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Use of primary healthcare for persons with epilepsy

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ABSTRACT

Introduction: In Denmark, care and treatment related to epilepsy primarily takes place at specialized hospital departments (neurology and pediatrics). The general practitioner (GP) in contrast is the primary contact and acts as a gatekeeper to the healthcare system for other disorders. The aim of the present study was to describe the utilization of services provided by the GP for children with epilepsy before and after diagnosis of epilepsy and to compare it with that of children without epilepsy.

Methods: All live born children born in Denmark between 1st of January 1996 and 1st of December 2013 were identified in the Danish National Patient Registry. Information about number and type of contact to the general practitioner was obtained from the Health Insurance Service Register. Information about epilepsy was obtained from the Danish National Patient Registry (n = 10,062). For each child with epilepsy, we sampled 10 children without an epilepsy diagnosis matched on sex and age at the time of diagnosis (n = 100,620). Children were followed up until 31st of December 2013. Multiple negative binomial regression analysis adjusting for relevant confounders was used to estimate the association between epilepsy and the use of GPs both before and after the time of epilepsy diagnosis.

Results: Children with epilepsy had a higher utilization of services provided by the GP after the diagnosis of epilepsy compared with children without epilepsy (incidence rate ratio (IRR): 1.64 (1.61–1.67)). The IRR for any contacts stayed relatively stable during the follow-up period, whereas the IRR for face-to-face contacts tended to decline and phone contacts tended to increase. The more frequent GP contacts in children with epilepsy were also evident before the time of diagnosis and for both sexes and in all age groups. For the specific services provided, children with epilepsy more often had a blood sample taken and more urine stix and CRP tests performed during the first years following diagnosis.

Conclusion: Children with epilepsy have a higher use of services provided by the GP both before and after the epilepsy diagnosis compared with children without epilepsy. This is likely due to a higher prevalence of comorbid conditions in children with epilepsy as well as consequences of the underlying condition.

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1. Introduction

Epilepsy has substantial impact on the life of the individuals affected. It is one of the most common neurological disorders in children and adolescents worldwide with about 2% of the population being diagnosed with epilepsy before the age of 25 years [1]. The mortality rate among children and adults with epilepsy is significantly increased being up to fifteen times higher than for children in general [2,3].

Comorbidities are often found in persons with epilepsy; mainly other neurological disorders and psychiatric conditions [4], but also conditions such as stomach and intestinal ulcers, diabetes, asthma, cancer, and heart disease are found with increased prevalence [5–7]. Some of these conditions are particularly evident in children with epilepsy [8–11]. Early identification and treatment of comorbid conditions may alter the course and prognosis of these disorders.

In Denmark, the epilepsy-related healthcare for children primarily takes place at specialized pediatric hospital departments with regular visits and assessment of seizure status and possible adverse effects to the antiepileptic drugs (AEDs). The pediatricians at these departments often have a special interest and expertise in children with severe epilepsy with comorbid conditions such as cerebral palsy and tuberous sclerosis, and many of these children also suffer from other disorders including autism and mental retardation.

The general practitioner (GP) on the other hand serves as the gatekeeper for the rest of the healthcare system for other disorders and therefore, regular visits to the GP could be important for early identification of

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the comorbid conditions that are not assessed at the specialized pediatric departments.

Only few studies have previously investigated the use of primary healthcare in children with epilepsy, and these studies have focused more on healthcare costs than on the specific services provided.

Hence, the objective of this study was to describe the utilization of services provided by the GP both before and after a diagnosis of epilepsy and to compare it with that of children without epilepsy.

2. Methods

2.1. Study population and exposure

Participants in the study were live born children born in Denmark between 1st of January 1996 and 1st of December 2013 identified in the Danish National Patient Registry [12]. Information about epilepsy and comorbid conditions was obtained from the Danish National Patient Registry. Individuals were identified as those with either a primary or secondary diagnosis of epilepsy (ICD10: G40) more than 30 days after birth (to exclude neonatal seizure). Children were followed up until 31st of December 2013. The date of first admission to hospital (in or out patients) with a diagnosis of epilepsy was defined as the index date. For each child with epilepsy, we sampled 10 children without epilepsy matched on sex and age at index (+/− 60 days).

2.2. Outcome

In Denmark, the GP registers every contact and procedure in order to receive payment for the services provided and the contacts are registered for administrative purposes in the National Health Insurance Service Register (NHSR) [13]. The outcomes in the present study were defined as number of "all contacts", number of daytime consultations (face to face contacts + telephone contacts), number of out-of-hours consultations (face to face contacts + home visits + telephone contacts) as well as total number of telephone contacts. The outcome measure 'All contacts' was the sum of number of face to face contacts, telephone contacts, email contacts and home visits for both daytime and out-of-hours. All contacts that were related to routine well-child visits and the childhood vaccination program were excluded. Also, number of specific diagnostic tests performed during daytime was included as outcomes. We obtained information on blood tests (activity codes 2601 and 2101), B-hemoglobin (activity code 7108), C-reactive protein (CRP) (activity code 7120), strep-A test (activity code 7109), spirometry/peakflow (activity codes 7113, 7121, 7183) and urinary stix (activity code 7101).

2.3. Covariates

We received information on sex, date of birth, and maternal age from the Danish Civil Registration System [14] and about Apgar score at 5 min and gestational age from the Danish National Patient Register [12]. Information about maternal income, education, and marital status at the index date was obtained from Statistics Denmark [15].

2.4. Analyses

Multiple negative binomial regression analysis was used to estimate the incidence rate ratios (IRR) with 95%-confidence intervals for the association between childhood epilepsy and utilization of general practice. Children were followed up from the day of diagnosis until death, emigration or 31st of December 2013, whichever occurred first. Incidence rate ratios were estimated both for the entire follow-up period and for each year of follow-up. Cluster robust variance was applied to account for correlation between GP contacts within one child. The analyses were adjusted for the following confounders: age (continuous), sex (male, female), Apgar score (≤7 or >7), gestational age (continuous) as well as maternal age (continuous), income (quartiles and unknown category), education (duration: unknown, <10 years, 10–15 years, and >15 years), and marital status (unknown, widow, divorced, married, and unmarried).

In addition, a number of subanalyses were performed. Hence, in order to explore possible different associations in boys and girls, the analyses were stratified on sex. Also, childhood epilepsy is known to be associated with congenital malformations, brain tumors, head traumas, preterm birth, and low Apgar score which in themselves could be associated with a higher frequency of contacts to the GP. A subanalysis on a group of children without these conditions was therefore performed excluding all matched strata containing at least one child with any of these conditions.

Due to the very different patterns of GP contacts depending on the age of the child, the analyses on GP contacts were additionally stratified on age groups (0–2, 2–5, 5–10 and 10+). Also, a subanalysis was performed analyzing the GP contacts in children backwards in time from the time of diagnosis.

Finally, since the use of antiepileptic medication (AED) could be associated with the use of services provided by the GP, both due to the severity of the condition, regular blood sampling and potential adverse effects to the medication, we additionally stratified the analyses according to whether the children received AED after the epilepsy diagnosis. Information was based on reimbursements of on AEDs (ATC codes: N03A* and N05BA09) obtained from the Danish Register of Medicinal Product Statistics.

Table 1
Characteristics of children with epilepsy and a sex and age-matched reference group.

	Epilepsy (n = 10,062)	Reference group (n = 100,620)	p-value
Characteristics of the children			
Sex, n (%)			1
Female	4699 (47)	46,990 (47)	
Male	5363 (53)	53,630 (53)	
Birth year, n (%)			1
1996–2001	5487 (55)	54,895 (55)	
2002–2007	3268 (33)	32,661 (33)	
2008–2013	1307 (13)	13,064 (13)	
Age at first epilepsy diagnosis			
Median (IQ-range), years	4.0 (1.2–7.9)	–	NA
Gestational age			
Mean (SD), weeks	39.3 (2.6)	39.7 (2.1)	<0.0005
Preterm (<37 weeks), %	925 (9)	5702 (6)	<0.0005
Apgar score at 5 min			
0–7 (%)	350 (4)	1127 (1)	<0.0005
Diagnoses, n (%)[a]			
Congenital malformations	1312 (13)	5879 (6)	<0.0005
Brain tumours	7(<0.1)	12 (<0.1)	<0.0005
Head traumas	1914 (19)	431 (<1)	<0.0005
Use of antiepileptic medication, n (%)			
Yes	5955 (59)	574 (<1)	<0.0005
Maternal characteristics			
Maternal age, years			
Mean (SD)	34.8(6.6)	35.1(6.3)	<0.0005
Marital status, n(%)			<0.0005
Married	6057 (60)	64,958 (65)	
Unmarried	3097 (31)	27,629 (27)	
Divorced	808 (8)	6929 (7)	
Widow	42 (<1)	283 (<1)	
Unknown	58 (<1)	821 (<1)	
Income, (%)			<0.0005
Quartile 1	2746 (27)	24,913 (25)	
Quartile 2	2657 (26)	24,996 (25)	
Quartile 3	2364 (23)	25,290 (25)	
Quartile 4	2284 (23)	25,363 (25)	
Unknown	11 (<1)	58 (<1)	
Education, (%)			<0.0005
<10 y	2269 (23)	17,259 (17)	
10–15 y	4119 (41)	43,348 (43)	
>15 y	2610 (26)	29,179 (29)	
Unknown	1064 (11)	10,834 (11)	

Abbreviations: IQ-range, inter quartile range; SD standard deviation.
[a] Not mutually exclusive.

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