



Research Article

Main Diagnosis in Patients Referred for Prompt Evaluation to a Neurology Clinic in a Tertiary Center in Argentina

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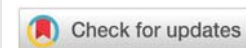
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Abstract

Introduction: This study aims to evaluate the prevalence, distribution, and clinical profile of neurological diseases and syndromes in patients referred for prompt neurological evaluation at a tertiary care center.

Methods: This was a retrospective study including patients referred to the Neurology Department for rapid ambulatory evaluation (within 24–48 hours) from June 2022 to May 2023. Data on age, sex, reason for referral, and requesting services were collected to identify the sample's profile.

Results: A total of 1,714 patients were included. The average age was 55.24 years; 58.86% were female. Among these patients, 76.98% were referred from the emergency department ($p = 0.042$).

A total of 83.02% of the consultations were for neurological conditions, with the main reason for referral being explanation of tests results (25.23%), followed by migraine without aura (14.05%), tension-type headache (9.49%), migraine with aura (5.55%), cognitive disorders (4.50%), and complicated headache syndromes (4.43%). The most common neurological syndromes were headache and facial pain (35.41%), neuropathies (8.51%), and cognitive syndrome (4.50%).

Twenty-five point three percent of referrals were from individuals seeking explanations for complementary test findings, with neuroimaging assessments being the most common requests.

A total of 13.24% of consultations were for non-neurological conditions.

A total of 7.35% required admission, with the main causes being acute focal neurological syndromes of probable vascular etiology (2.28%), complicated headache syndrome (1.23%), and delirium (0.76%).

Conclusion: Our findings enhance the understanding of the prevalence and distribution patterns of confirmed or suspected neurological diseases and syndromes in patients referred for prompt ambulatory evaluation by a neurologist.

Introduction

Studying the prevalence and distribution of primary diagnoses made at the neurology department of a hospital is crucial for effectively understanding and addressing neurological diseases. Neurology, as a medical discipline, focuses on disorders of the nervous system and plays a pivotal

role in public health because of the significant burden of diseases and disability associated with these conditions. Thus, analyzing the prevalence of different neurological diagnoses within a hospital setting not only highlights the disease burden faced by the population that is being cared for but also provides valuable insights into health resources and service planning.

By identifying the most common neurological diseases and their demographic distribution, healthcare providers can better direct their efforts toward prevention, diagnosis, and treatment. Furthermore, understanding the distribution of neurological diagnoses can reveal patterns related to medical care, staff training needs, and areas requiring improvement in patient care. This aspect is particularly relevant in the context of evidence-based medicine, where clinical decision-making relies heavily on robust epidemiological data and prevalence studies.

In this context, the present research aims to analyze the prevalence and distribution of the main neurological diagnoses treated at the Neurology Department of a specific hospital. Through this analysis, we seek to enhance the scientific understanding of the burden of neurological diseases in the population while also identifying areas for improvement in the management and care of these disorders.

Several studies have evaluated the profiles of patients treated in outpatient neurology clinics, particularly in regions such as Latin America, Africa, and Asia. These investigations revealed variable prevalences of conditions such as headaches (11.4% to 36.1%), dementia syndromes (0.7% to 6.8%), movement disorders (4.9% to 8.2%), radiculopathies (2.7% to 12.6%), and cerebrovascular diseases (3.18% to 57.1%). However, it is important to recognize that previous studies on neurological conditions in outpatient clinics across these regions may not accurately reflect local contexts for several reasons [1–9].

Variations in healthcare access and infrastructure can significantly influence patient demographics, leading to a skewed representation of disorders. Additionally, cultural perceptions of health may result in underreporting or misattribution of neurological symptoms, whereas differences in the availability of diagnostic tools can impact diagnostic accuracy. Moreover, demographic factors such as age and socioeconomic status vary widely across regions, affecting prevalence rates and limiting the generalizability of findings. Many studies tend to focus on specific populations, which can obscure the broader epidemiological picture.

With respect to Argentina, the challenges in neurological care are particularly pronounced. The limited distribution of neurologists—only 1,047 professionals serving a population of over 36 million—results in a ratio of approximately one neurologist per 34,632 people. This disparity is especially evident in urban areas such as the city of Buenos Aires, where the practice of 31% of neurologists is based on [10]. Neurological diseases contribute considerably to disability, accounting for 46.9% of the disability-adjusted burden of disease, with dementias, cerebrovascular diseases, and epilepsy being the primary contributors. Notably, 5.5% of the urban population suffers from disabilities related to neurological disorders, underscoring the urgent need for accessible neurological care [11].

Compounding these challenges is a phenomenon known as neurophobia, which significantly affects physicians' willingness and ability to refer patients for urgent neurological

evaluations. A study on clinical practice in emergency settings highlights a concerning trend: 65% of physicians fail to make timely referrals for urgent neurological assessments, with 26% of these cases involving practices deemed inappropriate. This issue reflects a broader problem of neurological illiteracy, which hinders physicians' ability to accurately identify and manage neurological conditions. While referrals are most commonly made for cases of peripheral facial paralysis, there is considerable variability in the management of other critical conditions, such as acute headaches and seizures [12].

To explore these issues further, a study titled "Who Takes Care of Neurocritical Patients in Emergency Departments?" was conducted, an exploratory survey to assess factors influencing the management of neurocritical patients in emergency settings. In April 2015, this online survey collected 109 responses, primarily from urban areas in Argentina, with populations exceeding 300,000. The findings revealed that 37% of the surveyed hospitals had more than 200 beds, yet fewer than 20% of the active staff were certified emergency physicians. Although nearly half of the respondents reported treating more than 90 adult patients daily, only a small percentage of these cases were classified as critical, particularly concerning neurological disorders. General practitioners typically provide initial assessments for neurocritical patients, and treatment decisions are made by critical care physicians. Additionally, significant delays in patient transfers were noted, with only 27% of respondents able to arrange immediate intrahospital transfers and merely 20% achieving timely interfacility transfers [13].

In response to the increasing demand for efficient neurological care in acute settings, innovative services such as rapid access to neurology clinics, referred to as "hot clinics", have been established. A two-year evaluation conducted at St. George's Hospital in London demonstrated a significant rise in referrals, particularly from general practitioners, with appointments increasing from 232 to 528 in the second year. Despite this surge, the median waiting time increased from 4–6 days, and the rate of avoided hospital admissions decreased from 67.2% to 56.8%. Importantly, a substantial number of these referrals were deemed inappropriate, particularly concerning chronic migraine and primary headache disorders. This indicates a critical need for improved communication between general practitioners and neurologists to enhance referral processes and optimize care efficiency [14].

Parallel to these efforts, the hyperacute neurology service (HANS) at St. George's Hospital represents a consultant-led initiative designed to address existing deficiencies in acute neurological care. Adopting a disease-agnostic approach, HANS focuses on managing strokes and stroke mimics while providing essential support to the acute medical unit. In its initial year, HANS successfully avoided admissions in 25% of emergency department cases, reduced the length of stay for nonstroke disorders, and halved the occupancy of stroke beds by nonstroke patients. This adaptable service model underscores the importance of early consultant involvement and illustrates the efficacy of rapid access clinics in managing a diverse range of neurological conditions [15].

Recent developments in emergency neurology emphasize the need for optimized models of care to ensure timely and accurate diagnosis, which is critical for improving patient outcomes and reducing healthcare system burden. According to the Italian Association for Emergency Neurology (ANEU), efficient emergency neurology services—characterized by neurologist-led rapid triage and clearly defined clinical access criteria—can significantly decrease unnecessary diagnostic procedures, inappropriate hospital admissions, and overall costs. ANEU proposes redefining urgency timeframes to less than 24 hours for urgent cases and up to 72 hours for deferrable urgencies, replacing the current 72-hour and 10-day standards. These revisions are based on symptom-specific guidelines addressing deficits in motor and sensory function, gait disturbances, headache, dizziness, delirium, seizures, transient loss of consciousness, and visual disturbances, with attention to onset and symptom progression. The implementation of such structured models across Italy's neurology wards linked to emergency departments has improved care coordination, service appropriateness, and access efficiency. Within this framework, the emergency neurologist plays a pivotal role in integrating specialized neurological assessment into acute care pathways [16].

Several recent initiatives have explored the implementation of rapid access neurology clinics (RANCs) as a strategy to improve patient flow, reduce unnecessary hospital admissions, and enhance the quality of care for individuals presenting with nonemergent neurological complaints. In Sydney, the ED Rapid Access Neurology (ED RAN) clinic demonstrated that providing outpatient neurology assessments within 5 working days significantly improved diagnostic efficiency, prevented unnecessary admissions, and saved ED bed time, with high levels of patient and physician satisfaction [17]. Similarly, a pilot programme at the Royal Victoria Hospital in Belfast showed that direct referral from emergency physicians to a RANC reduced the number of admissions for conditions such as headache and seizures, with substantial cost savings and decreased imaging use [18]. In the United States, the UCLA Fast Neuro model reduced outpatient waiting times by more than 80% and nonurgent inpatient consultations by 60%, while maintaining high satisfaction rates among healthcare providers and patients. Collectively, these models highlight the potential of structured, early neurology access to optimize emergency department operations and provide timely, cost-effective, and patient-centered neurological care [19].

This study aims to address existing gaps by providing localized data that accurately capture the demographic and clinical profiles of patients within the neurology department of our institution, specifically focusing on the prevalence, distribution, and clinical profile of neurological diseases and syndromes in patients referred for prompt evaluation at a tertiary care center in CABA, Argentina. Given the increasing burden of neurological diseases and their diverse geographic and demographic distributions within the country, this research is particularly relevant, as many regions face significant challenges in accessing neurology services. This highlights the need for studies that reflect local realities. Ultimately, the

findings not only yield essential data on neurological diagnoses but also serve as a foundation for developing public health policies and intervention strategies tailored to the needs of the Argentine population. By identifying specific patterns, we aim to enhance the prevention, diagnosis, and treatment of neurological diseases across the country.

To guide this investigation, we propose the following research questions:

1. What are the most prevalent neurological diagnoses in patients attending the Neurology Department during the study period?
2. How do demographic factors (age, sex, and socioeconomic status) influence the distribution of these diagnoses?
3. What patterns can be identified regarding the referral sources and reasons for consultations?
4. How does the burden of neurological diseases in this specific population compare to existing data from other regions?

Materials and methods

Design

This study is a retrospective, observational, and descriptive analysis of medical records from patients referred for prompt ambulatory neurological evaluation (within 24–48 hours) at a tertiary care center in CABA, Argentina, over a one-year period from June 2022 to May 2023, which consisted of 246 working days. The neurology service comprises 16 neurologists, including 3 resident physicians, and offers a range of complementary studies, such as electroencephalograms, electromyograms, evoked potentials, and neurocognitive assessments.

Setting

The Churruca-Visca Medical Police Hospital, located in Buenos Aires, is a specialized healthcare facility that provides comprehensive medical care to members of security forces and their families. With a focus on public health and emergency care, hospitals offer a wide range of specialties and services. It is also committed to the training of healthcare professionals and research, establishing itself as a reference point in the realm of medical care for police forces.

Sample and participant selection

We conducted a non-probability consecutive sampling of all patients referred to the Neurology Department's rapid ambulatory evaluation pathway ("hot clinic") between June 1, 2022, and May 31, 2023. This method involved including every eligible patient in chronological order during the study period, thereby minimizing selection bias. In total, 1,714 visits were analyzed.

The sample size calculation was based on a 95% confidence level and a 5% margin of error. Using preliminary estimates

of the prevalence of neurological conditions in the target population, we confirmed that the achieved sample size was sufficient to ensure statistical validity.

- **Inclusion criteria:** (i) referral to the rapid ambulatory evaluation pathway with an intended neurologist assessment within 24–48 hours; (ii) age ≥ 18 years; and (iii) availability of both a documented reason for referral and a finalized main diagnosis (confirmed or suspected) at the index visit.
- **Exclusion criteria:** (i) inpatient neurology consultations; (ii) routine outpatient visits scheduled outside the rapid pathway; (iii) duplicate records or repeat visits during the study period (only the first encounter was retained); and (iv) incomplete records, specifically those missing the main diagnosis (primary outcome) or referral source (primary exposure).

Data collection tool, standardization, and quality control

Data were retrospectively abstracted from the clinic's electronic medical record (EMR) system using a standardized case report form (CRF) specifically developed for this study. The CRF was derived from established clinical guidelines and accepted taxonomies to ensure consistency. Headache disorders were classified according to the International Classification of Headache Disorders, 3rd edition (ICHD-3), while general neurological diagnoses were mapped to the International Classification of Diseases, 10th Revision (ICD-10) codes when applicable. To minimize variability, we defined a priori the categories for reason for referral (e.g., explanation of test results, suspected migraine without aura, tension-type headache, migraine with aura, cognitive complaints) and grouped diagnoses into broader syndromic categories (e.g., headache and facial pain, neuropathies, cognitive syndrome) using an explicit data dictionary.

Although no formal psychometric validation (e.g., construct validity, test–retest reliability) was feasible given the retrospective nature of the study, we implemented multiple quality assurance procedures. Data abstraction was performed by two neurologists trained in the use of the CRF and data dictionary. To enhance reliability, borderline cases were subjected to peer review, a random audit of 10% of records was conducted to verify internal consistency (e.g., concordance between reason for referral and final diagnosis), and discrepancies were resolved by consensus with a senior neurologist. This systematic and standardized approach supports the accuracy, reproducibility, and robustness of the findings, while also providing a transparent framework for future research.

Confounding and statistical analysis

All analyses were performed using IBM SPSS Statistics Version 25[®]. Quantitative variables (e.g., age) are summarized as means $\pm$ standard deviations, and qualitative variables (e.g., sex, comorbidities, referral source, syndromic categories) are

reported as absolute frequencies and percentages. Initial group comparisons used chi-square tests for categorical variables and t-tests or ANOVA for continuous variables, with statistical significance defined as two-sided $p < 0.05$.

We prespecified age, sex, and referral source (emergency department vs. other services) as potential confounders of the associations between clinical presentation and outcomes, given established differences in case mix (e.g., higher acuity in older patients and emergency referrals, sex differences in headache prevalence). To account for confounding, we constructed multivariable models:

- **Primary model:** multivariable logistic regression with hospital admission (yes/no) as the dependent variable. Independent variables included age (continuous, per 10-year increase), sex (female vs. male), referral source (emergency vs. other), and syndromic category (headache/facial pain [reference], neuropathies, cognitive syndrome, other neurological syndromes, non-neurological presentation). "Explanation of test results" was included as a distinct referral reason category when applicable.
- **Secondary model:** multivariable logistic regression for the probability of a neurological vs. non-neurological presentation, adjusting for age, sex, referral source, and syndromic category.
- **Sensitivity analyses:** (i) models restricted to emergency department referrals, to reduce heterogeneity by referral pathway; (ii) models excluding visits in which the main reason for referral was "explanation of test results."

Effect sizes were reported in addition to p-values. For continuous variables, we calculated Cohen's d with 95% CIs; for associations between categorical variables, we used Cramér's V; for binary outcomes, we presented adjusted odds ratios (aORs) with 95% confidence intervals. Because some outcomes were relatively frequent, we also fitted modified Poisson regression models with robust standard errors to estimate adjusted risk ratios (aRRs). Absolute risk differences (RDs) were provided when informative.

Ethical considerations

The study was approved by the hospital's ethics committee, and all patient data were anonymized to ensure confidentiality.

Results

A total of 1,714 patients were included, with a mean age of 55.24 years (range 16–97). Of these, 58.86% were female and 41.14% were male (Table 1). Most patients were referred from the emergency department (ED) (69.14%, $p = 0.042$) (Table 2).

Overall, 83.02% of consultations were for neurological conditions. The main reasons for referral were: explanation

Table 1: Sociodemographic data (N = 1714).

Age	Minimal and Maximum 16 – 97 Mean 55,24 SD 20,46
Age distribution	
<20 years	84 (4,90%)
20-29 years	162 (9,46%)
30-39 years	212 (12,37%)
40-49 years	205 (11,96%)
50-59 years	207 (12,07%)
60-69 years	292 (17,04%)
70-79 years	379 (22,11%)
80-89 years	144 (8,40%)
>= 90 years	29 (1,69%)
Gender	Male 705 (41,13%) Female 1009 (58,87%)

Data are presented as the number (percentage) of 1714 patients.

Table 2: Referral Patterns to the Neurology Department by Hospital Services and Medical Specialties.

Hospital services (N = 33)	N = 1714
Emergency department	69,14%
Delegation	7,35%
Otolaryngology	2,39%
Administration/Management	1,98%
Internal medicine	1,75%
Rheumatology	1,75%
Cardiology	1,69%
Oncology	1,69%
Cadet School	1,58%
Gynecology	1,52%
Psychiatry	1,34%
Ophthalmology	1,28%
Traumatology	0,82%
Endocrinology	0,70%
Hematology	0,70%
Dermatology	0,58%
Nutrition and Diabetes	0,53%
Peripheral Center	0,47%
Surgery	0,41%
Vascular Surgery	0,35%
Dentistry	0,29%
Physical Medicine and Rehabilitation	0,23%
Phlebology	0,23%
Urology	0,23%
Nephrology	0,18%
Neurosurgery	0,18%
Gastroenterology	0,18%
Gerontology	0,12%
Anesthesia/Pain Management Service	0,12%
Proctology	0,06%
Forensic Science	0,06%
Infectology	0,06%
Pulmonology	0,06%

of test results ordered by other physicians (25.23%), migraine without aura (14.05%), tension-type headache (9.49%), migraine with aura (5.55%), cognitive disorders (4.50%), complicated headache syndromes (4.43%), transient ischemic attacks (3.94%), polyneuropathies (3.58%), and epilepsy/recurrent seizures (3.16%). The most common neurological syndromes were headache and facial pain (35.41%), neuropathies (8.51%), and cognitive syndrome (4.50%).

Non-neurological conditions accounted for 13.24% of consultations, with benign paroxysmal positional vertigo (40.97%) and syncope/collapse (21.15%) being the most frequent. Among these, 65.19% of consultations were also conducted through the ED. Administrative consultations accounted for 3.73% (71.88% for prescription renewals and 28.13% for medical certificate extensions) (Table 3).

Table 3: Distribution of patients referred to the Neurology Department by neurological pathology, non-neurological conditions, and administrative consultation.

Neurological disease	N
Neurological disease	83,02%
Z71.2 (Person consulting for explanation of research findings)	25,23%
G43.0 (Migraine without aura)	14,05%
G44.2 (Tension headache)	9,49%
G43.1 (Migraine with aura)	5,55%
G30-G32 (Other degenerative diseases of the nervous system)	4,50%
G44.5 (Complicated headache syndromes)	4,43%
G45 (Transient cerebral ischemic attacks and related syndromes)	3,94%
G62 (Other and unspecified polyneuropathies)	3,58%
G40 (Epilepsy and recurrent epileptic seizures)	3,16%
G51.0 (Bell's palsy)	2,53%
G54 (Disorders of roots and plexus nerves)	2,25%
G56 (Mononeuropathies of upper limb)	2,18%
G40.5 (Seizures related to external causes)	2,11%
T88.7 (Adverse effects of drugs or medications)	1,90%
G46 (Cerebrovascular syndromes in cerebrovascular diseases)	1,62%
S06.0X0 (Concussion without loss of consciousness)	1,41%
G52 (Disorders of other cranial nerves)	1,19%
G20 (Parkinson's disease)	1,05%
G50.0 (Trigeminal neuralgia)	0,98%
Z01.89 (Encounter for other specified special examinations)	0,84%
Z60.2 (Problems related to living alone)	0,84%
G35-G37 (Demyelinating diseases of the central nervous system)	0,77%
B02.29 (Postherpetic neuralgia, postherpetic)	0,77%
G47.0 (Insomnia)	0,70%
G57 (Mononeuropathies of lower limb)	0,56%
G21 (Secondary Parkinsonism)	0,56%
T58 (Toxic effect of carbon monoxide)	0,42%
G04 (Encephalitis, myelitis, and encephalomyelitis)	0,28%
G25.0 (Essential tremor)	0,28%
G51.4 (Facial myokymia)	0,28%
G97 (Intraoperative and postprocedural complications of nervous system, not elsewhere classified)	0,28%
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S06.360 (Traumatic hemorrhage of brain, unspecified, without loss of consciousness)	0,21%
Z59.4 (Problems related to living in a residential institution)	0,21%
I69.3 (Sequelae of cerebral infarction)	0,21%
G12.20 (Unspecified motor neuron disease)	0,14%
G45.4 (Transient global amnesia)	0,14%
R06.6 (Hiccup)	0,14%
S06.0X1 (Concussion with loss of consciousness of 30 minutes or less)	0,07%
C41.2 (Malignant neoplasm of spinal cord)	0,07%
G53.0 (Ramsay Hunt syndrome)	0,07%
H57.0 (Adie's pupil)	0,07%
G63.4 (Polyneuropathy due to vitamin B12 deficiency)	0,07%
I60 (Subarachnoid hemorrhage)	0,07%
G25.81 (Restless legs syndrome)	0,07%
G35-G37 (Demyelinating diseases of the central nervous system)	0,07%
G47.1 (Excessive daytime sleepiness disorder)	0,07%
G44.00 (Cluster headache syndrome, unspecified)	0,07%
G61.0 (Guillain-Barré syndrome)	0,07%
G35 (Multiple sclerosis)	0,07%
G70.0 (Myasthenia gravis)	0,07%
R43 (Disorders of smell and taste)	0,07%
G47.3 (Sleep apnea)	0,07%
H46 (Optic neuritis)	0,07%
G51.3 (Clonic hemifacial spasm)	0,07%
Non neurological	13,24%
H81.1 (Benign paroxysmal positional vertigo)	40,97%
R55 (Syncope and collapse)	21,15%
F41.9 (Anxiety disorder, unspecified)	10,13%
F05 (Delirium)	9,69%
G89.3 (Pain (chronic) related to neoplasia)	4,41%
F44 (Dissociative and conversion disorders)	2,64%
M79.7 (Fibromyalgia)	2,20%
H47.1 (Optic papilledema)	1,32%
H54.3 (Decreased visual acuity in both eyes)	0,88%
H53.5 (Blurred vision)	0,88%
R13 (Oropharyngeal dysphagia)	0,88%
D50 (Iron deficiency anemias)	0,88%
F91 (Conduct disorders)	0,88%
H20.9 (Uveitis)	0,44%
H53.4 (Vision with restricted field)	0,44%
F13.0 (Intoxication due to anxiolytics)	0,44%
K11.7 (Salivary secretion disturbances)	0,44%
H02.4 (Ptosis)	0,44%
K72.9 (Hepatic encephalopathy)	0,44%
L29.9 (Pruritus)	0,44%
Administrative	3,73%
Z76.0 (Consultation for prescription renewal)	71,88%
Z02.7 (Medical certificate extension)	28,13%
N	100,00%

Regarding referrals specifically for explanation of medical tests, 25.30% of patients were referred for this reason, most commonly neuroimaging studies: brain CT (53.89%) and brain MRI (29.72%) (Table 4). The primary diagnostic suspicions prompting these studies were migraine without aura (18.33%), cognitive complaints (17.78%), tension-type headache (9.72%), syncope/collapse (8.33%), migraine with aura (7.50%), and delirium (6.39%). A total of 72.78% of these consultations originated from the ED (Table 5).

A total of 126 patients (7.35%) required hospitalization. The main causes of admission were acute focal neurological syndromes of probable vascular etiology (2.28%; transient ischemic attacks 1.46% and cerebrovascular syndromes 0.82%), complicated headache syndromes (1.23%), and delirium (0.76%) (Table 6). Most admitted patients were referred from the ED (76.98%, $p = 0.037$).

Table 4: Patient Referrals Driven by Requests for Explanations of Research Findings.

	N
Brain CT	53,89%
Brain MRI	29,72%
Electromyogram	5,28%
Laboratory	4,72%
Neuropsychological evaluation	3,06%
Polysomnography	1,67%
Electroencephalogram	1,11%
Neck vessel Doppler	0,56%
N	100,00%

Table 5: Services Referring Patients Seeking Explanations for Research Findings.

	N
Emergency department	72,78%
Delegation	12,50%
Administration/Management	3,89%
Ophthalmology	1,11%
Vascular Surgery	1,11%
Cardiology	1,11%
Internal Medicine	1,11%
Peripheral Center	0,83%
Oncology	0,83%
Psychiatry	0,83%
Rheumatology	0,83%
Otolaryngology	0,56%
Endocrinology	0,56%
Traumatology	0,56%
Dermatology	0,28%
Pulmonology	0,28%
Proctology	0,28%
Physical Medicine and Rehabilitation	0,28%
Gynecology	0,28%
N	100,00%

Table 6: Hospitalization Causes and Frequencies Among Patients.

N	7,35%
G45 (Transient cerebral ischemic attacks and related syndromes)	1,46%
G44.5 (Complicated headache syndromes)	1,23%
G46 (Cerebral vascular syndromes in cerebrovascular diseases)	0,82%
F05 (Delirium)	0,76%
G52 (Disorders of other cranial nerves)	0,70%
G35-G37 (Demyelinating diseases of the central nervous system)	0,53%
S06.0X0 (Concussion without loss of consciousness)	0,29%
H81.1 (Benign paroxysmal positional vertigo)	0,23%
G04 (Encephalitis, myelitis, and encephalomyelitis)	0,23%
G35 (Multiple sclerosis)	0,12%
H46 (Optic neuritis)	0,12%
G12.20 (Unspecified motor neuron disease)	0,12%
K72.9 (Hepatic encephalopathy)	0,06%
G40 (Epilepsy and recurrent epileptic seizures)	0,06%
G40.5 (Epileptic seizures related to external causes)	0,06%
T88.7 (Adverse effects of drugs or medications)	0,06%
I60 (Subarachnoid hemorrhage)	0,06%
F44 (Dissociative and conversion disorders)	0,06%
R55 (Syncope and collapse)	0,06%
S06.360 (Traumatic brain hemorrhage, unspecified, without loss of consciousness)	0,06%
C41.2 (Malignant tumor of the spine)	0,06%
Z71.2 (Person consulting for explanation of research findings)	0,06%
G62 (Other and unspecified polyneuropathies)	0,06%
G61.0 (Guillain-Barré syndrome)	0,06%
G50.0 (Trigeminal neuralgia)	0,06%
N	100,00%

estimates. Empirical observation is reported (0 admissions among cognitive presentations).

Neurological vs. non-neurological presentation (multi-variable analysis)

After adjustment for age, sex, and referral source, ED referral was associated with a higher probability of a neurological diagnosis:

- **ED referral:** aOR = 1.72 (95% CI 1.23–2.40), $p = 0.002$; aRR = 1.63 (95% CI 1.18–2.26), $p = 0.003$.

This indicates that patients referred from the ED were significantly more likely to have a neurological condition compared with those referred from other sources.

Effect sizes and descriptive comparisons

- **Mean age was slightly higher among admitted versus non-admitted patients;** Cohen's $d = 0.118$ (95% CI -0.067 to 0.289), indicating a small and not clearly significant effect.
- **Association between referral source (ED vs other) and syndromic category:** Cramér's $V = 0.134$, indicating a small-to-moderate association.
- **Admission by referral source:** ED admission proportion = 8.27% (98/1,185) vs. other = 5.67% (30/529); absolute risk difference (RD) = 2.60 percentage points; unadjusted risk ratio = 1.46.

Discussion

From an evidence-based medicine perspective, the data presented reveal critical concerns regarding resource management and utilization within the healthcare system. This approach emphasizes integrating clinical expertise, patient values, and the best available research evidence in decision-making. The observed misallocation of resources, particularly the high percentage of consultations for non-neurological conditions and the reliance on specialists for imaging study interpretations, highlights inefficiencies that compromise both patient outcomes and system effectiveness. Addressing these issues is essential for aligning healthcare practices with evidence-based standards that prioritize high-quality patient care and optimize resource allocation.

Resource allocation

The high proportion of consultations for neurological syndromes, such as headache and facial pain (35.41%), neuropathies (8.51%), and cognitive syndromes (4.50%), aligns with the expertise of neurologists. However, the significant number of consultations for conditions such as migraine without aura (14.05%) and tension-type headache (9.49%) suggests that these cases could be managed effectively by primary care physicians with appropriate training and resources. Additionally, 13.24% of consultations for non-neurological conditions, particularly benign paroxysmal positional vertigo (40.97%) and syncope/collapse (21.15%),

Hospital admission (multivariable analysis)

In a logistic regression model adjusted for age (continuous), sex (female vs male), referral source (ED vs other), and syndromic category (reference = Headache), the following associations were observed:

- **ED referral:** aOR = 1.56 (95% CI 1.01–2.42), $p = 0.046$; aRR = 1.47 (95% CI 1.00–2.17), $p = 0.050$.
- **“Explanation of tests” as referral reason:** aOR = 0.20 (95% CI 0.07–0.58), $p = 0.003$; aRR = 0.21 (95% CI 0.06–0.62), $p = 0.004$.
- **Syndromic category “Other” (vs Headache):** aOR = 3.89 (95% CI 2.36–6.40), $p < 0.001$; aRR = 3.40 (95% CI 1.82–6.35), $p < 0.001$.
- **Age (per 10-year increase):** aOR = 1.05 (95% CI 0.95–1.16), $p = 0.36$; aRR = 1.04 (95% CI 0.95–1.14), $p = 0.37$.

Model note – cognitive presentations

No hospital admissions occurred among patients presenting with cognitive syndromes (0/110), producing quasi-complete separation and unstable logistic coefficient

further strain departmental resources. This misallocation of consultations not only diverts attention from patients with genuine neurological concerns but also leads to increased wait times for these patients, ultimately compromising the overall efficiency and effectiveness of the neurology department. By addressing this issue, the capacity of the department could be significantly increased to deliver timely care to those with actual serious neurological conditions.

Training needs

While it is anticipated that 83.02% of consultations to the neurology service pertain to neurological conditions, the fact that 25.23% of referrals are primarily for assessing and interpreting ancillary tests raises significant concerns. This phenomenon, often referred to as "complementary test evaluation," suggests that a substantial proportion of patients are referred to neurologists solely for the interpretation of laboratory, neurophysiological, or imaging studies, representing a misallocation of specialist resources.

There is an urgent need to enhance training for general practitioners and emergency physicians in the interpretation of neuroimaging studies. Accurate interpretation is crucial for ruling out acute pathologies that require immediate intervention. If non-neurologists caring for patients in the acute setting lack the necessary skills, delays in diagnosis and treatment may occur, potentially affecting patient outcomes. The frequent reliance on neurologists to evaluate urgent imaging studies highlights inefficiencies and a lack of coordination among healthcare services.

Patient management strategies

Another concerning finding is that 72.78% of consultations occur through the emergency department, suggesting that many patients with neurological symptoms bypass primary care physicians. This raises questions about the lack of early intervention and appropriate follow-up care, which can result in inadequate management of neurological conditions and further strain on emergency services. The primary reasons for requesting imaging studies, such as migraine without aura (18.33%) and long-standing cognitive complaints (17.78%), indicate inefficient resource use, as many of these studies do not constitute neurological emergencies.

Hospitalization and complications

The hospitalization rate of 7.35% (126 patients) is alarming, indicating that a significant proportion of patients seen in either the clinic or emergency department had severe or complicated conditions that cannot be managed on an outpatient basis. The leading causes for hospitalization (acute focal neurological syndromes of probable vascular etiology) underscore the gravity of the situation. This highlights potential gaps in timely care or ineffective outpatient management, and the high rates of hospitalization and emergency department referrals place additional strain on the healthcare system.

Biases and limitations of the study

This study offers a detailed characterization of rapid-access neurology referrals, though several methodological

considerations warrant attention. Its retrospective, single-center design inherently introduces selection bias and limits generalizability. All patients were referred for expedited evaluation within a tertiary neurology department, likely overrepresenting complex, severe, or diagnostically uncertain cases. The 12-month study period may also be affected by seasonal variation in neurological presentations and evolving post-pandemic care patterns, though inclusion of consecutive referrals over this timeframe provides a comprehensive, real-world overview.

The study population predominantly comprises police personnel and their families, reflecting a specific occupational and socio-demographic profile. While this may limit extrapolation to the general Argentine population or other healthcare systems, it enables focused insights into referral patterns and service demands within a defined cohort.

Data were systematically abstracted from electronic medical records, reducing recall bias and ensuring consistent capture. Nonetheless, variability in completeness, diagnostic labeling, and lack of centralized application of standardized criteria (e.g., ICHD-3 for headache, DSM-5/ICD-10 for cognitive disorders) could introduce misclassification. The reason for referral "explanation of test results" is heterogeneous, encompassing both reassurance visits and genuine diagnostic inquiries, which may overrepresent non-pathological presentations. Repeat visits were not explicitly analyzed, though focusing on initial encounters enhances consistency.

Rapid-access pathways and operational constraints (e.g., clinic capacity, referral source logistics, daytime hours) may shape the case mix and induce collider bias, whereby patients seen rapidly are selected based on multiple factors. Diagnostic assessments performed at the initial visit were sometimes preliminary, particularly for cognitive or paroxysmal syndromes, and inter-rater variability among neurologists and heterogeneity in ancillary testing availability (e.g., neuroimaging, EEG) may affect diagnostic accuracy.

The study is primarily descriptive, and while statistical testing was limited and confidence intervals were not reported for key proportions, this approach aligns with the objective of service profiling. Missing data were present but captured through standardized EMR fields; future studies could benefit from predefined strategies for handling incomplete records and multivariable analyses to adjust for confounding.

Despite these limitations, several features strengthen the study's findings. The large cohort ($n = 1,714$) over a continuous 12-month period enhances the stability of descriptive estimates. Use of a unified EMR, predefined data fields, and a standardized 24–48 hour referral pathway improves data consistency. Inclusion of both neurological and non-neurological assessments and clear syndromic categorization support interpretation of referral appropriateness and service demand. Taken together, these design features mitigate potential biases and provide a reliable foundation for understanding patterns in rapid-access neurology services.

Resource allocation and management of neurological care: Insights from Argentina

The management of neurological resources in Argentina parallels the findings presented in this study. With approximately 1,047 neurologists serving a population exceeding 35 million, the uneven distribution of specialists underscores the challenges faced in resource allocation. Like the 72.78% of consultations originating from emergency departments in this study, many patients in Argentina also opt for emergency services, indicating a gap in primary care access.

Neurological disorders account for 46.9% of the disability burden in Argentina, highlighting the high prevalence of conditions such as dementia and cerebrovascular diseases. The hospitalization rate of 7.35% reported in this study aligns with the context in Argentina, where many patients present in advanced stages of their disease.

Enhancing training for general practitioners in neuroimaging interpretation is critical, as inadequate training may lead to delays in diagnosis. Both this study and the context in Argentina emphasize the need for clear referral protocols and improved coordination between services to optimize resource utilization and enhance patient care.

Resource allocation and management of neurological care: Insights from Churruca-visca medical police hospital

The neurology department in this hospital (staffed by 16 physicians, including 3 residents) faces significant challenges in terms of resource allocation amidst a high volume of patient referrals. The dual responsibilities of managing outpatient consultations and responding to inpatient consultations place considerable demands on the available medical personnel. The need to conduct various complementary studies, such as electroencephalograms and electromyograms, further complicates the daily workflow, requiring effective time management and prioritization.

This analysis is based on a one-year study period, which included 246 working days. In this timeframe, a total of 1,714 patients were evaluated, revealing that 69.14% of these patients were referred from the emergency department. These figures indicate a systemic issue in patient management and highlight the importance of establishing robust referral protocols to ensure that patients receive appropriate initial evaluations before being directed to specialized care.

The study also revealed that 83.02% of consultations were for neurological conditions, with a notable 25.23% of referrals driven by the need for explanations of the results of neurological tests. This reflects a significant misallocation of specialist resources, as a substantial portion of consultations may not necessarily require the expertise of a neurologist. Conditions such as migraine without aura (14.05%) and tension-type headache (9.49%) could be managed effectively by primary care physicians, thereby alleviating some of the pressures faced by the neurology service.

Given the substantial influx of patients throughout the 246 working days of the study, the Department must allocate its resources efficiently to ensure timely and comprehensive care. The presence of residents provides valuable support; however, their training and experience level can influence the quality and efficiency of care delivered. Ensuring that residents are adequately supervised and trained is essential to maintaining high standards of patient management while also facilitating their professional development.

The hospitalization rate of 7.35% reported in the study indicates that many patients present with severe or complicated conditions, a scenario that echoes our service, where advanced-stage cases often come through the emergency department. This not only highlights potential gaps in timely outpatient care but also intensifies the demands on neurologists who are already managing a high volume of cases.

In light of these challenges, it is crucial for the Neurology Department to implement strategies aimed at optimizing resource utilization. These may include developing clear referral guidelines that delineate when to refer patients to specialists, improving interdisciplinary communication to facilitate faster responses to consultations, and enhancing training programs for both residents and attending physicians.

Additionally, fostering a culture of collaboration between neurology and primary care can help ensure that patients receive appropriate initial evaluations, reducing unnecessary referrals to specialized care. By addressing these issues, the capacity of neurological services can be increased to provide high-quality care to patients while effectively managing the resources at their disposal.

Conclusion and recommendations

In conclusion, the high number of non-neurological consultations and administrative tasks directed to the neurology service signifies substantial mismanagement of resources. This misallocation results in increased wait times for patients seeking appropriate neurological care and places an unnecessary burden on both neurologists and emergency departments. Strategies to streamline referrals, enhance training for primary care physicians, and optimize administrative processes could significantly improve the efficiency and effectiveness of the healthcare system.

To address these issues, the following recommendations are proposed:

- Evidence-based referral protocols:** Develop standardized protocols that clearly define referral criteria between emergency, primary care, and neurology departments, grounded in current clinical guidelines.
- Interdepartmental training workshops:** Organize regular training sessions for staff from different departments, focusing on best practices for managing neurological conditions according to the latest evidence.
- Electronic communication tools:** Implement secure electronic communication platforms to facilitate real-

time information exchange between departments, enhancing collaborative patient management.

4. **Regular multidisciplinary meetings:** Establish routine meetings with representatives from emergency, primary care, and neurology to discuss complex cases and review protocols on the basis of recent evidence.
5. **Data analysis and continuous feedback:** Conducting regular analyses of patient care data to identify bottlenecks and areas for improvement, and sharing feedback across departments to foster a collaborative approach.
6. **Patient education programs:** Create evidence-based educational materials to inform patients about appropriate care pathways, emphasizing the importance of starting with primary care.
7. **Direct consultation lines:** Direct consultation lines should be set up for quick communication between primary care providers and neurologists, facilitating timely clinical decision-making.
8. **Outcome evaluation systems:** Implement a system to evaluate the impact of these strategies on patient flow and clinical outcomes, using data to refine interdepartmental processes continuously.

Improving general practitioners' training in neuroimaging interpretation and promoting better coordination among services are essential for ensuring efficient and timely neurological care. Additionally, patient education is crucial in helping individuals understand when it is appropriate to seek care from the emergency department versus their primary care physician. Addressing these issues will optimize resource utilization, improve patient care, and reduce the burden on emergency services.

Finally, the results of this study contribute to a better understanding of the prevalence and distribution patterns of neurological diseases and syndromes, providing valuable insights into the profiles of patients with neurological complaints. Future epidemiological studies with broader population coverage are crucial for definitively establishing the burden of neurological disease in our population.

The findings of this study underscore critical issues within the healthcare system that extend beyond local implications and suggest the need for broader public health strategies at the national level. The significant percentage of consultations for the interpretation of complementary test findings, combined with the substantial number of non-neurological consultations in a neurology setting, reveals a misallocation of healthcare resources that could be addressed through systemic reforms.

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