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Short communication

## Exploring seizure management in hospitals, unmet need, and the impact of the COVID-19 pandemic on seizure presentations to hospital

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## ABSTRACT

**Purpose:** This study assesses investigations, referrals and admissions in patients presenting to the Emergency Department (ED) with seizures, and the effect of the COVID-19 pandemic on such management. Outcomes in patients with learning disabilities, active significant mental health concerns, and from the most socioeconomically deprived areas were compared to those of the general cohort.

**Methods:** Investigations, referrals and admissions were recorded for 120 patients across two cohorts; pre-pandemic (September 2019) and during the pandemic (December 2020). Retrospective review of individual patient electronic health care records was used for data collection.

**Results:** There was a decrease in patient numbers from 2019 to 2020. A greater proportion of patients presented with organic cause seizures and fewer presented with non-epileptic attacks. Frequent use of CT heads (45%) is likely to represent improper use of limited resources. There were low referral rates, both to acute neurology (28%) and to the adult epilepsy team (32%). Patients with active significant mental health concerns were significantly less likely to be referred to neurology or admitted.

**Conclusions:** Despite a greater proportion of admissions during the Covid-19 pandemic, referrals to acute neurology and the epilepsy team remained low. Failure to refer prevents the most vulnerable seizure patients from receiving appropriate support, as seen in patients with active significant mental health concerns. Neurology staff were unaware of a significant number of patients presenting with seizures, which is of concern in an already over-stretched department. This offers an opportunity to improve care for people with epilepsy.

## 1. Introduction

Epilepsy has an estimated prevalence of 0.5-1% in the UK and is the most common chronic disabling neurological condition worldwide [1]. Only 50% of epilepsy patients are seizure free in the UK, but 20% more could be with optimal medication [2]. Seizures often lead to emergency department (ED) attendances and are responsible for 1% of all hospital admissions [3].

The National Audit of Seizure Management in Hospitals (NASH) was set up to investigate outcomes for patients with seizures following ED attendances. It has identified overuse of neuroimaging, under-referral to relevant services and inadequate safety and driving advice [3]. This

project will further investigate outcomes in specific, vulnerable patient groups: patients with socioeconomic deprivation, mental health disorders and learning disabilities. These groups were selected since they are likely to experience barriers to managing their condition independently, making optimal management especially important. However, their needs may be complex, meaning non-specialist management in the ED is less likely to be satisfactory. We also took the opportunity to explore what impact the COVID-19 pandemic had on patterns of convulsive type seizure and non-epileptic attack presentation to the emergency department.

Patients with epilepsy are more likely to be socioeconomically deprived [4] and there is a higher incidence of epilepsy amongst

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socioeconomically deprived patients [5]. Deprived patients with epilepsy are also more likely to attend hospital with seizures [4]. Similarly, a reciprocal relationship between mental health conditions and epilepsy has been shown [6]. Organic lesions in epilepsy may contribute to psychiatric symptoms, while the psychological strain of living with such an unpredictable and stigmatised disorder can contribute to development of psychiatric disorders, such as depression [6]. Indeed, the suicide rate is 40–50% higher in people with epilepsy than the general population [7]. Finally, epilepsy is seen in 22% of people with learning disabilities, a much higher proportion than in the general population (<1%) [8].

## 2. Materials and Methods

All patients aged 16 and over coded with ‘Fitting/Seizure’ as their presenting complaint to ED in September 2019 and December 2020 were included, allowing for additional comparison of care prior to and during the Covid-19 pandemic. These months were chosen since seizure attendances are ordinarily comparable between them, within our local health board (we receive weekly reports on number of attendances). December 2020 was chosen specifically as, at the time of data collection, the worst peak in the pandemic had occurred then [9]. Following a detailed notes review, patients found not to have had a seizure were excluded from further analysis. ED diagnoses were categorised into 5 groups: epileptic seizures (recurrent seizures in patients diagnosed with epilepsy), organic cause seizures (acute symptomatic seizures, including drug and alcohol-related seizures), non-categorised seizures (includes first unprovoked seizures), non-epileptic attacks and patients who weren’t seen.

All relevant information in each patient’s NHS electronic health record was retrospectively reviewed to collect data. Ethnicity was initially included but since it was frequently undocumented, with the remaining cohort being predominantly ‘White’, outcomes could not be assessed. Patients for whom there was specific documentation of current and disabling mental health symptoms, either from the ED attendance documentation or any other available secondary care notes, were included in the ‘Active significant’ mental health concerns category. A history of prior anxiety or depression was not included in this group, as such labels were very common and non-specific. Deprivation was recorded using the Welsh Index of Multiple Deprivation: a score between 1 and 1909, from most to least deprived, is assigned based on postcode. Four patients did not have a Welsh address, so deprivation was analysed in the remaining 116. Patients with a score of less than 383, meaning they were from the 20% most deprived areas in Wales, were included in the ‘Deprived’ category. Learning disabilities were identified from patients’ secondary care electronic health records via a formal ‘alert’, which highlights patients with learning disabilities diagnosed by a specialist learning disability psychiatrist.

Study outcomes were imaging performed (CT or MRI), hospital admission, referral to acute neurology or the epilepsy team. Microsoft Excel was used to perform Chi-squared tests to analyse whether there was a difference in frequency of all outcomes in the vulnerable patient groups compared to the general cohort.

## 3. Results

Once those under 16 (n=32) and patients who had not actually had seizures (n=15) had been excluded, 120 patients remained: 74 from September 2019, 46 from December 2020. There was a 38% decrease in seizure presentations in December 2020 compared to September 2019 and a reduction in proportion of non-epileptic attacks (16.2% versus 4.3%;  $\chi^2=4.77$ ;  $p=0.029$ ) (Table 1).

### 3.1. Imaging

A significant increase in use of imaging (both CT and MRI) was

**Table 1**

Table showing ED diagnoses by percentage in September 2019 and December 2020. There was a reduction in proportion of non-epileptic attacks (16.2% versus 4.3%;  $\chi^2=4.77$ ;  $p=0.029$ ) from September 2019 to December 2020. An increase was noted in organic seizures while a similar proportion of diagnoses of epileptic seizures and non-categorised seizures were seen before and during the pandemic.

ED Diagnosis	September 2019 attendances (%) (n=74)	December 2020 attendances (%) (n=46)
<i>Epileptic seizure</i>	29.7	32.6
<i>Non-categorised seizure</i>	29.7	32.6
<i>Non-epileptic attack</i>	16.2	4.3
<i>Organic cause seizure</i>	18.9	28.3
<i>Not seen</i>	5.4	2.2

observed from 2019 to 2020 (CT: 39.1% versus 54.3%,  $\chi^2=4.26$ ,  $p=0.035$ ; MRI: 5.4% versus 13%,  $\chi^2=2.37$ ,  $p=0.022$ ). However, patients with active significant mental health concerns and learning disabilities were consistently less likely to undergo a CT head than the general cohort (28.6% versus 50%,  $\chi^2=5.14$ ,  $p=0.023$ ; 19% versus 50%,  $\chi^2=8.31$ ,  $p=0.004$ , respectively). Across both time periods, approximately 20% of patients with non-epileptic attacks underwent a CT head, compared to 50% of patients with all other seizure types.

### 3.2. Onward referral

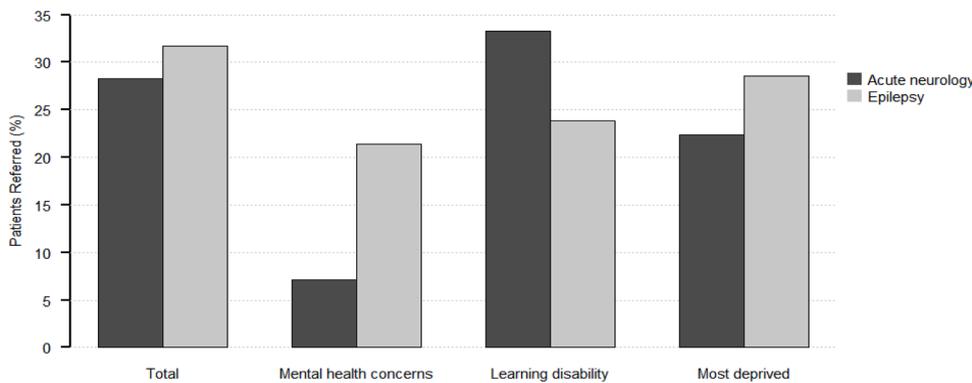
Overall, the number of referrals were low: 32% of the total cohort were referred to the epilepsy team, while only 28% were referred to acute neurology (Fig. 1). Even fewer referrals to acute neurology were made for patients with active significant mental health concerns (7.1% versus 34.8%;  $\chi^2=9.43$ ;  $p=0.002$ ). Similarly, patients with active significant mental health concerns were less likely to be admitted to hospital (17.9% versus 41.3%;  $\chi^2=6.35$ ;  $p=0.012$ ).

## 4. Discussion

This study found a 38% decrease in ED attendances from 2019 to 2020, which may be attributable to reluctance to present to the emergency department during the pandemic [10]. The most striking decline was seen in the number of non-epileptic attack presentations, an encouraging trend since non-epileptic attacks are known to be better managed through a multidisciplinary team (MDT) approach, involving psychological interventions [11].

Higher rates of investigation observed during the pandemic may be explained by lower overall attendances, permitting emergency department staff the time to investigate patients further. However, this is not necessarily a positive outcome, particularly the increased use of CT. Neuroimaging should mainly be used where structural brain abnormalities are suspected, for example, following new onset of focal seizures. Furthermore, where neuroimaging is indicated, MRI head is the modality of choice, and CT should only be used where MRI is inappropriate or unavailable, or in an acute situation [1]. Thus, increased use of CT heads during the pandemic is likely to represent an inappropriate use of resources and unnecessary radiation exposure for patients. Fortunately, in both time periods, patients with non-epileptic attacks received much less ionizing radiation (CT head) than the rest of the cohort.

Whilst patients seem to have been over-investigated, under-referral to neurology teams was observed. NICE states that all patients with a suspected epileptic seizure should be seen by neurology specialists within 2 weeks [1]. Across the total patient cohort, 45% of patients were not known to the local neurology service. Of these patients, 57% were not referred to the acute neurology team or the epilepsy team. This can only be partially explained by 29% of these patients discharging against



**Fig. 1.** Bar chart to demonstrate acute neurology and epilepsy team referrals across the whole cohort. Referrals to acute neurology were made in 28% of cases in the total cohort; 7% of patients with active significant mental health concerns (7.1% versus 34.8%;  $\chi^2= 9.43$ ;  $p= 0.002$ ); 33% of patients with learning disabilities and 22% of deprived patients. Referrals to the epilepsy team were made in 32% of cases in the total cohort, 21% of patients with active significant mental health concerns, 23% of patients with learning disabilities and 29% of deprived patients.

medical advice or refusing to be seen. This low referral rate reveals a staggering unmet need within the service. It is a particularly distressing finding for a neurology team that is already so over-stretched by the current volume of referrals.

Referral rates were lowest in patients with active significant mental health concerns. This is of particular concern since these patients are likely to benefit considerably from an MDT approach. Locally, there is a health care support worker who arranges mental health support for epilepsy patients, based on patient-reported outcome measures. This service is particularly important as other mental health services can struggle to cope with the complexity of the interplay between patients' mental health and epilepsy [12]. Without referral, patients cannot access this service and unfortunately, even if adequate referrals were made, the service could not currently accommodate all those who need it.

This study is limited by its use of ED front-door coding to identify the patient cohort. This method relies on identification of seizures by paramedics and reception staff, which is not always possible. ED attendances are also unlikely to capture non-convulsive type seizures. Retrospective use of notes limits our understanding of the specifics of individual patients, such as the type and severity of learning disabilities, seizure and epilepsy semiology/classification and mental health concerns. In future studies, access to this information via GP records could identify more patients in these categories and help characterise specific trends within these groups. ED notes also provide little insight into the reasoning behind management decisions. This would require further investigation, for example ED doctor interviews could provide insight into the cause for low rates of referrals. It will also be important to review departmental guidelines for referral, to allow for provision of training on appropriate referring and epilepsy in general.

In conclusion, this study has demonstrated that patients presenting to the emergency department are over-investigated and under-referred.

It has revealed substantial unmet need and presents an opportunity to improve access to epilepsy services.

#### Declaration of Competing Interest

None.

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