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## Antiepileptic drug use in Austrian nursing home residents

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## ABSTRACT

**Purpose:** Currently around 30% of all newly developed seizures are diagnosed in persons older than 65 years. Five to 17% of nursing home-residents take antiepileptic drugs. The aim of our study was to analyze the type and frequency of prescribed antiepileptic drugs, as well as their indication, co-morbidities and co-medications in institutionalized elderly in Austria.

**Methods:** This was a retrospective, cross-sectional study, which included all residents of the seven public nursing homes in Innsbruck, Austria. The data of 828 probands were extracted from the charts at site and maintained anonymously. The data collection was followed by descriptive statistics.

**Key findings:** 70 (8.5%; 26 M/44 F) of the 828 (192 M/636 F) residents took at least one antiepileptic medication. In 51.5% the reason for the prescription were epileptic seizures – yielding a minimum prevalence of 4.5%. The most often used antiepileptic drugs were gabapentin (37%), levetiracetam (24%) and valproate (18.5%). The three most common co-morbidities were arterial hypertension (49%), ischemic stroke (36%) and other cerebrovascular diseases (29%). Six to nine co-medications were prescribed in 41%, 26% had more than 10 additional drugs and 91% were treated with proconvulsive co-medications (64/70, median 2, range 0–6).

**Significance:** Austrian nursing home residents receive more frequently newer antiepileptic drugs compared to other countries, but co-prescription of proconvulsive drugs is common.

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## 1. Introduction

Compared with all other age groups persons over 75 years have the highest incidence of acute symptomatic seizures, epilepsy and status epilepticus.<sup>1</sup> For the year 2020 it is expected that 50% of all newly developed seizures will be diagnosed in patients over 65 years.<sup>2,3</sup> In contrast to the general population nursing home residents have even a much higher prevalence for epilepsy: 1 versus 5–6%.<sup>4–6</sup> Antiepileptic drug (AED) use, however, varies in the different countries: AEDs are taken in 10.5–11% of US-nursing home-residents,<sup>7</sup> in 4% of Italian,<sup>8</sup> in 5% of German<sup>9</sup>, in 9% of Swedish<sup>10</sup> and in 17% of Irish institutionalized elderly.<sup>11</sup> The ILAE Guidelines recommend lamotrigine and gabapentin as the AEDs of choice in the therapy of elderly people. Alternatively, levetiracetam is considered by many experts in the field as appropriate drug in the elderly.<sup>12</sup> Nevertheless, phenytoin is still the most frequently used drug in the US.<sup>7</sup> And in German (37%),<sup>9</sup> Swedish (32%)<sup>10</sup> and

Irish nursing homes (45%)<sup>11</sup> it is carbamazepine. The aim of our study is to assess the type and frequency of prescribed AEDs in Austrian nursing homes, as well as their indication, co-morbidities and co-medications.

## 2. Methods

## 2.1. Study design

This was a retrospective, cross-sectional study, which included all residents of the seven public nursing homes in the district of Innsbruck (Tyrol, Austria). The data acquisition was carried out between 23rd March 2010 and 7th April 2010 by D.P. Huber, always accompanied by R. Griener, the Quality Manager of Innsbruck's social services who ensured data security and protection of anonymity. Following data were extracted from the patient charts at site: name of the residential home and number of its inhabitants, date of birth and gender of the nursing home resident, specialization of the physician in charge, the seizure semiology, the date of first prescription, the indication and the dose of AEDs, the co-morbidities and co-medications. The informed consent was waived by the Ethics Commission of the Medical University of Innsbruck.

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## 2.2. Statistical analysis

The data were entered directly at site into the prepared data sheet of program SPSS version 18.0 and the descriptive analysis was carried out with SPSS 18.0. Percentages, the mean and median with standard deviations were used to summarize baseline information for all variables.

## 3. Results

At least one AED was used by 8.5% (70/828) of the participating nursing home residents. The prevalence of patients using AEDs in nursing home-residents was 4.5% (36/828). Demographic data and age distribution are displayed in Table 1. Age at diagnosis was noted in the charts only in 36% (25/70): 84% (21/25) were older than 60 years at the time of their first seizure. Half of the patients had at least five to ten co-morbidities (median 6, range 2–10). The two most common diseases were arterial hypertension (49%, 34/70) and ischemic stroke (36%, 25/70); others were peripheral arterial occlusive disease, carotid stenosis and deep leg vein thrombosis (29%, 20/70) (see Table 2). The substance class, the number and distribution, as well as the proconvulsant potential of co-medications, prescribed next to AED, are detailed in Fig. 1. In total, patients had median eight (range 0–16) co-medications and 91% of them took next to the AED at least one proconvulsive drug (64/70) – with a median of two and a range of zero to six.

The three most commonly used AEDs were gabapentin (37%, 26/70), levetiracetam (24%, 17/70) and valproate (19%, 13/70) (see Fig. 2). Median dose of gabapentin was 700 mg (range 100–2400 mg), of levetiracetam 2000 mg (range 1000–3000 mg), of valproate 850 mg (range 300–2000 mg), of phenytoin 300 mg (range 200–900 mg), of carbamazepine 400 mg, of topiramate 200 mg, of primidone 375 mg and of pregabalin 225 mg (range 225–300 mg). Most patients (62%, 43/70) used one AED and nine used two AEDs (13%, 9/70).

Indication for AED use was ascertained in 61% (43/70). Epilepsy or epileptic seizures were the most common reason: 52% of all participating residents got the AED because of their epilepsy (36/70). Other indications were neuropathic pain (4%, 3/70), manic-depressives disorders (3%, 2/70), essential tremor (1%, 1/70) and restless legs syndrome (1%, 1/70). In 39% the indication could not be identified. Of the 36 patients, which used AEDs because of epilepsy, the type of epileptic seizure was ascertained by chart entry in 64% (23/70). 22% had tonic-clonic seizures, 22% had secondary generalized, 11% complex focal and 8% simple focal seizures.

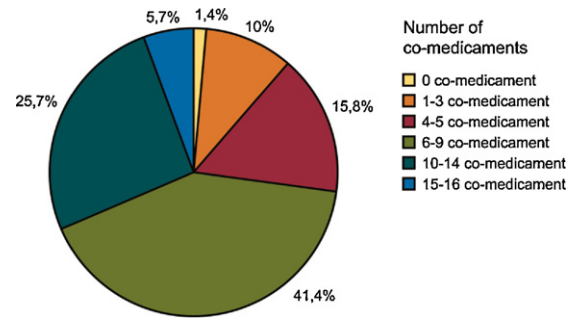


Fig. 1. Number of co-medications prescribed next to AED in Austrian nursing home residents.

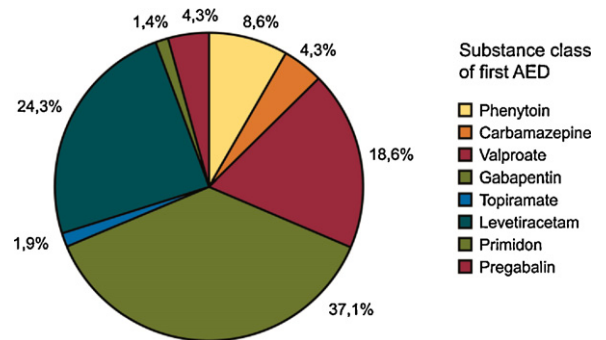


Fig. 2. Initial AED treatment of nursing home residents in Innsbruck, Austria.

## 4. Discussion

### 4.1. Main findings

8.5% of all nursing home-residents in Innsbruck took at least one AED. In 51% the indication was Epilepsy, implying a prevalence of 4.5%. Thus, our findings are in line with those from Swedish and US institutions, where the prevalence of AED use is between 9 and 11%,<sup>7,10</sup> but they are divergent to other European studies: compared to German and Italian nursing homes the use of AEDs in Austrian institutions is higher (4–5% versus 8.5%),<sup>8,9</sup> compared to Irish residents the use is lower (17% versus 8.5%).<sup>11</sup> The divergence may be caused by differences in data sources, the assessment of AED use and the more recent dataset, at which time epilepsy in the elderly and newer AEDs, such as gabapentin and

Table 1  
Demographic information on the study population.

	Nursing home							Total
	1	2	3	4	5	6	7	
Inhabitants	107	156	96	60	189	126	94	828
Women, n (%)	83 (78)	123 (79)	67 (70)	45 (75)	154 (81)	96 (76)	68 (72)	636 (77)
Used AED	8	12	9	6	16	11	8	70
Sex (M/F)	3/5	3/9	3/6	3/3	3/13	7/4	4/4	26/44
Age at diagnosis								
≤15 a	0	0	0	0	0	1	0	1
16–59 a	1	0	0	1	0	1	0	3
≥60 a	2	5	0	2	5	6	1	21
Unknown	5	7	9	3	11	3	7	45
Used first AED	2GBP, 2LEV, 1VPA, 1CBZ, 1PHT, 1PGB	6GBP 4LEV 2VPA	5GBP 1PHT 1PGB 1PRM 1TPM	2GBP, 2VPA, 1LEV, 1PHT	5VPA 4GBP 3LEV 2CBZ 1PHT 1PGB	4LEV 3GBP 2VPA 2PHT	4GBP 3LEV, 1VPA	26GBP 17LEV 13VPA 6PHT 3CBZ 3PGB 1PRM 1TPM

Abbreviations: M/F=men/women, a=years, AED=antiepileptic drug, CBZ=carbamazepine, GBP=gabapentin, LEV=levetiracetam, PHT=phenytoin, PGB=pregabalin, PRM=primidone, TPM=topiramate, VPA=valproic acid.

**Table 2**

The most commonly co-morbidities of Austrian nursing home residents with AED use.

Co-morbidity	Prevalence
Arterial hypertension	49% (34/70)
Ischemic stroke	36% (25/70)
Other angiopathies	29% (20/70)
Coronary heart disease	26% (18/70)
Osteoporosis	24% (17/70)
Diabetes mellitus	19% (13/70)
Atrial fibrillation	19% (13/70)
Depression and/or bipolar affective disorder	17% (12/70)
Dementia	14% (10/70)
Brain hemorrhage	9% (6/70)
Head injury	7% (5/70)
Thyroid disorder	7% (5/70)

levetiracetam were already more common. Therefore, our study shows that newer generation AEDs were used most frequently: 80% of the residents were treated with gabapentin (37%), levetiracetam (24%), or valproate (19%), only 9% with phenytoin and no one with phenobarbital. Compared to that, in USA phenytoin was the most frequently prescribed AED with 57% of all nursing home residents,<sup>13</sup> despite its high potential of drug interactions, guideline<sup>14</sup> and expert opinion recommendations.<sup>15</sup> Next to the more recent dataset, this could be explained by the fact, that in Austria most prescriptions in newly diagnosed patients with seizures were performed by neurologists and rarely by other specialities. Thus, in Austria 52% took the AED because of epilepsy (36/70), in Germany 63% and in US 58%<sup>7</sup> to 80%.<sup>16</sup> The second most frequent situation was that the cause for AED prescription could not be ascertained – in Germany in 30%, in Austria in 37%. So maybe even many more residents were treated with an AED because of epilepsy. Other diseases, like neuropathic pain, manic-depressives disorders, essential tremor or restless legs-syndrome seem to play a minor role: 11.5% of AED-prescriptions for Austrian residents and 13% of AED-prescriptions for US residents were based on one of them.<sup>17</sup> Generally spoken, seizures seem to pose the most frequent indication for a therapy with an AED in nursing homes.

**Table 3**

Used co-medications next to AEDs among nursing home residents in Innsbruck, Austria.

Co-medication	Incidence	Proconvulsivity
Azole derivate	64% (45/70)	No
Bezodiazepine derivative + benzodiazepine analog	49% (34/70) 56% (39/70)	No No
Antidepressant	44% (31/70)	Yes
Atypical neuroleptic + old neuroleptic	43% (30/70) 47% (33/70)	Yes No
Diuretic + in a fixed combination with antihypertensive	46% (32/70) 60% (42/70)	No In combination with $\beta$ -blocker yes
Non-opioid-pain killer + opioid	29% (20/70) 53% (37/70)	No Yes
ACE-inhibitor	36% (25/70)	No
$\beta$ -Blocker	14% (10/70)	Yes
Calcium channel blocker	13% (9/70)	No
Nitrate derivate	7% (5/70)	No
Angiotensin 1-antagonist	3% (2/70)	No
Antihypertensiva in total	73% (51/70)	Partially
Thrombo-ASS	31% (22/70)	No
Clopidogrel	14% (10/70)	No
Coumarin	7% (5/70)	No
Heparin	4% (3/70)	No
Laxative	23% (16/70)	No

Further, all of the Austrian residents had at least two co-morbidities: 50% had a maximum of five co-morbidities and 50% had six to ten. The three most common co-morbidities were arterial hypertension (49%), ischemic stroke (36%) and other cerebrovascular disorders (29%). These findings confirmed the study of Huyendo et al., who reported that German nursing home residents had cerebrovascular diseases in 56% and dementia, intracerebral hematoma and other neurological diseases in 15%.<sup>9</sup> On the contrary, Austrian residents took twice as much co-medications as German or US residents, where in average five medications in addition to the AEDs were prescribed. Indeed, residents in Innsbruck received in average nine co-medications (see Table 3). In total 91% were treated with at least one proconvulsive drug (64/70): 77% got one to three, 14% four to six and only 9% none proconvulsive co-medication. Compared to the study of Shorvon et al. where 11% of 294 patients with epilepsy followed in general practice were treated with proconvulsant co-medications, this is a concerning figure. Reasons for this striking difference could be first, the younger study population in the study of Shorvon et al. with less co-medications and co-morbidities. Second, the fact that our study included just nursing home-residents in contrast to the community-dwelling patients in the study of Shorvon et al. and third, the different classification of proconvulsant and non-proconvulsant medications – we used the classification of proconvulsant drugs according to a previous publication by Stephen and Brodie,<sup>18</sup> which classified more drugs as proconvulsant than the National General Practice of Epilepsy Study.<sup>19</sup>

Furthermore, our results allow an indirect conclusion on the prevalence of seizures in institutionalized elderly Austrians: 4.5% of all residents had documented epilepsy in their medical history (36/828). By comparison, Huyendo et al. showed that 3% of the German residents had epilepsy (18/565)<sup>9</sup> and according to three US studies between 6.5% and 9% of the US residents suffered from seizures (65/996,<sup>16</sup> 42/572,<sup>20</sup> and 885/10186<sup>13</sup>). Summarized, these results suggest a higher prevalence of epilepsy in nursing home-residents – most likely explained by a selection bias of those people, who need more care and attention, and probably also have more diseases including brain diseases, which lead to a higher seizure prevalence compared to the standard population.<sup>2,21</sup>

#### 4.2. Limitations

First, it is a retrospective study implicating a limited statement of the cause and outcome of seizures and therefore, prevalence and incidence rates can only be estimated. Second, it should be noted that the study evaluated only urban nursing homes, all situated in proximity to the Medical University of Innsbruck with direct access to medical specialized care and a specialized epilepsy outpatient clinic, as well as neurological emergency unit. On the one hand this can explain the high use of newer AEDs. And on the other hand our results may not be representative for the nursing home residents in Austrian rural areas. Third, the study was cross-sectional, which is problematic because variation of AED use may be higher over a longer time period. Forth, AED data were completely extracted from patient records. Therefore, it was not possible to ascertain more precise data on the indication for AED prescription, the duration of treatment and the seizure type in all patients. In general, however, these results show a high AED use in Austrian nursing homes because of seizures and show that AEDs are among the most commonly used class of neuropsychiatric medications in Austrian nursing homes.

#### 5. Conclusions

Austrian nursing home residents are mainly treated with newer AEDs, like gabapentin and levetiracetam. Furthermore, the results

allow a crude estimate on prevalence of epileptic seizures in nursing home-residents: 4.5% of the residents had documented epilepsy in their medical history (36/828).

### Conflict of interest

None of the authors has any conflict of interest to disclose.

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### Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.seizure.2012.09.012>.

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