A Neurologist's Contribution to a Respiratory Diseases Hospital

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ABSTRACT

Purpose: Despite some data on neurological comorbidities in general hospitals, emergency rooms or intensive care units no previous study, to our knowledge, regarding neurological consultations in respiratory diseases hospitals has been performed yet. In this study, it has been aimed to question the value and benefit of neurological consultations for a respiratory disease hospital.

Methods: This study was performed in a respiratory diseases and thorax surgery education and research hospital in Istanbul, Turkey in the first quarter of 2012. We evaluated the characteristics of neurological consultations and diagnoses. Patients who were consulted by the same neurologist in 3 consecutive months were included in the study. A form questioning demographics and clinical details of the consultation was filled in for each patient. Results have been analyzed with student t-test and chi-square analysis.

Findings: During 3 months, 116 patients were consulted to neurology. The prevalence of neurology consultations was 2%. Oncology clinic followed by respiratory intensive care unit asked consultations the most frequently (42.3% and 40.9%). Agitation was the most frequent reason for neurology consultations (13%). The most common diagnoses made by the neurologist in all patients were stroke and dementia (12% each). Delirium (25%) was the most common diagnosis for the symptoms which started after hospitalization.

Discussion: Neurology consultation frequency in a respiratory diseases hospital was not different from general hospitals. The neurologist has been consulted for a vast spectrum of symptoms which are neurologic, neurologically related or non-neurologic.

Conclusion: A neurologist is necessary for all branch hospitals. Rational consultation demands will increase the benefit from consultation process.

Keywords: neurology, consultation, respiratory diseases

ÖZET

Bir Solunum Hastalıkları Hastânesine Nöroloğun Katkısı

Amaç: Genel hastâneler, acil servisler ve yoğun bakım ünitelerindeki nörolojik komorbidetelerle ilgili bazı veriler mevcut olmakla birlikte, bildiğimiz kadarıyla göğüs hastalıkları hastânelerindeki nöroloji konsultasyonlarıyla ilgili yapılmış bir çalışma henüz bulunmamaktadır. Bu çalışmada bir göğüs hastalıkları hastânesinde nöroloji konsultasyonlarının değeri ve faydasının sorgulanması amaçlanmıştır.

Yöntem: Bu çalışma 2012'nin ilk üç ayında İstanbul'daki bir göğüs hastalıkları ve göğüs cerrahisi eğitim araştırma hastânesinde gerçekleştirilmiştir. Nöroloji konsültasyonları ve tanılarının özellikleri değerlendirilmiştir. Aynı nörolog tarafından ardışık 3 ay boyunca konsulte edilen hastalar çalışmaya dâhil edilmiştir. Her hasta için konsültasyonun klinik detaylarını ve demografik verilerini sorgulayan standart bir form doldurulmuştur. Sonuçlar student t- test ve ki-kare testleri ile analiz edilmiştir.

Bulgular: Üç ay süresince 116 hasta nörolojiye konsülte edilmiştir. Nöroloji konsültasyonlarının prevalansı %2'dir. Konsültasyonlar en sık onkoloji kliniği ve ardından solunumsal yoğun bakım ünitesi tarafından istenmiştir (%42.3 ve %40.9). Ajitasyon, nöroloji konsültasyonu istemlerinin en sık nedenidir (%13). Tüm hastalar değerlendirildiğinde nöroloğun en sık koyduğu tanılar inme ve demanstır (her biri %12). Hastâneye yatıştan sonra başalayan semptomlara konulan tanılar içinde en sık olanı deliryumdur (%25).

Tartışma: Bir göğüs hastalıkları hastânesindeki nöroloji konsultasyon sıklığı genel hastanelerden farklı değildir. Nörolog nörolojik, nöroloji ile ilişkili ve nörolojik olmayan pek çok semptom için konsülte edilmiştir.

Sonuç: Bir nörolog tüm branş hastaneleri için gereklidir. Akılcı konsultasyon istekleri konsultasyon sürecinden faydalanmayı artıracaktır.

Anahtar Kelimler: nöroloji, konsültasyon, göğüs hastalıkları

INTRODUCTION

Neurological diseases develop or accompany other system diseases especially in older individuals. Thus, neurologists are frequently consulted by other clinics. Studies on neurological referrals have been performed in general hospitals or intensive care units (ICU) so far (Geocadin and Koenig 2008). Common neurological symptoms and diagnoses, primary medical diseases and their relations with neurological symptoms as well as the value and necessity of neurological consultations in general hospitals and ICU units have been studied and discussed before (Geocadin and Koenig 2008, Costello et al. 2005, McColgan et al. 2011). But department based data on usefulness and necessity of neurological opinion is inadequate. To our knowledge, there is no specific study about neurological consultations in respiratory diseases (RD) patients. This study has focused on the characteristics and prevalence of neurological consultations in a RD hospital in Istanbul. It has been aimed to question the value and benefit of the neurological consultations for RD patients.

METHODS

This study was performed in a RD and thorax surgery education and research hospital in Istanbul, Turkey. The hospital serves as a so called branch hospital with RD, thorax surgery, respiratory intensive care unit (ICU), postoperative ICU, oncology and allergy as main departments while all other departments like neurology, psychiatry, internal medicine etc. serve as outpatient clinics and consultants.

All random adult patients consulted to the same neurologist in the first quarter of 2012 were included in the study. The only exclusion criteria were being younger than 18 years old. A standard form which questioned age, sex, reason for consultation, primary diagnosis of hospitalization, neurologist's diagnosis, relationship of neurologist's diagnosis with primary diagnosis, diagnostic tests requested by the neurologist and need for neurological follow-up has been filled in for each patient.

Consultation requests were grouped according to the main clinic in which patients were hospitalized. The primary diagnoses for hospitalization were detected. The reasons for consultation were grouped and determined whether they were present formerly or became evident after hospitalization. The diagnoses made by the neurologist were noted and their relationship with the primary hospitalization reason was questioned. The rate of referrals to different branches and control appointment for neurology outpatient clinic were calculated.

The results are given as both numbers and percentages. Continuous variables such as age are normally distributed and therefore reported as means and standard deviations (SDs). Comparison of subgroups was performed using chi-square analysis and student t-test. The level of statistical significance was set at $P< 0.05$.

FINDINGS

The hospital has 605 inpatient clinic beds. The major departments and their number of beds are as follows: Respiratory Diseases; 455 beds (75.2%); Thorax Surgery; 46 beds (7.6%), Oncology; 26 beds (4.3%), Respiratory ICU; 22 beds (3.6%), Postoperative ICU; 14 beds (2.3%) and Allergy; 9 beds (1.5%). Pediatric RD and sleep laboratory own the remaining 33 beds (5.5%).

In the first quarter of 2012, inpatient clinics served 5840 patients. Excluding the patients hospitalized in pediatric RD (n:189), among remaining 5651 patients, the neurologist was consulted for 116 patients (2%). Thirty seven (31.9%) of the patients were female, while 79 (68.1%) were male. The mean age of the patients was 66.46 + 16.93 years (19-98). The age difference between male and female patients was not significant (68.02+14.21 vs. 63.13+16.93, p:0213).

The majority of the consulted patients were being treated in RD clinics (n:91, 78%), followed by oncology (n:11, 9%). Respiratory ICU requested consulta-

Table 1. Neurology consultation numbers and frequency of departments compared to inpatient bed numbers

DEPARTMENT	# of Inpatient Beds	# of Neurology Consultation Requests	Neurology Consultation Frequency (%)
Oncology	26	11	42.3*,†
Respiratory ICU	22	9	40.9
Pulmonary Diseases	455	91	20
Postop. ICU	14	2	14.2
Allergy	9	1	11.2
Thorax Surgery	46	2	4.3

*p:0.0006
†chi-square:21.618

Table 2. Primary diagnoses of consulted patients

PRIMARY DIAGNOSES	# of Patients
COPD	29(25%)
Pneumonia	26(22.4%)
Lung Cancer	22(18.9%)
Pulmonary Tuberculosis	17(14.6%)
Pulmonary Embolism	5(4.3%)
Other*	17(14.6%)
TOTAL	**116(100%)**

*: pleuresis, haemoptisis, acute bronchitis, interstitial pulmonary disease, acute respiratory failure, sarcoidosis, asthma, pneumothorax, thymoma.

tion for nine patients (7.7%) while thorax surgery and postoperative ICU requested 2 consultations (1.7%) each. Allergy clinic requested 1 consultation (0.8%) during 3 months.

Consultation frequencies of the clinics considering the number of beds have been summarized in Table 1. These results are significant with the value of chi-square 21.618 (p: 0.0006).

The primary diagnoses of the consulted patients have been listed in Table 2.

Agitation (n:15, 13%) was the most frequent reason for neurology consultations. Dizziness was the second common reason (n:13, 11%), followed by clouding of consciousness (n:10, 8.6%), headache (n:8, 6.8%), seizures or extremity pain (n:7, 6%, each), tremor (n:5, 4%), hallucinations or numbness of the extremities (n:4, 3.4%, each), amnesia, slurred speech or weakness of an extremity (n:3, 2.6%, each). Seven patients (6%) were consulted for medication planning for their chronic neurological diseases while 3 patients (2.6%) were consulted for routine neurological examination. Twenty-four patients (20.7%) were consulted for variety of symptoms such as head trauma, urinary incontinence, backpain, hemifacial hyperesthesia, insomnia, worsening of the respiratory symptoms, fatigue, local swelling of the hairy skin, numbness of the head, shivering of the abdomen, decline in visual acuity etc. each having a frequency of 1.7% or less. Symptoms were newly onset during hospitalization in 34.4% of the patients (n:40). Seventy-three patients (62.9%) were consulted for reasons which were already present before hospitalization. Three patients (2.6%) were consulted for general neurological examination without any complaints.

The patients' symptoms were the complications of their primary RD in 38.8% of the patients (n: 45) while they were the reason leading to their RD in 4.3% (n:5). The majority of the consultation reasons had no relation with the primary disease (n:66, 56.9%).

The most common diagnoses of the neurologist were stroke (n:14, 12%) and dementia (n:14, 12%) followed by delirium (n:12, 10.3%). Acute stroke was di-

Table 3. Summary of the neurologist's diagnoses for whole symptoms group

Neurologist's diagnoses for all symptoms	# of Patients
Stroke	14(12%)
Dementia	14(12%)
Delirium	12(10.3%)
Peripheral vertigo	11(9.5%)
Intracranial metastasis	6(5%)
Parkinsonism	5(4.3%)
Epilepsy	3(2.6%)
Neuropathic pain	4(3.4%)
Psychological somatisation	4(3.4%)
Tuberculosis meningitis	1(0.8%)
Status epilepticus	1(0.8%)
Myasthenia Gravis	1(0.8%)
Other*	44(37.9%)
TOTAL	**116(100%)**

*: normal, no diagnosis, nonspecific complaints, spinal metastasis, sepsis, respiratory acidosis, medication side effects

agnosed in 42.9% of stroke patients (n:6) while chronic stroke was diagnosed in 57.1% (n:8). Half of the acute stroke patients were hospitalized for COPD, 1 patient each (16.6%) was hospitalized for pneumonia, pleurisies and acute bronchitis. The most common RD in chronic stroke patients was pneumonia (n:5, 62.5%) followed by pulmonary embolism, pneumothorax and pleurisies (n:1, 12.5%, each).

Regarding dementia patients, 5 of them (35.7%) were in decompensated dementia status. Three of the decompensated dementia patients (60%) were hospitalized for COPD, and 1 patient (20%) each was internated for pneumonia and pulmonary embolism.

The mean age in delirium patients was 77.53+ 13.07 years. The most common primary disease of the delirium patients (n:5, 41.6%) was pneumonia, 2 patients each (16.6%) were internated for COPD and lung cancer, 1 patient each (8.3%) was internated for pulmonary embolism, pulmonary tuberculosis and interstitial pulmonary disease. The neurologist's diagnoses for all consultations have been summarized in Table 3.

Among 40 patients who had newly onset symptoms after hospitalization the most common diagnoses made by the neurologist were delirium (n:10, 25%), acute stroke (n:6, 15%), decompansated dementia (n:5, 12.5%) and medication side effect (n:3, 7.5%). Seizures and intracranial metastases were present in 2 patients (5%) each. Less frequent diagnoses were status epilepticus, neuropathic pain, myasthenia gravis (MG), spinal metastasis and peripheral vertigo (n:1, 2.5%, each). The neurologist had no neurologic or neurologically related diagnosis for seven patients (17.5%) (Table 4).

Totally 43 patients (37%) out of 116 had definite neurological disorders (Table 3). Among all consultations 10 patients (8.6%) were neurological emergencies which were stroke (n:6, 60%), seizures (n:2, 20%), status epilepticus (n:1, 10%) and tuberculosis meningitis (TBM) (n:1, 10%).

Thirty patients (25.8%) had neurologically related disorders like delirium (10.3%), peripheral vertigo (9.5%), intracranial metastasis (5%), and spinal metastasis (1.7%). Forty-three patients (37%) were completely non-neurological.

Seventy five patients (64.6%) were referred to a different branch including psychiatry, neurosurgery, orthopedics, urology etc. Forty three patients (37%) were given a neurology outpatient clinic appointment for follow-up.

Considering all 116 patients, the neurologist gave 132 total visits. The mean visit per patient was calculated as 1.14+ 0.32. One hundred and six patients were visited once, 5 patients were visited twice, 4 patients were visited 3 times and 1 patient was visited 4 times. Diagnostic tests were asked for 102 of the patients (87.9%) (Table 5). The assessments of the test results are not included in the total visit number.

Table 4. Summary of the neurologist's diagnoses for symptoms which started after hospitalization

Neurologist's Diagnosis for de novo symptoms	# of Patients
Delirium	10(25%)
Acute CVO	6(15%)
Decompansated Dementia	5(12.5%)
Medication Side Effect	3(7.5%)
Seizure	2(5%)
Intracranial Metastasis	2(5%)
Status epilepticus	1(2.5%)
Neuropathic pain	1(2.5%)
MG	1(2.5%)
Spinal metastasis	1(2.5%)
Peripheral vertigo	1(2.5%)
No diagnosis	7(17.5%)
TOTAL	40(100%)

Table 5. Diagnostic tests requested by the neurologist

DIAGNOSTIC TESTS	**# of Patients**
Carotids- Vertebrobasilary Doppler US	17(14.6%)
Blood tests*	21(18.1%)
Cranial Computerized Tomography(CT)	70(60%)
Cranial Magnetic Resonance Imaging(MRI)	20(17.2%)
Electrocardiography(EKG)	4(3.4%)
Electroencephalography(EEG)	10(8.6%)
Electromyography(EMG)	7(6%)
Nerve biopsy	1(0.8%)
Cervical vertebral MRI	1(0.8%)
None	14(12.1%)
TOTAL	**116(100%)**

*: complete blood count, electrolytes, lipid profile, thyroid function tests, sedimentation

DISCUSSION

This study analyzed the neurology consultation records of a RD branch hospital. The results showed that 2% of the hospitalized RD patients have been referred to the neurologist. This result is nearly the same with a former study from UK which was run in a general hospital (McColgan et al. 2011). Comparing inpatient beds of the departments, consultations were most commonly requested from oncology, respiratory ICU and RD clinics respectively. Agitation was the most common reason for consultations. The neurologist's most frequent diagnoses were stroke, dementia and delirium. Delirium was the leading diagnosis for the consultation reasons which started after hospitalization.

There was a male predominance of the consulted patients. This may be related with the male predominance in most of the pulmonary diseases related with the higher smoking rate (Chapman et al. 2001, Du et al. 1996).

Inter-department comparisons showed that oncology clinic has asked neurology consultations the most often (42.3%). Approximately 15 to 20 percent of all cancer patients have neurologic complications during their illnesses (Clouston et al. 1992), this ratio increases to 30% in patients with small-cell lung cancer (Sculier et al. 1987). This invasive nature of the disease leads both the physicians and the patients to be more meticulous about any symptoms. Brain metastases are known to occur in 20-40% of patients with cancer while lung cancer is one of the commonest sources (Soffietti et al. 2012). Consistent with this result 27.2% (n:6) of 22 lung cancer patients in our study had brain metastases.

The most common primary disease among consultation patients was COPD (25%). The prevalence of COPD in a random population has recently been released as 9.6% (Raghavan et al. 2012). Certainly the prevalence is higher in a RD branch hospital. The higher prevalence of smoking in Turkey augments the incidence of COPD. According to non-official data from 2009, smoking prevalence in Turkey is estimated to be 31.3% while it is 26% in European Union (Bogdanovica et al. 2011).

Agitation which is considered to be one of the main types of psychiatric emergency (Mavrogiorgou et al. 2011) was the most frequent reason for neurology consultations (13%). We may suggest that agitation in our patients was mostly a symptom of delirium.

Neurological symptoms especially stroke and seizures may be the complications in any long-term hospitalized patients including the RD patients (Lindberg et al. 2011, Fava et al. 2011, Chen et al. 2011, Newton et al. 2007, Kaas and Shandera 2010). Consultation reasons were the neurological complications of the primary disease in 38.8% while 4.3% of the consultation patients were hospitalized for respiratory complications of their neurological diseases.

Neurological diseases may lead to many systemic diseases. Swallowing disorders which may be the result of stroke, dementia or Parkinsonism may cause airway obstruction, aspiration pneumonie or pneumonitis (Puisieux et al. 2011). Pulmonary embolism or respiratory failure may be a consequence of some neurological diseases, as well (Burns and Haramati 2012, Rezania et al. 2012).

Among all patients the neurologist's most frequent diagnoses were stroke and dementia. Fourteen patients (8 chronic and 6 acute, 12%) were diagnosed as stroke. The prevalence of stroke is approximately 27% for individuals older than 80 years compared with 13% for individuals 60-79 years of age (Rosamond et al. 2008). Our prevalence is similar to these results but cannot be matched thoroughly because of the wide range of our patients' ages (19-98 years). Stroke risk is known to increase in COPD (Doehner et al. 2011). Consistently, our acute stroke patients were primarily hospitalized because of COPD (50%, n:3). Chronic stroke patients were internated for pneumonia (50%, n:4) which is possibly the consequence of stroke not the reason.

The World Alzheimer report estimates the prevalence of dementia at 4.7% in individuals aged 60 and older (Christensen 2012). The prevalence is known to be affected by factors such as comorbidities and environmental factors as well as genetic and age (Treves and Korczyn 2012) and we speculate that chronic RD or chronic hypoxia may be precipitating factors for dementia to explain the higher prevalence (12%) in our patient group. Physical diseases in dementia patients are common while morbidity and mortality for any physical illness treated in hospital and complicated by dementia is increased (Leung and Todd, 2010). We had 4.3% of our patients with decompensated dementia. Four of these patients (80%) were hospitalized for pneumonia while 1 patient (20%) was hospitalized for COPD.

Delirium; which is definitely a psychiatric emergency was the other commonenst diagnosis. Many studies have noted that delirium is associated with prolonged hospital stays and advanced age (Furlanetto et al. 2003, Inouye 1994). Consistent with this information, the mean age in our patients was 77.53+13.07 years, higher than the mean of all consulted patient. In a delirium study with RD patients the incidence of delirium was found 9.6% (Takeuchi et al. 2005). In our study the frequency of delirium was 10.3%. But comparing the two results will be incorrect because our study was run among neurologically consulted patients only. Pneumonia (41.6%) was found to be the most common primary disease among all RD in our delirium patients, but there is no literature supporting this result.

The incidence of peripheral vertigo changes in a wide range (3% to 25.2%) between studies (Karlberg et al. 2000, Caldas et al. 2009). We diagnosed peripheral vertigo in 9.5% of our patients. Our result is between the ranges declared before but it will be a bias to compare our results with mentioned studies since our study took place among already hospitalized individuals.

The incidence of Parkinsonism rise rapidly after the age of 60 years (Van Den Eeden et al. 2003). The mean age among our patients was 75.6+5.0128. A former

study released the prevalence of Parkinsonism as 2.3% (de Rijk et al. 1997). In our study we found that 4.3% of our patients had Parkinsonism. The slightly higher result is probably because of the higher mean age compared to the whole population in the former study.

A recent study from Germany has mentioned the prevalence of neuropathic pain as 6.5% in hospital units (Ohayon et al. 2012). In our study 3.4% of our patients were diagnosed as neuropathic pain. Treatment side effects were the main cause in our patients. Three of the patients (75%) with tuberculosis were under treatment with Isoniazid (INH) which causes neuropathic pain frequently (van der Watt et al. 2011) and one of our patients (25%) with lung cancer was being treated with platinum drugs which cause toxicity to the peripheral nervous system (Amptoulach and Tsavaris 2011).

Four patients were consulted for epileptic seizures; one of which was status epilepticus. Two patients including the one who suffered from status epilepticus were already epileptic, 2 patients had de novo seizures following brain metastases. Epileptic seizures are well known to be complications of intracranial metastases 15 and 9% of our lung cancer patients presented seizures.

Cranial CT was asked for 60% of patients while MRI was asked for 17.2%. MRI was especially preferred for cancer patients. In diseases in which the X-ray attenuation of the suspected brain lesion differs little from normal parenchyma like low-grade infiltrating neoplasms, MRI is more advantaged since CT is degraded by bone hardening and streak artifacts (Hadley et al. 1988).

Neurology outpatient clinic control appointment was planned for 37% of the patients, 64.6 % of patients were referred to another specialist. The mean number of visits was 1.14 for 116 patients which show that a patient very rarely required a second visit.

One of the main findings of this study is the misperception of RD specialists about psychiatric symptoms. Agitation and delirium were erroneously consulted to the neurologist. The second main finding which is consistent with the first one shows that 1/3 of the neurologist's burden and time loss could have been prevented with accurate consultation demands from the concerned specialist. These facts will best be improved with liason-neurology.

CONCLUSION

Besides the neurological emergencies, neurological consultation opportunity during hospitalization would be beneficial both for patients and by the means of public health expenses. As stated before, older individuals are object to many comorbidites and diseases. Both because of social or economical reasons and the medical status of the patients, they may not have the opportunity to get neurological care from outpatient clinics. Thus a neurologist is definitely necessary for all branch hospitals. The key in the beneficial consultation process should be rational consultation demands from the concerned specialist.

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