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Tackling increased risks in older adults with intellectual disability and epilepsy: Data from a national multicentre cohort study

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ABSTRACT

Purpose: People with intellectual disabilities (ID) suffer multimorbidity, polypharmacy and excess mortality at a younger age than general population. Those with ID and epilepsy are at higher risk of worse clinical outcomes than their peers without epilepsy. In the ID population the health profile of those aged ≥40 years can be compared to those aged over 65 in the general population. To date there is limited data available to identify clinical characteristics and risk factors in older adults (≥40 years) with ID and epilepsy.

Methods: The Epilepsy in ID National Audit (Epi-IDNA) identified 904 patients with ID and epilepsy from 10 sites in England and Wales. This subsequent analysis of the Epi-IDNA cohort compared the 405 adults over 40 years with 499 adults ≥18 years aged under 40 years. Comparison was made between clinical characteristics and established risk factors using the Sudden Unexpected Death in Epilepsy (SUDEP) and Seizure Safety Checklist.

Results: The older adults' cohort had significantly higher levels of co-morbid physical health conditions, mental health conditions, anti-seizure medications (median 5), and antipsychotics compared to the younger cohort. The older group were significantly less likely to be diagnosed with a co-morbid neurodevelopmental disorder, and to have an epilepsy care plan.

Conclusion: This is the largest study to date focused on adults with ID and epilepsy over 40 years. The ≥40 years cohort compared to the younger group has higher levels of clinical risk factors associated with multi-morbidity, potential iatrogenic harm and premature mortality with worse clinical oversight mechanisms.

1. Introduction

1.1. Intellectual disability and epilepsy

Intellectual disability (ID) is neurodevelopmental disorder defined by global deficits in cognitive and adaptive functioning with an onset during the developmental period [1]. A previous meta-analysis demonstrated that more than one in five people with ID are also diagnosed with epilepsy compared with less than 1% in the general population [2,3]. People with ID and epilepsy are a complex heterogeneous population with multifactorial aetiology. This includes the influence of specific genetic syndromes (e.g., Down's syndrome) on morbidity as people age. People with ID and epilepsy have high rates of multi-morbidity (two or more chronic conditions) specifically mental and

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emotional disorders, neurodevelopmental disorders and neurological conditions [4,5]. This is associated with a higher prevalence of polypharmacy (5 or more regular medicines) [6,7]. Epilepsy prevalence is 30-50% in those with moderate to profound ID as compared to those with mild ID where it is approximately 8-12% [8, 9].

1.2. Morbidity and mortality

The Learning Disabilities Mortality Review (LeDeR) of ID deaths estimated that sixty-three percent of people with ID die before the age of 65 [10]. With co-morbid epilepsy, life expectancy is estimated to be more than 10 years younger compared to other chronic conditions in people with ID [10]. Those with moderate to profound ID were more likely to die earlier than those with mild ID. LeDeR analysis from 2020 demonstrated that 46% of people with ID who died had 7-10 long-term health conditions and 47% had epilepsy [10].

1.3. Older adults with epilepsy

There is good recognition of the burden and challenges of epilepsy in older people without ID [11]. Epilepsy among the elderly differs in clinical presentation and prognosis from those of young people. Particularly, physiological modifications in metabolism impacting on medication, increased risks of pharmacological interactions and higher burdens of polypharmacy are well recognised [11].

1.4. Ageing in adults with ID and epilepsy

The consensus definition of older adults in the ID population in research cohorts is over 40 years of age as this sub-group has a significantly lower life expectancy, particularly in association with epilepsy compared to the general population [12]. A cross-sectional study in the Netherlands identified frailty scores in people with ID aged over 50 years that were similar to those in people aged over 75 years in the general population [13].

The large longitudinal dataset from the Intellectual Disability Supplement to the Irish Longitudinal Study on Ageing (IDS-TILDA) shows that epilepsy is a common co-morbidity in adults over 40 years of age (35.6%) [14]. Mental health conditions are even more common (57.7%) [14]. A cross sectional observational study from Wave 1 of the IDS-TILDA (2009-10) of older adults ($\geq$40 years old) with epilepsy and ID found anti-seizure polytherapy in over half of the participants [12].

While studies have looked for presentation differences in older adults with epilepsy in general population and those generally in ID populations respectively, no study till date has specifically looked to understand whether there is any specific difference in clinical risk characteristics, between older adults with ID and epilepsy (aged 40 years and over) as compared younger adults.

2. Methods

This investigation is a post hoc sub-group analysis of a 10-site multicentre retrospective cohort study of people with ID and epilepsy from across England and Wales. The methodology for the original investigation is published and summarised in Appendix 1 [5]. The STROBE guidelines for cross sectional studies was utilised (supplementary file 1). The original data collected were re-analysed to assess for any relevant differences between older (aged 40 years or more) and younger (aged 18-39 years) adults with epilepsy and ID that might help guide prescribing practice. The data for each group were compared for all available parameters including demographics, clinical characteristics including seizure type and frequency, and seizure risk factors, including those for sudden unexpected death in epilepsy (SUDEP). Comparisons were undertaken between mild ID and moderate to profound ID cohorts. For ease of analysis anti-seizure medications (ASM) were pooled based on their generation. Generation one was the older ASMs: phenobarbitone, ethosuximide and phenytoin. Generation two being: pre-2000 licenced drugs, Generation three: drugs licenced between 2000 and 2010 and finally generation four: drugs which were licenced post 2010 for treatment resistant epilepsy.

2.1. Ethics, standard protocol approvals, registrations, and patient consents

Each NHS centre had registered the primary project as an internal audit/service evaluation, conducted a Data Protection Impact Assessment (DPIA) and gained approval from their Information Governance (IG) leads to submit anonymous data to the central REDCap database. An IG lead oversaw the full process. REDCap was used to collect data in compliance with the General Data Protection Regulation (GDPR). As per the NHS Health Research Authority tool (http://www.hra-decisiontools.org.uk/research/index.html) no formal ethical approval was necessary for this study (Supplementary File 2). No patient identifiable data was collected. Individual patient data from each centre were combined into a single dataset prior to analysis.

2.2. Data sharing

Deidentified participant data, data dictionary and the study protocol can be requested from the corresponding author.

2.3. Statistical analysis

Descriptive statistics for demographics, co-morbidities, pharmacotherapy, and risk profiles were obtained. Continuous variables were summarised using the mean and standard deviation (SD) (or median and inter quartile range (IQR) where the distribution was skewed), and categorical data were summarised as a number and percentage. Univariate associations between age group or severity of intellectual disabilities (mild; moderate-profound) and other categorical factors were assessed using the Chi-squared test, or Fisher's exact test (when one or more expected cell counts were less than 5). Logistic regression analysis was used to explore the associations between SUDEP risk factors and age group (considered as the exposure variable), after controlling for any confounding effect of ID severity. The potential for effect modification was explored through inclusion of relevant interaction terms. Statistical significance was accepted at $p<0.05$.

3. Results

A recent retrospective multi-centre cohort study evaluated the clinical characteristics of people with ID and epilepsy including 904 adults from 10 different sites [5]. From this cohort 45% (n=405) of those included were considered older adults (aged 40 years or over).

Of the 405 older adults with ID and epilepsy, nearly two thirds (62%) had a comorbid physical condition, just under a third a co-morbid neurodevelopmental disorder (28%) and just over a third (38%) any mental health condition (Table 1). The chronic drug burden was five (interquartile range (IQR) 5), with nearly a third (31%) being on an antipsychotic in addition to an average of two ASMs.

3.1. Older adults with ID and epilepsy compared to those under 40 years of age

When comparing the older adult group (n=405) with the rest of the cohort (n=499) there was no significant difference in the proportion of those with mild ID compared to those with moderate to profound ID (Table 1). Nor was there any differences in the type and natures of the seizures with generalised seizures being the most frequent type in both groups.

The older adults had a significantly higher level of co-morbid physical illness (62% vs 56%; p=0.04) and mental health disorder (38% vs

Table 1
Characteristics of adults with Intellectual Disability (ID) and Epilepsy by age group (over 40 vs under 40).

	Age < 40 (n=499)	Age ≥40 (n=405)	p-value
ID severity			
Mild	179 (36%)	141 (35%)	0.78
Moderate to profound	320 (64%)	264 (65%)	
Diagnosis of ASD	225 (45%)	112 (28%)	<0.001
Diagnosis of ADHD	52 (10%)	7 (2%)	<0.001
Mental health disorder	151 (30%)	154 (38%)	0.02
Physical health disorder	278 (56%)	253 (62%)	0.04
Total medications: median (IQR)	4 (3)	5 (5)	<0.001
ASM: n (%)	452 (93%)	389 (97%)	0.02
Number of ASM meds: median (IQR)	2 (2)	2 (2)	
ASM type			
Generation 1 and 2	395 (79%)	336 (83%)	0.17
Generation 3 and 4	220 (44%)	216 (53%)	0.006
Antipsychotic meds: n (%)	113 (23%)	123 (31%)	0.02
Number of anti-psychotic meds: median (IQR)	0 (0)	0 (1)	

*ASD-Autism Spectrum Disorder, ADHD- Attention Deficit Hyperactivity Disorder, IQR-Interquartile range, ASM-Anti-seizure medication

30%; p=0.02). In the older adult cohort, there was also a significantly higher level of both ASM and antipsychotic prescribing (p=0.02), although the median number of medicines prescribed was the same in both groups. Four fifth of the study cohort were on at least one generation 1 or 2 ASMs with no differences between the two groups (p =0.17). However, differences were found in the use of generation 3 or 4 ASMs, where it's use favoured the older cohort (p<0.006).

In contrast, older adults were significantly less likely than younger adults to have been diagnosed with additional co-morbid neurodevelopmental disorders. The prevalence of autism was 45% in the younger cohort compared to 28% in the older cohort (p<0.001). The prevalence of attention deficit hyperactivity disorder (ADHD) was 10% in the younger cohort compared to 2% in the older cohort (p<0.001).

3.2. Sudden unexpected death in epilepsy (SUDEP) and other seizure related risk factors

Known static and modifiable risk factors for sudden death were considered using the SUDEP and Seizure Safety Checklist (Table 2) [15]. Those in the older group had a longer duration of epilepsy diagnosis (p<0.001). Those in the younger group were more likely to have a childhood onset epilepsy i.e., before the age of 16 (p<0.001). The younger group were also significantly more likely to have had a seizure in the previous 12 months (p=0.01). The older group had a lower proportion of people with an epilepsy care plan (p=0.057). Consistent results were obtained when using logistic regression analysis to estimate the effects of age group on SUDEP risk factors (Table 3). The odds of having an epilepsy care plan were significantly lower in the older cohort than the younger cohort, after adjustment for ID severity (OR 0.94, 95% CI 0.89, 1.00, p=0.048). There was no evidence that the effect of groups varied by ID severity for any of the selected SUDEP and other seizure related risk factors (Table 3).

4. Discussion

The results from this investigation demonstrate a significant difference between those adults aged 40 and over with epilepsy and ID and the younger adult cohort in various clinical, prescribing and risk and service delivery characteristics. As expected, the older adults have higher levels of prescribing, physical, and mental health co-morbidities that the younger group. In addition, Low levels of neurodevelopmental

Table 2
SUDEP and seizure Safety Checklist. Comparing SUDEP risk factors between older adults with epilepsy and ID and younger adults [13].

	Age < 40 (n=499)	Age ≥40 (n=405)	Missing/ not recorded	p-value
Has the patient's epilepsy been reviewed in the last 12 months?	442 (92%)	370 (93%)	26	0.898
Who reviewed the patient's epilepsy?			94	0.265
Neurologist	101 (23%)	74 (20%)		
GP	31 (7%)	27 (7%)		
Psychiatrist	280 (63%)	236 (64%)		
Specialist Epilepsy Nurse	31 (8%)	26		<0.001
Other	24 (5%)	1 (0%)		
When was the patient first diagnosed with epilepsy?	5 (1%)	13 (3%)		
< 5 years ago	35 (7%)	12 (3%)		
5-15 years ago	56 (12%)	317 (79%)	26	<0.001
>15 years ago	353 (74%)	57 (14%)		
Unknown	35 (7%)			
At what age were they when they were diagnosed with epilepsy?		257 (64%)	26	0.013
<16 years	371 (77%)	39 (10%)		
>16 years	62 (13%)	103 (26%)		
Unknown	46 (10%)		26	0.525
Has the patient had a seizure in the last 12 months?	325 (68%)	236 (59%)		
Yes	149 (31%)	161 (40%)		
No	5 (1%)	2 (1%)		
Unknown			26	0.300
Has the patient had a Generalised Tonic Clonic Seizure in the last 12 months?	215 (45%)	165 (41%)		
Yes	257 (54%)	229 (57%)	26	0.145
No	7 (1%)	5 (1%)		
Unknown			630	0.937
Has the patient had a seizure lasting longer than 5 minutes or an episode of status epilepticus in the last 5 years?	70 (15%)	45 (11%)		
Yes	401 (84%)	345 (86%)		
No	8 (2%)	9 (2%)	26	0.547
Unknown				
Does the patient have seizures at night?	162 (34%)	112 (28%)		
Yes	281 (59%)	249 (62%)	26	0.457
No	36 (8%)	38 (10%)		
Unknown				
Does the patient have any surveillance at night?	125 (77%)	87 (78%)	26	0.194
Yes	31 (19%)	22 (20%)		
No	6 (4%)	3 (3%)		
Unknown				
Has the patient attended the emergency department (ED) or called 999 due to seizures in the last 5 years?	100 (21%)	80 (20%)	27	0.529
Yes	362 (76%)	299 (75%)		
No	17 (3%)	20 (5%)	26	0.754
Unknown				
Does the patient have any problems taking medications?	42 (9%)	29 (7%)		
Yes	437 (91%)	370 (93%)	26	0.057
No				
Have there been frequent changes to the patient's anti-epileptic medications (more than 3 in the last year)?	67 (14%)	42 (11%)	26	0.836
Yes	408 (85%)	351 (88%)		
	4 (1%)	6 (2%)		
		11 (3%)		

(*continued on next page*)

Table 2 (*continued*)

	Age < 40 (n=499)	Age ≥40 (n=405)	Missing/ not recorded	p-value
No		386		
Unknown	8 (2%)	(97%)		
Does the patient abuse alcohol?	467 (98%)	2 (1%)		
Yes	3 (1%)	4 (1%)		
No		394		
Unknown	6 (1%)	(99%)		
Does the patient take any recreational drugs?	470 (98%)	1 (0%)		
Yes	3 (1%)	278		
No		(70%)		
Unknown	362	121		
Does the patient have an epilepsy care plan?	(76%) 117	(30%)		
Yes	(24%)	246		
No		(62%)		
Is there a documented discussion of SUDEP risk?	286 (60%)	142 (36%)		
Yes	178	11 (3%)		
No	(37%)			
Unknown	15 (3%)			

disabilities in older people with ID compared to younger group were identified. Until the early 21st century diagnosis of neurodevelopmental disorders was not routine [16]. This means that there is a "lost generation" of older people with ID whose co-morbid neurodevelopmental disorders remain undiagnosed in keeping with the current study. It could stem from people receiving diagnoses which are then rarely reviewed and updated with the latest criteria highlighting the need for ongoing time to time holistic clinical reviews of diagnoses. Given the over -representation of neurodevelopmental conditions in people with ID and epilepsy there is an urgent need to ensure parity in access for identification and management to these issues, as this may make a difference to management and prognosis [17].

An interesting finding was that the younger population had significantly higher number of seizures, but not generalised seizures compared to the older cohort. There could be various explanations for this. An important possibility is observer bias in picking up partial seizures as there is a higher likelihood of those younger to be with families who would be alert from experience to such events. Likewise, the older group are more likely to be in care in residential setting where carers and informants are not as alert or trained to identify these attacks.

The need for regular reviews is also emphasised by the increased prescribing rates in the older adults. There is little evidence on the efficacy and adverse effect profile of ASMs in older people with ID. The 2020 LeDeR report outlines that almost one in five deaths were associated with the prescription of ten or more medications [10]. Eighty-four percent of deaths were associated with the prescription of medicines that affect the central nervous system with ASMs being the most common (47%). Antipsychotics, antidepressants, and ASM prescribing was higher in the older age groups and these medicines were often prescribed in combinations [10]. In over half of reported deaths, individuals were taking 5 (mean 5.8) or more ASMs [10]. In comparison, the cohort in this investigation was found to be on a median number of two ASMs though the total drug burden median was five. The increased association of those prescribed higher numbers of medications (particularly ASMs) with mortality warrants further investigation, to determine if this is a modifiable risk factor, or a marker of higher medical and psychiatric disease burden. This may indicate that those prescribed higher numbers of ASMs need to be pro-actively identified and possibly reviewed more frequently.

It was identified that 83% of the older adult group are on at least one generation 1 or 2 ASM. While there was no identified difference between the older and younger group the negative impact of these older drugs on general physical health needs considering. In addition, a third of the older cohort was on antipsychotics which was statistically increased as compared to the younger group. It is worth considering that the older ASMs (1st Generation) and antipsychotics have considerable anticholinergic effects, and the effects of multiple drugs on cholinergic burden are cumulative. The adverse anticholinergic effects include sedation,

Table 3
Logistic regression analysis of effect of age and ID severity on selected SUDEP risk factors.

SUDEP risk factor	Age:Age ≥40 v Age < 40 (reference)	ID:Moderate to profound v mild (reference)	Interaction between age and ID severity
Has the patient's epilepsy been reviewed in the last 12 months?	1.00 (0.97, 1.04), p=0.79	1.07 (1.03, 1.11), p<0.001	p=0.26
Has the patient had a seizure in the last 12 months?	0.91 (0.86, 0.97), p=0.005	1.15 (1.07, 1.23), p<0.001	p=0.60
Has the patient had a Generalised Tonic Clonic Seizure in the last 12 months?	0.96 (0.90, 1.03), p=0.26	1.14 (1.07, 1.22), p<0.001	p=0.64
Has the patient had a seizure lasting longer than 5 minutes or an episode of status epilepticus in the last 5 years?	0.97 (0.92, 1.01), p=0.15	0.99 (0.95, 1.04), p=0.79	p=0.53
Does the patient have seizures at night?	0.94 (0.88, 1.01), p=0.09	1.10 (1.03, 1.18), p=0.007	p=0.49
Does the patient have any surveillance at night?	1.00 (0.91, 1.10), p=0.97	1.17 (1.05, 1.30), p=0.005	p=0.24
Has the patient attended the emergency department (ED) or called 999 due to seizures in the last 5 years?	0.99 (0.94, 1.05), p=0.85	0.98 (0.93, 1.04), p=0.60	p=0.88
Does the patient have any problems taking medications?	0.98 (0.95, 1.02), p=0.41	0.93 (0.89, 0.96), p<0.001	p=0.27
Have there been frequent changes to the patient's anti-epileptic medications (more than 3 in the last year)?	0.97 (0.92, 1.01), p=0.13	0.98 (0.94, 1.03), p=0.44	p=0.08
Does the patient abuse alcohol?	1.01 (0.99, 1.03), p=0.28	0.96 (0.94, 0.98), p<0.001	p=0.05
Does the patient take any recreational drugs?	1.00 (0.98, 1.01), p=0.72	0.99 (0.97, 1.00), p=0.10	p=0.58
Does the patient have an epilepsy care plan?	0.94 (0.89, 1.00), p=0.05	1.20 (1.13, 1.28), p<0.001	p=0.87
Is there a documented discussion of SUDEP risk?	1.02 (0.95, 1.08), p=0.61	1.28 (1.20, 1.37), p<0.001	

confusion, and constipation. Anticholinergic drug burden is associated with negative clinical outcomes including increased contact with services, hospitalisation, and dementia diagnosis [18]. A study of adults with ID and matched controls identified that people with ID have a higher anticholinergic burden and are more likely to be prescribed anticholinergic medication (OR 1.49, 95%CI: 1.38-1.59) [19]. Our study confirms this and further enumerates that those older with ID and epilepsy carry greater risk than their younger peers.

The newer generations of ASMs have been developed with specific attention to minimising adverse effects including reducing sedative and anticholinergic symptoms. Just over half of the older cohort were prescribed generation 3 or 4 ASMs. It is unclear what the opportunities or challenges are of improving the availability of these ASMs.

This study indicates a hidden vulnerable older ID population with inadequate review highlighted by the significantly lower percentage of epilepsy care plans as compared to the younger ID group. Taken alongside with the other results of the study which suggest a population increasing in complexity of health needs with age after 40 where many do not live past their 50s more specific and intensive clinical support needs considering. In the general population in economically developed countries there is increased specific provision for the older adult population i.e., 65 years and over. This provision is not replicated for people with ID.

Epilepsy in older adults in general population is also an under-researched area but recognised to require specific attention [20]. However, this is much worse for those with ID and epilepsy [21]. Recent initiatives highlight the specific issues of care for people with ID and epilepsy [22]. These include delivering person centred care in risk assessments, medication, impact of co-morbidities and care planning [23,24,25,26,27,28]. However, there has been very little concern or inquiry into those with older adults with ID and epilepsy who remain a hidden population. This investigation indicates that care given while aging is a potential specific risk factor for premature and preventable mortality. With a move to increased inclusivity and advocating for improved access to generic services, there is a need to ensure that specialist guidance is available.

This study has shown there is noted significant over-prescribing of antipsychotics in people with ID and epilepsy across the age range but more specifically older adults. Prescribing in the ID populations particularly older adults with epilepsy require specific mention. The ‘Stopping over-medication of people with a learning disability, autism or both’ (STOMP) initiative from England aimed to reduce overprescribing, specifically of antipsychotic medicines [29]. Results to date are mixed [30,31]. A potential confounder is ASMs which have been marginal to this project. The lack of clinical insights to distinguish complex behavioural issues from seizure presentations can be a contributing factor for the high levels of psychotropic and ASM prescribing [32]. Thus, programmes to reduce psychotropic burden in people with ID should also take into account the role of the ASM, looking to provide a holistic approach.

. Until this issue is addressed, those older adults with ID and epilepsy will continued to be at significant risk of iatrogenic harm through polypharmacy. Given the emerging evidence, a methodological approach towards prescribing practice needs to be considered. There may be scope to consider adapting tools used in the general population [33]. All these need to be undertaken ensuring historical co-morbid diagnoses are re-visited, examined and corrected or new added as necessary.

4.1. Limitations

This sub-analysis is derived from a pragmatic retrospective real-world study and is thus not without limitations. The specific limitations are outlined in the main study [5]. The most prominent of these include no seizure outcome data, lack of historical data on medication use and lack of a validated psychiatric diagnosis. Due to the methodological restrictions outlined this investigation did not gather control group data from general population. In future it would be useful to directly compare the findings to a cohort of people with epilepsy without ID who are treatment resistant, possibly age, sex and ethnicity matched extracted from the local population. The study pools data of populations supported by different services principally identified by their nature and degree of their ID. In the study methodology ASMs where classified by generation for ease of data collection and in order to establish prescribing practices and a broad indication of the potential adverse effects and drug interactions. In a future large scale investigation it would also help to identify the specific ASMs prescribed so that subgroups can be analysed. For example, grouping ASMs with known associated enzyme inducing properties, psychiatric impact, a negative cognitive profile, and hyponatraemia would provide useful data with direct clinical relevance. Similar, classifying anti-psychotics and other psychotropics to their generation of origin could give valuable insights on issues such as anti-cholinergic burden, movement disorders and other specific side effects.

5. Conclusion

This is the first study which outlines increased multi-morbidity and polypharmacy in people with ID and epilepsy above the age of 40, while receiving less structured epilepsy clinical support when compared to their younger peers. This may in part explain the resultant excess mortality in this population, including premature and preventable deaths. In order to improve outcomes, there is a need to invest in large scale robust investigations to rigorously evidence the clinical factors that are associated with a higher risk of mortality. From this, specific clinical decision support tools can be developed to guide prescribing practices with a focus on reducing harm in this complex vulnerable population.

Ethics statement

We confirm that we have read the journal’s position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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Author contributions

All authors satisfy the ICMJE guidance by substantially contributing to the design, analysis and interpretation of the work, drafting of the manuscript, final approval of the manuscript and all agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work is appropriately investigated and resolved.

Data statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Competing Interest

No known conflict of interest exists for any of the authors involved in this manuscript.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.seizure.2022.05.022.

Appendix 1

Outline of Original Study protocol [2]

The Epilepsy in Intellectual Disability National Audit protocol was a consensus questionnaire developed by specialists in epilepsy and intellectual disabilities in consultation with experts by experience. Data analysis and interpretation was undertaken with SUDEP Action, a national charity. It collected information on key demographic and pharmacological profiles and used the 'SUDEP and Seizure Safety Checklist' to capture information on seizures (including risk factors of Sudden Unexplained Death in Epilepsy) and associated risk. Services were recruited through advertisement on the national audit database of the Healthcare Quality Improvement Partnership, at national conferences and by individual invitation between October 2019 and April 2020. The inclusion criteria were adults aged 18 years or older known to the local intellectual disabilities or epilepsy services with a coded diagnosis of intellectual disabilities and epilepsy and on the NHS England (and Wales) primary care intellectual disability national register. Adults with autism spectrum disorder, attention deficient hyperactivity disorder (ADHD), but without a co-morbid intellectual disability, were excluded. Severity of intellectual disabilities was divided as per the ICD criteria into two groups: mild intellectual disabilities and moderate to profound Intellectual disabilities.

Participating centres identified eligible cases through automated and manual searches of electronic health records between October 2019 and June 2020. Through case record review, data on demographics, health background, epilepsy profile, medications, and epilepsy mortality/SUDEP risk factors were collected. No patient identifiable data were collected. Subsequently, data from each centre was entered into a secure electronic database: Research Electronic Data Capture (REDCap) to allow pooled analysis. For ease of analysis ASMs were pooled based on their generation. Generation one was the older ASDs: phenobarbitone, ethosuximide and phenytoin. Generation two being: pre-2000 licenced drugs, Generation three: drugs licenced between 2000 and 2010 and finally generation four: drugs which were licenced post 2010 for treatment resistant epilepsy.

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