

## CME ARTICLE

## Palliative care needs of patients with neurologic or neurosurgical conditions

L. M. Chahine<sup>a</sup>, B. Malik<sup>a</sup> and M. Davis<sup>b</sup><sup>a</sup>Department of Neurology, Cleveland Clinic, Cleveland, OH; and <sup>b</sup>Harry R. Horvitz Center for Palliative Medicine, Taussig Cancer Center, Cleveland Clinic, Cleveland, OH, USA**Keywords:**

clinical neurology, health services research, palliative care, terminal care

Received 22 June 2008  
Accepted 11 August 2008

**Background and purpose:** Many patients with non-cancer diagnoses utilize palliative services. There is little data on the palliative care needs of patients with neurologic and neurosurgical disorders. **Methods:** Retrospective chart review. Log sheets which contain all patients seen between January 2004 and 2007 by palliative medicine (PM) were reviewed. Patients with neurologic or neurosurgical disorders were identified and their in-patient charts and electronic records reviewed. Patients with cancer were excluded. **Results:** A total of 1429 cancer patients were seen by PM. Neurologic or neurosurgical diseases were the second most common in patients seen by the PM service, in 177 cases. Forty-seven patients were excluded. Complete data was collected on 129 patients. Mean age was 70. Seventy-one (55%) were female. The most common neurologic diagnosis was ischemic stroke in 33 (26%). Seventy-five (58%) had symptoms recorded. Reasons for PM consultation included 'comfort measures' in 40 (39%) and 'hospice candidacy' in 38 (37%). The most common recommendation made by the PM service was morphine in 44 (42%). Sixty-three (49%) were deemed hospice appropriate. **Conclusions:** Our findings support the need for PM services for patients with various neurologic and neurosurgical disorders. Understanding these needs will allow for the tailoring of palliative care services to such patients.

**Introduction**

Early in the inception of palliative medicine (PM) was the thought of expanding services to include patients with non-malignant diseases [1]. Despite this, palliative care services have largely involved cancer patients. Patients with non-malignant diseases constituted only 19.8% of patients involved in hospice services in the United States in 1990 [2]. Utilization of hospice and palliative care by patients with non-malignant diseases is on the rise, and was estimated at 54% in 2005 [3]. Patients with cancer still constitute the largest proportion of patients seen by in-patient PM consultation services [4–6].

Palliative care needs of individuals with non-malignant diseases are increasingly being recognized [7–9].

Whilst the palliative care needs of patients with non-malignant diseases are similar in many respects to those of patients with cancer, several important differences have been recognized [10–12]. For example, in the last year of life, patients with various non-cancer diagnoses are older than cancer patients and less likely to die at home compared to cancer patients [12]. In the last year of life, patients with congestive heart failure, chronic obstructive pulmonary disease, stroke, and diabetes mellitus, have a longer duration and higher rates of functional impairment prior to death than cancer patients [13]. A larger number have impairment in activities of daily living compared to cancer patients. On the other hand, patients with cancer have a sharp functional decline in the last months of life, whereas patients with non-cancer diagnoses have a more gradual decline [13]. Patients with advanced dementia are less likely to show symptoms of pain, acute confusion, or nausea and vomiting relative to patients with advanced cancer [14].

Understanding palliative care needs of non-cancer patients is of great importance if one is to tailor services to such patients. There is little data on the palliative care needs of patients with neurologic or neurosurgical diseases in the in-patient setting. This study was undertaken with the objectives of: (i) describing the characteristics of patients with neurologic or neurosurgical diseases admitted to the PM service or seen in consultation by PM at our institution, (ii) exploring the

Correspondence: Lama Chahine, S-100, Department of Neurology, Cleveland Clinic, 9500 Euclid Avenue, Cleveland, OH 44195, USA (tel.: 216 444 2000; fax: 216 444 0230; e-mail: chahinl@ccf.org).

This work was carried out in its entirety at the Cleveland Clinic, 9500 Euclid Avenue, Cleveland, OH 44195.

This work was presented in part at the 2008 American Academy of Neurology meeting, Chicago, IL.

This is a Continuing Medical Education article, and can be found with corresponding questions on the internet at <http://www.efns.org/content.php?pid=132>. Certificates for correctly answering the questions will be issued by the EFNS.

reasons for admission to the PM service or PM consultation and (iii) delineating the consequences of interaction with PM.

## Methods

This study was approved by the Institutional Review Board of the Cleveland Clinic.

At our institution, a log sheet is kept which contains information pertaining to all patients admitted to PM or seen by PM in consultation. All consults are requested by contacting a specific telephone number. The individual receiving the consult documents the referral and records on the log sheet the name of the patient, medical record number, primary diagnosis, and referring physician. Identification of eligible patients for the study involved reviewing all log sheets with information pertaining to admissions or consults to the PM service from the first week of January 2004 until the last week of January 2007.

Patients for whom the primary diagnosis was indicated (on the log sheet) as a malignancy were excluded. From the patients with non-malignant diseases, patients with a neurologic or neurosurgical diagnosis were identified and their medical records were reviewed thoroughly. Records from the electronic medical record and the electronic problem list were reviewed with the specific purpose of identifying patients who fit eligibility criteria. The charts of all patients for whom the primary diagnosis on the log sheet was vague, such as 'multiple co-morbidities' or 'failure to thrive' were also reviewed to identify any patient in whom the underlying primary diagnosis was in fact a neurologic or neurosurgical disease.

All patients with a neurologic or neurosurgical diagnosis who were admitted to or seen in consultation by the PM medicine service were included in the study unless they met exclusion criteria. Exclusion criteria were (i) current or remote diagnosis of a malignant condition or benign intracranial neoplasm and (ii) sufficient data could not be gathered based on chart review. Patients with malignancy or intracranial neoplasm were excluded because the objectives of this study were to identify the palliative care needs of non-cancer neurology or neurosurgery patients. Diagnosis of a malignant disease or benign neoplasm would detract from the purpose of this study. Though patients with intracranial benign neoplasms usually have a better prognosis than those with malignancy, some share similar complications and care needs to cancer patients and thus were excluded.

The following data were collected: patient demographics, location of living prior to admission, date of hospital admission and discharge, diagnosis, reason for admission, symptoms if any (as noted in the primary team's progress notes and PM service admission/consult

notes); in the case of non-communicative patients, data was collected regarding the presence of signs and symptoms as obtained by the primary team and PM consultant from caregivers including nurses and family members (as documented in the history and review of systems) and the physical examination (documented as observations of the examiner), signs of chronic debility (decubitus ulcers, cachexia, recurrent falls, and weight loss), ability to communicate at the time of PM contact (as noted by primary team's progress notes and PM admission/consult note), whether the patient was intubated at the time of PM consult, what subspecialty the patient was originally admitted to, and if the patient was not originally admitted to the PM service, which service had primary responsibility for the patient at the time consult to PM was placed, resuscitation status at the time of consult, types of palliative medications administered, whether or not a social work or bioethics consult was placed for the patient, if the patient received non-invasive ventilation during admission, and whether the patient had a percutaneous gastrostomy tube (PEG) or tracheostomy. The outcomes of the PM consult were also documented, including what changes were made to medications, resuscitation status, goals of care, and discharge planning.

The admission during which the patient had contact with a PM specialist will be referred to as the index admission.

Patients were divided into two groups: those with a newly diagnosed disease, i.e., those diagnosed with a neurologic or neurosurgical disease during the index admission, and those with a previously diagnosed neurologic or neurosurgical disease who were admitted, for example, for a procedure or with an acute medical problem related to their chronic disease.

If the patient had a previously diagnosed neurologic or neurosurgical disease, yet was admitted for an acute, unrelated neurologic or neurosurgical disease, the patient was classified as having a newly diagnosed neurologic or neurosurgical disease. For example, if a patient with dementia was admitted with an acute intracranial hemorrhage, the patient was categorized as having a newly diagnosed disease.

For patients not admitted to the PM service, reason for PM consult, recommendations by the PM service, and number of recommendations followed by the primary service were collected. If a patient was transferred to the PM service shortly (within hours) of the consult, the number of recommendations was not counted (as recommendations made by the consultant may not have been implemented in anticipation of transfer of the patient to the PM service). However, the actual recommendations of the PM consult were still documented for the latter cases.

## Results

From January 2004 to 2007, a total of 2015 admissions and consults to the PM service occurred (Fig. 1). Of these, 1429 (70.9%) patients had a malignant diagnosis. Five hundred and eighty-six (29.1%) had non-malignant diseases. Of the patients with non-malignant diseases, 177 (30.2%) had neurologic or neurosurgical diseases, 139 (23.7%) had primarily cardiac diseases, 62 (10.6%) had primarily renal diseases, 52 (8.9%) had primarily pulmonary diseases, 43 (7.3%) had primarily liver diseases, 37 (6.3%) had primarily infectious diseases, 22 (3.8%) had primarily vascular diseases, and 54 (9.2%) had various other diseases (hematological, infectious, gastrointestinal, or rheumatologic).

The charts of the 177 patients with neurologic or neurosurgical diseases were thoroughly reviewed for exclusion criteria. Forty-seven patients were excluded, seven because of inaccurate or incomplete documentation and 41 patients because they had current, recent, or remote diagnoses of malignancy (38 patients) or benign intracranial neoplasm (3 patients). The remaining 129 patients were included in the study.

### Patient characteristics and hospital admission data

Demographics, patient characteristics, and admitting service are shown in Table 1. Mean patient age was 69.9 years (SD 15.5 years). Seventy-one (55.0%) were female.

The average number of hospital days during admission was 11.5 (SD 9). Twenty-two (17%) were hospitalized for more than 20 days.

Twenty-five (19.4%) patients were admitted to the PM service and 104 (80.6%) to services other than PM (Table 1). Patients admitted to a neurology ward or neuro-intensive care unit bed (under care of the neurology or neurosurgery services) combined constituted 43 (33.3%) patients.

### Diagnosis and symptoms

Fifty-six (43.4%) patients had a newly diagnosed neurologic or neurosurgical diseases, i.e., neurologic or neurosurgical diseases that were diagnosed during the index hospital admission (Table 2). Seventy-three (56.6%) individuals had previously diagnosed neurologic conditions and were admitted for various reasons (Table 2). The most common neurologic or neurosurgical diagnosis in patients admitted to the PM service or seen by them in consultation was ischemic stroke in 33 (25.6%) followed by amyotrophic lateral sclerosis (ALS) in 30 (23.2%) and neurodegenerative disorders in 22 (17.1%). The most common reason for admission of ALS patients was for placement of a PEG tube, in 17 of 29 (56%) cases (Table 3). Altered mental status was the most common reason for admission for patients with dementia, in 10 of 28 (35.7%; Table 3).

At the time patients were seen by a PM specialist, 83 (64.3%) could not communicate by verbalization.

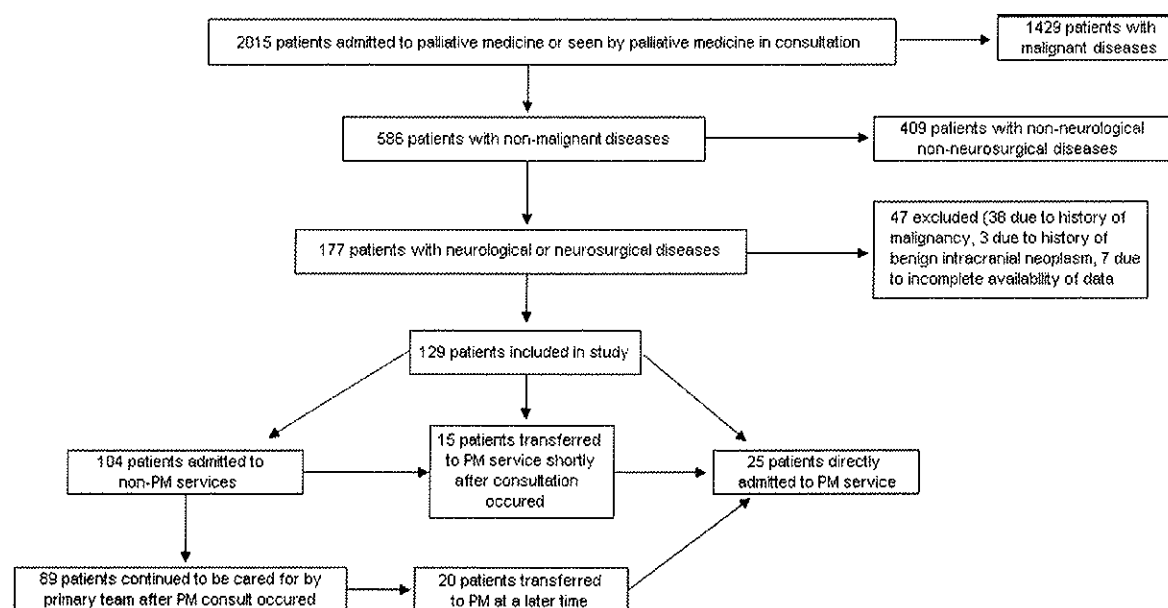


Figure 1 Summary of patients seen by the Palliative Medicine service from January 2004 to January 2007.

**Table 1** Demographics, patient characteristics, and other information regarding patients admitted to the Palliative Medicine service or seen by them in consultation

Demographic characteristic	Number (%) n = 129
Age	
30-39	3 (2.3)
40-49	12 (9.3)
50-59	24 (18.6)
60-69	23 (17.8)
70-79	25 (19.4)
80-89	30 (23.3)
90-99	10 (7.8)
100-109	2 (1.6)
Gender	
Female	71 (55)
Male	58 (45)
Marital status	
Married	71 (55)
Single	13 (10.1)
Widowed	35 (26.9)
Other	10 (7.8)
Ethnicity	
Caucasian	81 (62.3)
African American	44 (33.8)
Hispanic	3 (2.3)
Other (ethnicity unknown)	1 (0.8)
Living situation prior to admission	
Home	79 (60.8)
Nursing home	24 (18.5)
Other (subacute nursing facility, rehab, extended care facility, assisted living, unknown)	26 (20.2)
Admitting service	
Palliative Medicine	25 (19.4)
Medicine*	23 (17.8)
Neurosurgery ICU*	15 (11.5)
Medicine-hospitalist service	15 (10.9)
Neurology ICU*	14 (10.8)
Neurology*	14 (10.8)
Medical ICU*	11 (8.5)
Other (cardiology teaching or hospitalist, cardiology ICU, surgical ICU, vascular surgery, spine surgery, emergency department, pulmonology)	12 (9.3)
ICU admission at any time during admission	
Yes	55 (42.6)
No	73 (56.6)

ICU, intensive care unit.

\*Teaching service.

writing, or gesticulation. The mean number of symptoms or signs was 2.1. Seventy-five (58.1%) patients were documented as having at least one sign of chronic debility or at least one symptom. Of these, 34 of 75 (45.3%) could not communicate. Forty-eight (37.2%) had three or more symptoms or signs. The most common symptoms were dysphagia in 36 (27.9%) patients, pain in 32 (25%), dyspnea in 26 (20.2%), generalized

**Table 2** Diagnoses of patients admitted to the Palliative Medicine service or seen by them in consultation

Diagnosis	Number (%) n = 129
Chronic neurodegenerative disorder	
Newly diagnosed	0
Previously diagnosed	
Dementia	22 (17.1)
Motor neuron disease	
Newly diagnosed	
ALS	1 (0.8)
Previously diagnosed	
ALS	29 (22.4)
Ischemic or hemorrhagic stroke	
Newly diagnosed	
Acute ischemic stroke	21 (16.3)
Acute ischemic stroke with hemorrhagic conversion	5 (3.9)
Previously diagnosed	
Prior stroke with residual deficit	7 (8.3)
Intracranial hemorrhage (excluding ischemic stroke with hemorrhagic conversion)	
Newly diagnosed	
Intraventricular hemorrhage	1 (0.8)
Acute subdural hematoma	2 (1.6)
Hypertensive intracerebral hemorrhage	4 (3.1)
Anti-coagulation related intracerebral hemorrhage	5 (3.9)
Aneurysmal subarachnoid hemorrhage	3 (2.3)
Previously diagnosed	
Chronic subdural hematoma	1 (0.8)
Demyelinating disease	
Newly diagnosed	
Acute CNS demyelination of undetermined cause	2 (1.6)
Previously diagnosed	
Devic's neuromyelitis optica	1 (0.8)
Multiple sclerosis	4 (3.1)
Movement disorder	
Newly diagnosed	0
Previously diagnosed	
Multisystem atrophy	2 (1.6)
Parkinson's disease	4 (3.1)
Central nervous system infection	
Newly diagnosed	
Bacterial meningitis	1 (0.8)
Creutzfeldt-Jacob disease	1 (0.8)
Previously diagnosed	
Progressive multifocal leukoencephalopathy	2 (1.6)
Other	
Newly diagnosed	
Spinal cord compression	1 (0.8)
Status epilepticus	2 (1.6)
Previously diagnosed	
Neurofibromatosis	1 (0.8)

ALS, amyotrophic lateral sclerosis.

weakness in 20 (15.4%), dysarthria in 16 (12.4%), anorexia or decreased oral intake in 15 (11.6%), and constipation in eight (6.2%). The most common signs of chronic debility were unintentional weight loss in 19

**Table 3** Reason for admission of patients previously diagnosed with dementia or ALS

Diagnosis, reason for admission, and results of work-up if any	Number
<b>Dementia</b>	28 <sup>a</sup>
Admitted with altered mental status	10
Found to have UTI	2
Found to have pneumonia	2
Work-up for cause negative	2
Found to have pneumonia and NSTEMI	1
Found to have multi-organ failure	1
Found to have sepsis (source not found) and ARF	1
Found to have bacteremia with sepsis	1
Admitted with respiratory distress	6
Found to have pneumonia	4
Found to have NSTEMI	1
Found to have NSTEMI and ARF	1
Admitted with a newly diagnosed neurologic condition	6
Acute ischemic stroke	2
Intracranial hemorrhage	2
Status epilepticus	1
Admitted after fall, found to have bilateral subdural hematoma	1
<b>Other</b>	5
Admitted with hypotension, found to be dehydrated	2
Admitted with leg swelling, found to have DVT	1
Admitted for multiple complications following MVA	1
Admitted with PEG tube dysfunction and increased moaning	1
<b>ALS</b>	29 <sup>b</sup>
Admitted for PEG placement	17
Admitted with respiratory distress	8
Respiratory distress attributed to diaphragmatic weakness	7
Found to have NSTEMI	1
<b>Other</b>	4
Admitted with dehydration and malnutrition	1
Admitted with leg swelling, found to have DVT	1
Admitted near end-of-life, in order to be able to donate organs	1
Admitted with urinary retention	1

ALS, amyotrophic lateral sclerosis; AM, altered mental status; DVT, deep vein thrombosis; MVA, motor vehicle accident; NSTEMI, non-ST elevation MI; UTI, Urinary tract infection; PEG, percutaneous gastrostomy.

<sup>a</sup>Six patients with dementia had a newly diagnosed neurologic condition and thus were classified under the category of that neurologic condition in Table 2.

<sup>b</sup>One patient was admitted with acute respiratory failure and work-up revealed ALS. Thus the patient was classified under newly diagnosed motor neuron disease in Table 2.

(14.7%) patients, decubitus ulcers in six (4.7%), and cachexia in six (4.7%).

A PEG tube had been placed at some point (in previous admissions or during the index admission) in 50 (38.8%) patients. Of these, 29 were non-communicative and decision and consent for PEG tube placement had

occurred based on wishes stated in the living will when available (in four cases), by family members (in 15 cases) or durable power of attorney (DPOA) when one had been appointed (in 10 cases).

### Resuscitation status

Living wills were present for only 18 (14.0%) patients (10 of which had previously diagnosed neurologic diseases). Twenty-nine (22.3%) patients (17 of which had previously diagnosed diseases) had a DPOA appointed prior to hospitalization.

At the time patients were seen by the PM service (whether through admission or consultation), resuscitation status was documented as DNR-Comfort Care (DNR-CC) for 55 (45.0%) patients, DNR-Comfort Care Arrest (DNR-CCA) for 22 (16.9%), full resuscitation for 17 (13.1%), and DNR-Specified (no cardiopulmonary resuscitation and/or no intubation) in 17 (13.1%).

Fifty-seven patients were admitted to non-PM services and were DNR-CC prior to PM contact. One or more indicators consistent with the patients' palliative plan of care had been implemented by the primary team in 43 of 57 (75%) patients. The most common indicator was initiation of one or more medications for comfort for 32 of 57 (56.1%) patients, including opioids for 31 of 57 (54.4%). Laboratory testing was discontinued when the DNR-CC status was instituted in 29 of 57 (50.9%) patients. On the other hand, vital sign monitoring was continued for 44 of 57 (77.2%) patients despite DNR-CC status, medications not considered essential for comfort were continued for 30 of 57 (52.6%), and intravenous hydration was continued for 50 of 57 (87.7%).

### Reasons for admission to PM or PM consult

Of the 25 patients admitted directly to the PM service, 17 were ALS patients admitted for PEG tube placement. Four patients were admitted for acute symptom management, two for an acute medical problem, and two for symptomatic end-of-life care.

For the 104 patients not admitted to the PM service, more than one reason for PM consultation was documented in 40 of 104 (38.5%). Reasons for PM consultation as documented by the primary service or PM consultant included 'comfort measures' in 40 of 104 (38.5%) cases, 'hospice candidacy' or 'transition to hospice' in 38 of 104 (36.5%), 'symptom management' in 21 of 104 (20.2%), 'end of life issues' in 21 of 104 (20.2%), and 'goals of care' in 15 of 104 (14.4%).

The total number of patients transferred to the PM service after they were seen in consultation was 25

(19.4%; Fig. 1). Fifteen were transferred to PM shortly (within hours) of being seen by a PM consultant. These patients were included with patients admitted to the PM service for analysis in regards to number of recommendations made and followed by the primary service.

#### Recommendations of PM consultant and results of contact with PM

Of the 89 patients seen in consultation who were not transferred to the PM service, a total of 399 recommendations were made, and a total of 342 (86%) recommendations were implemented by the primary service. All recommendations made by the PM consultant were followed by the primary service in 52 of 89 (58.4%) cases.

For the 104 patients seen by PM in consultation, the most common recommendation made by the PM service was morphine as needed for pain or dyspnea in 44 (42.3%) cases (Table 4).

Of the 129 patients seen by the PM service, 63 (49.2%) were deemed hospice appropriate. Resuscitation status was changed in 21 (16.3%) patients following PM contact: resuscitation status was changed to DNR-CC in 17 of 21 (90%). The results of PM contact included institution of comfort measures or additions to comfort measures (if they had already been instituted by the primary service) in 64 (49.6%) cases, management of symptoms in 60 (46.5%), arrangement for hospice in 47 (36.4%), discontinuation of unnecessary interventions or interventions deemed futile in 48 (37.2%), and discussion and determination of goals of care in 32 (24.8%).

**Table 4** Recommendations made by the Palliative Medicine service for patients seen by Palliative Medicine in consultation

Recommendation	Number (%) <i>n</i> = 104
Opioids as needed for pain or dyspnea	
Morphine	44 (42.3)
Fentanyl	8 (7.7)
Methadone	5 (4.8)
Initiation of mucolytic agent	43 (41.3)
Initiation of an antipsychotic as need for agitation	37 (35.6)
Discontinuation of unnecessary medications	31 (29.8)
Discontinuation of vital sign measurement	22 (21.2)
Discontinuation of further laboratory testing	19 (18.3)
Discontinuation of intravenous fluids	19 (18.3)
Discontinuation of percutaneous gastrostomy tube feeds	14 (13.5)
Initiation of intravenous benzodiazepine	13 (12.5)
Organization of a family meeting	12 (11.5)
Social work consultation	10 (9.6)

Social work was involved in the care of consult patients at some point during the index admission in 31 (24.0%) cases. Bioethics was involved in three cases.

#### Patient disposition

Forty-four (34.1%) patients died during the index admission. Thirty-seven (28.7%) died within 5 days of having contact with a PM specialist. Thirty-two (24.8%) were discharged to in-patient hospice, 19 (14.7%) were discharged home with hospice services, and 17 (13.2%) were discharged home with or without home care. The disposition also included a subacute nursing facility for seven (5.4%) and a nursing home with hospice for six (4.7%).

#### Discussion

Patients with various acute or chronic neurologic or neurosurgical diseases have multiple physical, psychosocial, and spiritual needs. This study explores the palliative care needs of such patients.

Whilst patients with cancer constitute the largest proportion of patients seen by palliative care consultation services [4-6,15,16], PM specialists also care for patients with non-malignant diseases. Patients with neurologic or neurosurgical diseases constituted the largest group of patients with non-malignant diseases seen by the PM service at our institution.

The adoption of the palliative care approach by neurologists involved in the treatment of ALS patients has resulted in improvements in the standard of care, prognosis, and quality of life of patients with ALS [17,18]. Unfortunately, this does not hold true for several other neurologic conditions. Stroke is the 3rd leading cause of death worldwide [19]. Patients who die within days to months of their stroke, and their families, have been shown to have several unmet palliative care needs [20,21]. A large proportion of stroke patients live with residual deficits and disability [22]. Some physicians regard stroke and dementia as not being appropriate for referral to a specialist palliative care service [23]. In our study, stroke was the most common diagnosis amongst patients with non-malignant diseases seen by PM over a 3-year period, and dementia constituted a large number of our patient population as well.

Dysphagia is not a common symptom in cancer patients in general [24], though it is common amongst patients with gastrointestinal and head and neck malignancies [25,26]. Dysphagia was the most common recorded symptom in our group of patients; this suggests that palliative care offered to patients with neurologic conditions may need to include

services for the assessment and treatment of this problem.

Of 75 patients with documented symptoms seen by PM, 45% were non-communicative. Our patient population may differ in this respect compared to cancer patients in that the latter may be more likely to maintain awareness and communicate symptoms; this deserves further study. The high percentage of non-communicative patients indicates that for such patients, symptoms should be anticipated by those caring for the patient or inferred from the patient's appearance and behavior. Collateral information from relatives and those most closely involved in the patient's care is essential in such cases. Monitoring techniques that aid in the gauging of a non-communicative patient's level of awareness and pain level [27] may prove to be useful in the palliative care of patients with neurologic or neurosurgical disorders.

Over half of the patients in our study had previously diagnosed neurologic diseases in which decline could have been anticipated yet only a minority had living wills. This points to a need for neurologists and other physicians taking care of patients with chronic neurologic diseases to discuss living wills with their patients.

In our study, the primary team had initiated one or more comfort measures prior to consultation with PM for the majority of patients who were DNR-CC. However, for most patients, the healthcare team continued to monitor their vital signs, administer medications that are typically used for co-morbidities rather than comfort, and order intravenous hydration. Whilst no direct conclusion can be drawn from this data, there are various explanations for this that are likely related to both physician understanding of the DNR-CC resuscitation status, physicians' perception of what is futile treatment and what is not, physician comfort in withdrawing what would be considered usual care, and patient/family perceptions and/or preferences.

In other studies of in-patient PM consultation liaison service referrals, the mean number of recommendations made per patient was 4.2 and 91% of the recommendations were implemented by the primary team [28]. We found similar results, with an average of three recommendations made per consult and 86% of recommendations implemented by the primary team. This indicates, in general, a willingness of physicians from a variety of specialties to institute palliative care measures in their patients as recommended by palliative care specialists.

This data is limited by the design of this study, a retrospective chart review that relied heavily on documentation of the admitting service and/or the PM consultant. Our tertiary-case patient population may

not be representative of patients in other settings. In addition, the diagnoses of patients with non-malignant conditions that were not neurologic or neurosurgical, with few exceptions as noted in Methods, were not pursued further. Therefore, some patients initially classified as having non-malignant diseases may have also had cancer. In addition, the charts of patients with non-malignant diseases who were listed as having a non-neurologic or neurosurgical diagnosis (for example, patients listed as 'end stage renal disease') were not further reviewed; a proportion of these patients may have in fact had underlying neurologic or neurosurgical diseases related to their admission. Another limitation of this retrospective study is the absence of data on the psychosocial aspects of the patients' care, largely due to the way records are maintained such that the latter is not documented in the main medical records that were reviewed for this study.

Despite these limitations, our study supports the idea that patients with various acute or chronic non-malignant neurologic or neurosurgical disorders have a variety of palliative care needs. The success of integrating palliative care services into the care of patients with neurologic diseases is exemplified in the case of ALS care [17,18], and similar models of care could potentially offer patients with other neurologic or neurosurgical diseases an improved quality of life. Our data suggests that palliative care services offered to patients with neurologic and neurosurgical conditions would need to include means of assessing symptoms in non-communicative patients and protocols for assessment and treatment of dysphagia. Patients with progressive neurologic and neurosurgical conditions need to be encouraged to adopt living wills and appoint DPOAs early in their illness. Further studies examining which palliative interventions are most effective will be needed to determine how to best tailor palliative services to such patients. The palliative care needs of neuro-oncology patients, not included in this study, will also be important to understand as this field grows.

### Conflict of interest

The authors report no conflicts of interest.

### References

1. Doyle D, Hanks G, Cherny NI, Calman K. *Palliative Medicine in Non-Malignant Disease*. Oxford Textbook of Palliative Medicine, 3rd edn. New York: Oxford University Press, 2004: pp. 843-846
2. Christakis NA, Escarce JJ. Survival of Medicare patients after enrollment in hospice programs. *New England Journal of Medicine* 1996; **335**: 172-178.

3. National Hospice and Palliative Care Organization. *NHPCO's Facts and Figures – 2005 Findings*. 2006; 4. Available from: <http://www.allhealth.org/BriefingMaterials/NHPCO-NHPCOsFactsandFigures-2005-Findings-760.pdf> (accessed 15/09/2008).
4. Weissman DE. Consultation in palliative medicine. *Archives of Internal Medicine* 1997; **157**: 733–737.
5. Weissman DE, Griffie J. The Palliative Care Consultation Service of the Medical College of Wisconsin. *Journal of Pain and Symptom Management* 1994; **9**: 474–479.
6. Walsh TD. Continuing care in a medical center: the Cleveland Clinic Foundation Palliative Care Service. *Journal of Pain and Symptom Management* 1990; **5**: 273–278.
7. Addington-Hall J, Fakhoury W, McCarthy M. Specialist palliative care in nonmalignant disease. *Palliative Medicine* 1998; **12**: 417–427.
8. Rosenwax LK, McNamara B, Blackmore AM, Holman CD. Estimating the size of a potential palliative care population. *Palliative Medicine* 2005; **19**: 556–562.
9. Foley KM, Carver AC. Palliative care in neurology. *Neurologic Clinics of North America* 2001; **19**: 789–799.
10. Albinsson L, Strang P. Differences in supporting families of dementia patients and cancer patients: a palliative perspective. *Palliative Medicine* 2003; **17**: 359–367.
11. Hirahara S. The present state and subject of home hospice for patients with non-cancer disorders. *Gan To Kagaku Ryoho* 2004; **31**(Suppl. 2): 196–198.
12. Addington-Hall J, Fakhoury W, McCarthy M. Specialist palliative care in nonmalignant disease. *Palliative Medicine* 1998; **12**: 417–427.
13. Teno JM, Weitzen S, Fennell ML, Mor V. Dying trajectory in the last year of life: does cancer trajectory fit other diseases? *Journal of Palliative Medicine* 2001; **4**: 457–464.
14. Hirakawa Y, Masuda Y, Kuzuya M, Iguchi A, Asahi T, Uemura K. Home end-of-life care for advanced dementia vs advanced cancer elderly patients: dying elderly at home project. *Nippon Ronen Igakkai Zasshi* 2006; **43**: 355–360.
15. Kite S, Jones K, Tookman A. Specialist palliative care and patients with noncancer diagnoses: the experience of a service. *Palliative Medicine* 1999; **13**: 477–484.
16. Virik K, Glare P. Profile and evaluation of a palliative medicine consultation service within a tertiary teaching hospital in Sydney, Australia. *Journal of Pain and Symptom Management* 2002; **23**: 17–25.
17. Traynor BJ, Alexander M, Corr B, Frost E, Hardiman O. Effect of a multidisciplinary amyotrophic lateral sclerosis (ALS) clinic on ALS survival: a population based study, 1996–2000. *Journal of Neurology, Neurosurgery, and Psychiatry* 2003; **74**: 1258–1261.
18. Bradley WG, Anderson F, Gowda N, Miller RG. ALS CARE Study Group. Changes in the management of ALS since the publication of the AAN ALS practice parameter 1999. *Amyotrophic Lateral Sclerosis and Other Motor Neuron Disorders* 2004; **5**: 240–244.
19. Lopez AD, Murray CC. The global burden of disease, 1990–2020. *Nature Medicine* 1998; **4**: 1241–1243.
20. Rogers A, Addington-Hall J. Care of the dying stroke patient in the acute setting. *Journal of Research in Nursing* 2005; **10**: 153–167.
21. Addington-Hall J, Lay M, Altmann D, McCarthy M. Symptom control, communication with health professionals, and hospital care of stroke patients in the last year of life as reported by surviving family, friends, and officials. *Stroke* 1995; **26**: 2242–2248.
22. Volpe BT. Palliative treatment for stroke. *Neurologic Clinics of North America* 2001; **19**: 903–920.
23. Dharmasena JP, Forbes K. Palliative care for patients with non-malignant disease: will hospital physicians refer? *Palliative Medicine* 2001; **15**: 413–418.
24. Teunissen SC, Wesker W, Kruitwagen C, de Haes HC, Voest EE, de Graeff A. Symptom prevalence in patients with incurable cancer: a systematic review. *Journal of Pain and Symptom Management* 2007; **34**: 94–104.
25. Khalid U, Spiro A, Baldwin C, et al. Symptoms and weight loss in patients with gastrointestinal and lung cancer at presentation. *Supportive Care in Cancer* 2007; **15**: 39–46.
26. Chiu TY, Hu WY, Chen CY. Prevalence and severity of symptoms in terminal cancer patients: a study in Taiwan. *Supportive Care in Cancer* 2000; **8**: 311–313.
27. Gambrell M. Using the BIS monitor in palliative care: a case study. *Journal of Neuroscience Nursing* 2005; **37**: 140–143.
28. Manfredi PL, Morrison RS, Morris J, Goldhirsch SL, Carter JM, Meier DE. Palliative care consultations: how do they impact the care of hospitalized patients? *Journal of Pain and Symptom Management* 2000; **20**: 166–173.