Medication Management of Adult Patients Admitted to Hospital with Epilepsy, Seizure or Convulsion

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ABSTRACT

Background: An inpatient medication chart review at the Gold Coast Hospital identified shortcomings with the prescribing and monitoring of antiepileptic medications.

Aim: To evaluate medication management of patients with epilepsy, seizure or convulsion; to map their transition through the health system; and to identify lifestyle behaviours that may lead to overt risks for seizure occurrence.

Method: A retrospective observational audit of adult patients (16 years and over) admitted to hospital with a diagnosis of epilepsy, seizure or convulsion from 1 to 31 January 2012.

Results: Majority of the 62 episodes of care investigated involved patients who were discharged directly from the ED (68%). Only 30% of all patients discharged from an inpatient unit received a discharge medication record from a pharmacist. Non-adherence with antiepileptic medications, alcohol and/or recreational drug use and prescription medication misuse were identified as overt risks for seizure occurrence.

Conclusion: Valuable insights were gained into the management of seizure patients. The role of the ED pharmacist was reviewed to focus on high-risk seizure patients. An increase in the provision of discharge medication records and patient education on the overt risks for seizure occurrence is needed.

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INTRODUCTION

Epilepsy is a chronic neurological condition with a worldwide prevalence estimated at 50 million people.¹ A meta-analysis investigating the burden of lifetime epilepsy and active epilepsy reported that the overall prevalence may be higher.² Despite epilepsy being one of the oldest recognised conditions, it continues to be associated with widespread ignorance, fear, discrimination and social stigma.^{1,3} These associations can impact negatively on sufferers as well as their families.^{1,4}

The management and classification of epilepsy is complex and varies between patients.⁴⁻⁷ Pharmacotherapy with antiepileptic medications is a common strategy.⁴ Antiepileptic medications may reduce or stop the frequency of seizures but can have serious adverse drug reactions (ADRs), such as skin reactions and teratogenicity.^{8,9} Serious ADRs lead to increased emergency department (ED) visits and healthcare needs, with economic implications and a burden on the health system.^{1,4,10} Furthermore, frequent

seizures and polytherapy with antiepileptic medications are associated with reduced quality of life.^{4,11}

Some of the problems associated with antiepileptic medications can be minimised through patient monitoring, dietary modification or vitamin supplementation, e.g. folic acid supplements in women planning to conceive.^{12,13} Counselling and communication between health professionals and people with epilepsy is essential.⁷ Pharmacists are pivotal in providing pharmaceutical care to patients with epilepsy, such as educating patients about their disease, dose adjustments, therapeutic drug monitoring and counselling on potential ADRs.⁴ This is essential given the ADRs and non-adherence rates associated with antiepileptic medication use.^{4,8}

An inpatient medication chart review in 2010 at the Gold Coast Hospital identified shortcomings with the prescribing and monitoring of phenytoin and sodium valproate. The audit identified that medication management of patients with epilepsy, seizure or convulsion at the Gold Coast Health Service District needed evaluation. This coincided with the introduction of an epilepsy outpatient clinic within the health service in early 2012.

This study aimed to evaluate medication management of patients with epilepsy, seizure or convulsion; to map their transition through the health system; and to identify lifestyle behaviours that may lead to overt risks for seizure occurrence.

METHOD

Approval to conduct the study was granted by the Queensland Health Human Research Ethics Committee and the Griffith University Human Research Ethics Committee. A retrospective observational audit was conducted of medical records of adult patients admitted to the Gold Coast and Robina Hospitals, tertiary hospitals with around 800 beds, from 1 to 31 January 2012.

An episode of care (EOC) was defined as a patient admission to hospital for the clinical management of a specific disease or condition over a continuous period of time.¹⁴ An EOC was initially screened for eligibility based on ED presentation and discharge diagnostic coding (Table 1). For ED presentations, coding was extracted from the ED information system database. Discharge coding was extracted from the hospital computer information system database. All diagnostic code screening was performed by the Queensland Health Casemix Reporting Service.

Inclusion criteria were: adult patients (16 years and over) presenting to the hospital with a diagnosis of epilepsy, seizure or convulsion, and a epilepsy, seizure or convulsion occurrence on or after 1 to 31 January 2012 (inclusive).

Exclusion criteria were: failure to comply with the inclusion criteria, e.g. seizure diagnosis not confirmed; and/or duplication of coding (patients were coded both on presentation to the ED and on discharge). For instances of duplication of coding, patients were classified as one EOC only.

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Table 1. ED presentation and discharge diagnostic coding

Source	Diagnostic code	Diagnostic description
EDIS	G40.0	Simple partial seizures
EDIS	G40.2	Complex partial seizures
EDIS	G40.5	Convulsions due to drug withdrawal
EDIS	G40.6	Grand mal epilepsy
EDIS	G40.8	Temporal lobe epilepsy
EDIS	R56.8	Seizure – unknown cause
HBCIS	A35	Convulsions (tetanus, tetanic)
HBCIS	A52.1	Convulsions (paretic)
HBCIS	E10.64	Type 1 diabetes mellitus with hypoglycaemia(ic): coma, NOS, seizure (convulsion) (fit)
HBCIS	E11.64	Type 2 diabetes mellitus with hypoglycaemia(ic): coma, NOS, seizure (convulsion) (fit)
HBCIS	E13.64	Diabetes mellitus NEC with hypoglycaemia(ic): coma, NOS, seizure (convulsion) (fit)
HBCIS	E14.64	Diabetes mellitus NOS with hypoglycaemia(ic): coma, NOS, seizure (convulsion) (fit)
HBCIS	F44.5	Dissociative convulsions
HBCIS	G40	Epilepsy
HBCIS	G41.0	Seizures (tonic-clonic) (grand mal)
HBCIS	G41.1	Seizures (absence) (petit mal)
HBCIS	G41.2	Seizures (complex partial) (psychomotor) (temporal lobe)
HBCIS	G41.8	Seizures (focal motor) (specified NEC)
HBCIS	G41.9	Seizures (status)
HBCIS	G97.8	Seizures (postprocedural, early)
HBCIS	I64	Seizures (apoplexy, apoplectic, brain or cerebral, paralysis)
HBCIS	I67.8	Convulsions (apoplectiform) (cerebral ischaemia)
HBCIS	N19	Convulsions (uraemic)
HBCIS	R25.8	Convulsions (reflex)
HBCIS	R56	Convulsions (NEC)
HBCIS	T41.0	Convulsions (overdose or wrong substance given)

EDIS = emergency department information system. HBCIS = hospital-based computer information system. NEC = not elsewhere classified. NOS = not otherwise specified.

An audit tool was developed through collaboration with the Project Steering Committee whose membership consisted of pharmacists, neurologists and pharmacy researchers. The audit tool was used to capture data and classify the clinical management of patients throughout their EOC.¹⁵⁻¹⁷

Data were retrieved from paper and electronic medical records, pathology results, radiology reports and medication resources. Data were stored electronically and entered into the audit tool.

RESULTS

A total of 100 EOCs attributing to seizure, epilepsy or convulsion were evaluated and 63 met the inclusion criteria (Figure 1). This related to 62 different patients (one patient was responsible for two EOCs). The inpatient and discharge patient journey characteristics are shown in Table 2.

Figure 1. Flowchart of episodes of care based on inclusion and exclusion criteria (ED = emergency department, EOC = episode of care).

Of the 15 EOCs in which patients did not have a previous history of seizure(s), three EOCs were for three patients who were initiated on new maintenance antiepileptic medications: sodium valproate 200 mg twice daily, carbamazepine 200 mg twice daily and phenytoin 360 mg daily, respectively. For two of these EOCs the decision to initiate medication was discussed with a neurology team. The third EOC involved a patient who was under the care of a neurosurgical team. The medication management of seizures for all EOCs is summarised in Figure 2.

Alcohol and Recreational Drug Use

Alcohol intake was not documented in 30 EOCs (48%). Of the 32 EOCs in which alcohol intake was documented, 25 (78%) involved patients who reported alcohol use; of which 13 EOCs (52%) involved patients who were classified as drinking at 'harmful' levels (based on the assessment provided by the treating physician).¹³ In nine of these 13 EOCs (69%), the cause of seizure was likely to be secondary to alcohol intake or due to alcohol withdrawal. Alcohol was not identified as a contributing cause of seizure in any EOCs in which patients were classified as drinking at 'occasional' or 'regular' levels. Alcohol intake or alcohol withdrawal was the likely cause of seizure in 9/62 EOCs (15%).

In 36 of the 62 EOCs (58%), recreational drug use was not documented. In the 26 EOCs in which recreational drug use was documented, ten (38%) involved patients who reported using – amphetamines, cannabis, ecstasy, heroin and/or marijuana. Marijuana was the most common choice of recreational drug, with a 70% incidence rate (seven out of ten EOCs) in those who admitted to using recreational drugs, attributing to an 11% incidence rate for all EOCs. One EOC involved a patient who reported recreational drug use as well as benzodiazepine abuse. Another EOC involved a patient who denied recreational drug use but reported abuse of prescription opioid analgesics. Overall, recreational drug use or prescription medication misuse was a likely contributing cause of seizure in 4/62 EOCs (6.5%).

Table 2. Patient journey characteristics

Characteristics	No. of EOCs	No. of applicable EOCs
<i>Inpatient Data*</i>		
Previous history of seizure(s)	47	62 76%
Cause of seizure specified by treating physician	36	62 58%
Non-adherence with antiepileptic medications recognised as the likely contributing cause of seizure	7	62 11%
Neurology reported as treating team†	5	51 9.8%
Neurology consult only†	12	51 24%
Neurology input - total†	17	51 33%
<i>Discharge Data‡</i>		
Self-discharged against medical advice - total	7	62 11%
Discharged directly from the ED (including self-discharges from the ED)	42	62 68%
Discharged from an inpatient unit (including self-discharges from an inpatient unit)	20	62 32%
Completed electronic discharge summaries (inpatient unit discharges only)	15	20 75%
Completed discharge medication record (inpatient unit discharges only)	6	20 30%
Completed electronic discharge summary and discharge medication record (inpatient unit discharges only)	4	20 20%
Source of medication list in electronic discharge summary was discharge medication record	4	15 27%
Medication list hand-typed in electronic discharge summary	4	15 27%
Medication not listed in electronic discharge summary	7	15 47%

ED = emergency department. EOC = episode of care.

*Excludes EOCs of patients who self-discharged before being adequately assessed in the ED. †Excludes EOCs where the cause of seizure was secondary to alcohol or illicit/prescription medication misuse. ‡Excludes EOC of patients who died in the intensive care unit.

Figure 2. Medication management of seizures at the hospital from 1 to 31 January 2012 (EOC = episode of care).

Of the 13 EOCs involving patients assessed as consuming alcohol to 'harmful' levels, six (46%) involved patients who also reported recreational drug use or prescription medication misuse. The incidence of cause of seizure being likely to be attributed to alcohol and/or recreational drug use or prescription medication misuse was 18%.

Folic Acid

No EOCs involved patients who reported to be pregnant, breastfeeding or planning conception. Twenty-three of the 62 EOCs (37%) involved patients who were classified as women of childbearing age. Only one of these EOCs involved a patient who was recorded as taking folic acid 5 mg daily prior to presenting to the ED. There were no

recommendations recorded of adding folic acid to the medication management of any women of childbearing age during their EOCs.

Drug Monitoring

Eight EOCs involved patients taking phenytoin prior to presentation to hospital. Phenytoin and albumin levels were taken for seven of these patients (88%), with some dose adjustments noted. Five EOCs involved patients taking carbamazepine prior to presentation. Of these, carbamazepine levels were taken in three (60%) instances. Fourteen EOCs involved patients taking sodium valproate prior to presentation. Sodium valproate levels were taken for eight (57%) of these EOCs.

DISCUSSION

This study analysed the care of epilepsy, seizure or convulsion patients and highlighted a range of issues that warrant attention. A review of the patient journey characteristics revealed that the majority of EOCs involved patients who were discharged directly from the ED. This highlights the need for optimal clinical treatment of patients with these conditions in the ED, and a review of the role of the ED pharmacist to focus on high-risk seizure patients as well as patients transferred to an inpatient unit.

Only 30% of inpatient unit EOCs involved patients who received a discharge medication record from a pharmacist on discharge from hospital. Given the documented role of pharmacists in providing pharmaceutical information to epileptic patients, including education on drug mechanism of action, drug interactions and potential ADRs, this lack of discharge medication records is suggestive that thorough patient counselling by pharmacists on discharge may not have occurred.⁴ Pharmacist counselling is expected to promote medication adherence, which is particularly relevant in patients taking antiepileptic medications as shown by the non-adherence rate in this study and its likely contribution towards the cause of seizures in 11% of all EOCs.

Six discharge medication records were produced by a pharmacist and four electronic discharge summaries contained hand-typed medication lists. Therefore, we assumed that the patient and GP did not receive any form of official documentation relating to discharge medications in the remaining 10/20 (50%) inpatient unit EOCs. This excludes the majority of patients who were discharged directly from the ED. This trend identifies a potential contributor to discontinuity of care, where the risk of seizure events may be increased due to insufficient communication from hospital to community health practitioners.

The appropriateness of individual seizure cessation or seizure preventive medications was not assessed as seizure type was not routinely classified and therefore medication management was difficult to assess. Use of intravenous levetiracetam and intravenous sodium valproate were limited to two and one EOC(s), respectively. This was an expected occurrence rate given the current Queensland Health List of Approved Medicines restrictions on their use: maintenance treatment of partial epilepsy not controlled by other drugs when the oral formulations of these agents have already been established but are temporarily not feasible. Not to be used for emergency treatment.¹⁸ Given phenytoin's well-established use in seizure management, unrestricted prescribing on the List of

Approved Medicines and overall cost-effectiveness, it was not surprising that the use of intravenous phenytoin was found to be far greater than the other available intravenous antiepileptic medications.¹⁹ The administration of intravenous phenytoin was observed for both first- and second-line seizure management in this audit.

The assessed rates of alcohol intake and recreational drug use or prescription medication misuse and the correlation between use of these agents and likely causative effects of seizure(s) were striking. The audit indicated that 18% of seizure EOCs were likely attributed to alcohol and/or recreational drug use or prescription medication misuse. This trend highlights a need for patient education and public awareness of these habitual behaviours and their potential contribution to seizures.

Over one-third of all EOCs involved women of childbearing age, of which one EOC involved a woman who was taking folic acid (5 mg daily) prior to presentation.²⁰ The role of folic acid in the prevention of fetal neural tube defects during pregnancy is well-established, and adequate dietary folic acid intake and/or supplementary folic acid is recommended for all women planning to conceive.²¹

The role of folic acid in women of childbearing age taking antiepileptic medications is not well defined.^{21,22} Since infants exposed to some antiepileptic drugs *in utero* have around twice the risk of developing congenital malformations, folic acid supplementation is recommended in women taking antiepileptic drugs when planning to conceive.^{12,20,21} As the data obtained from this audit was not specific enough to detail a female patient's plans for conception, the need to have prescribed folic acid for these patients cannot be assessed. It is essential, however, that women with epilepsy are given accurate information and counselling about contraception, conception and pregnancy as part of their management.⁷

With 68% of EOCs involving patients who were discharged directly from the ED, a review of the role of the ED pharmacist to focus on high-risk seizure patients was identified. The low rate of generated discharge medication records from inpatient unit discharges (30%) was suggestive that thorough patient counselling on discharge by a pharmacist was not likely to be met. A subsequent need was identified to reassess inpatient unit pharmacist prioritisation and/or inpatient unit staff education on the appropriate discharge procedures. Increased patient awareness of lifestyle behaviours that may lead to overt risks of seizure occurrence (such as non-adherence with antiepileptic medications, alcohol and/or recreational drug use, or prescription medication misuse) was strongly advocated. As part of the healthcare team, pharmacists are in a prime position to play a significant role in patient education for these overt risks that may lead to seizure occurrence and subsequent healthcare burden.

In conclusion, valuable insights were gained into the management of seizure patients. The role of the ED pharmacist was reviewed to focus on high-risk seizure patients. An increase in the provision of discharge medication records and patient education on overt risks for seizure occurrence is needed.

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