

Underutilization of Specialist Palliative Care in Acute Ischemic Stroke: A Retrospective Matched Cohort Study Identifying Clinical Referral Triggers

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Abstract

Background

Although advances in acute stroke management have substantially improved survival after ischemic stroke, many patients still experience severe neurological deficits, high symptom burden and complex care needs. Current recommendations advocate early integration of specialist palliative care for patients with life-limiting neurological diseases; however, referral patterns following acute ischemic stroke remain poorly characterized. The present study aimed to evaluate the utilization of specialist palliative care consultations after ischemic stroke and to identify clinical characteristics associated with referral that may serve as potential trigger factors for earlier integration of palliative care.

Methods

In this retrospective matched cohort study, patients admitted with acute ischemic stroke to a tertiary university stroke center between January 2021 and December 2024 were identified from the institutional stroke registry. Patients who received an inpatient specialist palliative care consultation (SPC) were compared with a matched cohort of patients who did not receive palliative care involvement. Matching was performed for age, sex, infarct location, and stroke severity as assessed by the National Institutes of Health Stroke Scale (NIHSS). Demographic characteristics, comorbidities, neurological deficits, symptom burden, functional status, advance care planning documents, clinical course, discharge destination, and survival were analyzed.

Results

Of 1,302 patients with acute ischemic stroke receiving reperfusion therapy, only 62 (4.8%) received specialist palliative care consultation. After matching, 56 patients with specialist palliative care consultation were compared with 56 matched controls. Baseline characteristics were balanced, including age (median 79.2 vs. 80.3 years), sex (62.5% female), stroke severity (median NIHSS 14), and infarct location (80.4% anterior circulation). Patients receiving specialist palliative care more frequently had active malignancy (21.4% vs. 8.9%) and a higher burden of vascular risk factors (median 4 vs. 3). Combined intravenous thrombolysis and thrombectomy was less common in the palliative care group (16.1% vs. 50.0%), whereas conservative management occurred only in this group (17.9%). Functional status at consultation was severely impaired (median ECOG 4).

Conclusions

Specialist palliative care remains underutilized among patients with acute ischemic stroke despite a substantial burden of symptoms and complex care needs. Severe dysphagia, advanced functional

impairment, and difficulties regarding future care planning appear to represent clinically meaningful trigger factors for referral. The implementation of structured referral criteria may facilitate earlier integration of specialist palliative care into comprehensive stroke management.

Introduction

Stroke remains one of the leading causes of mortality and long-term disability worldwide and continues to impose a considerable burden on healthcare systems despite substantial therapeutic advances (1, 2). The widespread implementation of intravenous thrombolysis, endovascular thrombectomy, specialized stroke units, and improvements in secondary prevention has significantly reduced mortality and improved functional outcomes in selected patient populations (3). Nevertheless, a considerable proportion of patients with acute ischemic stroke experience severe neurological deficits resulting in permanent disability, loss of independence, impaired communication, dysphagia, cognitive dysfunction, and high levels of physical and psychological distress (3).

As populations continue to age, the absolute number of individuals affected by ischemic stroke is expected to increase (4). Consequently, healthcare professionals are increasingly confronted with patients whose clinical course is characterized not only by acute neurological impairment but also by complex symptom management (5, 6), difficult treatment decisions, uncertainty regarding prognosis, and substantial psychosocial needs affecting both patients and their families (7–10). These challenges extend beyond life-prolonging therapies and frequently require an interdisciplinary approach focused on quality of life, symptom control, shared decision-making, and advance care planning.

Specialist palliative care has traditionally been associated with cancer. However, increasing evidence demonstrates that patients with severe neurological disorders comparably benefit from palliative care interventions (11–14). Current international guidelines on palliative care for neurological diseases recommend that patients with non-curable, life-limiting neurological conditions and complex care needs should have timely access to specialist palliative care services with expertise in both neurology and palliative medicine (1, 2, 8, 11–17). Despite these recommendations, implementation within routine stroke care remains inconsistent, and specialist palliative care is often initiated only during the terminal phase of illness (18, 19).

One major challenge is the absence of clearly defined referral criteria for patients with acute ischemic stroke (19, 20). Prognostic uncertainty frequently complicates clinical decision-making during the early phase after stroke, while neurological deficits may fluctuate substantially during the first days following symptom onset (16, 21–24). Consequently, clinicians often hesitate to involve specialist palliative care, fearing that referral may be interpreted as therapeutic nihilism or as a conflict with ongoing restorative treatment (23, 25). Contemporary concepts of neuro-palliative care emphasize that palliative care should however complement, rather than replace, disease-directed therapies and may be integrated alongside acute stroke treatment whenever complex supportive needs arise (1, 26).

Several clinical characteristics have been proposed as indicators of palliative care needs after stroke, including severe functional dependency, dysphagia, impaired communication, reduced consciousness, recurrent aspiration, pre-existing frailty, advanced comorbidity, and complex goals-of-care discussions (4, 16, 22, 27, 28). Nevertheless, empirical evidence identifying which patients should receive specialist palliative care consultation in routine clinical practice remains limited.

The present study therefore aimed to evaluate current referral practices for specialist palliative care among patients with acute ischemic stroke treated at a tertiary university hospital. Furthermore, we sought to identify clinical characteristics associated with palliative care consultation that may serve as potential trigger factors for earlier and more systematic integration of specialist palliative care into comprehensive stroke management. We hypothesized that only a minority of patients with substantial palliative care needs receive specialist consultation and that specific neurological deficits, functional impairment, and symptom burden are associated with referral to specialist palliative care.

Methods

Study Design and Setting

This retrospective matched cohort study was conducted at the Department of Neurology of the University Hospital Aachen, Germany, a tertiary referral center with a certified comprehensive stroke unit and an established specialist palliative care service. Consecutive patients admitted with acute ischemic stroke during the study period (January 2021 to December 2024) were identified from the institutional stroke registry. The primary objective was to investigate current referral practices for specialist palliative care consultation and to identify clinical characteristics associated with referral that may serve as potential trigger factors for earlier integration of neuro-palliative care.

Patient Selection

All adult patients admitted with a diagnosis of acute ischemic stroke were screened for eligibility retrospectively. The study cohort included patients who received an inpatient consultation by the specialist palliative care team during their neurological admission. These patients were compared to a matched control cohort of patients who did not receive specialist palliative care during hospitalization. Patients with hemorrhagic stroke, transient ischemic attack, or incomplete clinical documentation were excluded from the analysis.

Matching Procedure

To minimize confounding by stroke severity and demographic characteristics, patients receiving specialist palliative care were matched to patients without such care using predefined clinical variables. Matching was performed according to age, sex, vascular territory affected by the ischemic stroke

(anterior versus posterior circulation) and stroke severity at admission measured by the National Institutes of Health Stroke Scale (NIHSS) at admission. Consequently, the matched cohort enabled comparison between patients with similar neurological disease severity while evaluating factors associated with palliative care referral.

Data Collection

Clinical data were extracted retrospectively from the institutional stroke registry and complemented by detailed review of electronic medical records. The following variables were collected:

Demographic and Clinical Characteristics

Baseline characteristics included age, sex, vascular territory of infarction, NIHSS score at admission, vascular risk factors, previous malignancy, and acute reperfusion therapy, including intravenous thrombolysis and endovascular thrombectomy. Functional performance prior to discharge was assessed using the Eastern Cooperative Oncology Group (ECOG) Performance Status whenever documented.

Neurologic Deficits

Neurologic impairments were systematically recorded and included dysphagia, aphasia, dysarthria, mobility limitations, impaired activities of daily living (ADL) and need for assistance with self-care. Dysphagia was categorized according to clinical documentation as absent, mild, moderate or severe. Aphasia was classified as absent, mild or global. Dysarthria was categorized as absent, mild, severe or anarthria.

Symptom Burden

Symptom burden was assessed using the standardized palliative care basic assessment performed during specialist palliative care consultation (29). This assessment includes weakness, fatigue, pain, dyspnea, anxiety, impaired mobility, self-care limitations, restrictions in activities of daily living, challenges in discharge planning, and caregiver burden. Symptoms were documented according to predefined severity categories on a four-point Likert scale (none, mild, moderate or severe).

Advance Care Planning

Documentation regarding advance care planning was reviewed for the presence of advance directives and healthcare proxy or durable power of attorney.

Clinical Outcomes

Several clinical outcomes were analyzed. We assessed how frequently patients received specialist palliative care consultations and determined the time between hospital admission and the first palliative care consultation. We also examined the length of neurological hospital stays and evaluated patients' discharge destinations. In addition, we assessed in-hospital mortality and analyzed overall survival following hospitalization. Discharge destinations were categorized as home, inpatient rehabilitation, nursing home, palliative care ward, transfer to another hospital or hospital department, or death during hospitalization.

Statistical Analysis

Continuous variables are presented as median and range owing to their non-normal distribution. Categorical variables are reported as absolute frequencies and percentages. Comparisons between study groups were performed using appropriate parametric or non-parametric statistical methods depending on data distribution. Categorical variables were compared using the χ^2 test or Fisher's exact test, whereas continuous variables were analyzed using the Mann–Whitney U test. Time-to-event analyses were performed using Kaplan–Meier survival estimates. Differences between survival curves were assessed using the log-rank test. Statistical significance was defined as a two-sided p value < 0.05 . All statistical analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA).

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki and applicable national regulations governing retrospective observational research. Approval was obtained from the local Ethics Committee of the Medical Faculty of RWTH Aachen University (approval number: 335/15). Owing to the retrospective study design and anonymized analysis of routinely collected clinical data, the requirement for individual informed consent was waived in accordance with institutional regulations.

Results

Study Population

During the study period, 1,302 patients with acute ischemic stroke were included in the institutional stroke registry. This registry is limited to patients who received acute reperfusion therapy, namely intravenous thrombolysis and/or endovascular thrombectomy. Among these, only 62 patients (4.8%) received an inpatient specialist palliative care consultation.

Following matching, 56 patients with specialist palliative care consultation were compared with 56 patients without such SPC consultation. Matching served well-balanced study groups with respect to age, sex, vascular territory affected by the stroke, and neurological severity at admission.

The median age of patients receiving specialist palliative care consultation was 79.2 years (range 40.9–96.5 years), compared with 80.3 years (range 58.3–93.1 years) in the matched control cohort. Women accounted for approximately two-thirds of both groups (62.5%). Most patients had infarctions involving

the anterior circulation (80.4%), whereas posterior circulation and multilobar infarctions were considerably less frequent. Stroke severity was comparable between groups, with a median NIHSS score of 14 in both cohorts.

Baseline Clinical Characteristics

Despite comparable demographic characteristics and stroke severity, several clinically relevant differences were observed between groups (Table 1).

Patients receiving specialist palliative care consultation more frequently had a coinciding malignant disease than patients without consultation. Likewise, the number of vascular risk factors tended to be higher in the palliative care cohort. Functional performance at the time of specialist consultation was markedly impaired, with a median ECOG Performance Status of 4, indicating complete dependence on nursing care and inability to perform self-care.

Differences were also observed regarding acute stroke treatment. Patients without specialist palliative care consultation more frequently underwent combined intravenous thrombolysis and mechanical thrombectomy, whereas patients receiving specialist palliative care consultation were more likely to have received conservative treatment or single-modality reperfusion therapy.

Table 1

Baseline and clinical characteristics of the propensity score–matched study population. Data are presented as median (range) or *n* (%), as appropriate. NIHSS = National Institutes of Health Stroke Scale; ECOG = Eastern Cooperative Oncology Group Performance Status.

Demographic characteristics	Palliative Care Consultation (n = 56)	Matched Control (n = 56)
Age in years, median (range)	79.21 (40.89–96.45)	80.25 (58.30–93.06)
Sex, n (%)		
Male	21 (37.5)	21 (37.5)
Female	35 (62.5)	35 (62.5)
Stroke characteristics		
Infarction territory, n (%)		
Anterior circulation	45 (80.4)	45 (80.4)
Posterior circulation	5 (8.9)	5 (8.9)
Combined anterior and posterior circulation	5 (8.9)	5 (8.9)
Multilobar	1 (1.8)	1 (1.8)
NIHSS		
Median (range)	14 (3–40)	14 (3–40)
Acute stroke treatment, n (%)		
No acute intervention	10 (17.9)	0 (0.0)
Intravenous thrombolysis	13 (23.2)	10 (17.9)
Intra-arterial thrombolysis	0 (0.0)	0 (0.0)
Mechanical thrombectomy	21 (37.5)	17 (30.4)
Intravenous thrombolysis + thrombectomy	9 (16.1)	28 (50.0)
Intra-arterial thrombolysis + thrombectomy	1 (1.8)	0 (0.0)
Intravenous + intra-arterial thrombolysis + thrombectomy	1 (1.8)	0 (0.0)
Other	1 (1.8)	1 (1.8)
Clinical characteristics		
Vascular risk factors, median (range)	4 (0–7)	3 (0–6)

Demographic characteristics	Palliative Care Consultation (n = 56)	Matched Control (n = 56)
Malignancy, n (%)		
Active	12 (21.4)	5 (8.9)
Previous	3 (5.4)	3 (5.4)
ECOG Performance Status		
Median (range)	4 (2–4)	Not assessed

Symptom Burden

Patients referred to specialist palliative care exhibited a multidimensional symptom burden (Fig. 1). The most frequently documented severe symptoms were weakness, fatigue, immobility, impairment in activities of daily living, impaired ability to perform self-care, and challenges related to discharge planning. Caregiver burden was also frequently documented, highlighting the considerable psychosocial impact of severe stroke on family members and informal caregivers.

In contrast, symptoms such as pain, dyspnea, and anxiety were reported less frequently and when reported were predominantly classified as absent or mild. This symptom profile differs from that commonly observed in patients with advanced cancer and underlines the distinctive care needs of patients with severe neurological disorders. Overall, functional impairment rather than physical symptom intensity appeared to represent the predominant indication for specialist palliative care involvement.

Communication Impairments

The prevalence of aphasia was remarkably equal in both cohorts. Approximately half of the patients in each group exhibited no aphasia, whereas global aphasia was documented in approximately one-third of patients (Fig. 2). Consequently, aphasia alone did not discriminate between patients who did and did not receive specialist palliative care consultation. Similarly, dysarthria was frequently observed in both groups (Fig. 3). Although severe dysarthria and anarthria occurred more often among patients receiving specialist palliative care consultation, communication impairment in isolation did not emerge as a distinguishing clinical characteristic.

Dysphagia

In contrast to communication disorders, dysphagia demonstrated a clear association with SPC. Patients receiving SPC exhibited substantially higher rates of moderate and severe dysphagia than matched controls (Fig. 4). Severe dysphagia was particularly common in the consultation group, whereas most patients without specialist palliative care had either no dysphagia or only mild swallowing impairment.

Furthermore, the interval between hospital admission and specialist palliative care consultation decreased with increasing dysphagia severity (Fig. 5). Patients with severe swallowing disorders were referred considerably earlier than those with less pronounced impairment. The shortest latency was observed in patients with mild dysphagia.

Advance Care Planning

Documentation of advance care planning differed between the two cohorts. Healthcare proxy documentation was present with comparable frequency in both groups (n = 22 with SPC, n = 24 without SPC) (Fig. 6). However, written advance directives were substantially more common among patients who received specialist palliative care consultation (n = 20 with SPC, n = 2 without SPC). This observation may reflect increased attention to advance care planning during specialist consultation rather than pre-existing differences between patient groups. Alternatively, patients with documented treatment preferences may have been more readily identified as requiring specialist palliative care support.

Length of Hospital Stay

Patients receiving specialist palliative care consultation generally experienced longer neurological hospital stays than matched controls (median 15 in the SPC group vs 8.5 days in the control group). This finding is consistent with the increased clinical complexity observed in this cohort and probably reflects prolonged interdisciplinary decision-making due to prognostic uncertainty, symptom management, discharge planning, and end-of-life care.

Survival

Comparisons of survival and discharge outcomes between the cohorts should be interpreted cautiously, as these endpoints are partially cohort-defining and are therefore inherently affected by self-fulfilling bias. Kaplan–Meier survival analysis demonstrated markedly reduced survival among patients receiving specialist palliative care consultation (Fig. 7). Although interpretation should be undertaken cautiously because referral was driven by clinical severity rather than randomized allocation, these findings indicate that patients referred for specialist palliative care represented a subgroup with particularly poor prognosis and advanced disease burden.

Importantly, specialist palliative care consultation should therefore not be interpreted as a determinant of poor survival but rather as a marker of patients with greater supportive care needs and more severe clinical trajectories.

Discharge Destination

Discharge destinations differed considerably between study groups. Among patients receiving specialist palliative care consultation, discharge to a specialist palliative care ward was common, and almost half of the patients died during the index hospitalization (Fig. 8). Only a small proportion returned home (n = 4

in the SPC group vs n = 21 in the group without SPC) or were discharged to a nursing home (n = 3 in both groups). In contrast, patients without specialist palliative care consultation were substantially more likely to be discharged home or transferred to inpatient rehabilitation. In-hospital mortality was considerably lower in this cohort (13 deceased patients without SPC vs 25 deceased with SPC).

These findings are consistent with the markedly different clinical trajectories observed between groups and further support the notion that specialist palliative care was primarily initiated in patients with advanced neurological impairment and limited prognosis.

Discussion

In this retrospective matched cohort study of patients hospitalized with acute ischemic stroke, we found that specialist palliative care (SPC) consultation was infrequently utilized despite a substantial burden of neurological impairment, functional dependency, and complex supportive care needs. Among more than 1,300 patients admitted with ischemic stroke, fewer than 5% received an inpatient SPC consultation. Patients referred to SPC represented a clinically distinct subgroup characterized by profound disability, severe dysphagia, high levels of dependence in activities of daily living, and complex discharge planning. Importantly, severe dysphagia emerged as the most consistent clinical feature associated with earlier SPC involvement, suggesting that swallowing impairment may serve as a practical trigger for referral in routine stroke care.

Specialist palliative care remains underutilized in acute stroke care

The low referral rate observed in our cohort is consistent with previous reports demonstrating that patients with acute stroke receive specialist palliative care considerably less frequently than patients with advanced malignant disease, despite experiencing comparable levels of symptom burden (5, 10, 30–32) and psychosocial distress (33, 34). This discrepancy reflects the historical development of palliative medicine, which has traditionally focused on oncology (12), whereas neurological diseases have only more recently become recognized as conditions in which specialist palliative care can provide substantial benefit (1, 11, 14, 35).

Several factors may contribute to the limited integration of SPC into stroke care. First, prognostic uncertainty during the acute phase of ischemic stroke often complicates decisions regarding the appropriate timing of referral (7, 19, 22). Neurological recovery is inherently dynamic, particularly during the first days following stroke, and clinicians may hesitate to involve palliative care while meaningful neurological improvement remains possible. Second, misconceptions persist among healthcare professionals, patients, and families that palliative care is synonymous with treatment limitation or end-of-life care (2, 8). Contemporary concepts of neuro-palliative care, however, emphasize that palliative interventions are compatible with active, restorative treatment and should be integrated according to patient needs rather than estimated life expectancy (12, 26). Moreover, a proportion of palliative care,

especially primarily medical aspects of palliative care like symptom relief, may have been provided by the treating clinical teams themselves, without formal involvement of specialist palliative care services.

Our findings therefore support a shift from prognosis-based referral strategies towards a needs-based model of palliative care integration. Such an approach aligns with current international recommendations, which advocate timely involvement of specialist palliative care whenever patients experience complex symptom burden, difficult decision-making, or substantial psychosocial challenges.

Functional impairment rather than pain predominates after severe stroke

An important observation of the present study is the distinctive symptom profile of patients referred for SPC. In contrast to many oncological populations (36, 37), physical symptoms such as pain or dyspnea were relatively uncommon. Instead, severe functional impairment—including immobility, complete dependence for self-care, limitations in activities of daily living, and caregiver burden - constituted the dominant clinical problems.

These findings underline the unique nature of palliative care in neurology. Following severe ischemic stroke, the principal challenges frequently arise not from uncontrolled physical symptoms but from loss of autonomy, impaired communication, nutritional difficulties, uncertainty regarding prognosis, and the need for coordinated interdisciplinary care. Consequently, palliative care interventions should extend beyond symptom control to encompass communication support, advance care planning, family counselling, ethical decision-making, and coordination of post-acute care.

This broader understanding of palliative care is increasingly reflected in the emerging field of neuro-palliative medicine and supports the integration of palliative expertise as a complementary component of comprehensive stroke management.

Dysphagia as a potential clinical trigger for specialist palliative care

Among all neurological deficits assessed, dysphagia demonstrated the strongest association with SPC consultation. However, patients with mild dysphagia exhibited the shortest latency from hospital admission to SPC involvement, appearing counterintuitive, as one might anticipate that more severe dysphagia would prompt earlier referral. A possible explanation is that, in patients with mild dysphagia, referral decisions were often driven by other clinical features or disease-related circumstances, such as uncontrolled symptoms, rapid functional decline, or complex psychosocial needs. However, when such additional triggers were absent, dysphagia itself may have become the salient clinical feature prompting SPC consultation. This interpretation suggests that even mild dysphagia can serve as an important indicator of palliative care needs, particularly when it occurs in relative isolation. In contrast, patients with more advanced dysphagia may have experienced delayed referral because swallowing impairment developed gradually within the broader context of progressive disease, where symptom burden was

managed by the primary treating team before SPC involvement was considered. Alternatively, the observed differences may reflect the small sample size or unmeasured confounding factors and therefore should be interpreted with caution. Nevertheless, these findings emphasize that the severity of an individual symptom alone may not determine referral timing. Rather, SPC referral appears to be influenced by the overall clinical context and the combination of symptoms and care needs present at the time of assessment.

The clinical importance of dysphagia extends well beyond the risk of aspiration pneumonia. Severe swallowing disorders frequently initiate complex discussions regarding artificial nutrition, prognosis, quality of life, and the patient's treatment preferences. Decisions concerning nasogastric tube feeding, percutaneous endoscopic gastrostomy, or comfort-focused oral intake often require careful interdisciplinary evaluation involving neurologists, speech and language therapists, nursing staff, palliative care specialists, patients, and family members.

Moreover, dysphagia is closely associated with severe neurological injury and poor functional outcome after stroke (23). It may therefore represent a readily identifiable clinical marker for patients who are likely to benefit from comprehensive supportive care. Although dysphagia alone should not automatically prompt SPC referral, our findings suggest that it may serve as an important component of structured referral criteria.

Future prospective studies should investigate whether the implementation of dysphagia-based referral pathways improves symptom management, shared decision-making, and patient- and family-centered outcomes.

Communication deficits alone appear insufficient to trigger referral

In contrast to dysphagia, aphasia and dysarthria were similarly distributed between patients with and without SPC consultation. Communication disorders therefore appeared to have limited influence on referral decisions in our cohort.

This finding is noteworthy because severe communication impairment substantially complicates assessment of symptoms, patient participation in treatment decisions, and discussions regarding goals of care. Patients with aphasia may be particularly vulnerable to unmet palliative care needs because they are less able to express distress, preferences, or concerns. The absence of an association between communication deficits and SPC referral should therefore not be interpreted as evidence of lower palliative care need but may instead reflect the lack of structured referral pathways recognizing these patients.

Advance care planning and family support

Advance care planning represents an integral component of specialist palliative care (14, 38, 39). Patients receiving SPC consultation more frequently had documented advance directives, although the

prevalence of healthcare proxies was similar between groups. These findings may indicate that SPC consultation facilitates discussions regarding future treatment preferences and supports documentation of patients' wishes. Alternatively, patients with pre-existing advance directives may have been more readily identified as requiring palliative care involvement.

Irrespective of causality, the high prevalence of complex discharge planning and documented caregiver burden highlights the importance of addressing psychosocial needs alongside medical management. Stroke frequently affects entire families, who must adapt to sudden disability, uncertain prognosis, and extensive caregiving responsibilities. Specialist palliative care teams are uniquely positioned to support these processes through structured communication, psychosocial counselling, and coordination of interdisciplinary care.

Towards structured referral criteria for neuro-palliative care in ischemic stroke

A major implication of the present study is the need to move from implicit, experience-based referral decisions towards transparent and reproducible referral pathways. At present, referral decisions rely largely on individual clinical judgement rather than standardized criteria. While clinical expertise remains indispensable, this approach inevitably leads to variation in practice and may contribute to the under-recognition of patients with substantial palliative care needs.

Our findings suggest that certain clinical and care-related characteristics—including severe dysphagia, profound functional dependency, complex discharge planning, repeated goals-of-care discussions, and substantial caregiver burden—may serve as practical indicators for considering specialist palliative care consultation. Importantly, these characteristics should not be interpreted as markers of imminent death or treatment failure. Rather, they reflect increasing clinical complexity, multidimensional symptom burden, and psychosocial needs that may benefit from interdisciplinary palliative expertise alongside simultaneous, ongoing stroke-specific management.

More broadly, adopting standardized, needs-based referral pathways would support a shift from a prognosis-driven to a needs-based model of neuro-palliative care. This paradigm is particularly relevant in ischemic stroke, where recovery trajectories are highly heterogeneous and difficult to predict. Integrating palliative care based on patient needs rather than estimated life expectancy may ensure that supportive interventions are provided at the appropriate time without precluding ongoing rehabilitation or disease-directed treatment.

Future research should prospectively validate these potential trigger criteria in diverse stroke populations and evaluate whether their implementation leads to earlier SPC involvement, more timely palliative care referral when appropriate, improved patient- and caregiver-reported outcomes, and more efficient utilization of specialist palliative care resources. Such studies should also examine whether structured

referral pathways reduce unwarranted practice variation while maintaining flexibility for individualized clinical decision-making.

Strengths and limitations

The strengths of this study include the use of a matched cohort design, which reduced confounding by age, sex, stroke severity, and infarct location, thereby allowing a more focused evaluation of referral patterns. Furthermore, the study reflects routine clinical practice at a tertiary comprehensive stroke center and therefore provides valuable real-world insights into current implementation of neuro-palliative care.

Several limitations should be acknowledged. First, the retrospective single-center design limits the generalizability of our findings and precludes causal inference. Referral to SPC was based on individual clinical judgement rather than predefined criteria, introducing potential selection bias. Second, several variables associated with palliative care needs, including frailty, premorbid functional status, cognitive impairment, and socioeconomic factors, were not consistently available and therefore could not be included in the analysis. Third, the relatively small number of patients receiving SPC consultation limited statistical power and prevented more comprehensive multivariable modelling. Finally, symptom assessment was based on routine clinical documentation and may therefore have underestimated symptom burden in patients who did not receive formal palliative assessment.

Conclusions

In this matched cohort study, specialist palliative care was involved in a small proportion of patients hospitalized with acute ischemic stroke despite substantial neurological disability and supportive care needs. Referral was primarily associated with profound functional impairment, severe dysphagia, and increasing complexity of care rather than with demographic characteristics or stroke severity alone. These findings support a needs-based approach to neuro-palliative care after ischemic stroke and suggest that structured referral criteria incorporating dysphagia, functional dependency, and complex care planning could facilitate earlier and more equitable access to specialist palliative care. Prospective multicenter studies are warranted to validate these potential trigger factors and to determine whether systematic integration of specialist palliative care improves patient- and family-centered outcomes after acute ischemic stroke.

Declarations

Competing Interests

All authors declare no competing interests with the contents of the current paper. RR received fees as a speaker or for counselling services from Aristo Pharma, Avextra, cannamedical, Grünenthal, Tilray, Vayamed.

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Author Contribution

This work contains essential parts of the doctoral thesis of LR and the first draft of this manuscript was solely written by the first author LR. All other authors have reviewed and corrected the manuscript.

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Data Availability

All data supporting the findings of this study are available within the paper. Raw data from the institutional stroke registry is obtainable upon request.

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Figures

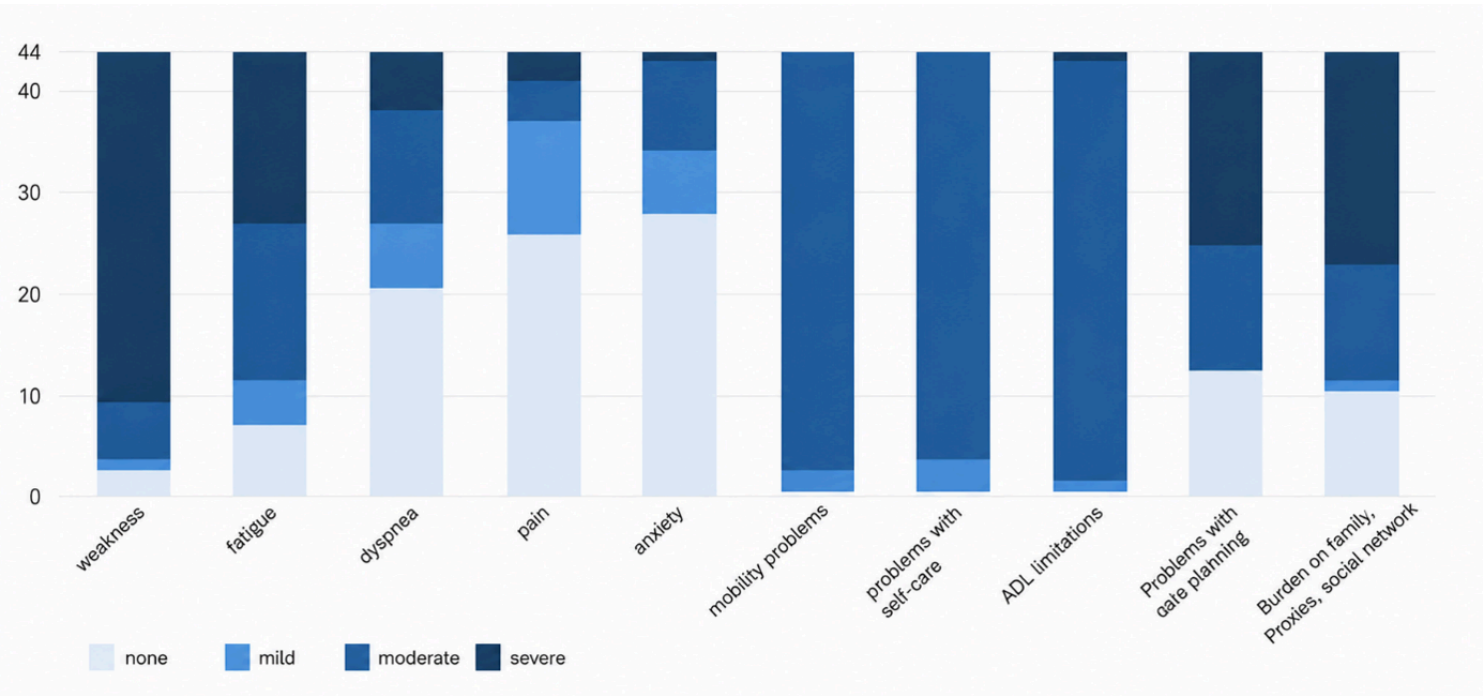


Figure 1

Symptom Burden of patients with SPC after ischemic stroke.

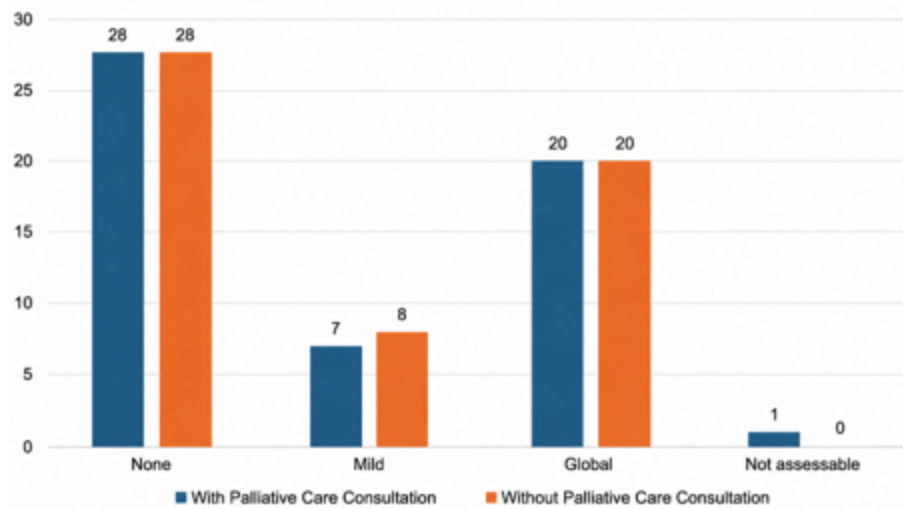


Figure 2

Aphasia after ischemic stroke in patients with and without SPC.

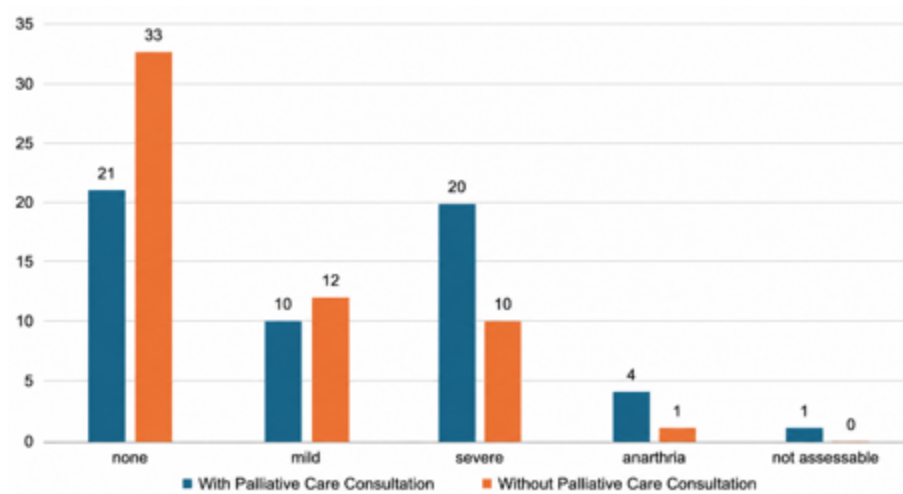


Figure 3

Dysarthria after ischemic stroke in patients with and without SPC.

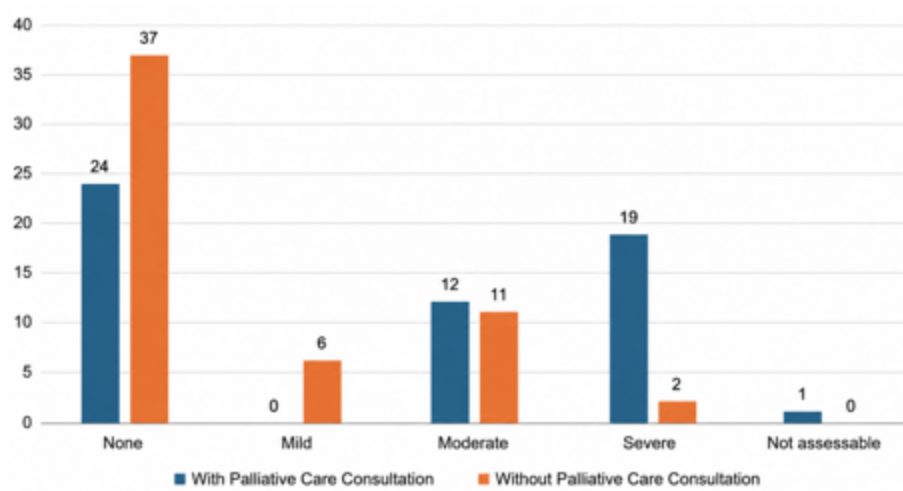


Figure 4

Dysphagia after ischemic stroke in patients with and without SPC.

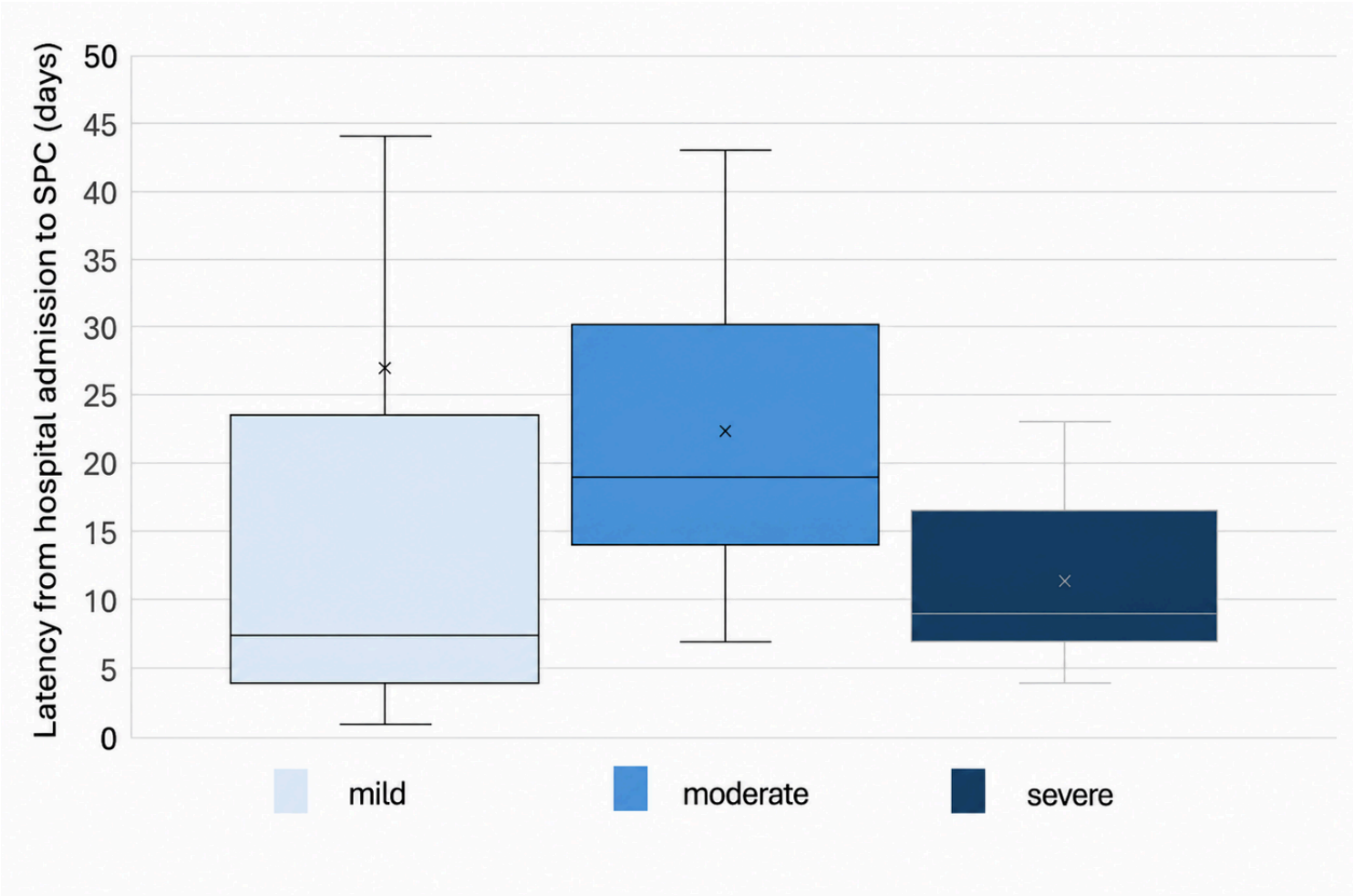


Figure 5

Latency from hospital admission to SPC depending on severity of dysphagia after ischemic stroke.

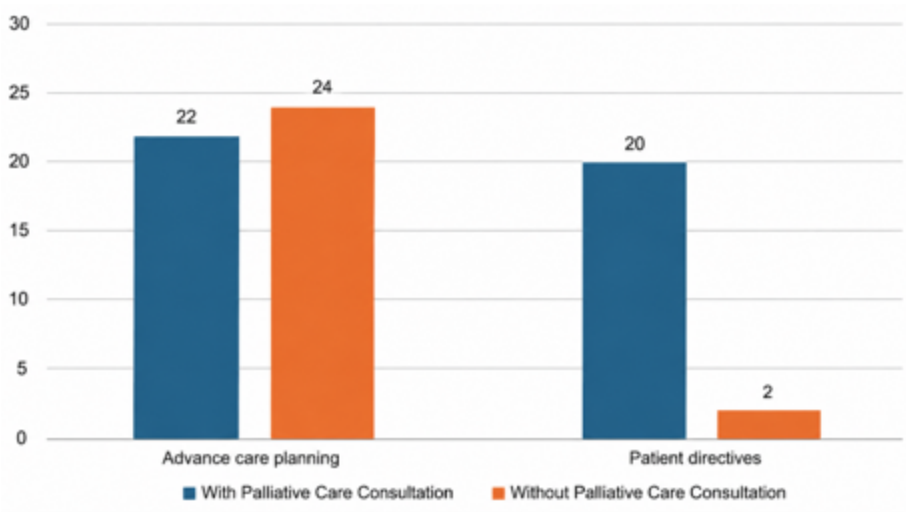


Figure 6

Advance Care Planning before ischemic stroke in patients with and without SPC.

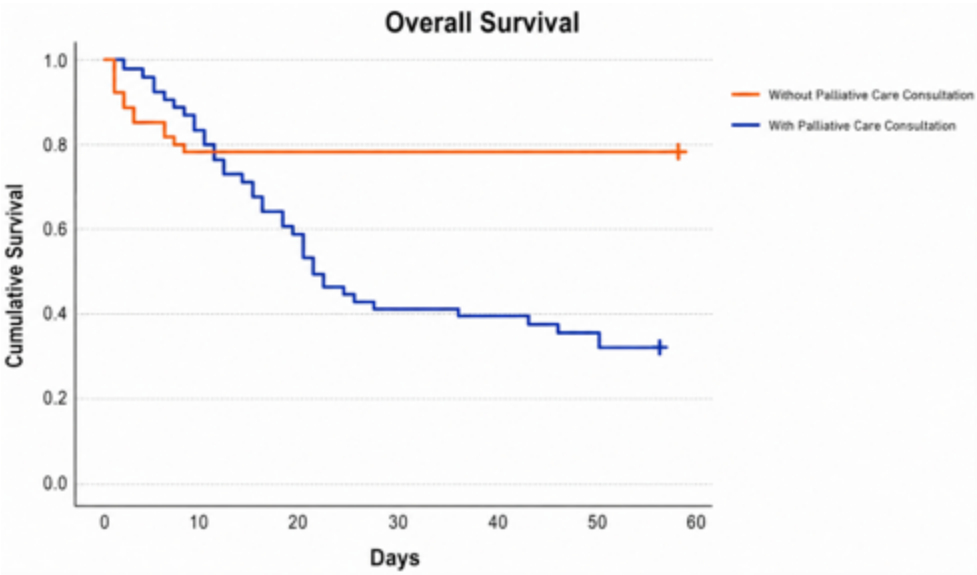


Figure 7

Overall survival of patients after ischemic stroke with or without SPC.

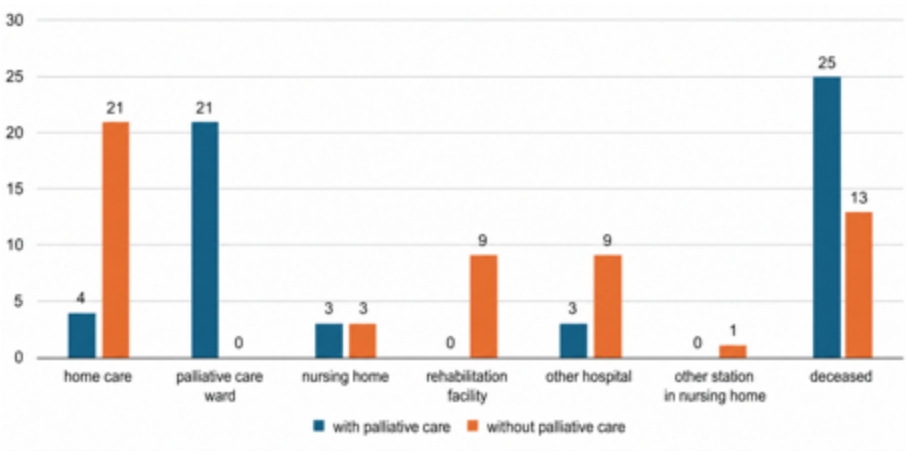


Figure 8

Discharge location with and without SPC