the Croatian-speaking area and to evaluate its reliability. The results demonstrate high internal consistency of the scale (α = 0.768–0.891), which is consistent with previous studies by Lawrence et al. (4) and Hudson-Barr (11). Although the inter-rater agreement (ICC 0.516–0.759) was moderate and somewhat lower compared to the excellent results reported by Sarhangi et al. (6), the findings confirm that the scale is a stable instrument for application within the local clinical context.

The interpretation of the results indicates a significant sensitivity of the NIPS scale to behavioral changes. The statistically significant increase in facial grimacing and changes in respiratory patterns during the painful procedure ($p < 0.001$) confirms the validity of the behavioral indicators measured by the scale. Furthermore, the correlation between the scale scores and physiological deviations (heart rate and oxygen saturation) supports the multidimensional nature of the neonatal pain response, aligning with international findings (10 – 12). The observation that a smaller proportion of newborns cried in the presence of parents suggests that situational factors may influence the intensity of the response captured by the scale, further emphasizing the importance of standardized assessment conditions.

The decision to validate the NIPS scale in Croatia (Bošković and Ličen (1)) is based on its successful cultural adaptation in numerous countries (5). The findings of this research provide an empirical basis for its integration into neonatal care standards in Croatia.

Study limitations

The primary limitation of this study is the relatively small sample size, which restricts the generalizability of the results to the broader national population and various gestational ages. Additionally, the research focused primarily on reliability and internal consistency, while aspects such as concurrent validity in relation to other behavioral scales within the Croatian context remain less explored.

Implications for future research

Future research should focus on validating the scale using a larger sample to achieve full national standardization. Comparative studies involving multiple pain assessment scales are recommended to identify the most sensitive instrument for specific types of stimuli (e.g., postoperative vs. procedural pain). Furthermore, it is necessary to investigate the impact of systematic NIPS implementation on long-term clinical outcomes and the effectiveness of pain management within neonatal intensive care units in Croatia.

Conclusion

The Croatian version of the NIPS scale demonstrated good reliability and high internal consistency (α = 0.846). Significant changes in vital parameters and behavioral indicators ($p < 0.001$) confirm the instrument's sensitivity in detecting neonatal pain. This study confirms the psychometric reliability of the scale for clinical use, while further research on a larger sample will enable its full standardization in accordance with national methodological guidelines.

Table 3. **Behavioral assessment parameters**		0	1	2	*p*
Facial Expression	Before	73	21		
	During	0	94		< 0.001
	After	71	23		
Cry	Before	68	26	0	
	During	0	27	67	< 0.001
	After	46	48	0	
Breathing Patterns	Before	76	18		
	During	1	93		< 0.001
	After	72	22		
Arms	Before	69	25		
	During	3	91		< 0.001
	After	60	34		
Legs	Before	70	24		
	During	1	93		< 0.001
	After	66	28		
State of Arousal	Before	66	28		
	During	0	94		< 0.001
	After	59	35		

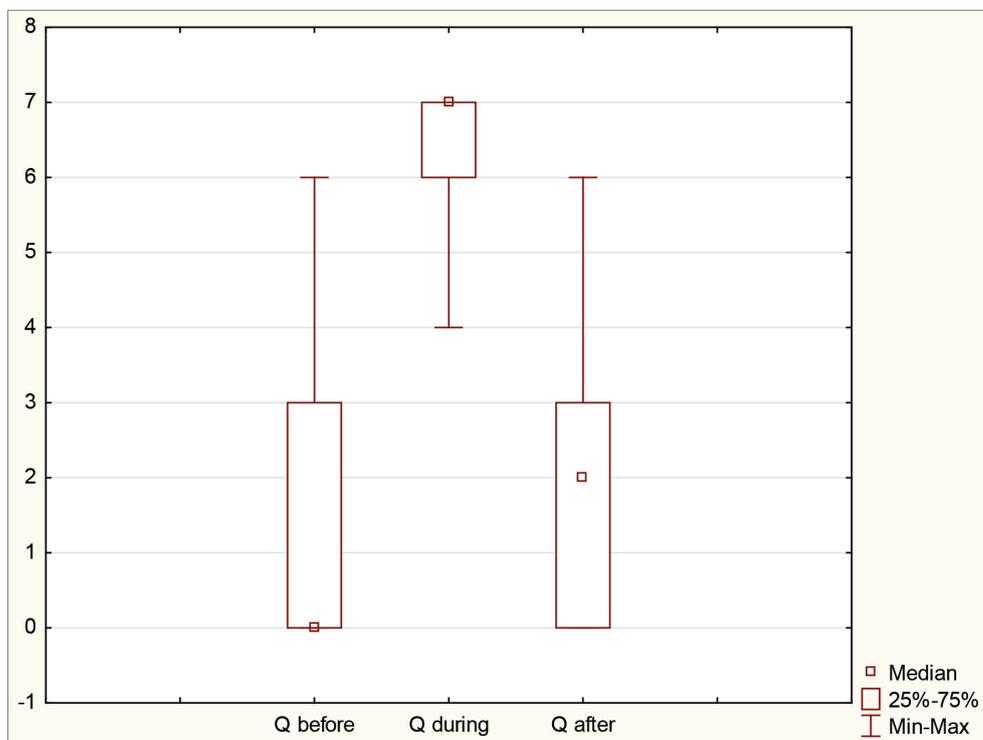Note: *p* - statistical significance

Figure 1. **Behavioral Responses**

Author contributions

Conceptualization and methodology (SB, MS, DŠ, IK, SŠ, AL); data curation and formal analysis (SB, MS, DŠ, IK, SŠ, AL); investigation and project administration (SB, MS, DŠ, IK., SŠ, AL); writing – original draft and review & editing (SB, MS, DŠ, IK, SŠ, AL). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgments

Not applicable.

Funding

This research was carried out as part of the scientific project uniri-iskusni-biomed-23-76 of the University of Rijeka. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Use of Generative AI

During preparation, the author(s) used ChatGPT for language enhancement.

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Continuity of Care and Unmet Supportive Needs Among Women Living with Cancer: A Patient-Centered Perspective

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Abstract

Introduction. Continuity of care is a critical element in enhancing the quality of cancer management, particularly for women who frequently encounter fragmented care and numerous unmet supportive care needs throughout their cancer trajectory. Understanding the extent of patients' supportive care requirements and their perceptions of continuity of care is essential for improving patient-centered oncology services.

Aim. This study aimed to explore women's perceptions of continuity of care and to identify their unmet supportive care requirements throughout various stages of the cancer care continuum.

Methods. A descriptive cross-sectional study was conducted among 134 women with cancer at Jendral Ahmad Yani Metro Hospital, Lampung, Indonesia, from 15 July to 9 August 2025, using the Supportive Care Needs Survey-SF34 and the Patient Continuity of Care Questionnaire-12 to assess supportive care needs and continuity of care. All procedures received ethical approval, and informed consent was obtained from participants.

Result. The highest unmet supportive care needs were observed in the Health System and Information domain, particularly regarding inadequate written information (71.6%) and information on cancer status, including whether the disease was under control or in remission (67.2%). The Physical and Daily Living domain had the second-highest level of unmet needs, particularly for pain (79.9%) and fatigue

(79.1%). Psychological concerns were also frequently reported, including fear of metastasis (63.4%) and anxiety about the future (59.7%). The Patient Care and Support domains as well as Sexuality domains demonstrated lower, but still notable, unmet needs (38–45%). The mean total PCCQ-12 score was 43.93 (SD = 6.04), indicating moderate to good continuity of care, with the highest mean observed in the Management Continuity domain (15.65; SD = 2.27) and lower scores in informational and relational continuity domains.

Conclusion. Women with cancer experience substantial unmet supportive care needs alongside moderate continuity of care. Strengthening communication, coordination, and emotional support is essential to enhance patient-centered oncology nursing practice and improve care continuity across transitions.

Introduction

Cancer stands as one of the foremost factors influencing health challenges and loss of life worldwide, with a significant impact on women. As reported by the Global Burden of Cancer (Globocan) 2020, female breast cancer was the most commonly diagnosed cancer worldwide, accounting for 11.7% of all new cases, and it also ranked among the leading causes of cancer-related mortality in women. It is followed by lung (11.4%), colorectal (10.0%), stomach (5.6%), and other site-specific cancers (1). The World Health Organization (WHO) documented a total of 396,914 cancer cases in Indonesia. Breast cancer was the predominant proportion, accounting for 42.1% of cases. Cervical cancer was the second most common malignancy, with 36,633 cases (9.2%), while ovarian cancer ranked third among women in Indonesia, with 14,896 cases (1,2). The Indonesian Cancer Foundation in Lampung stated that 5,672 of the 8,117,000 population were diagnosed with cancer, with the biggest proportions of cases being breast, cervical, and ovarian cancer (3).

The effects of cancer and its treatments are deeply felt by individuals, highlighting the need for a holistic approach to care that goes beyond just medical treatment (4). This comprehensive viewpoint is es-

sential for women diagnosed with different cancers, due to their unique physiological and psychosocial challenges (5). Despite increasing acknowledgment of the significance of supportive care, a considerable burden of unmet needs continues to exist across multiple supportive care areas for numerous cancer patients throughout all stages of their illness (6). This unmet need frequently arises from inadequate care coordination and insufficient recognition of individual patient requirements within intricate healthcare systems (7). Therefore, understanding these unmet requirements from a patient-centered perspective is essential for developing tailored interventions and enhancing overall well-being (8).

Women with cancer experience a noticeable emotional and physical burden; nonetheless, information concerning their specific supportive care requirements and access to pertinent treatments is still restricted (9). Existing literature indicates that many women with cancer often report non-physical needs, such as anxiety about relapse or metastasis, more frequently than physical symptoms (10). Furthermore, this holistic assessment should also consider the profound impact of cancer on psychological well-being, including fears of recurrence, concerns for loved ones, and uncertainty about the future, which are frequently reported as high-priority unmet needs among cancer survivors (11). This highlights the importance of healthcare professionals evaluating these complex needs thoroughly, extending beyond the treatment of physical conditions (12).

Effective coordination of care and comprehensive survivorship services are essential for addressing the diverse needs of cancer survivors, especially women who may face specific challenges associated with their cancer type and treatment (13,14). A key element of comprehensive care is continuous follow-up support to manage late and long-term side effects, monitor for relapse, and address new or pre-existing comorbidities (15). Continuous Nursing Care is a comprehensive approach in which patients are actively involved in decision-making and in creating personalized nursing care plans that cater to their unique needs, from admission to discharge. The objective of ongoing nursing care is to enhance patients' quality of life, promote physical rehabilitation, and support them in optimizing their health status in accordance with their individual needs (16,17).

Continuous nursing care from hospitalization to post-discharge follow-up is beneficial for patients.

In Indonesia, only a limited number of hospitals have implemented follow-up procedures to assess patients' conditions after discharge. Evidence from other countries, including the United Kingdom, indicates that nurses who provide follow-up services after hospital discharge can enhance patients' quality of life and effectively manage their ongoing care needs at home (18,19). Malignancies significantly impact women, with over one million survivors in the United States. This number is projected to increase by 33% over the next decade, underscoring the need for coordinated, ongoing supportive care to address persistent symptoms and potential long-term complications (20). This continuity is crucial for optimizing patient satisfaction and health outcomes, particularly given the complex and often fragmented nature of post-treatment surveillance and long-term care. Without robust continuity, patients face increased risks of unmet needs, compromised care quality, and poorer psychosocial adjustment during a vulnerable period (12,14).

Aim

This study investigates patients' perceptions of continuity of care and identifies the types and extent of their supportive care needs, aiming to provide evidence to enhance patient-centered cancer care services.

Methods

Study design and participants

This research employed a descriptive cross-sectional design to examine patients' perceptions of continuity of care and to identify the types and extent of their supportive care needs. The study was conducted using a convenience sampling approach at Jendral Ahmad Yani Metro Hospital in Lampung, Indonesia, over

a four-week period from 15 July to 9 August 2025. Participants were eligible if they were women diagnosed with cancer, aged 18 years or older, currently receiving or having previously received cancer-related treatment at the hospital, able to communicate effectively, and willing to provide informed consent. Patients were excluded if they had severe cognitive impairment, were in critical clinical condition at the time of data collection, or submitted incomplete questionnaire responses.

The sample size was determined through an a priori power analysis using G*Power software (version 3.1.9.4). Assuming a medium effect size (r = 0.30), a two-tailed significance level of 0.05, and a statistical power of 0.95, the minimum required sample size was calculated to be 134 participants. Accordingly, 134 eligible individuals were recruited and included in the final analysis. The questionnaires were distributed by trained research assistants directly to the participants in their hospital rooms. Participants completed the questionnaires independently and returned them by placing the completed questionnaires into a closed collection box located at the nurse station. This procedure ensured the anonymity and confidentiality of responses, adhered to ethical standards, and complied with voluntary participation requirements.

Ethics

Participants engaged in a survey that ensured their anonymity. Before completing the survey, participants were informed about the research's purpose, and their involvement was entirely voluntary. The research protocol was reviewed and approved by the Ethics Committee of Jendral Ahmad Yani Hospital, Lampung, Indonesia, with approval number 370/634/KEPK-LE/LL-02/2025. All participants received comprehensive information about the study's objectives, methodologies, potential risks, and benefits. All participants provided written informed consent before data collection. Participation was completely voluntary, and respondents were assured they could withdraw at any time without repercussions regarding their medical treatment or nursing care.

Instruments

Supportive care needs were assessed using the Supportive Care Needs Survey Short Form (SCNS-SF34). The SCNS-SF34 is a validated 34-item question-

naire comprising five domains: physical and daily living, psychological, patient care and support, health system and information, and sexuality. Each item is rated on a five-point Likert scale ranging from 1 (not applicable) to 5 (high need). In this study, responses scored as 1 (not applicable) or 2 (satisfied) were categorized as indicating no unmet supportive care need. In contrast, responses scored 3 (low need), 4 (moderate need), or 5 (high need) were classified as indicating unmet supportive care needs, reflecting additional support that was not adequately addressed.

The SCNS-SF34 consists of 34 items divided into five domains: Psychological Needs (10 items), Health System and Information Needs (11 items), Patient Care and Support Needs (5 items), Physical and Daily Living Needs (5 items), and Sexuality Needs (3 items). Scores were calculated using a Likert summated scale by summing individual item scores within each domain, in accordance with the SCNS scoring guidelines. The resulting scores were analyzed either as crude totals or converted into standardized scores to enable comparison across scales with different numbers of items. Standardized scores were calculated using the formula:

$$(\sum item\ scores - m)\ x\ 100/[m\ x\ (k-1)]$$

where *m* represents the number of items in the domain and represents the maximum response value for each item. This scoring approach follows the recommendations outlined in the Supportive Care Needs Survey: A Guide to Administration, Scoring and Analysis (21). The SCNS-SF34 had a validity score of 0.302-0.792 and the reliability 0.933 (9).

The Patient Continuity of Care Questionnaire short version (PCCQ-12) was utilized to assess patients' perceptions of continuity of care. The PCCQ-12 consists of three domains: informational continuity (4 items), management continuity (4 items), and relational continuity (4 items). Each item has five response options ranging from strongly disagree to strongly agree, scored from 1 to 5, with higher scores indicating better continuity of care. All items also include a "not applicable" option, which is treated as a missing response and excluded from scoring. For each domain, the domain score is calculated by summing the scores of its constituent items, using only responses scored 1–5. The domain score therefore ranges from 4 to 20 for each domain. The total PC-

CQ-12 score is the sum of all 12 items, with a potential range from 12 to 60, where higher scores reflect better overall continuity of care (22). The PCCQ-12 were translated from English to Bahasa Indonesia by an academic language center, followed by a review conducted by an expert panel. The PCCQ-12 underwent piloting for validity and reliability testing, yielding validity scores ranging from 0.512 to 0.828 and a reliability score of 0.887.

Statistics

Descriptive statistics were used to summarize patients' demographic characteristics, perceptions of continuity of care, and supportive care needs. The normality of continuous variables was assessed using the Kolmogorov-Smirnov test, which indicated that both perceptions of continuity of care and supportive care needs were normally distributed, justifying the use of parametric statistical analyses. All statistical analyses were performed using Statistical Package for Social Sciences (SPSS version 26.0, IBM Corp.).

Results

The sociodemographic characteristics of women with cancer included in the study are presented in Table 1.

Table 1 findings indicated that the majority of respondents belonged to the middle adulthood group (43.3%), with educational backgrounds primarily at the lower and upper secondary education levels. A significant proportion of respondents were unemployed (65.7%) and had incomes below the minimum wage (76.9%), reflecting constrained socioeconomic conditions. Breast cancer was the most prevalent type reported, accounting for 79.9%, whereas other cancers, including colon cancer, rectal cancer, and multiple myeloma, were identified in a minor percentage of respondents. A significant majority of patients (48.5%) were diagnosed at advanced stage (III), indicating a low rate of early detection. The predominant ethnicity among respondents was Javanese, comprising 79.1% of the sample. The predominant treatment duration ranged from 1 to 6 months, accounting for

Table 1. **The sociodemographic characteristics of women with cancer**		
Characteristics	**Frequency**	**%**
Age		
Young adulthood (25 – 44 years)	51	38.1
Middle adulthood (45 – 59 years)	58	43.3
Elderly (60 – 75 years)	25	18.7
Educational qualifications		
Primary education	31	23.1
Lower secondary education	44	32.8
Upper secondary education	43	32.1
Higher education (Diploma/Bachelor's degree)	13	9.7
Occupation		
Unemployed	88	65.7
Employed	46	34.3
Income		
Below the minimum wage	103	76.9
At or above the minimum wage	31	23.1
Type of Cancer		
Breast cancer	107	79.9
Multiple myeloma	6	4.5
Ovarian cancer	1	0.7
Rectal cancer	6	4.5
Hodgkin's lymphoma	2	1.5
Lung cancer	1	0.7
Colon cancer	9	6.7
Adenocarcinoma	1	0.7
Non-Hodgkin's lymphoma	1	0.7
Stage		
Stage I	7	5.2
Stage II	54	40.3
Stage III	65	48.5
Stage IV	8	6.0
Duration of Treatment		
1 – 6 months	82	61.2
>6 months – 1 year	50	37.3
>1 year	2	1.5
Treatment		
Chemotherapy	20	14.9
Surgery and Chemotherapy	114	85.1
Ethnicity		
Balinese	5	3.7
Batak	1	0.8
Javanese	106	79.1
Lampungese	6	4.5
Minangkabau	5	3.7
Palembangese	2	1.5
Sundanese	1	0.7
Other/Not Reported	8	6.0

61.2% of cases, while the combination of surgery and chemotherapy was the most commonly utilized therapy, representing 85.1% of instances.

Tables 2 and 3 present the supportive care needs among women with cancer, with Table 2 showing the distribution of needs across domains and Table 3 highlighting the prevalence of moderate-to-high unmet needs in each domain.

Table 2. **Supportive Care Needs variables among women with cancer**		
Variables	**Frequency**	**%**
Supportive Care Needs		
No Need	16	11.9
Unmet Need	118	88.1
Physical and Daily Living Domain		
No Need	25	18.7
Unmet Need	109	81.3
Psychological Domain		
No Need	42	31.3
Unmet Need	92	68.7
Patient Care and Support Domain		
No Need	57	42.5
Unmet Need	77	57.5
Health System and Information Domain		
No Need	24	17.9
Unmet Need	110	82.1
Sexuality Domain		
No Need	80	59.7
Unmet Need	54	40.3

Table 2 and Table 3 present the distribution of unmet supportive care needs among cancer patients across five primary domains. Unmet supportive care needs were defined as item responses scored 3 (low need), 4 (moderate need), or 5 (high need) on the Supportive Care Needs Survey (SCNS). Scores of 1 (not applicable) and 2 (satisfied) indicate no unmet need. Domain-level unmet needs represent summary categories derived from item-level responses within each SCNS domain.

The findings indicate that the Health System and Information domain exhibited the highest proportion of unmet needs. Patients most frequently reported requiring adequate written information regarding illness management and treatment outcomes (71.6%),

as well as information on cancer status, including whether the disease was under control or in remission (67.2%).

The Physical and Daily Living domain had the second-highest level of unmet needs. Pain (79.9%) and fatigue/lack of energy (79.1%) were the predominant issues, suggesting that physical symptoms remain the most significant challenges in patients' daily lives. Psychological needs were also frequently reported, including feelings of sadness (61.2%), anxiety and concern about the future (59.7%), and fears of cancer spreading (63.4%), indicating that emotional distress among patients is substantial and often insufficiently addressed. The Patient Care and Support domain and Sexuality domain showed lower, yet meaningful levels of unmet needs, with approximately 38–45% of patients reporting challenges related to changes in sexual feelings, interpersonal relationships, and insufficient information regarding sexuality.

Table 4 presents the results of the Patient Continuity of Care Questionnaire short version (PCCQ-12), including mean scores for each domain and the overall total score.

The mean scores for the Patient Continuity of Care Questionnaire short version (PCCQ-12) are displayed in Table 4, including three domains and the overall patient perception score. The results suggest that patients experienced moderate to good continuity of care. The Informational Continuity domain recorded a mean score of 14.15 (SD = 2.623), where the item with the highest score pertained to comprehensive information on medications, while the item with the lowest score was associated with clarity of prognosis. The Management Continuity domain exhibited the highest overall mean (15.65; SD = 2.265), indicating effective coordination and follow-up arrangements post-discharge, although the consistency of information among providers was relatively lower. The Relational Continuity domain yielded a mean score of 14.12 (SD = 2.271), suggesting that patients perceived themselves as sufficiently prepared for discharge, yet reported a lack of familiarity with providers post-discharge. The total score reflecting patients' perceptions of continuity of care was 43.93 (SD = 6.038), with a range of 31–60. Higher scores indicate better perceived continuity of care. Clinically, this suggests that the participants experienced moderate to good continuity of care.

Table 3. **Prevalence of unmet supportive care needs among women with cancer**		
Unmet Supportive Care Needs	**Frequency**	**%**
Physical and Daily Living Domain		
Pain	107	79.9
Lack of energy/tiredness	106	79.1
Feeling unwell a lot of the time	80	59.7
Work around the home	91	67.9
Not being able to do the things you used to do	94	70.1
Psychological Domain		
Anxiety	80	59.7
Feeling down or depressed	73	54.5
Feelings of sadness	82	61.2
Fears about the cancer spreading	85	63.4
Worry that the results of treatment are beyond your control	79	59.0
Uncertainty about the future	80	59.7
Learning to feel in control of your situation	74	55.2
Keeping a positive outlook	50	37.3
Feelings about death and dying	56	41.8
Concerns about the worries of those close to you	52	38.8
Patient Care and Support Domain		
More choice about which cancer specialists you see	37	27.6
More choice about which hospital you attend	21	15.7
Reassurance by medical staff that the way you feel is normal	61	45.5
Hospital staff attending promptly to your physical needs	42	31.3
Hospital staff acknowledging, and showing sensitivity to your feelings and emotional needs	61	45.5
Health System and Information Domain		
Being given written information about the important aspects of your care	46	34.3
Being given information (written, diagrams, drawings) about aspects of managing your illness and side-effects at home	96	71.6
Being given explanations of those tests for which you would like explanations	52	38.8
Being adequately informed about the benefits and side-effects of treatments before you choose to have them	39	29.1
Being informed about your test results as soon as feasible	72	53.7
Being informed about cancer which is under control or diminishing in remission)	90	67.2
Being informed about things you can do to help yourself get well	61	45.5
Having access to professional counselling (e.g., psychologist, social worker, counsellor, nurse specialist) if you, your family or friends need it	42	31.3
Being treated like a person not just another case	18	13.4
Being treated in a hospital or clinic that is as physically pleasant as possible	30	22.4
Having one member of hospital staff with whom you can talk to about all aspects of your condition, treatment and follow-up	59	44.0
Sexuality Domain		
Changes in sexual feelings	52	38.8
Changes in your sexual relationships	51	38.1
To be given information about sexual relationships	53	39.6

Table 4. **The Patient Continuity of Care Questionnaire short version (PCCQ-12)**				
Variables	**Mean (SD)**	**Median**	**Mode**	**Min-Max**
Patients' perceptions of continuity of care	43.93 (6.038)	44.00	48	31-60
Informational	14.15 (2.623)	14.00	16	8-20
I was provided with clear information on my diagnosis.	4.00 (0.704)	4.00	4	1-5
I was provided with clear information on my prognosis.	2.94 (1.249)	3.00	4	1-5
I was given information on symptoms that may signal a need to seek urgent medical attention and whom to contact for these symptoms (e.g., specialist, family physician, homecare).	2.96 (1.204)	3.00	4	1-5
I was given complete information on my medications (e.g., type, purpose, method of administration, timing, duration, dosage, side effects, drug interactions, and required blood work).	4.25 (0.677)	4.00	4	2-5
Management	15.65 (2.265)	16.00	16	9-20
I was given information on follow-up appointments that have been made for me and appointments I have to schedule for myself.	4.43 (0.606)	4.00	5	2-5
I was informed of ongoing treatment that may be required after discharge (e.g., purpose, how, when) and whether I will have ongoing contact with providers of my care (e.g., physician, etc.).	3.84 (0.900)	4.00	4	1-5
A well developed and realistic follow-up plan was prepared and explained to me.	3.84 (0.777)	4.00	4	1-5
I was given consistent information by all providers about my care.	3.54 (0.690)	3.50	3	2-5
Relational	14.12 (2.271)	14.00	16	10-20
I felt "known" by the providers involved in my care (e.g., they were aware of my current clinical condition and recent events).	3.69 (0.750)	4.00	4	2-5
I felt adequately prepared for discharge.	3.72 (0.633)	4.00	4	2-5
I feel "known" (e.g., current health condition) by my present providers who have taken over my care since discharge.	3.34 (0.796)	3.00	4	1-5
I have confidence in my providers who have taken over my care since discharge.	3.37 (0.712)	3.00	3	2-5

Discussion

Supportive care needs encompass the requirements for managing symptoms and treatment-related side effects, enhancing adaptive and coping abilities, optimising understanding and access to information for informed decision-making, and minimising impairments in physical functioning (23). Consistent with this framework, the findings of the present study demonstrate that women with cancer reported the highest unmet supportive care needs in the Health System and Information domain, followed by the Physical and Daily Living domain, with considerable unmet needs also evident in the Psychological domain. This distribution indicates that gaps in information provision and communication within the healthcare system may undermine patients' capacity to manage physical symptoms, adapt psychologically, and maintain daily functioning. Adequate, timely, and comprehensible information is therefore fundamental to strengthening patients' self-efficacy, supporting effective coping strategies, and promoting active engagement in self-care. In this context, nurses play a central role in identifying unmet supportive care needs and delivering person-centred education and support tailored to patients' informational, physical, and psychological concerns.

Supportive care requirements are categorised into five domains: physical, psychological, patient care and support, health system and information, and sexuality. This study found that 88.1% of cancer patients

required supportive care. In the physical domain, 81.3% of cancer patients indicated a requirement for supportive care, whereas in the health system and information domain, 82.1% reported comparable needs. These results highlight that, although cancer care often emphasizes physical treatment, patients continue to experience significant unmet supportive care needs, particularly in the physical, emotional, and informational domains. Overall, the findings emphasize the necessity of a comprehensive, patient-centered approach to oncology nursing that addresses not only physical treatment but also emotional, informational, and psychosocial aspects of care to meet patients' supportive care needs adequately.

This finding is consistent with the study by Effendy et al., which reported a wide range of unmet physical symptom needs among patients with advanced cancer. Specifically, unmet needs were reported for pain (66.4%), fatigue (60.0%), sleeping problems (65.6%), shortness of breath (67.3%), cough (63.2%), itch (61.7%), numbness (54.1%), and night sweats (76.2%). The higher proportions observed in the present study, particularly for pain and lack of energy, may be partly explained by differences in study populations. Effendy et al. included only patients with advanced-stage cancer, who often experience more complex and fluctuating symptom patterns and may receive more intensive palliative-oriented care. In contrast, variations in disease stage and treatment trajectories in the present study may have contributed to differences in symptom burden and access to supportive care services. Price et al. conducted an investigation into physical symptoms in patients with ovarian cancer, identifying lack of energy, abdominal bloating, pain, and nausea as the most commonly reported symptoms. Key issues associated with cancer and its treatment include disruptions in physical condition, social functioning, and body image. Patients frequently encounter uncertainty about the significance of unexplained physical symptoms and the management of ongoing treatment effects during their care (24,25).

These findings highlight two interrelated challenges in cancer care: the burden of treatment-related physical symptoms and the persistent gap in patients' access to clear and reliable health information. Physical challenges such as fatigue and pain remain among the most prevalent adverse effects of cancer treatment, underscoring the need for effective symptom management strategies. Evidence suggests that im-

proved symptom control can substantially enhance patients' quality of life, as demonstrated by Li et al. (26). In parallel, unmet informational needs reflect an emerging "infodemic" in healthcare, in which patients may experience confusion or anxiety due to fragmented or inconsistent information. Holden et al. (2021) emphasised the critical role of health literacy and the responsibility of healthcare professionals to provide accurate and comprehensible information to mitigate patient distress (27). Collectively, these observations are consistent with previous studies highlighting that integrated attention to both physical and informational needs is essential for improving overall patient well-being.

Unmet psychological needs were reported by 68.7% of respondents. The diagnosis and treatment of cancer frequently induce anxiety, depression, and concerns regarding relapse. Cancer patients undergoing therapy encounter not only physical symptoms but also emotional alterations, including anxiety and depression, alongside concerns regarding a potential decline in their quality of life due to uncertainty about their prognosis. Cancer patients frequently present with multiple interrelated symptoms; for example, depression may correlate with fatigue. The interaction of concurrent symptoms may intensify existing symptoms or contribute to the emergence of new symptoms (28). Emotional well-being is the dimension most adversely impacted during chemotherapy. Cancer patients receiving treatment necessitate emotional support to manage anxiety, sadness, and fear during the diagnosis and treatment phases (29).

One of the most alarming discoveries in this study is that nearly 89% of respondents were diagnosed with breast cancer at advanced stages (II and III). This highlights a major challenge in the early detection process. According to Siegel et al. (2022), early detection remains the key to improving survival rates, even with advances in treatment options. Insufficiently organized and cost-effective screening initiatives, coupled with a general unawareness of the initial signs of cancer, are often associated with delayed diagnoses (30). Following established global clinical guidelines, the typical treatment strategy for stage II and III breast cancer involves a combination of chemotherapy and surgery, a choice favored by most patients.

The treatment typically lasts from one to six months, though this timeframe can vary. Papalexis et al. conducted a systematic review highlighting the impor-

tance of tailored therapy and the thorough management of side effects, especially for patients receiving long-term chemotherapy (31). The significant presence of respondents from the Javanese ethnic group likely reflects the study's geographical context; however, it is crucial to consider the influence of ethnicity and culture. Özdemir et al. (2017) illustrated that ethnic background and genetic lineage can influence particular cancer types and treatment responses. Cultural influences, such as the stigma associated with illness and reliance on traditional medicine, may prevent patients from seeking professional medical attention, resulting in diagnoses occurring at more advanced stages (32). Consequently, it is imperative for nurses to actively provide supportive care by facilitating effective communication with patients and disseminating vital care-related information to enhance the quality of life for cancer patients. Continuous Nursing Care is an extensive nursing care approach that engages patients in decision-making and the formulation of personalised care plans, extending from hospital admission to discharge and customised to each patient's distinct needs.

Continuity of care, which encompasses seamless coordination and effective transitions across healthcare services, is widely recognised as a key indicator of healthcare quality. In the context of cancer care, where management extends beyond curative treatment to include supportive, rehabilitative, and palliative services delivered by multidisciplinary teams, patients' favourable perceptions of continuity of care are associated with better perceived health status and overall well-being (16,17). The findings of the present study suggest that coordination and communication among healthcare providers were generally perceived as adequate; however, opportunities for improvement remain, particularly in informational and relational continuity. When patients perceive that their supportive care needs are adequately met, they are more likely to report a positive perception of continuity of care, highlighting the importance of integrated, patient-centred approaches to cancer care.

Cancer patients' needs encompass not only medical interventions like chemotherapy, surgery, or radiotherapy but also emotional, spiritual, and financial support. A favourable perception of care continuity enables patients to regard the treatment process as organised, consistent, and conducive to their overall well-being. Chen et al. (2019) conducted a study indicating that breast cancer survivors exhibiting a high Continuity of Care Index (COCI), regardless of whether oncologists or primary care providers managed their care, were more inclined to participate in routine screenings (e.g., mammography/ultrasound), experienced reduced hospitalisation rates, and had fewer emergency department visits in comparison to those with low continuity of care (33).

This study highlights the critical role of uninterrupted continuity of care and the systematic identification of unmet supportive care needs as essential components of patient-centred cancer care. The findings emphasize the importance of strengthening inter-professional communication, improving the clarity and consistency of information provided to patients, and enhancing care coordination, particularly during transitions from hospital to home. Clinically, these results support the implementation of structured patient education programs, routine monitoring of supportive care needs, and targeted nursing interventions focused on informational and emotional support. Future research should employ longitudinal and interventional designs to further evaluate the effectiveness of continuity of care models and supportive care interventions across different stages of the cancer trajectory and healthcare settings.

Several limitations should be considered when interpreting these findings. The cross-sectional design does not allow causal inferences, and the use of convenience sampling within a single hospital setting may limit transferability to other contexts. In addition, reliance on self-reported data may introduce response bias. Furthermore, the Patient Continuity of Care Questionnaire (PCCQ-12) includes only positively phrased statements, which may have led to more favorable responses than participants actually experienced.

Conclusion

This study indicates that women living with cancer reported varying levels of continuity of care across informational, management, and relational domains. Management continuity showed higher scores than informational and relational continuity, while gaps were identified in the clarity of prognostic information and in patients' familiarity with healthcare providers after hospital discharge. In addition, substan-

tial unmet supportive care needs were identified, particularly in the physical and daily living domain, including pain and fatigue, as well as in the psychological domain, such as emotional distress, anxiety, and fear of disease progression. Moderate unmet needs were also reported in the areas of patient care, support, and health system information. Overall, these findings reflect key challenges in delivering patient-centered cancer care that adequately addresses both continuity of care and patients' multidimensional supportive care needs.

Declaration of Generative AI in Writing

During preparation, the author(s) used ChatGPT from OpenAI for language enhancement.

Author Contributions

Conceptualization (RHP, YE); Data Curation (RHP, YE); Methodology (RHP, AG); Data Analysis (RHP, AG); Writing – Original Draft (RHP, YE); Writing—review and editing (RHP, TAN). All authors have approved the final manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

Funding

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Efficacy of High-Flow Nasal Cannula in Preventing Hypoxemia During Sedated Endoscopic Procedures: A Literature Review

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Abstract

Introduction. Hypoxemia is a common and potentially serious complication during endoscopic procedures performed under sedation, particularly in patients with obesity, chronic respiratory disease, or reduced pulmonary reserve. The high flow nasal cannula (HFNC) delivers heated and humidified oxygen at high flow rates with a stable fraction of inspired oxygen (FiO_2), thereby reducing desaturation and improving oxygenation compared with conventional oxygen delivery methods.

Aim. This review evaluated the efficacy of HFNC in preventing hypoxemia during gastrointestinal endoscopy, bronchoscopy, and endoscopic retrograde cholangiopancreatography (ERCP) under sedation, focusing on clinical applicability and patient safety.

Methods. A systematic search of PubMed, Web of Science, and Scopus (2015–2025) identified English language studies, including randomized trials, comparative and observational studies, and reviews. Predefined inclusion criteria were applied, and outcomes included the incidence of hypoxemia, minimum SpO_2, and the need for airway interventions.

Results. Of 628 records screened, 30 studies met the inclusion criteria (13 randomized trials, 3 prospective comparative, 1 observational, 3 retrospective, and 10 systematic reviews or meta-analyses). Most confirmed that HFNC reduces hypoxemia, increases minimum SpO_2, and improves ventilation stability compared with conventional oxygen therapy. The greatest benefits were observed among high-risk patients such as elderly, obese, and those with respiratory disease. Optimal flow rates ranged from 50 to 60 L/min, ensuring efficacy, comfort, and safety.

Conclusion. HFNC provides effective oxygenation support during sedated endoscopic procedures, reducing desaturation and the need for airway interventions. Standardized protocols and further research on long term outcomes are recommended.

Introduction

Hypoxemia is one of the most common and serious complications during sedated endoscopic procedures, particularly in patients at increased risk due to respiratory diseases, obesity, or other factors that reduce pulmonary reserve (1). Conventional methods of oxygenation support, such as conventional oxygen therapy (COT) delivered via nasal cannula or face mask, are often insufficient to maintain adequate oxygenation in conditions of increased oxygen demand and reduced respiratory volume caused by sedation (2). Therefore, advanced non-invasive oxygenation methods are increasingly being applied in clinical practice, among which the high-flow nasal cannula (HFNC) is gaining an increasingly important role.

HFNC delivers heated and humidified oxygen at high flow rates (typically 30-60 L/min) with precise control of the fraction of inspired oxygen (FiO_2) (3). This technology provides partial positive pressure support (PEEP effect), reduces dead space in the upper airways, improves alveolar ventilation, and enhances overall gas exchange (4). HFNC increases the partial pressure of arterial oxygen (PaO_2), reduces respiratory effort, and improves patient comfort compared with traditional methods (5). In addition, continuous airflow through the upper airways prevents rebreathing of carbon dioxide (CO_2), thereby reducing the risk of hypercapnia, which is a common problem in sedated patients during procedures such as bronchoscopy, gastroscopy, or endoscopic retrograde cholangiopancreatography (ERCP).

The significance of HFNC is particularly evident in patients at high risk of developing hypoxemia, including elderly individuals, patients with elevated BMI, those with chronic lung diseases (e.g., COPD, interstitial lung disease), and patients undergoing prolonged or invasive endoscopic procedures (6,7). Numerous studies and meta-analyses report that HFNC reduces the incidence of hypoxemic episodes, the need for procedural interruptions, and additional airway interventions (e.g., mask ventilation, intubation), while simultaneously increasing minimum oxygen saturation (SpO_2). Compared with COT or low-flow oxygen therapy, HFNC provides more stable oxygenation and better control of ventilation parameters, thereby contributing to the safer performance of procedures (8).

Despite the increasing use of HFNC, its application in procedural sedation and endoscopy has not yet been standardized, and the determination of optimal flow rates and indications varies across clinical centers in different countries. In addition, considerable heterogeneity exists regarding study design, sedation protocols, and definitions of hypoxemia, which complicates the development of unified guidelines. Given the growing number of endoscopic procedures performed under sedation and the increasingly complex patient population, there is a need for a detailed analysis of the effectiveness of HFNC in this context. Numerous studies have shown that the incidence of hypoxemia during gastrointestinal endoscopy under sedation may range from as low as 1.8% to as high as 69% (9–12).

Aim

The purpose of this paper is to systematically analyze the existing scientific literature on the effectiveness of high-flow nasal cannula (HFNC) in managing hypoxemia during endoscopic procedures. The study aims to identify the advantages of HFNC in comparison with conventional methods of oxygenation support. A particular emphasis was placed on outcomes such as improved oxygenation, reduced need for invasive ventilation, and patient safety.

Methods

A systematic literature search was conducted in July 2025 using the PubMed, Web of Science, and Scopus databases. Scientific articles published between 2015 and 2025 were reviewed. In accordance with PRISMA guidelines for systematic reviews, only articles classified as Clinical Trial, Controlled Clinical Trial, Multicenter Study, Observational Study, Randomized Controlled Trial, Review, and Systematic Review were included.

Inclusion criteria comprised studies focusing on the use of high-flow nasal cannula (HFNC) in adult patients with hypoxemia, including gastrointestinal endoscopy (gastroscopy, colonoscopy, EGD), bronchoscopy, and endoscopic retrograde cholangiopancreatography (ERCP) performed under sedation. Predefined search keywords were used: "high flow nasal cannula," HFNC, and hypoxemia. These terms were required to appear in the title, abstract, or keywords of the included articles to ensure their relevance.

Only studies published between 2015 and 2025 were included. This period was selected to capture the most recent decade of scientific evidence, reflecting advances in high-flow nasal cannula technology, evolving procedural sedation protocols, and the growing number of clinical trials in this field. Studies published before 2015 were excluded to avoid outdated technologies and practices that no longer represent current standards.

The authors predefined the search objectives, established inclusion and exclusion criteria (see Table 1), and focused the analysis on studies investigating the use of HFNC compared with COT in adult patients. The search was further limited to articles available in English and required to contain either an abstract or full text. After duplicate removal using the Zotero application, a total of 628 records were identified for review (Figure 1). Two independent authors screened the titles and abstracts (n = 628), excluding 384 studies that did not meet the basic inclusion criteria or were deemed irrelevant. Full-text articles were retrieved for 244 studies and assessed for eligibility. In the final selection round, 214 articles were excluded because they were not related to endoscopic procedures, resulting in 30 studies being included in the analysis, all directly addressing HFNC use in relation to endoscopic procedures.

Data extraction was conducted independently by two authors (VJ and JP), with accuracy verified through mutual comparison and consensus among all authors. The quality of the included studies was evaluated according to predefined criteria encompassing study design, sample size, outcome reporting, and overall methodological rigor.

Table 1. **Inclusion and exclusion criteria**	
Inclusion criteria	**Exclusion criteria**
Studies published between January 2015 and June 2025	Studies published before 2015
Original research articles available in English with accessible abstract or full text	Articles in languages other than English; editorials, letters, commentaries, books, or conference abstracts
Clinical and review studies: randomized controlled trials (RCTs), controlled clinical trials, multicenter studies, observational (prospective and retrospective), systematic and narrative reviews	Case reports, study protocols, low-quality meta-analyses, animal experiments, or studies lacking accessible abstract/full text
Studies investigating the use of HFNC in adults with acute respiratory failure or hypoxemia during endoscopic procedures under sedation, including gastrointestinal endoscopies (gastroscopy, colonoscopy, EGD), bronchoscopy, and ERCP under sedation	Studies involving pediatric or neonatal patients; studies in non-acute or chronic settings (e.g., COPD); studies not related to endoscopic procedures (e.g., ARDS studies or ICU weaning protocols)
Studies reporting outcomes such as hypoxemia incidence, oxygenation parameters, airway interventions, or procedure interruptions	Studies without clinically relevant outcomes.

Results

This systematic review includes 30 studies published between 2015 and 2025. The included studies evaluated the effectiveness of high-flow nasal cannula (HFNC) in preventing hypoxemia during sedated endoscopic procedures, including gastrointestinal endoscopy, bronchoscopy, and endoscopic retrograde cholangiopancreatography (ERCP). The PRISMA diagram (Figure 1) illustrates the selection

Identification of studies via databases and registers

Identification

Records identified from*:
Databases (n = 3)
PubMed (n = 37)
Web of Science (n = 174)
Scopus (n = 570)

Records removed before *screening*:
Duplicate records removed (n = 153)

Screening

Records screened
(n = 628)

Records excluded**
(n = 384)

Reports sought for retrieval
(n = 244)

Reports not retrieved
(n = 0)

Reports assessed for eligibility
(n = 30)

Reports excluded:
Reason 1
(n = 214)

Included

Studies included in review
(n = 30)
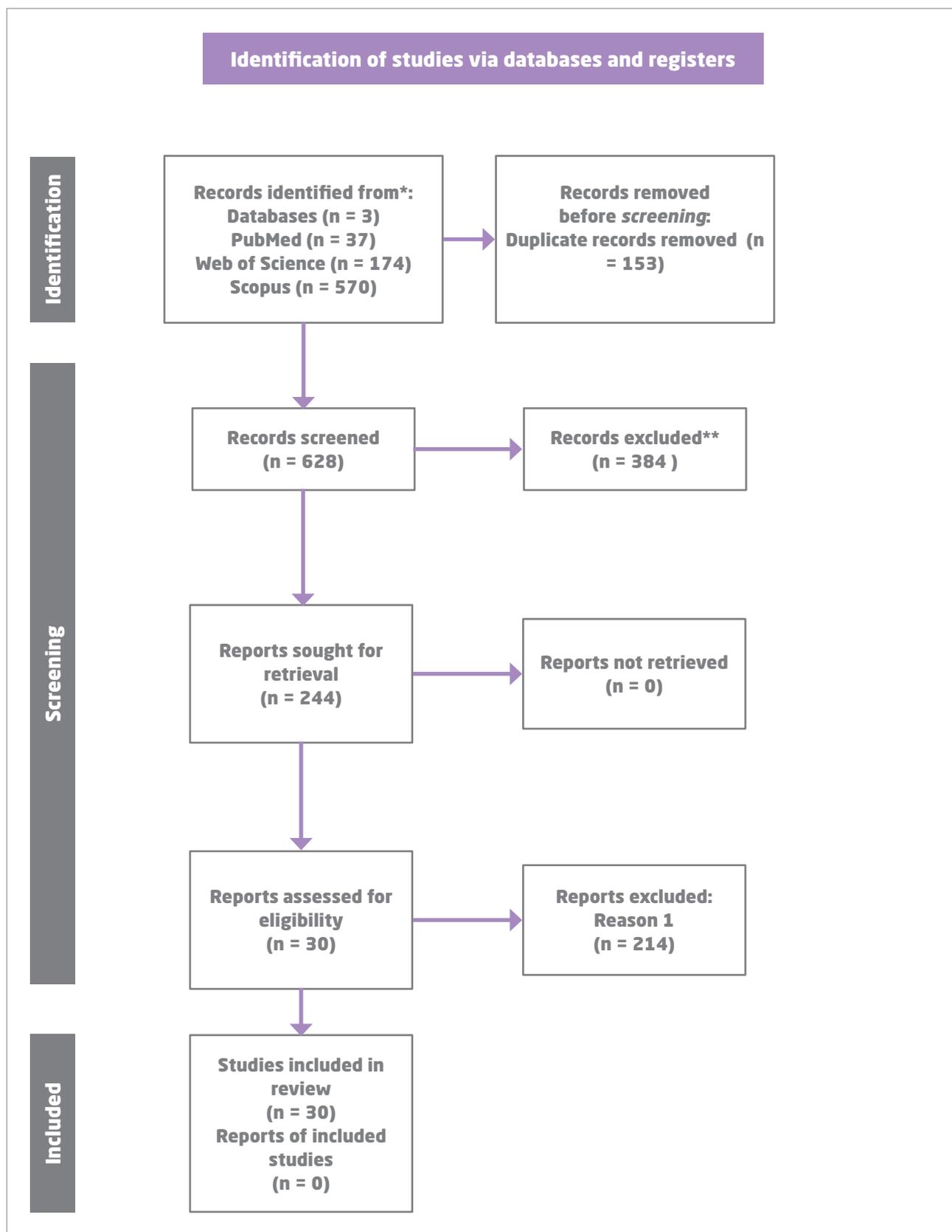Reports of included studies
(n = 0)

Figure 1. **PRISMA flow chart**

process, and Table 2 provides a detailed overview of the included studies, including authors, study design, population characteristics, and key findings. To avoid redundancy, detailed numerical results are summarized in Table 2.

Most of the studies were conducted in China (n = 13), with additional studies originating from Japan (n = 2), South Korea (n = 2), Australia (n = 2), Taiwan (n = 2), and Greece (n = 2), as well as single studies from Thailand, Egypt, Ecuador, France, India, and the United States. By study type, the included papers comprised 13 randomized controlled trials (RCTs), 3 prospective randomized comparative studies, 1 prospective observational study, 3 retrospective studies, and 10 systematic reviews and meta-analyses.

As shown in Table 2, most studies confirmed that HFNC significantly reduces the incidence of hypoxemia compared with COT and maintains higher minimum SpO_2 values. Systematic reviews and meta-analyses particularly highlighted the reduced risk of hypoxemia, fewer procedural interruptions, and a decreased need for airway interventions (13, 20, 23, 25, 31, 32, 35, 37–39).

Randomized controlled trials (n = 13) demonstrated the superiority of HFNC across different populations and procedures, including bronchoscopy, ERCP, gastroscopy, and endoscopic submucosal dissection (17, 19, 21, 24, 26, 28–30, 33, 36, 40–42). Several studies (14, 22, 34) observed that HFNC and other methods, such as NIV or low-flow oxygen, showed comparable efficacy; however, HFNC more consistently provided greater stability of oxygenation in high-risk patients.

Retrospective and prospective studies further confirmed that HFNC significantly reduces the occurrence of desaturation and maintains stable SpO_2 during procedures (14–16, 18, 21, 22, 27, 34).

A concise summary of these findings is presented in Table 2, which consolidates the numerical outcomes and key methodological details of all included studies.

In conclusion, the findings indicate that HFNC is most effective in preventing hypoxemia during sedated endoscopic procedures, with optimal flow rates of 50-60 L/min, and is associated with a lower risk of complications and reduced need for procedural interruptions (13, 19, 42).

Discussion

This systematic review analyzed evidence from randomized trials, observational studies, and meta-analyses, all of which consistently show that HFNC significantly reduces hypoxemia and improves oxygenation compared with COT. The following discussion summarizes key findings by procedure type and patient population.

HFNC during gastrointestinal endoscopy

Sedation during upper gastrointestinal endoscopic procedures often causes hypoventilation and airway obstruction, increasing the risk of hypoxemia. Numerous studies confirm that the use of HFNC significantly reduces this risk compared with standard low-flow oxygen therapy. Meta-analyses consistently report a 60-75% relative risk reduction with HFNC use (20,39).

For instance, Thiruvenkatarajan et al. (2023) demonstrated a lower incidence of hypoxemia and higher minimum oxygen saturation with HFNC (20), while Zhang et al. (2022) additionally reported a reduced need for airway interventions in patients undergoing sedated gastrointestinal endoscopy (37). In practice, HFNC markedly decreases desaturation episodes and maintains higher oxygen saturation levels than COT (37). In practice, HFNC markedly decreases desaturation episodes and maintains higher oxygen saturation levels than COT.

These findings have been further supported by randomized trials. The multicenter ODEPHI RCT by Nay et al. (2021) showed that HFNC substantially reduced critical desaturation events in high-risk patients compared with standard oxygen therapy (30). Beyond reducing hypoxemia incidence, HFNC also decreases the need for procedural interruptions and airway maneuvers (20,30). Other studies confirmed that HFNC lowers the need for airway maneuvers and procedural interruptions, with the most pronounced benefit observed in preventing severe desaturation (9,11,22,30,37,40). The meta-analysis by Khanna et al. (2023) involving more than 3,000 patients also demonstrated significant reductions in desaturation incidents and procedure interruptions, together with higher minimum oxygen saturation (39). Although

Table 2. Overview of included studies on the use of HFNC in the prevention of hypoxemia during endoscopic procedures (2015-2025)

Authors, year	Type of study	Aim	Country	Key findings
Wei C, Ma SY, Jiang LL, Wang JW, Yuan LP, Wang YY, 2024 (13)	Meta-analysis of 12 RCTs (2004–2024), conducted using RevMan 5.4	To evaluate the clinical effects of HFNC compared with COT during gastrointestinal endoscopic procedures.	China	HFNC significantly reduced the incidence of hypoxemia (OR = 0.39, 95% CI: 0.29-0.53), increased minimum SpO_2 (MD = 4.07, 95% CI: 3.14–5.01), and decreased the need for airway interventions (OR = 0.16, 95% CI: 0.05-0.53). No significant differences were observed in SpO_2, hypercapnia, or procedure duration.
Saksitthichok B, Petnak T, So-ngem A, Boonsamgsuk V, 2019 (14)	Prospective randomized comparative study	To compare HFNC and NIV in maintaining oxygenation during flexible bronchoscopy	Thailand	HFNC and NIV showed similar efficacy in preventing hypoxemia, but NIV provided more stable oxygenation in patients with PaO_2 < 60 mmHg.
Arias-Sanchez PP, Ledesma G, Cobos J, Tirape H, Jaramillo B, Ruiz J, et al., 2023 (15)	Observational study	To compare HFNC and standard oxygen therapy during fiberoptic bronchoscopy	Ecuador	HFNC reduced the drop in SpO_2 during bronchoscopy (94% vs 90%, p = 0.04) and demonstrated less variability in oxygen saturation compared with standard therapy.
Chung SM, Choi JW, Lee YS, Choi JH, Oh JY, Min KH, et al., 2019 (16)	Retrospective observational study	To assess the effectiveness of HFNC during diagnostic and therapeutic bronchoscopy	South Korea	HFNC maintained stable SpO_2 (95–99.4%) during bronchoscopy, with no hypoxemic episodes during diagnostic procedures and improved oxygenation after therapeutic interventions.
Kim SH, Bang S, Lee K-Y, Park SW, Park JY, Lee HS, et al., 2021 (17)	Randomized controlled trial	To compare HFNC and COT during sedation in the prone position	South Korea	HFNC significantly reduced hypoxemia incidence and improved oxygenation compared with COT.
Lee S, Choi JW, Chung IS, Kim DK, Sim WS, Kim TJ, 2023 (18)	Retrospective observational study	To compare HFNC and COT during deep sedation for ESD	South Korea	HFNC significantly reduced hypoxemia (11.4% vs 35.2%) and the need for interventions but was associated with a higher rate of postprocedural radiological abnormalities.
Wang L, Zhang Y, Han D, Wei M, Zhang J, Cheng X, et al., 2025 (19)	Multicenter RCT	To evaluate the effect of HFNC in obese patients during GI endoscopy	China	HFNC significantly reduced hypoxemia (2% vs 21.2%), subclinical respiratory depression, and severe hypoxemia without increasing other adverse events.
Thiruvenkatarajan V, Sekhar V, Wong DT, Currie J, Van Wijk R, Ludbrook GL, 2023 (20)	Systematic review and meta-analysis	To evaluate HFNC versus COT during procedural sedation	Australia	HFNC reduced the risk of hypoxemia (RR 0.37), increased minimum SpO_2, and decreased the need for procedural interruptions.

Table 2. **Overview of included studies on the use of HFNC in the prevention of hypoxemia during endoscopic procedures (2015-2025)**				
Authors, year	**Type of study**	**Aim**	**Country**	**Key findings**
Ayuse T, Kurata S, Mori T, Kuroda S, Ichinomiya T, Yano R, et al., 2023 (21)	Randomized comparative study	To assess the effect of HFNC on hypoxemia and hypercapnia during ERCP sedation	Japan	HFNC reduced hypoxemia and improved ventilation compared with a standard cannula.
Mohamed AM, Selima WZ, 2025 (22)	Prospective randomized study	To compare HFNC and COT during prolonged UGE in the ICU	Egypt	HFNC significantly reduced hypoxemia incidence (5.7% vs 51.4%) and improved safety.
Tao Y, Sun MY, Miao MR, Han YQ, Yang YT, Cong XH, Zhang JQ, 2022 (23)	Systematic review and meta-analysis	To evaluate the effectiveness of HFNC in endoscopic procedures	China	HFNC significantly reduced hypoxemia (RR 0.32), need for interventions, and procedural interruptions.
Teng WN, Ting CK, Wang YT, Hou MC, Chang WK, Tsou MY, et al., 2019 (24)	Randomized clinical trial	To evaluate the effectiveness of HFNC in endoscopic procedures	Taiwan	HFNC and MA reduced hypoxemia (18% and 12% fewer events, respectively) and the need for interventions.
Su CL, Chiang LL, Tam KW, Chen TT, Hu MC, 2021 (25)	Systematic review and meta-analysis of RCTs	To evaluate the effect of HFNC during bronchoscopy	USA	HFNC reduced hypoxemic events (RR 0.25) and increased minimum SpO_2 during procedures.
Zhaxi D, Ci D, Quan X, Laba C, 2024 (26)	Randomized controlled trial	To compare HFNC and COT during bronchoscopy in hypoxemic patients	China	HFNC reduced hypoxemia (9.3% vs 36.8%) and severe hypoxemia (0% vs 11.3%).
Luo XH, Xiang F, 2024 (27)	Retrospective study	To compare HFNC and COT during bronchoscopy in hypoxemic patients	China	HFNC significantly reduced SpO_2 < 90% events (3.8% vs 17.5%) and adverse effects (7.7% vs 20.1%).
Yin X, Xu W, Zhang J, Wang M, Chen Z, Liu S, Xu Y, Xu S, Ji D, Wang J, Gu W, 2024 (28)	Prospective randomized controlled trial	To compare HFNC and CNC in preventing hypoxemia in elderly patients during gastroscopy under sedation	China	HFNC significantly reduced hypoxemia (3.2% vs 22.6%, p = 0.001) and increased minimum SpO_2 compared with CNC.
Ben-Menachem E, McKenzie J, O'Sullivan C, Havryk AP, 2020 (29)	Randomized controlled trial (post-transplant patients)	To compare HFNC and LFNO during flexible bronchoscopy in lung transplant recipients	Australia	HFNC significantly reduced desaturation (SpO_2 < 94%: 43.2% vs 89.7%, p < 0.001) and procedural interruptions compared with LFNO.
Nay M-A, Fromont L, Eugene A, Marcueyz J-L, Mfam W-S, Baert O, Remerand F, Ravry C, Auvet A, Boulain T, 2021 (30)	Multicenter RCT (ODEPHI)	To evaluate the effect of HFNC on desaturation during gastrointestinal endoscopy under deep sedation	France	HFNC reduced the incidence of SpO_2 ≤ 92% (9.4% vs 33.5%, p < 0.001) and the need for airway maneuvers.

Table 2. Overview of included studies on the use of HFNC in the prevention of hypoxemia during endoscopic procedures (2015-2025)

Authors, year	Type of study	Aim	Country	Key findings
Doulberis M, Sampsonas F, Papaefthymiou A, Karamouzos V, Lagadinou M, Karampitsakos T, Stratakos G, Kuntzen T, Tzouvelekis A, 2022 (31)	Systematic review and meta-analysis	To evaluate the risk of hypoxemia with HFNC in gastrointestinal endoscopy compared with COT	Greece	HFNC reduced hypoxemia and procedural interruptions compared with COT.
Sampsonas F, Karamouzos V, Karampitsakos T, Papaioannou O, Katsaras M, Lagadinou M, Zarkadi E, Malakounidou E, Velissaris D, Stratakos G, Tzouvelekis A, 2022 (32)	Systematic review and meta-analysis (6 RCTs)	To evaluate HFNC versus LFNC during bronchoscopy	Greece	HFNC reduced hypoxemic episodes and procedural interruptions compared with LFNC.
Zhang W, Wang J-L, Fu S, Zhou J-M, Zhu Y-J, Cai S-N, Fang J, Xie K-J, Chen X-Z, 2022 (33)	Randomized controlled trial	To compare HFNC and face mask in patients at risk of hypoxemia during bronchoscopy	China	HFNC significantly reduced desaturation (4.6% vs 29.2%, $p < 0.001$) and the need for mask ventilation.
Sawase H, Ozawa E, Yano H, Ichinomiya T, et al., 2023 (34)	Prospective randomized single-center clinical trial (n = 75)	To compare HFNC with low-flow oxygen during ERCP under sedation for the prevention of hypercapnia and hypoxemia	Japan	HFNC at 40-60 L/min did not significantly reduce hypercapnia or hypoxemia compared with low-flow O_2 ($p > 0.05$).
Lee CC, Ju TR, Lai PC, Lin HT, Huang YT, 2022 (35)	Systematic review and meta-analysis of 8 RCTs	To evaluate the efficacy of HFNC in GI endoscopy compared with COT	Taiwan	HFNC reduced severe hypoxemia (RR 0.38, 95% CI: 0.20-0.74) but did not significantly affect overall hypoxemia incidence.
Zhang W, Yin H, Xu Y, Fang Z, et al., 2022 (36)	Prospective randomized single-blind trial (n = 369)	To compare HFNC with different FiO_2 levels (50% and 100%) and standard cannula during gastroscopy in elderly patients	China	HFNC significantly reduced hypoxemia compared with COT ($p < 0.05$); no difference between FiO_2 50% and 100%.
Zhang YX, He XX, Chen YP, Yang S, 2022 (37)	Systematic review and meta-analysis (7 RCTs, n = 2998)	To evaluate the efficacy of HFNC in sedated gastrointestinal endoscopy	China	HFNC reduced hypoxemia (OR 0.24, 95% CI: 0.09-0.64) and airway intervention requirements (OR 0.15, 95% CI: 0.03-0.69).
Wei C, Ma SY, Wang JW, Yang N, et al., 2024 (38)	Systematic review and meta-analysis of 12 studies (n = 1631)	To compare HFNC with other methods during bronchoscopy	China	HFNC significantly reduced hypoxemia (RR 0.27, 95% CI: 0.18-0.41) and improved minimum SpO_2.

Table 2. **Overview of included studies on the use of HFNC in the prevention of hypoxemia during endoscopic procedures (2015-2025)**				
Authors, year	**Type of study**	**Aim**	**Country**	**Key findings**
Khanna P, Haritha D, Das A, Sarkar S, Roy A, 2023 (39)	Systematic review and meta-analysis (9 studies, n = 3294)	To assess the utility of HFNC in upper GI endoscopy under sedation	India	HFNC reduced desaturation (OR 0.23, 95% CI: 0.11–0.48) and procedural interruptions (OR 0.11, 95% CI: 0.02–0.60).
Wang R, Li H-C, Li X-Y, Tang X, Chu H-W, Yuan X, Tong Z-H, Sun B, 2021 (40)	Prospective randomized controlled trial	To compare modified HFNC and COT during bronchoscopy in reducing SpO_2 < 90%	China	HFNC significantly reduced hypoxemia (12.5% vs 28.8%, p < 0.001) and maintained higher SpO_2 during and after bronchoscopy.
Feng Y, Chen Z, Wang J, 2024 (41)	Randomized controlled trial	To investigate the effect of transnasal HFNC therapy on gag reflex and oxygenation in elderly patients during fiberoptic bronchoscopy	China	HFNC improved SpO, reduced hypoxemia and gag reflex, with no significant impact on hemodynamics.
Zhang W, Yuan X, Shen Y, Wang J, Xie K, Chen X, 2024 (42)	Prospective randomized controlled trial	To determine the optimal HFNC flow rate for preventing desaturation during bronchoscopy	China	The optimal HFNC flow rate for preventing desaturation in 95% of patients was 43.2 L/min (95% CI: 36.4–56.0); 50-60 L/min is recommended.

Lee et al. (2016) did not find a significant difference in overall hypoxemia rates, their results indicated that HFNC reduces the risk of severe hypoxemia compared with COT (8).

Collectively, the evidence shows that HFNC enhances respiratory safety during sedated gastrointestinal endoscopy, leading to fewer and less severe desaturation events and reducing the need for airway interventions.

HFNC during bronchoscopy

Similar benefits of HFNC have been reported during sedated bronchoscopy. Patients, especially those with impaired lung function, are highly susceptible to hypoxemia due to sedation and airway obstruction. Several studies indicate that HFNC is more effective than COT in maintaining oxygenation in this setting. The systematic review and meta-analysis by Su et al. (2021), including five RCTs, showed that HFNC significantly reduced hypoxemic events and increased

minimum SpO_2 compared with COT (25). In practice, this means patients receiving HFNC were less likely to reach critically low saturation levels during the procedure.

HFNC has also been compared with other oxygenation techniques. The RCT by Saksitthichok et al. (2019) found comparable protection against desaturation between HFNC and NIV in high-risk hypoxemic patients, with no significant difference in lowest SpO_2 (14). Only in the most severely hypoxemic subgroup (baseline PaO_2 < 60 mmHg) did NIV provide slightly more stable oxygenation, suggesting a marginal advantage of mechanical support in that population.

Observational studies (15,16) further confirmed that HFNC maintains stable SpO_2 levels, often above 95%, without significant hypoxemia or procedural interruptions. Overall, HFNC improves oxygenation reserve, allowing safer and more continuous bronchoscopy with fewer complications related to oxygen deficiency.

High-risk patient populations and specific procedural conditions

The advantages of HFNC are particularly evident in vulnerable patient populations and specific procedural conditions. In a recent multicenter RCT (2025) in obese patients (BMI ≥ 28) undergoing sedated endoscopy, HFNC markedly reduced the incidence of hypoxemia, from 21% with COT to only 2%. Subclinical respiratory depression (SpO_2 90–94%) also decreased from 36% to 5%, while severe hypoxemia was virtually eliminated (0% vs 4%) (19). These results highlight the importance of HFNC in obese patients, who desaturate more rapidly due to obstructive physiology.

Similarly, in elderly patients and those with comorbidities, HFNC has shown clear superiority over COT. Yin et al. (2024) found that among geriatric patients (>65 years) undergoing sedated gastroscopy, hypoxemia occurred in only 3% with HFNC versus 23% with standard therapy, with higher minimum SpO_2 values (28). This suggests that older patients, often more sensitive to sedatives, derive substantial benefit from HFNC.

The method has proven effective even under extreme environmental conditions. At high altitude (3600 m), HFNC significantly reduced hypoxemia incidence during endoscopic procedures (9% vs 37% with COT), completely preventing severe desaturation (26). This demonstrates its potential beyond conventional hospital settings, including environments with baseline hypoxemia caused by hypobaric conditions.

In transplant populations with reduced respiratory reserve, HFNC has also shown benefit. In a randomized trial in post-lung transplant patients, Ben-Menachem et al. (2020) reported that HFNC nearly halved desaturation events (43% vs 90%) and reduced procedural interruptions compared with COT (29). Collectively, evidence confirms that high-risk populations, including obese, elderly, hypoxemic, and post-transplant patients, experience the greatest clinical advantage from HFNC.

Comparison of HFNC with other methods of oxygenation support

HFNC has become a valuable tool for preventing hypoxemia during invasive procedures under sedation, yet its limitations and comparison with alternative strategies remain relevant. Compared with non-invasive ventilation (NIV), HFNC provides similar oxygenation support in most patients (14). Its main advantages are simplicity, comfort, and patient preference for nasal cannula over pressurized masks (43). However, in severely compromised patients, NIV can offer stronger positive pressure and ventilatory assistance, outperforming HFNC in preventing profound hypoxemia or hypercapnia (44).

Not all studies have reported uniform benefits. In the trial by Sawase et al. (2023) during ERCP under moderate sedation, HFNC was applied with room air only (FiO_2 21%, 40–60 L/min) and compared with low-flow O_2. Under these conditions, HFNC did not significantly reduce hypoxemia or hypercapnia compared with COT (8% vs 5%; p = 0.674) (34). These results suggest that the effectiveness of HFNC depends on the delivered FiO_2 and that benefits are more pronounced when oxygen-enriched flow (40–100% O_2) is used, as is typical in clinical practice.

Regarding safety, most studies have not identified an increased rate of adverse events such as arrhythmias, aspiration, or post-procedural complications (19,29,39,45). Moreover, Lee et al. (2016) reported that HFNC significantly reduced the need to escalate to more invasive support methods, including mask ventilation or NIV, in three of four analyzed trials (46). HFNC is generally safe and well tolerated, with minimal risk of mucosal dryness due to heated and humidified gas. Proper device setup, flow adjustment, and cannula fixation are essential for optimal performance.

Cumulative evidence supports HFNC as an effective standard for sedated endoscopic procedures in patients at increased respiratory risk (20). Its capacity to reduce hypoxemia and emergent airway interventions represents a major advance in procedural safety (30). Consequently, many centers have incorporated HFNC into routine practice, especially for elderly, obese, and pulmonary patients. Future studies should refine application protocols, including optimal flow rates, FiO_2 levels, and duration. Based on current data, HFNC makes a substantial contribution to respiratory safety and deserves wider clinical implementation (20).

Limitations

This systematic review has several methodological limitations. First, the literature search was restricted to three databases (PubMed, Web of Science, and Scopus) and to articles available in English which may

have introduced language and publication bias. Second, most of the included studies were conducted in Asian countries, particularly in China, which may affect the generalizability of the findings due to potential differences in sedation protocols, clinical practice, and population characteristics. Third, heterogeneity across studies, including variable definitions of hypoxemia, different saturation thresholds and inconsistent flow and FiO_2 settings, makes direct comparison of results and meta-analytic conclusions more challenging. Finally, several of the included studies analyzed relatively small patient populations which may limit the statistical power and precision of the estimated effects of HFNC.

Conclusion

The analyzed studies clearly confirm that HFNC is a more effective method than COT for the prevention of hypoxemia during sedated endoscopic procedures. In addition to reducing the risk of desaturation, HFNC provides better oxygenation and decreases the need for additional airway interventions. Optimal flow rates of 50-60 L/min have proven to be the most effective and well tolerated.

From a nursing perspective, understanding the principles, indications, and clinical application of HFNC can significantly improve peri-procedural patient management, particularly in high-risk populations. Integrating HFNC protocols into routine nursing practice enhances respiratory safety, supports timely recognition of hypoxemia, and reduces the need for emergency interventions.

Future research should aim to define standardized protocols for HFNC use, compare different flow and FiO_2 settings, and evaluate long-term outcomes and cost effectiveness across diverse clinical environments. Further interdisciplinary studies are encouraged to assess nursing-led education, monitoring strategies, and the role of nurses in optimizing HFNC implementation and patient outcomes.

Author Contributions

Conceptualization (VJ, JP, MV, TMT, MS); Data Curation (VJ), Formal Analysis (VJ, JP, MS); Writing – Original Draft (VJ), Writing – Review & Editing (VJ, JP, MV, TMT, MS). All authors reviewed and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

Acknowledgments

Funding

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Transition and Challenges of Newly Employed Nurses: A Review

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Abstract

Introduction. The adaptation of newly graduated nurses to clinical practice is a complex process characterized by the so-called transition shock, which occurs when expectations of a new professional role significantly differ from reality.

Aim. This paper aims to identify the main challenges faced by newly employed nurses during the transition to clinical practice and to summarize strategies used to facilitate adaptation.

Methods. This study is based on a narrative review. The available literature was analyzed using a combination of key terms related to topic, without imposing formal restrictions on specific databases. Keywords included: newly employed nurses, transition shock, nurse adaptation, challenges, and strategies. Inclusion criteria: peer-reviewed articles in English addressing experiences, challenges, or strategies of newly employed nurses or nurses in new environments.

Results. Key identified challenges include lack of self-confidence, difficulties in collegial relationships, limited independence, demanding work environments, organizational challenges, and communication with physicians. Mitigation strategies include structured orientation programmes, mentoring, a healthy work environment, regular feedback, and stress management techniques. The literature also emphasizes that transition shock is experienced not only by new nurses but also by experienced staff when they are exposed to new or stressful working conditions.

Conclusion. Lack of self-confidence, difficulties in collegial relationships, limited independence, demanding work environments, organizational challenges, and communication with physicians were key presented challenges. Structured support, mentorship, and feedback are crucial in reducing transition shock, enhancing nurses' confidence, and promoting successful adaptation and retention in clinical practice.

Introduction

Employment after completing formal education presents a challenge for every individual, particularly due to the adaptation process (1–3), which is not linear and requires continuous confrontation with new obstacles (4). For certain professions, such as nursing, this adaptation can be especially demanding. As early as 1974, Marlene Kramer described inadequate adjustment to a new work environment using the term "reality shock" (5). Kramer defines a state that occurs when expectations regarding a new professional role significantly diverge from reality (5). This phenomenon often leads to leaving a workplace or even the profession itself (6), and some studies report that between 30–70% of nurses express an intention to leave the profession within the first few years of practice (7, 8). Stress, interpersonal relationships, a sense of not belonging, and a lack of skills have been identified as key contributing factors (6, 9), while some research points to the increasingly complex nature of the problem (10–12). According to the World Health Organization (13), there is currently a global shortage of approximately 6 million nurses, a number that is projected to rise to 13 million by 2030. In Croatia alone, there is a shortage of around 4,000 nurses (14). In addition to these consequences, reality shock also contributes to a shortened career span of employees (5). Judy Duchscher's model of transition shock outlines that newly employed nurses typically go through three main phases: the honeymoon phase, lasting approximately the first three to four months. It is characterized by enthusiasm and optimism, accompanied by a limited understanding of the actual challenges of the profession. The shock or crisis phase, usually occurring between the fourth and fifth month, is marked by a discrepancy between expectations and reality, often accompanied by stress, professional burnout, and doubts about the decision to pursue the profession. The resolution phase, generally lasting until the twelfth month of employment, during which newly employed nurses develop coping strategies, regain enthusiasm and self-confidence, and begin to progress professionally (4). However, the author also emphasizes that the adaptation process is not linear, and regressions between phases are possible. Stable interpersonal relationships, appropriate work assignments, support from col-leagues and supervisors, as well as opportunities for professional development, increase the likelihood of a healthy transition into clinical practice (4). Although they possess formal competencies, newly employed nurses often feel unprepared for their new role, which can undermine their self-confidence and performance in carrying out professional duties (15). Discrepancies between expectations and the actual level of responsibility contribute to stress, which frequently leads to leaving the workplace or even the profession altogether (15–17). The most common challenges include unrealistic expectations from colleagues, conflicts in professional values, fear of failure, and a lack of support (6). The first few months of employment are typically characterized by a focus on personal learning and performing tasks delegated by others, reliance on theoretical knowledge, and fear of making independent decisions (16, 17). However, after two to three months, nurses generally begin to develop critical thinking skills and the ability to plan care independently, while after five to six months, they are usually able to provide comprehensive, holistic, and individualized nursing care (15, 16).

Appropriate support for nurses during their transition is crucial, especially given the ongoing shortage of nurses in the healthcare system, which increases pressure on new and experienced staff. Clearly, information about challenges and strategies can be helpful to reduce the transition shock, current high turnover rates among nurses, and ensure the long-term sustainability of the healthcare system.

Aim

This paper aims to identify the main challenges faced by newly employed nurses during the transition to clinical practice and to summarize strategies used to facilitate adaptation.

Methods

This manuscript is based on a narrative review of literature addressing the adaptation of newly employed nurses to clinical practice and the phenomenon of *transition shock*.

Relevant sources were identified through a search of available publications in databases. As this study is based on a narrative review, the available literature was analyzed using a combination of key terms related to topic, without imposing formal restrictions on specific databases using keywords such as: *newly employed nurses, transition shock, nurse adaptation, challenges, and strategies.*

Inclusion criteria were: published in peer-reviewed journals, written in English, focused on experiences of newly employed nurses or nurses in new clinical environments, and addressing challenges and strategies related to transition shock. Studies were excluded if they did not meet these criteria or were not accessible in full text. Data from the included studies were analyzed thematically, identifying major themes and patterns related to challenges and strategies in the transition process. Findings were interpreted in the context of relevant literature. Although this is a narrative review, this search strategy, clearly defined inclusion/exclusion criteria, and thematic synthesis aim to enhance the transparency of the review. The selection of sources was guided by their relevance to the topic. Priority was given to studies that discuss the experiences of newly employed nurses or experienced nurses working in new and/or stressful environments, as well as those describing challenges and strategies related to transition shock.

Results

The review reveals that newly employed nurses commonly face several significant challenges, including low self-confidence, difficulties in building collegial relationships, limited professional autonomy, demanding work environments, organizational obsta-

cles, and communication challenges with physicians. Various strategies have been proposed to mitigate these issues, such as structured orientation programs, mentoring, fostering a supportive work environment, providing regular feedback, and implementing stress management interventions. Importantly, transition shock is not limited to newly employed nurses; evidence suggests that even experienced nurses may encounter similar difficulties when exposed to new or particularly stressful working conditions, such as those arising during the COVID-19 pandemic. Identified challenges and strategies are summarized in Table 1.

Table 1. **Challenges and Strategies**	
Challenges	**Strategies**
Lack of self-confidence	Structured orientation programs
Relationships with colleagues	Mentorship
Independence	Healthy work environment
Work environment	feedback
Organization and prioritization skills	Stress management
Communication with physicians	
Transition shock in new work conditions	

Discussion

The aim of this paper was to identify the main challenges faced by newly employed nurses during the transition to clinical practice and to summarize strategies used to facilitate adaptation. Many challenges have been found in the literature that accompany this period, such as: lack of self-confidence, independence, and relationships with team members. In addition, the literature cites difficulties experienced nurses face when changing jobs. Structured orientation, mentorship, healthy work environments, feedback, and stress management consistently improve adaptation outcomes and reduce transition shock.

Challenges in the transition period

The adaptation period for newly employed nurses typically lasts around 12 months, with the signs and effects of adjustment generally diminishing after approximately six months (15, 16). Nevertheless, even within this relatively short period, the rate of attrition from the profession can be significant (7, 8). Researchers have sought to categorize the factors that hinder this transition to develop effective solutions. One of the key contributions to understanding this phenomenon was provided by the research of Casey et al., who, using open-ended questions, identified six major challenges (18). These findings, including lack of self-confidence, difficulties in relationships with colleagues, limited independence, and challenges associated with the work environment, are not unique to a single region but have also been corroborated by studies conducted in Croatia (3, 6, 9). The consistency of these findings, regardless of geographical location, highlights the universal nature of transitional shock and underscores the need for global solutions.

Lack of Self-Confidence

Professional self-confidence is a key attribute for newly employed nurses (19). While formal education provides only the foundation, the workplace environment often demands a high level of independence and competence. Newly employed nurses frequently experience a perceived gap between theoretical knowledge and clinical practice, which further contributes to diminished self-confidence (20, 21). Ortiz identified seven factors that influence self-confidence: effective communication, making mistakes, the theory–practice gap, independence, interpersonal relationships, positive feedback, and experience (20). Negative events, such as errors in patient care and treatment, can significantly undermine self-confidence and lead to stress and anxiety (20). Conversely, positive feedback and experience substantially enhance professional self-confidence, increasing motivation and commitment to the profession (20).

Relationships with Colleagues

A sense of belonging within the workplace and the healthcare team has a positive impact on feelings of safety, self-confidence, and overall effectiveness (22). Nurses who develop supportive and collegial relationships at work tend to acquire new professional knowledge more quickly and feel emotionally supported, whereas poor relationships increase stress and anxiety and hinder the transition into the profession (23–25). On the other hand, positive relationships with colleagues and physicians can mitigate the negative effects of transition shock and strengthen the self-confidence of newly employed nurses (6, 20).

Independence

The transition from education to an autonomous professional role requires and entails assuming responsibility and making independent decisions. Conversely, a lack of independence in the early stages of employment can lead to feelings of being overwhelmed and increased anxiety, whereas achieving autonomy fosters professional satisfaction and strengthens self-confidence (18) which is a key attribute for newly employed nurses (19).

Work Environment

The adaptation of newly employed nurses is influenced by both the physical and organizational work environment, which includes factors such as shift length (8-12 hours, day/night), nurse-to-patient ratios, and the availability of equipment and medications (18). Twelve-hour shifts contribute to increased fatigue, while chronic understaffing intensifies workload and stress. Furthermore, extended shifts can contribute to work-family conflict, which affects social relationships and overall quality of life (26). Employees also report feelings of fatigue and cognitive impairment, which can exacerbate mental health problems (27). Positive work environments that encourage autonomy and collaboration are associated with greater job satisfaction, while negative experiences can lead to burnout and exhaustion (28).

Organization and Prioritization Skills

Newly employed nurses initially experience difficulties in establishing work routines and setting priorities, which significantly prolongs the time required to complete tasks and generates stress. Newly graduated nurses struggle with prioritization due to limited clinical experience, which is critical for effective decision-making in fast-paced environments (29). In this

sense, the mentoring process is of great importance, as mentors, through their knowledge and experience, can facilitate the understanding of work organization and assist in setting appropriate priorities (30). After 8-12 months, their organizational skills improve considerably (18).

Communication with Physicians

Effective communication with physicians is crucial for patient safety and the professional development of nurses. During the first six months, newly employed nurses are often uncertain about how to communicate appropriately with physicians or which physician to contact in specific situations. Over time, these barriers are gradually overcome (18). Newly employed nurses often face challenges such as difficulty asserting themselves, lack of clarity in communication, and feelings of undervaluation compared to physicians, which can lead to unresolved disagreements and hinder effective collaboration in patient care (31).

Strategies for mitigating challenges

Challenges to the adaptation of newly employed nurses induce stress, feelings of being overwhelmed, and reduced professional self-confidence, which in turn increase the intention to leave the profession. Research has identified potential strategies to mitigate these barriers, including enhanced communication with mentors, structured orientation programs, emotional support, timely feedback, stress management, and continuing education (32).

Structured Orientation Programs

Orientation programs begin with an introduction to the new role, followed by familiarization with the institution's mission, values, and organizational culture, which helps newcomers align with workplace goals (32). These programs refresh essential nursing skills (patient assessment, medication administration, wound care, infection control) and include workshops on interpersonal collaboration. They also define team members' roles and responsibilities, promote a multidisciplinary approach, and empower newly employed nurses to integrate effectively into the team (32). Orientation programs that focus on socializing new employees into the organizational culture can lead to higher levels of engagement (33).

Mentorship

Mentorship programs reduce the intention to leave the profession and increase job satisfaction (30, 34). Mentors assist in applying theoretical knowledge, alleviating stress, and building self-confidence. Programs are typically conducted on a one-to-one basis and include observation, skill demonstration, discussion, reflection, and the development of interpersonal skills (30). Evaluations indicate reduced turnover intentions, improved nursing competencies, skill enhancement, and higher job satisfaction (30). By providing support and guidance, mentoring increases job satisfaction and helps new nurses feel more integrated and valued within their organizations, making it an effective strategy for retaining nursing staff (35). Effective mentoring provides essential support, guidance and opportunities for continuous professional development (36).

Healthy Work Environment

A healthy work environment supports both nurses and patients. A healthy environment reduces nurse burnout, which in turn positively impacts patient care and outcomes (37). Standards include effective professional communication, genuine collaboration, sound decision-making, adequate nurse staffing, mutual respect, and strong leadership. Strong leadership, characterized by transparency, integrity, empathy, and adaptability, has a positive influence on interpersonal relationships and workplace policies (38). Newly employed nurses in supportive work environments learn more quickly and bridge the theory–practice gap more effectively. A systematic review showed that a good work environment leads to fewer patient complications and improved quality of care (37). Therefore, a positive and supportive work environment in healthcare has been shown to contribute to safer practices and enhanced quality of patient care.

Feedback

Constructive and timely feedback is essential for newly qualified nurses as it significantly increases their confidence, motivation, and professional satisfaction. Effective feedback fosters a supportive learning environment, enabling nurses to self-assess their skills and identify areas for improvement, which is essential for their professional growth (39). A lack of feedback can reduce self-confidence and prolong the

adaptation period. Reasons for absent feedback often include insufficient mentor competence, an unsupportive work environment, or a lack of time. In such circumstances, seeking feedback from other colleagues or changing mentors is recommended (38). Although the importance of feedback is well-recognized, its practical implementation often falls short of the ideal. This deficiency can be ascribed to a combination of organizational and individual factors, such as limited mentor competence, insufficient support within the workplace, and time-related constraints.

Stress Management

Stress is inevitable, therefore, it is essential to develop coping strategies. Mechanisms include controlling and preventing stressful situations, seeking help and support, regulating personal reactions, avoiding specific situations, and relying on faith or relaxation techniques (40). Controlling situations involves heightened attention, supervision, double-checking, and consultation with more experienced colleagues. Psychological support and self-directed strategies (exercise, recreation, positive thinking) are crucial for reducing the negative impact of stress and facilitating the transition (41).

Transition shock in new work conditions

Previous research has predominantly studied the occurrence of transition shock in newly employed nurses moving from the role of student or trainee to that of a professional worker. The main contributing factor is novelty, which includes a new work environment, colleagues, and job tasks. However, novelty can also trigger transition shock in experienced nurses (9). A 2023 study conducted during the COVID-19 pandemic (9) demonstrated that transferring nurses to COVID-19 wards induced transition shock even in those with prior professional experience. The results indicated that, regardless of gender, marital status, education, or length of work experience, personal and professional stressors were positively correlated with the level of transition shock. Age and gender were associated with a greater perception of transition shock and a higher intention among nurses to leave the profession (9). These findings suggest that transition shock is not limited to the transition from education to professional practice but can also occur in the context of workplace changes within the same profession, highlighting the need for further research on its prevalence.

Finally, the intensity and nature of transition shock vary according to workplace conditions, support systems, and individual nurse characteristics. The findings underscore that interventions should address both individual and organizational factors to mitigate stress and improve adaptation. Surely, the effectiveness of mentioned strategies depends on institutional context, availability of resources, and quality of implementation. Tailored interventions appear most effective, highlighting the need for flexible and context-sensitive approaches in practice.

Despite presenting important information, this traditional narrative review did not include a systematic literature review, which could have influenced the author's subjectivity in the selection of literature. Therefore, in future research, it is planned to apply a systematic review of the literature as well as a combination of qualitative and quantitative approaches, which would ensure a deeper insight into the present circumstances.

Conclusion

Newly employed nurses face multiple challenges during the transition to professional practice, including low self-confidence, difficulties in workplace relationships, limited autonomy, and organizational obstacles. Strategies such as structured orientation programs, mentorship, supportive work environments, timely feedback, and stress management consistently facilitate adaptation. Transition shock can affect both new and experienced nurses, particularly in novel or high-stress conditions. Tailored interventions addressing both organizational and individual factors are critical for improving nurse adaptation, satisfaction, and retention.

Author contributions

Conflict of interest

Acknowledgments

Funding

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Dementia: Challenges of Care, Stress, and Psychological Impact on Nurses and Informal Caregivers – A Review Article

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Abstract

Introduction. Dementia is a chronic and progressive syndrome in which cognitive function (i.e., the ability to process thoughts) deteriorates beyond what is expected from normal aging. There are several types of dementia, most of which are progressive neuro-degenerative disorders that significantly affect the quality of life of individuals living with the condition, as well as their families and caregivers.

Aim. This review article analyzes recent scientific literature with a particular focus on the challenges of long-term care and the stress experienced by caregivers including nurses. It explores the psychological, physical, and social aspects of caregiving, as well as potential interventions aimed at reducing caregiver burden. The article highlights the need for an integrated approach that includes education, support, and institutional change.

Methods. A literature review was conducted using PubMed, Scopus, and Web of Science and includes studies published between 2015 and 2025. The review included systematic reviews and quantitative and qualitative studies investigating the effects of dementia care on caregivers, particularly nurses. The analysis addressed psychological, social, physical, and organizational aspects of caregiving, as well as the effectiveness of interventions such as mindfulness training, educational programs, and professional supervision.

Results. Dementia caregiving is linked to high levels of stress, depression, anxiety, and emotional exhaustion. Prolonged exposure to stress and insufficient support increase burnout risk, while organizational support, ongoing education, and psychological interventions serve as protective factors. Mindfulness and cognitive-behavioral approaches significantly reduce stress and burnout, and supervision and peer support enhance job satisfaction.

Conclusion. Integrating psychological support and educational programs into nursing practice is essential for maintaining caregivers' mental health and care quality. Regular stress monitoring and preventive measures—such as mindfulness, supervision, and dementia-specific education—help prevent burnout and strengthen professional resilience among nurses.

Introduction

Dementia represents one of the greatest public health challenges of the 21st century. According to the World Health Organization, more than 55 million people worldwide are living with dementia, and this number continues to grow (1).

Dementias are neurodegenerative disorders characterized by progressive cognitive decline that interferes with daily functioning. The prevalence of dementia increases with age, and the most common type is Alzheimer's disease.

As the disease progresses, the need for continuous care becomes more pronounced, placing the burden of care on family members or professional caregivers such as nurses. Because the disease significantly impairs patients' functional abilities, the vast majority of individuals with dementia depend on daily assistance from both formal and informal caregivers—most often family members. This raises concerns about the long-term impact of caregiving on the mental and physical health of caregivers.

The most common types of dementia are Alzheimer's disease (accounting for 60–70% of cases), followed by vascular dementia, which is associated with cerebrovascular damage. Early symptoms include forgetfulness, speech and orientation difficulties, and changes in personality and behavior. As the disease advances, more intensive care and supervision are required.

Other forms include Lewy body dementia, characterized by visual hallucinations and fluctuations in alertness, and frontotemporal dementia, which typically occurs at a younger age and is marked by behavioral and speech changes (1,2,3).

Neuropsychiatric Symptoms and the Global Impact of Dementia

The occurrence of psychiatric symptoms in individuals with Alzheimer's disease and other forms of dementia presents one of the major challenges in their care. Conditions such as depression, psychotic episodes, or delirium occurring alongside pre-existing dementia can significantly impair cognitive abilities, accelerate cognitive decline, and negatively affect daily functioning and the level of independence in patients (4).

Epidemiological Trends, Gender Differences, and Risk Factors in Dementia

Furthermore, the study by Beam and colleagues (2018) highlights significant differences in the incidence of dementia and Alzheimer's disease between men and women. Findings show that women, especially in older age groups, are more susceptible to developing Alzheimer's disease. These differences cannot be fully explained by women's longer life expectancy, but rather point to possible biological and sociocultural factors. The study underscores the importance of developing gender-sensitive preventive and therapeutic strategies in dementia care (5).

Approximately 55 million people worldwide are currently living with dementia, with over 60% residing in low- and middle-income countries. Moreover, it is projected that the number of people diagnosed with dementia will reach 78 million by 2030, and 139 million by 2050, as the proportion of older individuals increases in nearly every country (6). Women exhibit a higher prevalence of dementia, primarily due to their longer average life expectancy (7). In Croatia, it is estimated that over 100,000 individuals are living with some form of dementia (8).

Risk factors include age and genetics (e.g., the presence of the APOE ε4 allele), as well as hypertension, diabetes, depression, low educational attainment, social isolation, and physical inactivity (9,10).

The diagnostic process involves clinical evaluation (e.g., MMSE, MoCA, ADAS-Cog), laboratory testing, neuroimaging (MRI, CT, PET), and increasingly the use of biomarkers such as CSF tau and beta-amyloid (11).

The Impact of Dementia on Female Caregivers: Professional and Informal Roles

The impact of dementia has been analyzed in relation to women who provide professional care—such as nurses—as well as those who assume the role of informal caregivers within the family setting. Dementia is known to disproportionately affect women worldwide. In many societies, there is a prevailing expectation that care for older family members, including those with dementia, should occur within the family unit. This responsibility is often automatically assigned to women, leading to additional physical, emotional, and social burdens.

This issue is particularly challenging in low-income countries, where the availability of community-based support services is critical—especially for women with limited access to education or low levels of formal schooling (12). Women constitute the majority of informal dementia caregivers—approximately two-thirds—with even higher proportions in low- and middle-income countries. As a result, the burden of caregiving, including health, emotional, and financial consequences, is especially pronounced for women in these regions.

Furthermore, women dominate the formal care sector, providing most of the health and social care services in community settings, hospitals, and long-term care facilities (12). Specialized competencies are required among healthcare and caregiving professionals to adequately care for people with dementia, who often present with complex needs and multiple comorbidities (12).

Caring for a person with Alzheimer's disease (AD) is associated with significant mental health challenges, such as depression, anxiety, and difficulties in social, family, and occupational functioning (13).

The concept of "caregiver burden," introduced in the 1980s, refers to the emotional, financial, social, and physical strain experienced by individuals caring for someone with a chronic illness. The intensity of caregiving is directly linked to the magnitude of its health impacts. Feelings of anxiety and depression can negatively affect the physical health of caregivers. Elevated rates of depression and stress, along with decreased subjective well-being, are associated with the care recipient's behavioral disturbances, cognitive impairments, and functional limitations, as well as the duration of caregiving and the age of the caregiver (13).

Aim

The aim of this review is to present and analyze current knowledge on psychological burden and stress among formal and informal caregivers of individuals with dementia, with particular emphasis on nurses, and to identify effective interventions that contribute to reducing caregiver burden and preventing burnout.

Methods

A narrative literature review was conducted by searching the PubMed, Scopus, and Web of Science databases. The review included studies published between 2015 and 2025, a time frame selected to capture the most recent scientific evidence on caregiver burden and to reflect contemporary clinical practices and recent developments in psychological and educational interventions in dementia care. This period also aligns with a significant rise in global dementia prevalence, prompting an increase in caregiver-focused research.

The search strategy used a combination of controlled vocabulary (e.g., MeSH terms) and free-text keywords. The following keywords and their combinations were used: *dementia, Alzheimer's disease, caregiving, caregiver burden, informal caregivers, nurses, stress, burnout, psychological health, psychological outcomes, quality of life, mental health, mindfulness, cognitive-behavioral interventions, education programs, psychological support, organizational support, long-term care, caregiver interventions.*

The included studies examined stress, burnout, quality of life, psychological and physical outcomes among caregivers, as well as the effects of educational programs, psychological support, mindfulness-based interventions, and organizational measures.

Results

A total of 48 articles were identified through the literature search, and all of them met the predefined inclusion criteria, as the search strategy was focused on the most recent evidence (2015–2025) and on clearly specified keywords related to dementia caregiving, caregiver burden, stress, burnout, and interventions.

The Role, Burden, and Health Consequences of Dementia Caregiving

Providing long-term care for individuals with Alzheimer's disease is largely the responsibility of both formal and informal caregivers. Care is a dynamic process between the caregiver and the patient. Informal care is rooted in family structures (e.g., family members, friends, neighbors), whereas formal care refers to services delivered by professional caregivers employed within public or private care systems (13).

A study examining 100 caregivers—50 formal and 50 informal—of patients with Alzheimer's disease used several tools to assess personal resources and mental health: the Social Support Questionnaire (SSQ), the General Self-Efficacy Scale (GSES), the Sense of Coherence Questionnaire (SCQ), the Depression Assessment Questionnaire (DAQ), and the General Health Questionnaire (GHQ).

The results indicated no significant differences between formal and informal caregivers in terms of psychological variables such as sense of coherence, social support, self-efficacy, or mental health problems. However, distinct predictors of mental health problems were identified in each group (13).

There is a notable increase in stress, depression, and fatigue, often manifesting as a sense of helplessness. Higher levels of depressive symptoms and stress caused by patients' challenging behaviors have been shown to predict the onset of cardiovascular diseases in caregivers within 18 months of starting caregiving. The duration of caregiving has also been linked to immune system dysregulation, which may persist for up to four years after the death of the care recipient. Caregivers are more likely to develop respiratory infections, suffer from obesity, and exhibit elevated serum lipid levels, contributing to increased cardiovascular risk (13).

The financial implications of caregiving are substantial. In a systematic review, authors found that most caregivers experienced increased care-related expenses, while family income decreased due to time and resources devoted to caregiving. Due to the progressive nature of dementia, resource use and family expenses increase over time, a trend observed even in both high- and lower-middle-income Asian countries.

Caregivers were found to utilize more healthcare resources, regardless of financial capacity, as reflected in frequent emergency room visits and use of other medical services (14).

Compared to caregivers of individuals with other chronic conditions, those caring for people with dementia are more likely to experience depression, elevated stress, and poorer overall health (15). Both formal caregivers, such as nurses, and informal caregivers often feel unprepared and insufficiently trained to provide dementia care. Due to unpredictable symptoms such as aggression or wandering, along with persistent stress and high care demands, caregivers are vulnerable to psychological difficulties, including depression, anxiety, insomnia, irritability, exhaustion, loneliness, guilt, helplessness, and chronic stress (16).

A clinical cross-sectional study conducted in Zagreb demonstrated that neuropsychiatric symptoms measured by the NPI-Q were significantly associated with poorer quality of life and higher caregiver burden according to the ZBI scale (17). The validation of the Croatian version of the ZBI confirmed key burden dimensions, including emotional strain, frustration, guilt, and social limitations among dementia caregivers (18). A symptom-specific analysis in the same cohort found that agitation/aggression and apathy/inactivity were the strongest predictors of increased caregiver burden (18). A systematic review of longitudinal studies showed that caregiver burden progressively increases as neuropsychiatric symptoms worsen and activities of daily living decline (19). A meta-analysis of 39 randomized controlled trials revealed that individual therapy and nurse-delivered workshops significantly reduced caregiver burden, with an effect size of approximately 0.48 (20). A review of psychoeducational interventions concluded that programs combining education, psychological support, and social resources are the most effective in reducing caregiver burden (21). A study examining the use of wearable devices and AI-based predictive analytics demonstrated that early detection of BPSD is feasible, enabling timelier intervention (22). A randomized controlled trial of an eight-week mindfulness-based health care (MBHC) program showed significant reductions in caregiver burden (ZBI) and improvements in activity balance (23). Research on organizational support for nurses found that structured supervision combined with education significantly reduced burnout and improved job satisfaction (23). Table 1 summarizes the studies outlined above, focusing on caregiver burden and evidence-based interventions designed to reduce stress and burnout among formal and informal caregivers, including nursing professionals.

No.	Study & Sample	Intervention/Focus	Key Findings	Author
	Table 1. Key studies from 2015-2025 on caregiver burden and interventions to reduce caregiver stress, including among nurses			
1	Clinical cross-sectional study, 131 patients in Zagreb	Burden measurement (ZBI), neuropsychiatric symptoms	NPIQ associated with poorer SF-36; higher burden predicted worse physical/mental health	Lucijanić et al., 2021 (17)
2	Validation of ZBI (NeDEM project), Croatian caregivers	Instrument validation	Confirmed burden dimensions: burden, frustration, guilt, social limitations	Lucijanić et al., 2020 (18)
4	Systematic review	Caregiver burden over time in dementia and its risk factors	Increasing caregiver burden	Van den Kieboom R, Snaphaan L, Mark R, Bongers I, et al (19)
5	Meta-analysis of 39 RCTs, n = 4,715	Individual therapy & nurse workshops	Reduced burden (~0.48 effect size)	Rodríguez-Alcázar, et al., 2024 (20)
6	Review of psychoeducational interventions	Education + psychological + social support	Most effective when combined	Walter & Pinquart, 2020 (21)
7	Wearables + AI to predict BPSD	Predictive analytics	Earlier intervention possible	Hsu et al., 2024 (22)
8	RCT, 66 informal caregivers, 8-week MBHC	Mindfulness program	Reduced ZBI (β = -7, p = 0.026), improved activity balance	Prieto-Botella et al., 2025 (23)

Discussion

Depression among caregivers, including nurses

Depression (melancholia) is an emotional response to chronic frustration and disappointment. In psychopathology, it is classified as an affective and emotional disorder (24). Depression is a common and serious health condition that differs from usual mood fluctuations and short-term emotional reactions to everyday challenges. It can cause significant suffering and impair functioning at work, in school, and within the family. According to the World Health Organization, approximately 332 million people globally suffer from depressive disorder, making it one of the leading causes of disability (25). The prevalence of depression among dementia caregivers is even higher than in the general population. As dementia patients experience cognitive decline and loss of ability to perform daily activities (such as bathing, eating, etc.), the quality of caregiving is crucial. Caregivers often spend several hours per day with the patient—or

live in the same household. Numerous studies have shown that behavioral and psychological symptoms of dementia (BPSD) affect caregiver performance and, in turn, negatively impact their own physical and mental health (26).

Depression can lead to various psychological and physical health problems, including increased risk of suicide among caregivers. It undermines caregivers' physical well-being, reduces their quality of life, and has been shown to be associated with earlier institutionalization of dementia patients. Caregiver depression may also negatively influence the cognitive status of the person with dementia and has been linked to faster cognitive decline in patients (26).

Mild forms of depressive mood are often difficult to distinguish from normal experiences of disappointment or grief. However, depression is a common, recurrent, and debilitating condition that may lead to suicidal behavior, interpersonal conflict, unemployment, and psychosocial dysfunction.

Demographic characteristics of caregivers (such as age, gender, employment status, and relationship to the patient) are known to influence the stress pro-

cess at multiple levels—shaping the types of stress, the perception of stressors, and outcomes such as caregiver burden and depression (26). On the other hand, caregivers who report a sense of purpose, stronger emotional closeness to the patient, and higher caregiving competence are more likely to derive positive meaning from the caregiving experience and experience fewer negative outcomes in such a challenging context (27).

Burnout among caregivers and nurses caring for individuals with dementia

Burnout among caregivers and nurses who care for individuals with dementia represents a significant public health concern. This syndrome is most commonly manifested through emotional exhaustion, depersonalization, and a reduced sense of professional accomplishment.

Multiple studies confirm that emotional stress, challenging patient behaviors, lack of organizational support, and insufficient dementia-related education are key contributing factors to burnout. A meta-analysis by Aguayo et al. (2018), which included 17 studies, found that caregivers in nursing homes—particularly those caring for individuals with dementia—demonstrate moderate to high levels of emotional exhaustion, most often associated with aggressive patient behaviors and staff shortages (27).

A study involving 436 nurses and caregivers from nursing homes in Croatia and Slovenia found that nearly half of the participants exhibited high levels of professional burnout. Although demographic variables such as age, years of experience, and educational background were examined, none were statistically significant predictors of burnout levels. The results suggest that nurses and caregivers in both countries are exposed to similar o ccupational stressors, which increase the risk of emotional exhaustion and depersonalization. The authors emphasize the need for systematic psychological support and preventive interventions within institutional care settings (28).

Uzun et al. (2019) point out that formal caregivers, especially nurses caring for individuals with Alzheimer's disease, often experience significant emotional stress, including anxiety, depression, and insomnia. They highlight the importance of early recognition of stress symptoms and the implementation of psychological support and education to prevent the deterioration of both mental and physical health in caregivers (29).

Kozumplik et al. (2019) warn that psychotic symptoms—such as delusions in individuals with dementia—further increase the emotional and cognitive burden on formal caregivers and nurses. They propose the implementation of educational programs and clear protocols for the identification and management of these symptoms, in order to reduce the workload and psychological distress of caregiving staff (30).

The COVID-19 pandemic further exacerbated the situation. A meta-analysis by Ghasemi Kooktapeh et al. (2023) revealed a notable increase in emotional exhaustion among nurses caring for dementia patients during the pandemic, with burnout prevalence reaching nearly 3% (31).

Regarding informal caregivers (i.e., family members), a study by Brownie et al. (2014) found that burnout among family caregivers correlated with higher levels of depression and lower quality of life (32).

A combination of support and interventions to maintain caregiver well-being

Organizational Support and Interventions for Preventing Burnout Among Dementia Care Professionals

Organizational support reduces the risk of burnout among dementia care professionals. A study by Maslach and Leiter (2016) highlights that a lack of organizational support—such as poor communication with management, imbalance between effort and reward, and unclear expectations—directly increases the risk of emotional exhaustion and depersonalization among healthcare workers. The authors conclude that a structured and consistent organizational support system acts as a protective factor against burnout syndrome (33).

Supervision and peer support are key to preserving professionals' mental health. A study by Edwards et al. (2006) showed that regular supervision and peer support groups enable aged care professionals to express emotional challenges, share experiences, and find collective solutions. Such structured support systems are associated with lower stress levels and higher job satisfaction, ultimately reducing the risk of burnout (34).

There is a clear association between the lack of organizational support and an increased risk of emotional exhaustion, as highlighted in the study by Maslach and Leiter, which established that a dysfunctional work environment significantly contributes to the development of burnout among healthcare professionals (33).

Conclusion

Burnout among caregivers and nurses working with people affected by dementia is a complex psychosocial phenomenon requiring a systematic, multifaceted response. Studies indicate that the combination of organizational support, continuous education, structured psychological interventions, and supervision represents the most effective approach for preventing and alleviating burnout. Implementing such measures benefits not only the mental health of professionals but also the quality of care they provide.

Author contributions

Conceptualization (TL, MH); Data Curation (TL, MH), Formal Analysis (TL, MH); Investigation and Project Administration (TL, MH); Writing – Original Draft (SU), Writing – Review & Editing (SU). All authors reviewed and approved the final version of the manuscript.

Conflict of interest

The authors declare no conflicts of interest.

Acknowledgments

Funding

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Young Children with Cancer Also Need Spiritual Care

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Spiritual care is a collaborative process aimed at strengthening spirituality in a person by utilizing all available spiritual resources, including religious texts, chaplains, spiritual leaders, and communities, to help individuals become closer to their Creator and to create a positive relationship with Him (1). Spiritual care is an essential element of caring for children with cancer. In many cultures around the world, children with cancer have distinct spiritual needs. At the end of life, spiritual care becomes especially crucial for children with cancer, as it supports their religious beliefs and helps them find meaning, purpose, solace, and hope (2). In this article, we present spiritual care for young children with cancer in order to draw attention to the fact that young children also have spiritual needs.

There are scarce self-reported studies on the spiritual needs and care of young children with cancer in the literature. Juškauskienė et al. (3) reported that children with cancer between the ages of 5 and 12 have a unique understanding of spirituality depending on their age, gender, and family structure. Children appeared to have their own views on whether to pray; their needs revolved around health and healing from their illness (3). Children emphasized the importance of spiritual aspects to their sense of well-being, even more than they had previously experienced in their lives. Younger children (5-8 years) scored higher than older children (9-12 years) across all three domains (personal, communal, and environmental) and in the overall life dimension. Church attendance has been shown to have a significant impact on children's spiritual well-being (4). Another study found that children (7-11 years) with a history of cancer scored higher on the religious well-being subscale compared to their healthy peers. Among childhood cancer survivors,

higher scores on the religious well-being subscale predicted lower anxiety and depression subscale scores (5). At the age of four, children can distinguish between identical and different objects and ask many questions to understand what they do not yet know. The needs or concerns of 5-year-old children with life-limiting and life-threatening conditions, including cancer, have been identified in the spiritual domain of care (6).

Spirituality is a fundamental aspect of children's psychological well-being. Acknowledgment of their spiritual needs helps young children with cancer cope with their illness. Pediatric cancer centers should include chaplains to address the spiritual needs of young children with cancer and help alleviate their concerns, as the chaplains' observations on beliefs, experiences, and emotional/spiritual states of patients and their families can inform the interdisciplinary care of the patient (7). Today, healthcare facilities in most European countries employ professional chaplains who specialize in providing spiritual care to their patients as part of their interdisciplinary teams (8). In Croatia, palliative care, including spiritual care, is established for adult patients, but spiritual care is not available for children (9). However, 188 (84%) of 224 children's hospitals in the United States provide spiritual and/or pastoral care (1). In many cultures around the world, especially in the United States, it is important to introduce and teach young children about Allah because a person who knows and loves Almighty Allah is subject to infinite happiness, blessings, lights, and mysteries, either potentially or actually. The one who does not truly know and love Him is afflicted to infinite miseries, pains, and fears, both spiritually and materially (10). We suggest that the book, "The Short Words" (11) including short stories, may be useful for this purpose.

In conclusion, the limited available studies have shown that young children with cancer, like adolescents and adults, need spiritual care because they have distinct spiritual needs or concerns. We suggest that observational and qualitative studies, especially those involving young children with cancer between the ages of 4 and 8, should be conducted in order to support the families' individual spiritual needs and preferences in societies with different sociocultural and religious backgrounds. These studies will help fill the gap in the literature and provide guidance to both health professionals and spiritual caregivers. Finally, we think that pediatric spiritual care unites should be established in Croatia, following the model implemented in the United States.

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Acknowledgments

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