

PATIENT AND FAMILY EDUCATION IN NEUROREHABILITATION

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I. INTRODUCTION

Stroke is the leading cause of acquired disability in adults and one of the most common conditions encountered in neurological rehabilitation services, alongside traumatic brain injury, multiple sclerosis, Parkinson's disease, and spinal cord injury [4,5]. Stroke survivors often face motor, cognitive, communication, and emotional deficits that impair their ability to perform activities of daily living and necessitate significant adaptation by the entire family. In this context, the structured delivery of information and the development of practical skills become essential components of care, with the nurse playing a central role in their provision [6].

Patient and family education goes beyond the mere communication of medical data; it entails a complex pedagogical process tailored to the recipients' cognitive level, emotional state, and health literacy. International literature has shown that structured, patient- and family-centered education programs can improve adherence to rehabilitation regimens, reduce readmission rates, and increase satisfaction among care recipients [7,8]. However, implementing these principles faces numerous obstacles, such as limited staff time, the cognitive impairments associated with neurological conditions, and the low health literacy of family caregivers [9].

Neurological rehabilitation represents one of the most complex and prolonged components of contemporary medical care, as it aims to restore functions lost following a nervous system injury and to reintegrate the affected individual into family, social, and professional life. Unlike acute care, where the focus is on stabilizing vital functions, the neurorehabilitation process unfolds over months or years and depends fundamentally on the active participation of the patient and their family [1,2]. Over the last decade, international research has increasingly focused on the role of therapeutic education as a tool for enhancing autonomy, preventing complications, and improving the quality of life for individuals with neurological disabilities [3].

Keywords: Neurological disorders, neurological rehabilitation, therapeutic education.

The global burden of neurological disorders has steadily increased in recent decades, with stroke, dementia, epilepsy, and migraine ranking among the leading causes of disability-adjusted life years worldwide. Demographic projections—driven by an aging population and the rising prevalence of cardiovascular and metabolic risk factors—anticipate a growing demand for neurological rehabilitation services in the coming decades [4,10]. Given these pressures, empowering patients and their families to self-manage care at home becomes not only a clinical imperative but also a strategy to optimize healthcare systems facing resource constraints.

A key concept underpinning therapeutic education in neurorehabilitation is health literacy, defined as the set of cognitive and social skills that determine an individual's ability to access, understand, and use information to maintain and promote health. Low health literacy—frequently observed in elderly patients and those with cognitive impairments—is associated with poor treatment adherence, inappropriate use of medical services, and inferior functional outcomes [9, 11]. Consequently, tailoring educational messages to the health literacy levels of the patient and their family is essential for the effectiveness of educational interventions within rehabilitation services.

In the Romanian context, patient and family education within neurological rehabilitation services often remains informal, unsystematized, and insufficiently adapted to the specific needs of this population. Most domestic contributions have focused on the clinical and functional aspects of rehabilitation, while the educational dimension and the role of therapeutic communication have rarely been evaluated through primary research [12]. Local data regarding current educational practices, staff communication skills, encountered barriers, and their impact on rehabilitation outcomes are limited, thereby justifying the need for a dedicated study.

II. PURPOSE / OBJECTIVES

The purpose of this study is to evaluate current patient and family education practices within a neurological rehabilitation unit by quantifying an educational practice score and analyzing its relationship with staff members' self-assessed communication skills, perceived barriers, and

professional experience. The general objectives aim to map educational practices, identify associated factors, and formulate evidence-based recommendations for structuring patient- and family-centered education programs[13].

Objectives:

To achieve the proposed goal, the following objectives were established:

- Mapping current patient and family education practices in neurological rehabilitation by quantifying an educational practices score and describing its distribution within the study population.
- Assessing the self-rated communication skills of medical and rehabilitation staff involved in patient and family education.
- Describing perceived barriers to delivering effective education by quantifying an educational barriers score.
- Analyzing the relationship between the educational practices score and staff self-rated communication skills, and assessing the statistical significance of this association.
- Analyzing the relationship between the educational practices score, the educational barriers score, and professional experience in the field of neurological rehabilitation.
- Estimating the predictive contribution of communication skills, perceived barriers, and professional experience to educational practices by constructing a multiple linear regression model.
- Describing the characteristics of the included patients, including the degree of disability (assessed via the Modified Rankin Scale), their level of knowledge regarding their condition, and their satisfaction with the education received.
- Formulating practical recommendations for structuring patient- and family-centered education programs and integrating them into the organizational culture of neurological rehabilitation services.

II. MATERIALS AND METHODS

The specialized section of the study was designed as an observational study aimed at evaluating the score of educational practices in neurological rehabilitation and the associated factors within the context of the topic under analysis. The research relied on a structured database comprising 155 records—each corresponding to a subject or case included in the study—with the data subsequently coded and statistically analyzed.

3.1. Data collection

The study population consisted of medical and rehabilitation staff working in a neurological rehabilitation unit—including nurses, physical therapists, and physicians—as well as data regarding patients with neurological conditions and their families. Inclusion criteria for staff required a minimum of six months of experience

in neurological rehabilitation and informed consent to participate in the study; exclusion criteria applied to individuals with exclusively administrative roles and those on extended leave during the data collection period. The total sample comprised 155 subjects and cases; the staff component—relevant to the analysis of educational practices—included 85 respondents, a sample size sufficient to ensure the feasibility of the proposed descriptive and inferential analyses.

The study was conducted on a cohort of 155 subjects/cases, selected in accordance with the inclusion and exclusion criteria specified in the research protocol. Data collection was carried out using standardized instruments and structured data collection forms, with all data entered into an electronic database in a tabular format.

The following instruments and measurement scales were used to evaluate the variables of interest:

Validated questionnaire

- Self-report scale
- Barriers scale
- mRS (van Swieten 1988)
- Satisfaction scale

The research adhered to the ethical principles of the Declaration of Helsinki; participation was voluntary and anonymous, with data confidentiality ensured in accordance with the General Data Protection Regulation (GDPR). The study was conducted with the approval of the institution where data collection took place.

3.2. Data processing

The collected data were aggregated and statistically processed using a specialized statistical analysis environment (Python 3.11—pandas, SciPy, and statsmodels libraries; methodologically equivalent to the IBM SPSS Statistics and R packages). For continuous variables, the mean, standard deviation, median, quartiles, and range were calculated, while absolute and relative (percentage) frequencies were determined for categorical variables.

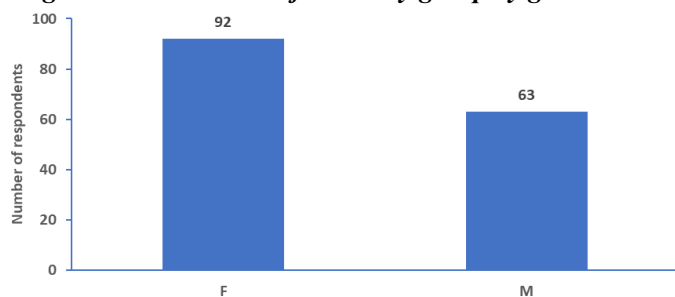
Inferential analysis employed the following: the Shapiro-Wilk test to assess distribution normality; Pearson or Spearman correlation coefficients, depending on the distribution type; and multiple linear regression analysis. The threshold for statistical significance was set at $p < 0.05$, and the results are presented in tables and graphs.

3.3. Description of the study sample

The analyzed sample consisted of 155 subjects/cases. The socio-demographic and professional characteristics of the sample are summarized in Table 1.

Table 1. General characteristics of the studied group

Characteristic	Mean $\pm$ SD / distribution	Median [Q1–Q3]	Interval
Age	45,1 $\pm$ 14,8	42,0 [33,0–54,0]	24–85
Sex	F: 92 (59,4%); M: 63 (40,6%)		
Years of Neuro Experience	8,7 $\pm$ 5,5	9,0 [4,0–12,0]	1–22
Profession	Nurse: 47 (55.3%); Physiotherapist: 24 (28.2%); Physician: 14 (16.5%)		

Figure 1. Distribution of the study group by gender

The mean age of the subjects was 45.1 ± 14.8 years (range: 24–85 years). Regarding sex distribution, the composition of the study group was as follows: F: 92 (59.4%), M: 63 (40.6%). Figure 1

The socio-demographic and professional composition of the study group, presented in the table and figure above, is representative of the study's target population and provides the necessary framework for the correct interpretation of the comparative and association analysis results. The observed variability regarding age, professional experience, and level of professional training was taken into account in subsequent analyses as a potential confounding factor.

Table 2. Descriptive statistics of the main numerical variables

Vary	n	Mean $\pm$ SD	Median [Q1–Q3]	Interval	Normal
Educational Practices Score	85	$28,25 \pm 5,93$	28,00 [24,70–32,10]	10,6–40,0	Yes
Communication Skills	85	$6,92 \pm 1,68$	6,80 [5,60–8,40]	3,6–10,0	No
Educational Barriers Score	85	$9,19 \pm 3,01$	9,20 [7,40–11,00]	1,1–15,0	Yes
Rankin Scale	70	$2,83 \pm 1,19$	3,00 [2,00–4,00]	1,0–5,0	No
Post-Stroke Knowledge	70	$11,60 \pm 3,91$	12,00 [9,00–14,00]	2,0–20,0	Yes
Patient Satisfaction	70	$7,06 \pm 1,58$	7,10 [6,30–7,90]	2,7–10,0	Yes

3.4. Ethical considerations

The research was conducted in compliance with the fundamental ethical principles of biomedical research established by the Declaration of Helsinki and applicable national and institutional regulations. Participation in the study was voluntary, and data were collected and processed anonymously, ensuring that the individuals included could not be identified.

The processing of personal data adhered to the provisions of Regulation (EU) 2016/679 on data protection (GDPR); the data were used exclusively for research purposes and stored securely. The study was conducted with the approval of the institution where data collection took place, and the results are presented in aggregate form, without compromising participant confidentiality.

IV. RESULTS

This chapter presents and interprets the results obtained from the statistical analysis of the collected data. The results are structured according to the study objectives and are accompanied by tables and graphical representations to facilitate their interpretation.

4.1. Descriptive analysis of the studied scores and indicators (Table 2)

Descriptive analysis revealed a mean value of 28.25 ± 5.93 for the Educational Practices Score, with a median of 28.00 and a range of 10.6 to 40.0. Distributions were assessed using the Shapiro-Wilk test, the results of which guided the selection

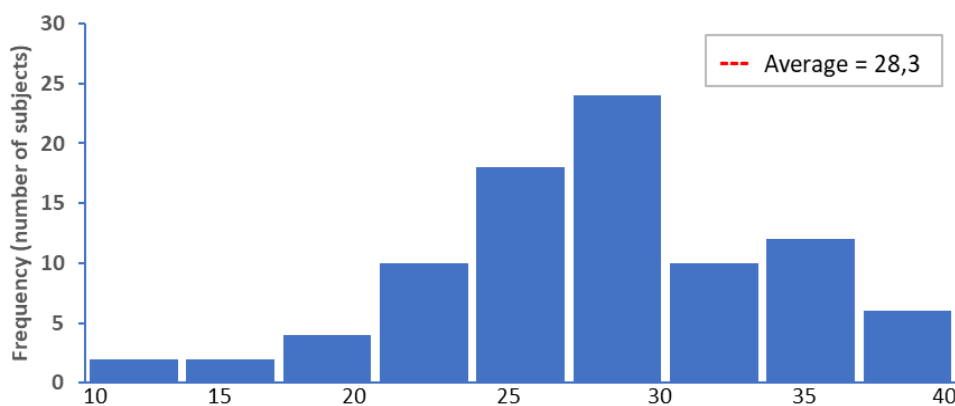
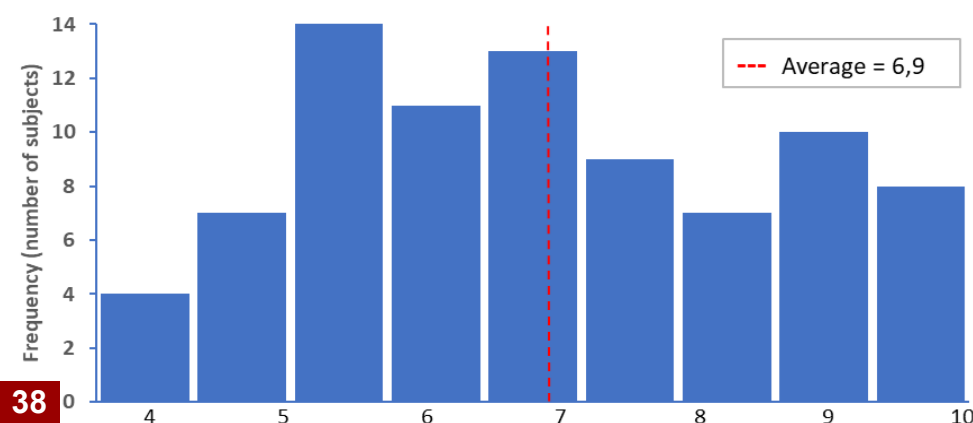
Figure 2. Distribution of the "neurological rehabilitation education practices score" variable in the study cohort**Figure 3. Distribution of the "Communication Skills" variable in the studied group**

Figure 4. Distribution of the "Education Barriers Score" variable in the studied group

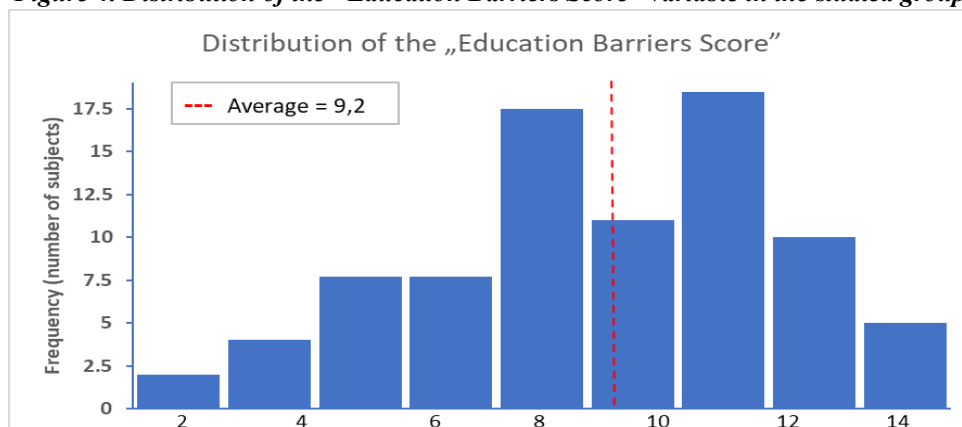


Figure 5. Distribution of the "Rankin Scale" variable in the study group

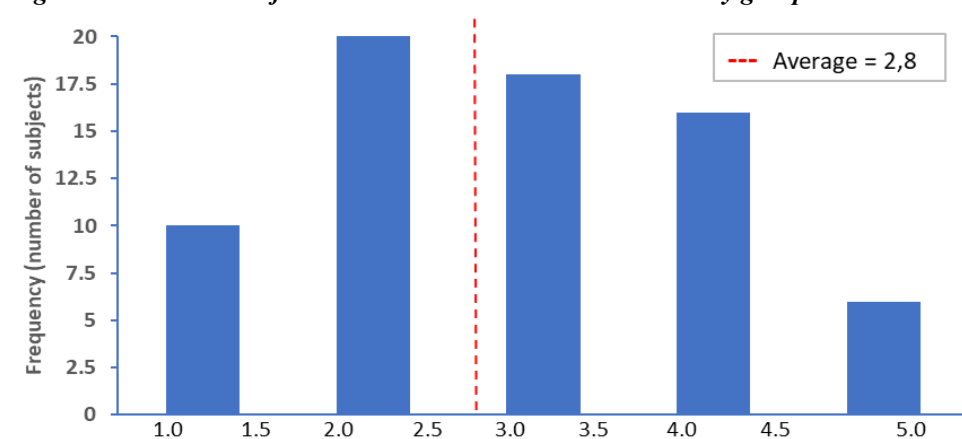


Table 3. Correlation matrix (Spearman coefficient) between numerical variables

	Score Practices	Competencies Com	Score Barriers E	Rankin Scale	Knowledge Pos	Satisfaction Pa
Practice Score	1,00	-0,14	0,19	—	—	—
Com Skills	-0,14	1,00	-0,18	—	—	—
Barrier Score E	0,19	-0,18	1,00	—	—	—
Rankin Scale	—	—	—	1,00	-0,04	0,09
Pos Knowledge	—	—	—	-0,04	1,00	0,06
Pa Satisfaction	—	—	—	0,09	0,06	1,00

of subsequent statistical tests (parametric or non-parametric). Figure 2

Regarding the Communication Skills variable, the recorded mean value was 6.92 ± 1.68 , with a median of 6.80 (interquartile range 5.60–8.40) and extreme values ranging from 3.6 to 10.0. The Shapiro-Wilk test ($p = 0.035$) indicated a distribution deviating from normality, a factor that guided the selection of statistical tests applied in subsequent analyses. Figure 3

Regarding the Education Barriers Score variable, the recorded mean value was 9.19 ± 3.01 , with a median of 9.20 (interquartile range 7.40–11.00) and extreme values ranging from 1.1 to 15.0. The Shapiro-Wilk test ($p =$

0.498) indicated a distribution close to normality, a factor that guided the selection of statistical tests applied in subsequent analyses. Figure 4

Regarding the Rankin Scale variable, the recorded mean value was 2.83 ± 1.19 , with a median of 3.00 (interquartile range 2.00–4.00) and extreme values ranging from 1.0 to 5.0. The Shapiro-Wilk test ($p < 0.001$) indicated a distribution deviating from normality, a factor that guided the selection of statistical tests applied in subsequent analyses. Figure 5

Regarding the "Post-Stroke Knowledge" variable, the recorded mean value was 11.60 ± 3.91 , with a median of 12.00 (interquartile range: 9.00–14.00) and extreme values ranging from 2.0 to 20.0. The Shapiro-Wilk test ($p = 0.418$) indicated a distribution approximating normality, a finding that guided the selection of statistical tests used in subsequent analyses.

The values obtained for the key numerical indicators fall within the theoretical ranges of the instruments used and provide an overview of the average level of the phenomenon under study within the analyzed sample. The dispersion of values—expressed through the standard deviation and the interquartile range—reflects the heterogeneity of the responses and justifies the comparative and association analyses presented in the subsequent subsections.

4.2. Correlation matrix of the variables under study

To evaluate the relationships between the main numerical variables, the Spearman correlation coefficient matrix was calculated and is presented in the following table. Positive values indicate a direct relationship between variables, while negative values indicate an inverse relationship; the strength of the correlation increases as the absolute value of the coefficient approaches 1. Table 3

4.3. Descriptive analysis by subgroup

The following table presents the mean values ($\pm$ standard deviation) of the main numerical variables, broken down by the subgroups defined by "Respondent Type," allowing for the observation of potential differences in levels between the analyzed categories.(Table 4)

Table 4. Descriptive statistics of numerical variables by subgroup ("Respondent Type")

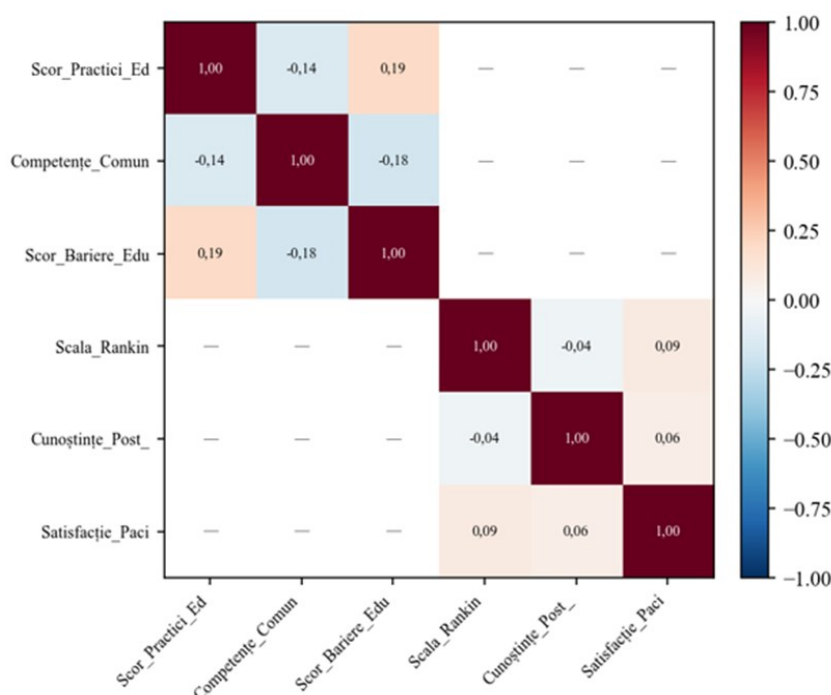
Variable	Staff	Patient/Family
Educational Practices Score	28,25 ± 5,93	—
Communication Skills	6,92 ± 1,68	—
Educational Barriers Score	9,19 ± 3,01	—
Rankin Scale	—	2,83 ± 1,19
Post-Stroke Knowledge	—	11,60 ± 3,91
Patient Satisfaction	—	7,06 ± 1,58

tion education practices score (adjusted $R^2 = 0.004$). None of the included predictors reached the threshold for statistical significance ($p < 0.05$), suggesting the involvement of additional factors not included in the model. Significance: * $p < 0.05$; ** $p < 0.01$; ns – not statistically significant.

4.8. Summary of results

The statistical analysis performed allowed for a comprehensive characterization of the study cohort and an evaluation of the relationships between the neurological rehabilitation education practices score and associated factors. The most significant association identified was between the Education Practices Score and the Education Barriers Score (Pearson coefficient $r = 0.175$, $p = 0.110$), representing a weak, statistically non-significant positive correlation. The multiple linear regression model ($n = 85$) explained 0.4% of the variation in the neurological rehabilitation education practices score (adjusted $R^2 = 0.004$). None of the included predictors reached the threshold for statistical significance ($p < 0.05$), suggesting the involvement of additional factors not included in the model.

The results obtained are discussed in the following chapter in comparison with existing literature data, highlighting both consistencies and potential differences, as well as practical implications for nursing practice and

Figure 6. Graphical representation (heatmap) of the correlation matrix

4.4. Prevalence of the practices and factors evaluated. (Table 5, Figure 7)

4.5. Additional comparative analysis (gender, education level). Table 6

Comparison between the groups defined by "Sex" using the Student's t-test revealed a difference that was not statistically significant ($p = 0.678$), with mean values ranging from 27.87 (group "M") to 28.42 (group "F"). Figure 8

4.6. Correlation analysis, Table 7.

The most significant association identified was that between the Educational Practices Score and the Educational Barriers Score (Pearson coefficient $r = 0.175$, $p = 0.110$), representing a weak positive correlation that was not statistically significant. Significance: * $p < 0.05$; ** $p < 0.01$; ns – not statistically significant. Figure 9

4.7. Model explicativ multivariat (regresie) Tabelul 8.

The multiple linear regression model ($n = 85$) explained 0.4% of the variation in the neurological rehabilita-

medical education.

V. DISCUSSION

The results of this study provide a quantitative characterization of patient and family education practices within a neurological rehabilitation ward. The education practice score showed a mean value of 28.25 ± 5.93 points, with a median of 28.00 and an interquartile range of 24.70–32.10, within a possible range of 10.6–40.0. The normal distribution of this score, confirmed by the Shapiro-Wilk test ($p = 0.564$), indicates consistent educational practices among the staff, with values falling in the upper half of the possible range, suggesting a moderate-to-good level of reported educational practices [7, 13].

Self-assessed communication skills showed a mean value of 6.92 ± 1.68 points, with a median of 6.80 and an interquartile range of 5.60–8.40, on a scale ranging from 3.6 to 10.0. Unlike the practice score, the distribution of communication skills was non-normal according to the Shapiro-Wilk test ($p = 0.035$), necessitating the use of non-parametric statistical methods for correlation analysis.

Table 5. Distribution of dichotomous indicators (affirmative responses)

Indicator / practice	Affirmative responses (n)	Percentage
Neuro-Education Training	28 / 85	32,9%

Figure 7. Proportion of affirmative responses for the evaluated indicators

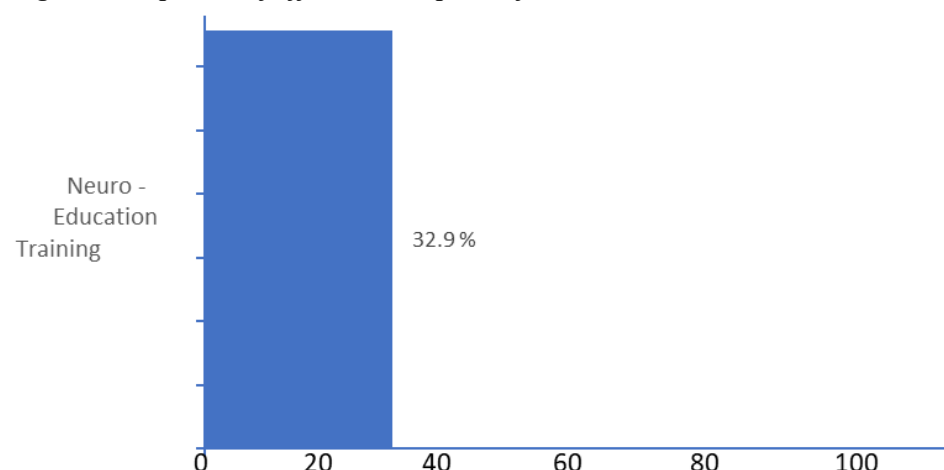


Table 6. Comparison of scores for educational practices in neurological rehabilitation based on subjects' gender (Student's t-test)

Sex	n	Mean $\pm$ SD
F	59	28,42 $\pm$ 6,23
M	26	27,87 $\pm$ 5,26

Table 7. Correlations between the score for educational practices in neurological rehabilitation and the independent variables

Dependent variable	Independent variable	Test	r	p	Meaning
Education Practices Score	Communication skills	Spearman	-0,141	= 0,198	ns
Education Practices Score	Education barriers score	Pearson	0,175	= 0,110	ns
Education Practices Score	Ani Experiență Neuro	Spearman	0,044	= 0,687	ns

The mean level of communication skills, situated in the upper half of the scale, reflects a generally favorable self-assessment by the staff, consistent with the recognized importance of communication in neurological rehabilitation [15, 16].

The educational barriers score had a mean value of 9.19 ± 3.01 points, with a median of 9.20 and a normal distribution (Shapiro-Wilk $p = 0.498$), indicating a moderate perception of obstacles to providing education. This finding confirms the existence of real barriers in educational practice, consistent with literature describing time constraints, patient cognitive deficits, and low family health literacy as frequent obstacles to effective education in neurological rehabilitation [9,14].

The most relevant finding regarding the study's primary objective is the absence of a significant correlation between the educational practices score and self-assessed communication skills, with a Spearman correlation coefficient of $r = -0.141$ and $p = 0.198$ ($n = 85$). Although the

coefficient's direction is negative, its low value and lack of statistical significance indicate the absence of a detectable linear association between the two variables. This seemingly counterintuitive result suggests that the self-assessed level of communication skills does not directly translate into more frequent educational practices, possibly due to the influence of organizational factors and contextual constraints [16,21].

Analysis of the relationship between the educational practices score and the educational barriers score revealed a weak, statistically non-significant positive correlation, with a Pearson coefficient of $r = 0.175$ and $p = 0.110$ ($n = 85$). The absence of a significant association suggests that the perceived level of barriers is not reflected in a detectable reduction of educational practices, which may indicate that staff continue to provide education despite perceived obstacles. This observation highlights the complex, multifactorial nature of the determinants of educational practices, which cannot be explained by a single factor [9,10].

The relationship between the educational practices score and professional experience—measured by the number of years working in neurological rehabilitation—also proved non-significant, with a Spearman correlation coefficient of $r = 0.044$ and $p = 0.687$ ($n = 85$). This very low value indicates the absence of any association between professional tenure and the frequency of educational practices. This result partially contrasts with the hypothesis that professional experience would strengthen educational practices and suggests that the mere accumulation of experience, in the absence of structured training in therapeutic education, is insufficient for developing better educational practices [11,15].

The multiple linear regression model, constructed to estimate the independent contribution of predictors to the educational practices score, explained a very small proportion of its variance, with an adjusted coefficient of determination of $R^2 = 0.004$ ($n = 85$). This value, close to zero, indicates that the variables included in the model—namely communication skills, perceived barriers, and professional experience—do not effectively explain the variation in educational practices within the studied population. This finding suggests that the primary determinants of educational practices likely lie outside the set of variables analyzed, encompassing organizational, motivational, and training-related factors [10, 14].

Figure 8. Distribution of the score for educational practices in neurological rehabilitation by gender (boxplot)

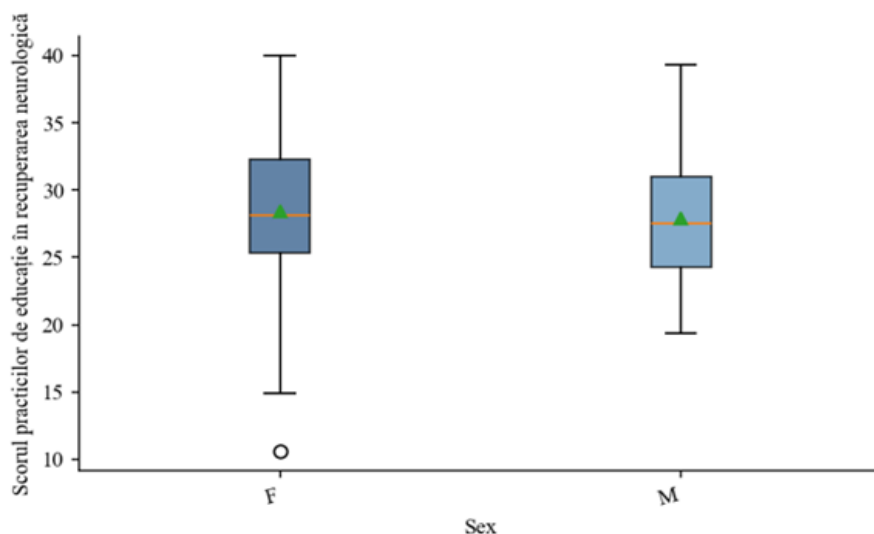
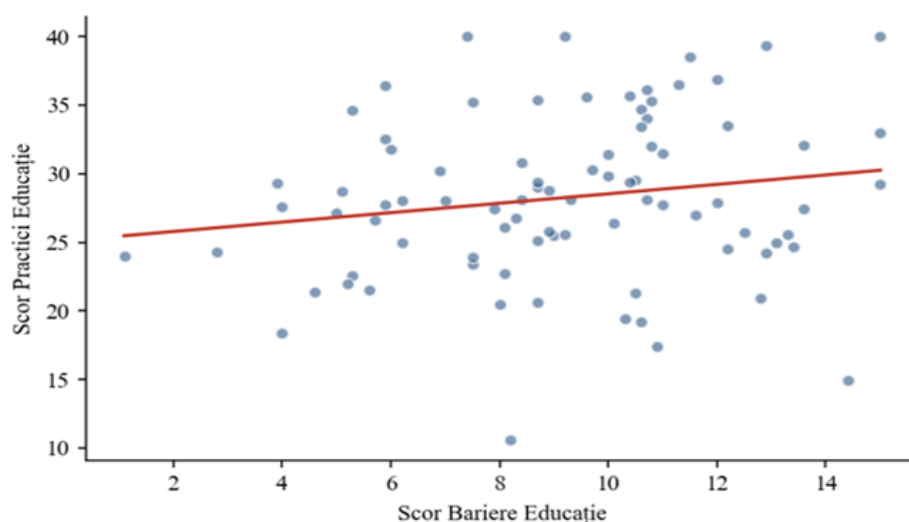


Figure 9. Relationship between the Educational Barriers Score and the Educational Practices Score



Tabelul 8. Rezultatele modelului de regresie liniară multiplă (R^2 ajustat = 0,004; n = 85)

Predictor	β	IC 95%	p	Meaning
Communication Skills	-0,342	-1,120 – 0,437	= 0,385	ns
Education Barriers Score	0,309	-0,125 – 0,742	= 0,160	ns
Years of Neuro Experience	0,020	-0,211 – 0,252	= 0,861	ns

In the regression model, none of the predictors reached the threshold of statistical significance. Communication skills showed a coefficient of $\beta = -0.342$ (95% CI: -1.120–0.437, $p = 0.385$); the educational barriers score, a coefficient of $\beta = 0.309$ (95% CI: -0.125–0.742, $p = 0.160$); and professional experience, a coefficient of $\beta = 0.020$ (95% CI: -0.211–0.252, $p = 0.861$). The confidence intervals for all coefficients included the value of zero, confirming the absence of significant independent effects. These

results reinforce the conclusion that educational practices in neurological rehabilitation are determined by a complex set of factors not fully captured by the individual variables included in the model [11,13].

The characterization of the patients included in the study provides important clinical context for interpreting the results. The degree of disability, assessed using the modified Rankin Scale, showed a mean value of 2.83 ± 1.19 , with a median of 3.00 and an interquartile range of 2.00–4.00 (range: 1.0–5.0). The non-normal distribution of this score (Shapiro-Wilk $p < 0.001$)—typical of an ordinal scale—indicates a predominance of patients with mild to moderate-severe disability, for whom both patient education and family involvement are relevant to successful recovery [16,17]. The level of knowledge regarding the condition and post-stroke care, as measured among patients and their families, showed a mean score of 11.60 ± 3.91 points, with a normal distribution (Shapiro-Wilk $p = 0.418$) and a range of 2.0 to 20.0. The considerable span of this range reflects marked heterogeneity in knowledge—ranging from low to high levels—which underscores the need for individualized education tailored to the baseline level of each patient and their family. This variability confirms the importance of initially assessing learning needs as a step in the educational process [19, 20].

Patient satisfaction regarding the education and care received showed a mean score of 7.06 ± 1.58 points, with a median of 7.10 and a normal distribution (Shapiro-Wilk $p = 0.162$), on a scale ranging from 2.7 to 10.0. The relatively high level of satisfaction indicates a generally favorable perception among recipients regarding the quality of education received, although the range of values suggests the existence of instances of dissatisfaction that warrant investigation.

Patient satisfaction is a recognized indicator of the quality of patient- and family-centered care and a factor associated with adherence to the rehabilitation program [6,8].

The relatively high level of patient satisfaction, correlated with a moderate-to-good level of educational practices, can be interpreted through the lens of patient- and family-centered care models, which link recipient involvement and information-sharing to a more favorable care

experience [18,6]. Even in the absence of a statistical correlation between self-assessed competencies and educational practices, the recipients' positive perception suggests that the relational aspect of care is valued. This observation supports the idea that satisfaction reflects not only the volume of information conveyed but also the quality of the therapeutic relationship and adherence to principles of dignity, participation, and collaboration.

An important aspect regarding staff training is the low proportion of personnel who have received specific training in the education of neurological patients. Only 28 of the 85 respondents (32.9%) stated that they had undergone training in neurological rehabilitation education. This finding highlights a significant gap in specialized training, which could explain—at least in part—the absence of an association between self-assessed competencies and educational practices, as well as the low explanatory power of the regression model. Investing in structured staff training thus emerges as a priority area for intervention [11, 15].

The marked heterogeneity in the level of knowledge regarding the condition, combined with the prevalence of disabilities ranging from mild to moderate-severe, highlights the value of an educational approach that leverages neuroplasticity principles to foster motivation. Conveying—in an accessible manner—the concept that the nervous system can reorganize itself through repetitive, task-oriented exercise can strengthen the commitment of both the patient and their family to the rehabilitation program [3,16]. The fact that a significant proportion of patients possess limited knowledge underscores the need for an initial assessment of learning needs and a personalized educational intervention capable of transforming the understanding of recovery mechanisms into a driver of perseverance.

Regarding implications for nursing practice, the findings support the need to reinforce the educational role of nurses and the entire rehabilitation team through specialized training and organizational support. The absence of significant associations between self-assessed competencies, perceived barriers, professional experience, and educational practices suggests that improving the latter cannot be achieved merely through gaining experience or positive self-assessment; rather, it requires structured interventions regarding training and the organization of work activities [10,14].

The finding that only one-third of respondents received specific training in neurological patient education aligns with observations in international literature, which frequently highlight a lack of staff preparation regarding therapeutic education and communication [21,22]. Studies evaluating staff training programs in neurological care communication have reported positive effects on skills and confidence, suggesting that structured training can improve educational practices [22]. Consequently, the lack of an association between professional experience and educational practices in the present study may reflect the fact that accumulating seniority—without dedicated training—does not lead to the development of educational competencies.

Regarding organizational culture management and continuing medical education, these findings support the integration of training programs focused on therapeutic communi-

cation and patient- and family-centered education, as well as the development of structured protocols and tailored educational materials. The fact that individual variables account for a negligible proportion of the variation in educational practices directs attention toward organizational and systemic factors—such as allocated time, available resources, and institutional culture—as primary targets for interventions aimed at improving the quality of education in neurological rehabilitation [13,18]. Interpreting these results also requires avoiding the confusion between the absence of a statistical association and the absence of any actual relationship, given that the cross-sectional design and sample size limit the power to detect small-scale effects [12].

The findings regarding the burden experienced by families—implied by the varying levels of knowledge and the functional dependence of some patients—highlight the importance of caregiver support interventions and the utilization of modern rehabilitation and educational technologies. Telerehabilitation and tele-education platforms, alongside hospital-to-home transition programs, can complement hospital-based education and support families during the critical period of assuming caregiving responsibilities [23,24]. Although this study did not directly evaluate these interventions, the described context advocates for their integration into strategies aimed at improving education and reducing caregiver burden within neurological rehabilitation services.

The prevalence of disability ranging from mild to moderate-severe—as reflected by the mean Modified Rankin Scale score—suggests the value of systematically using complementary functional assessment tools, such as the Barthel Index and the Functional Independence Measure, to precisely identify training needs. A detailed functional assessment would allow educational content to be tailored to each patient's specific deficits and the intervention to be adapted to their level of dependency [23,26]. While this study employed the Modified Rankin Scale as a global measure, integrating more granular tools into routine practice would strengthen the objective basis for educational planning and facilitate the monitoring of functional progress following rehabilitation and educational interventions.

Overall, the results of this study, interpreted through the theoretical framework outlined in the general section, present a coherent picture of patient and family education as a complex, multifactorial process that lacks sufficient support in terms of training and organizational structure within the context investigated. The absence of significant associations between individual variables and educational practices—far from diminishing the importance of education—shifts the focus toward systemic factors and the need for an integrated approach. This approach combines staff training, the use of functional assessment tools, the implementation of family-centered care models, caregiver support, and the judicious use of modern technologies [13, 18]. Such an integrative perspective provides a foundation for transforming education from an ancillary activity into a structured, measurable component of neurorehabilitation care, with a demonstrable impact on patient autonomy, family burden, and the overall quality of services.

VI. CONCLUSIONS

Based on the analysis performed and the interpretation of the results obtained, the following conclusions can be drawn:

- The study revealed a moderate-to-good level of patient and family education practices in the neurological rehabilitation ward under investigation, with a mean score of 28.25 ± 5.93 points and a normal distribution, reflecting the staff's consistent focus on the educational aspect of care.
- Staff self-assessed communication skills yielded a mean score of 6.92 ± 1.68 points—placing them in the upper half of the scale—but showed a non-normal distribution, indicating variability in how staff perceived their own communication abilities.
- The educational barriers score, with a mean of 9.19 ± 3.01 points, confirms the existence of moderate obstacles to providing education, consistent with literature citing time constraints, patient cognitive deficits, and low family health literacy.
- No statistically significant correlation was found between the education practices score and self-assessed communication skills (Spearman $r = -0.141$, $p = 0.198$), suggesting that a favorable self-assessment of skills does not directly translate into more frequent educational practices.
- The relationships between educational practices and the educational barriers score (Pearson $r = 0.175$, $p = 0.110$) or professional experience (Spearman $r = 0.044$, $p = 0.687$) were statistically non-significant, indicating the absence of detectable linear associations with these variables.
- The multiple linear regression model explained a negligible proportion of the variation in educational practices (adjusted $R^2 = 0.004$); none of the predictors—communication skills, perceived barriers, and professional experience—reached the threshold of statistical significance.
- The patients' degree of disability, assessed using the modified Rankin Scale, showed a mean value of 2.83 ± 1.19 , indicating a predominance of disability ranging from mild to moderate-severe—levels at which both patient education and family involvement are relevant.
- The level of knowledge regarding the condition (11.60 ± 3.91 points) showed marked heterogeneity, while patient satisfaction with the education received was relatively high (7.06 ± 1.58 points), underscoring the perceived value of the educational initiative.
- Only 32.9% of respondents had received specific training in neurological patient education, highlighting a significant gap in specialized preparation that may limit the effectiveness of educational practices.
- The results support the need to strengthen the educational role of nurses and the rehabilitation team through structured training in therapeutic communication and patient- and family-centered education.

- The absence of significant associations between individual variables and educational practices directs attention toward organizational and systemic factors as primary targets for interventions aimed at improving the quality of education.
- Future research—employing longitudinal or multicenter designs, more sensitive instruments, and the integration of organizational variables—is needed to gain a deeper understanding of the determinants of educational practices in neurological rehabilitation.
- The literature review highlighted that effective patient and family education is grounded in the principles of neuroplasticity and motor learning, as well as the use of validated assessment tools functional—such as the Barthel Index, the Functional Independence Measure, and the NIHSS scale—and on the application of patient- and family-centered care models, elements that should be integrated into the educational programs of rehabilitation services.
- Caregiver burden and the potential of modern technologies—such as robotic rehabilitation, virtual reality, and telerehabilitation—represent relevant dimensions for neurorehabilitation practice, justifying the expansion of future research to include support for informal caregivers and the evaluation of technology-assisted educational interventions within the local context.

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