Received: 18 August 2020 | Accepted: 30 December 2020

DOI: 10.1111/ene.14728

european journal of neurology
the official journal of the european academy of neurology

ORIGINAL ARTICLE

Functional neurological disorders presenting as emergencies to secondary care

James Beharry[1] | David Palmer[1] | Teddy Wu[1,2] | Duncan Wilson[1,2] | Campbell Le Heron[1,2] | Deborah Mason[1,2] | Jon Reimers[1] | John Fink[1] | Roger Mulder[3] | Roderick Duncan[1]

[1]Department of Neurology, Christchurch Hospital, Christchurch, New Zealand

[2]New Zealand Brain Research Institute, Christchurch, New Zealand

[3]Department of Psychiatry, Christchurch Hospital, Christchurch, New Zealand

Correspondence
James Beharry, Department of Neurology, Christchurch Hospital, Christchurch, New Zealand.
Email: james.beharry006@gmail.com

Abstract

Background: Functional neurological disorders (FND) represent a significant proportion of presentations to outpatient adult neurology services. There is little information relating to patients presenting to acute inpatient care.

Methods: We identified patients presenting as acute admissions with FND to Christchurch Hospital, Christchurch, New Zealand, from 2016 to 2018. We analyzed relevant demographic and clinical data from electronic records and measured incidence of presentation to secondary care and healthcare utilization.

Results: One hundred sixty-two patients presented on 173 occasions with FND, representing 9% of all admissions to the neurology service during the 3-year study period. The mean age was 40 (SD 17) years, 111 (69%) patients were female and the median length of stay was 3 (IQR 2–4) days. A total of 92 computed tomography brain scans, 77 magnetic resonance imaging brain scans and 42 electroencephalograms were carried out. On 22 (13%) occasions, patients were referred for outpatient psychological therapy. In the 3 years prior to each patient's last presentation in the study period, these 162 patients had a total of 671 presentations to the emergency department. Healthcare demand did not decrease after the index admission. The rate of acute inpatient admission for FND was 10 per 100,000 per year for the total Christchurch Hospital catchment, 6/100,000/year in rural areas, and 11/100,000/year in urban areas.

Conclusion: FND represented almost 1 in 10 acute neurology admissions with significant inpatient healthcare resource utilization.

KEYWORDS
cohort study <research methods, functional disorders <psychiatric disorders <neurological disorders, psychiatric disorders <neurological disorders

INTRODUCTION

Functional neurological disorders (FND) present with symptoms which are either inconsistent, or incongruent with other neurological disorders [1,2]. The term 'functional' has gained acceptance, as it has been demonstrated to be more acceptable to both patients and clinicians than older terms such as 'hysteria', and is agnostic of aetiological paradigm [3]. One large study found that 12% of neurology outpatients had symptoms unexplained by disease, and a further 18% had symptoms only partially explained by disease [4], with similar findings in smaller studies [5,6]. The incidence of FND presenting to an inpatient service acutely is less well known, but limited

literature suggests almost 1 in 10 admissions to inpatient neurology services are patients with FND [7,8]. Such patients may require extensive radiological and laboratory investigation, which represents a significant healthcare cost [9,10].

Christchurch Hospital is a tertiary centre and is the single access point for acute adult neurology inpatient care (including stroke) in the city of Christchurch and its rural surrounds with a catchment population of 529,927 people. Using retrospective data gathered from inpatient stays over a 3-year period, we describe a cohort of patients who presented acutely to hospital with FND and estimate the resulting inpatient healthcare utilization.

METHODS

The study was carried out at Christchurch Hospital, the only adult neurology inpatient service and only emergency department (ED) in the region. All acute admissions pass through the ED, and the neurology service takes acute admissions directly from there. At the time of discharge, all neurology inpatient admissions are given a diagnosis code by the admitting consultant neurologist according to an established in-house coding system. We identified patients presenting to Christchurch Hospital with FND over a 3-year period (2016–2018), and examined their electronic medical records. Following analysis of the in-house coding system, we identified all diagnosis codes that could be given to patients presenting with FND. The coding diagnoses searched were: functional seizures, psychogenic unresponsiveness, conversion (somatization) disorders including fugue, hypochondriasis, and psychoneurosis. Patients were identified by their unique healthcare identifier, and electronic patient records (in routine use in Christchurch Hospital since 2007) were examined. Patients were included if the content of the record agreed with the code, indicating that the symptoms were entirely functional, and no diagnostic revision had occurred. We collected prespecified demographic and clinical variables including age, sex, past psychiatric diagnosis, past neurological history, and other relevant comorbidities. We also recorded domicile and New Zealand Index of Deprivation (NZDep) scores. This score is an amalgam of census data related to deprivation by area. Overall scores are grouped into deciles, with 1 representing the least deprived, and 10 the most deprived [11]. For each patient, we also recorded the number of presentations to neurology inpatient services and to the ED in the 3 years leading up to their index admission. If an individual had presented to neurology inpatient services multiple times between 2016 and 2018 with a FND, we counted the number of presentations in the 3 years prior to their most recent presentation. We also recorded whether patients had been reviewed at any point in the past by regional psychiatric services. For privacy reasons, we were unable to access specific details within the psychiatric records. We recorded duration of inpatient stay, presenting symptoms (motor-positive, motor-negative, sensory-positive, sensory-negative, mixed motor-sensory loss, functional seizure or other), and follow-up. We recorded relevant investigations including computed tomography (CT), magnetic resonance imaging (MRI) of brain or spine, lumbar puncture, electroencephalogram (EEG), and number of blood draws.

The screening process of the New Zealand Health and Disability Ethics Committee identified this study as not requiring formal ethical review.

TABLE 1 Presenting symptoms

Presenting symptom	Presentations n (%)
Functional seizure	57 (33)
Motor-negative	69 (40)
Mixed motor-sensory loss	20 (12)
Motor-positive	12 (7)
Sensory-negative	5 (3)
Sensory-positive	2 (1)
Other	8 (5)

RESULTS

A total of 203 admissions between January 2016 and December 2018 with FND codes were identified. Thirty were excluded once electronic case records were reviewed, as symptoms were judged to be explainable or partially explainable by a non-functional disorder. The remaining 162 patients were admitted on 173 occasions with FND. The total number of admissions to the neurology service for any diagnosis between 2016 and 2018 was 1949.

Admissions with FND represented 9% of all admissions to the neurology service during this period. The mean age was 40 (SD 17) years and 111 (69%) patients were female. The median NZDep score was 5 (IQR 2–7). Of the 173 presentations, 57 were for functional seizure, 70 were for 'motor-negative' symptoms, 20 were for 'mixed motor-sensory' loss, 12 were for 'motor-positive' symptoms, 5 were for 'sensory-negative' symptoms, and 2 were for 'sensory-positive' symptoms (Table 1). Seven presentations with FND were not described by these prespecified descriptors. In eight presentations, multiple functional neurological symptoms were present (four patients with motor-negative symptoms also had non-epileptic seizures, three patients with motor-negative symptoms had speech disturbance, and one patient with mixed motor-sensory loss also had visual disturbance).

The median length of inpatient stay was 3 (IQR 2–4) days. Eighty-two (51%) patients had been reviewed by regional mental health services at the time data were collected (November 2019). We are unable to report whether review occurred before or after their index admission. Examination of the general medical file showed that 37 (23%) patients had diagnoses of depression, 22 (14%) anxiety, 16 (10%) chronic pain disorder, 12 (7%) personality disorder, 9 (6%) post-traumatic stress disorder, 6 (3%) schizophrenia, and 4 (2%) a history of bipolar disorder. Thirty-six (22%) patients had a prior diagnosis of epilepsy, 12 (7%) of stroke, and 8 (5%) had a history of prior head injury.

In the 3 years prior to each patient's index admission, there were a total of 59 (19.7 presentations per year) previous presentations to inpatient neurological services amongst the study population and 671 (223.7 presentations per year) presentations to the ED. In the 1-year periods following the index admissions, there were a total of 12 presentations to inpatient neurology services, and 312 presentations to the ED. Thus, a slight fall in the number of admissions was balanced by a distinct rise in presentations to ED. We were unable to review the specific reason for these additional presentations.

A total of 92 CT brain scans, 77 MRI brain scans, 30 MRI spine scans, 42 EEGs, and 4 lumbar punctures were completed over all admissions. Of the 42 EEGs, 14 involved prolonged video monitoring. We excluded patients who were admitted electively for video EEG monitoring. In addition, 264 blood draws were taken.

A physiotherapy or occupational therapy assessment occurred during 56 (32%) of the 184 admissions. A psychiatric assessment was completed during 22 (13%) of all admissions. A referral to outpatient psychiatry or rehabilitation occurred at discharge on 22 (13%) occasions. Neurology follow-up was planned at discharge on 23 (13%) occasions. One patient was transferred for inpatient rehabilitation following discharge from the acute neurology ward and the remainder were discharged home.

Of the 173 presentations, 125 were from Christchurch city district, which has a population of 369,000. Twenty-eight presentations were from patients in the hospital's catchment area, but outside Christchurch city itself. On 20 occasions, the patient was from outside the hospital's normal catchment and was either visiting the region or transferred from another centre.

The rate of FND presentations requiring inpatient admission was 10 per 100,000 per year for the total catchment of Christchurch Hospital, excluding patients from other regions. The rate of FND presentations for patients domiciled within Christchurch city catchment was 11 per 100,000 per year, and 6 per 100,000 per year for those patients in the surrounding hinterland.

DISCUSSION

FND are common in outpatient settings [4–6], and our findings confirm that they are also frequently encountered as inpatients: patients with FND represented 9% of acute neurology inpatient admissions to Christchurch Hospital during the study period. This is all the more striking as we included only those patients in whom symptoms were not at all explained by disease and in whom there was a sole diagnosis of FND. The largest comparable study of outpatients found that such patients comprised 12% of new patients in neurology clinics [4]. Thus, our figure of 9% may be in keeping with findings in outpatient populations, and is consistent with data from other inpatient neurology services [7,8].

Our cohort had an average of 4.1 presentations per person to ED in the 3 years prior to the index admission, which may suggest that some presentations were managed in ED without admission to hospital. For comparison, approximately 15% of the New Zealand population attend the ED each year [12], giving an 'expected' number of presentations per person over 3 years of 0.45. Our data suggest that they presented even more frequently to ED after the index admission. Therefore, the interventions and any information or explanation received during inpatient admission did not reduce future acute healthcare utilization in our cohort. It is known that acute healthcare demand can respond sharply to appropriate explanation of the diagnosis of functional seizures [13,14], but this does not appear to have extrapolated to our cohort of patients with mixed FND, a finding consistent with behaviours in similar populations [15,16]. Lack of psychological support and intervention is a potential cause, even if the therapeutic effect of psychological interventions remains poorly understood (see below). In the context of the study, we were unable to analyze specific reasons for presentations to ED, which limits our ability to draw further conclusions from these data.

Our cohort was relatively young, with a female preponderance which has been previously observed in other settings. From literature relating to functional seizures [17,18] we hypothesized that our patients would come predominantly from the lower part of the socioeconomic scale, but this turned out not to be the case. This may be because either the population that presents acutely is different from the rest of the FND population, or because FND as a whole are different from the functional seizures population. A study describing a cohort of patients with functional limb weakness found socioeconomic deprivation category was similar to a control population of patients with organic weakness and no correlation to lower socioeconomic deprivation category [19]. The small amount of available data suggest that patients with FND in New Zealand do come predominantly from socially and economically disadvantaged backgrounds [20]: if so then the difference may relate to the population who present acutely.

Our data show that FND is associated with significant healthcare utilization, not only in terms of ED presentations and admissions, but also investigations. While initial investigation of patients with FND is important, repeat investigations could potentially be avoided. The average number of CT head scans per presentation was 0.53, the average number of MRI head scans per presentation was 0.45, and the average number of EEGs per presentation was 0.24. In the New Zealand hospital system, investigations such as CT, MRI, and EEG are relatively easily available. Costs vary widely within and between countries. Indicative costs in our hospital are: for a 2-night hospital admission to a neurology ward €3076, for routine blood tests €14, for a CT head scan €419 and for a basic MRI of head €982 (total €4491). These significant costs are in keeping with recent data suggesting FND care in the ED and inpatient units costs US$1.2 billion annually in the United States [21].

Relatively few of our patients were referred for psychological intervention despite its wide use and evidence it can be beneficial in at least some patients [22–24]. This reflects limited resource: we have no direct access to inpatient psychological assessment or therapies, and access in the community following discharge is poor. We have no data to explain the variance in referrals for therapy. Physical therapy may be effective for some patients [25], and the majority of patients

with motor symptoms were referred as inpatients to physiotherapy and occupational therapy. Access to outpatient physiotherapy and occupational therapy is also limited by resource constraints. Low rates of referral for both physical and psychological therapy has been found in other studies [21].

A higher proportion of our FND presentations (82%) were from patients within Christchurch city which has a population of 369,000 (70% of the total), whereas only 18% of presentations were from patients in the hospital's wider catchment area which has a population of 160,927 (30% of the total). It is possible that the hinterland population was in some way different, resulting in less functional neurological illness. Given an overwhelmingly agricultural economy with many occupations involving a degree of physical work, this would seem at least conceivable, though we have no relevant data. The difference may also be partly or wholly due to differences in health services and pathways. Patients who are geographically isolated are more likely to present to local general practitioners initially rather than to a more distant ED, which may reduce the risk of admission, and might conceivably reduce the likelihood of an initial diagnosis of a FND.

Our study has limitations. To compare with published outpatient data, we chose one of the categories used in the Scottish Neurological Symptom Study (SNSS) studies, symptoms not at all explained by disease [4]. We were unable to capture patients whose symptoms were partly or mostly explained by disease (those with functional overlay). These patients are therefore included in our comparator population of admissions, and our data should be interpreted accordingly. We were unable to capture patients presenting to the ED who were not admitted, and the focus of our study was hospital admissions. It is therefore likely that in fact the incidence of any patients with FND presenting to Christchurch Hospital (i.e. admitted plus not admitted) was higher than our observed 9%.

It is unlikely that patients eligible for our study were admitted under other services. Our hospital pathway is straightforward in that all patients presenting with acute neurological complaints are admitted under the neurology service. A few patients with predominantly non-neurological presentation plus FND might be admitted to other services, then generate a neurology consult. If the FND component was mild or transient, they might remain under the other service for the duration of their inpatient stay and would not be included in our data. However, our study only includes patients whose symptoms were not at all explained by a non-functional disorder, so most of these patients would not in any event have met inclusion criteria.

Our cohort was confirmed by retrospective examination of case records. Published evidence suggests that diagnoses of functional symptoms are stable over time [4], and our review of the whole patient file found no significant diagnostic revisions, in-keeping with the SNSS data. While we were readily able to identify patients from outside our base population who presented in Christchurch, there may have been some presentations by patients from our base population to hospitals outside it.

Our study has a number of strengths. Initial identification of our cohort was based on contemporaneous coding by the treating consultant neurologist through a well-established in-house coding system, which may reduce ascertainment bias. There is no private acute service, and Christchurch Hospital is the single point of entry for acute inpatient neurology admissions in the region, allowing us to establish a relatively uncomplicated relationship between our data and our base population.

In conclusion, FND commonly present acutely to secondary care. Inpatient admissions utilize significant healthcare resource, and many of our patients presented repeatedly to both the ED and the inpatient service. Referrals for physiotherapy and occupational therapy were common but few were referred for psychological therapy.

ACKNOWLEDGMENT

None to declare.

CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTION

James Beharry: Conceptualization (equal); Data curation (equal); Formal analysis (lead); Investigation (equal); Methodology (equal); Writing-original draft (lead); Writing-review & editing (equal). **David Palmer:** Conceptualization (equal); Data curation (equal); Formal analysis (supporting); Project administration (supporting); Writing-review & editing (equal). **Teddy Y. Wu:** Conceptualization (equal); Resources (equal); Writing-review & editing (equal). **Duncan Wilson:** Conceptualization (equal); Data curation (equal); Formal analysis (equal); Writing-review & editing (equal). **Campbell Le Heron:** Conceptualization (equal); Resources (equal); Writing-review & editing (equal). **Deborah Mason:** Resources (equal); Writing-review & editing (equal). **Jon Reimers:** Resources (equal); Writing-review & editing (equal). **John Fink:** Resources (equal); Writing-review & editing (equal). **Roger Mulder:** Conceptualization (equal); Resources (equal); Writing-review & editing (equal). **Roderick Duncan:** Conceptualization (lead); Methodology (equal); Project administration (equal); Supervision (equal); Writing-original draft (equal); Writing-review & editing (equal).

ETHICAL APPROVAL

The study was submitted to the New Zealand Health and Disability Ethics Committee and it was deemed that formal ethics approval was not required following the screening process.

DATA AVAILABILITY STATEMENT

Anonymized data supporting the findings from this study are available upon reasonable request.

ORCID

James Beharry https://orcid.org/0000-0002-4932-954X

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How to cite this article: Beharry J, Palmer D, Wu T, et al. Functional neurological disorders presenting as emergencies to secondary care. *Eur J Neurol*. 2021;28:1441–1445. https://doi.org/10.1111/ene.14728