Children With Febrile Seizures Do Not Consume Excess Health Care Resources

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Background: Febrile seizures are benign but so terrifying for parents that they may subsequently view their affected children as “vulnerable.” Children viewed as vulnerable may be brought to medical attention more frequently. We examined subsequent hospitalizations and physician visits during a 6- to 7½-year period for a group of children who had participated in a case-control study of initial febrile seizures.

Methods: Individual data from a regional cohort of 75 children with a first febrile seizure and 150 febrile and 150 afebrile controls were linked to 2 comprehensive provincial health services databases—a hospital admissions/separations database and a physician services database.

Results: Linkage was achieved for 98% of the study cohort, with heath care utilization data for 6 to 7½ years available for 96%. Children with febrile seizures had nearly identical rates of subsequent hospitalization compared with age-matched controls ($\chi^2$ test, $P = .88$). An excess of day-surgery visits for primarily otolaryngologic procedures was seen for the febrile seizure patients 0 to 12 months after their initial febrile seizure ($\chi^2$ test, $P < .001$). During the next 6 to 7½ years, the febrile seizure patients had nearly identical rates of physician visits ($\chi^2$ test, $P = .15$); however, they had more visits to otolaryngologists in the first 3 to 9 months after the febrile seizure ($\chi^2$ test, $P < .001$), but fewer visits to pediatricians during the next 1 to 4 years ($\chi^2$ test, $P < .001$).

Conclusions: Children with febrile seizures have nearly identical rates of hospital and physician services utilization compared with controls. This supports the hypothesis that febrile seizures are benign, and that parents recover from their initial anxiety and do not consider their children vulnerable to additional illness in the years that follow.


RESULTS

DEMOGRAPHICS

Median age at study entry was 1.3 years (range, 0.1-4.4 years); 55% were boys and 45% girls. There was no difference in age or sex composition between the children with a first febrile seizure and the control...
MATERIALS AND METHODS

STUDY DESIGN

This study involved the linkage of data from a case-control study of initial febrile seizures with both the Nova Scotia Admissions/Separations/Day Treatment database and Medical Services Insurance Physician’s Services database.

The original study design was a matched case-control trial, with 2 control groups. Seventy-five children with a first febrile seizure were age-matched within 6 months to 150 febrile (temperature $\geq 38^\circ C$) and 150 afebrile controls. Cases and controls all presented to the emergency department of the IWK Grace Health Centre, Halifax, Nova Scotia. The visits of controls were within 10 days of those of the cases. All participants resided within Halifax County, which is the primary care catchment area for the facility.

The province of Nova Scotia provides universal health care coverage for all hospital and physician services. The Nova Scotia Admissions/Separations/Day Treatment database contains details of all hospital admissions for the province, including day-surgery visits. The Medical Services Insurance database includes all outpatient and inpatient physicians’ fee-for-service claims and therefore documents virtually every physician-patient encounter. Primary care is delivered by family physicians, while pediatricians usually provide consultative care and care within our emergency department.

We examined all hospitalizations and physician contacts for original study participants from birth through study entry (October 15, 1989, to March 15, 1991) and then until March 31, 1997, comprising a follow-up of 6 to 7 1/2 years.

DATA LINKAGE

Linkage was attempted by using the patient health card numbers for the 375 original study participants. Ultimately linkage was achieved for 368 (98%) with the Admissions/Separations/Day Treatment database (73 of 75 patients with febrile seizures, 146 of 150 febrile controls, and 149 of 150 afebrile controls). Linkage was accomplished for 369 (98%) with the Medical Services database (73 of 75 febrile seizures, 147 of 150 febrile controls, and 149 of 150 afebrile controls). The children for whom linkage was not achieved did not have Nova Scotia health card numbers and were most likely children of college or university students living within the study area. During the follow-up period there were only 8 children who were documented to have moved away from the province (2 febrile seizures, 0 febrile controls, and 6 afebrile controls). This allowed for follow-up data for 6 to 7 1/2 years on 96% of the original cohort, and at least partial data on 98%.

STATISTICAL ANALYSIS

Data manipulation and processing was performed using SYSTAT version 7.0. Because follow-up was nearly complete and there did not appear to be any systematic editing, all available data were analyzed. Data were graphed using 6-month periods from study entry for hospitalization data and 3-month periods for physician visits. Physician visits could be subanalyzed by physician type (family practitioner, pediatrician, and other specialists). For graphing, the 2 original control groups were viewed separately; however, for statistical testing, the 2 original control groups were amalgamated (as in the initial study). The primary hypotheses were tested using Mantel-Cox log-rank testing.

After reviewing the graphs, a series of post hoc tests was generated and analyzed similarly, but without any adjustment for multiple testing. This was because of the difficulty in determining the number of tests for post hoc adjustment when the post hoc tests are proposed after graphic review of results.

The Research Ethics Board of the IWK Grace Health Centre approved this study.

HOSPITALIZATION RATES

Children with a first febrile seizure had nearly identical subsequent hospitalization experiences compared with age-matched controls during the next 6 to 7 1/2 years after a first febrile seizure ($\chi^2$ test, $P = .88$) (Figure 1).

Post hoc results: Hospitalization rates showed an early peak, which corresponds to hospitalizations within 7 days of study entry for those children presenting to the emergency department with fever (febrile seizures and febrile controls). Not unexpectedly, febrile children were 2.6 times more likely to be admitted than were afebrile controls during this time ($\chi^2$ test, $P = .04$). After these early admissions were accounted for, a second peak appears within the hospitalization rates, occurring 0 to 12 months after study entry for the children with febrile seizures. During this 12-month period, children with febrile seizures were 3.1 times as likely as the control children to have same-day admissions ($\chi^2$ test, $P = .003$). Most of the same-day admissions were for otolaryngologic procedures (23 of 32 [72%]). Overall, 12% of children with febrile seizures had an otolaryngologic procedure within 12 months of their initial seizure compared with 4% of the control group.

PHYSICIAN CONTACT RATES

During the subsequent 6 to 7 1/2 years after a first febrile seizure, children with a first febrile seizure had nearly identical rates of physician visits as the control group ($\chi^2$ test, $P = .15$) (Figure 2).

Post hoc results: All children had increased rates of physician visits for the 3-month period after study entry. Compared with controls, children with a first febrile seizure had a 30% increase in physician visits (an excess of 1.5 physician visits) during the first 3 months following their seizure ($\chi^2$ test, $P < .001$). These excess visits for the febrile seizure group were primarily to family practitioners and pediatricians.

Physician visits were examined by type of physician. Rates of visits to family practitioners were not sig-
nificantly different for children with febrile seizures compared with controls ($\chi^2$ test, $P = .53$). Children with a first febrile seizure had 20% fewer visits to pediatricians during the 6 to 7½ years following their first febrile seizure ($\chi^2$ test, $P < .001$). There was an apparent increase in visits immediately after study entry; however, it is clear that the decrease in visits was primarily accounted for 1 to 4 years after study entry ($\chi^2$ test, $P < .001$). For specialist visits (excluding those to pediatricians), an excess of visits was seen 3 to 9 months after study entry for children with a first febrile seizure ($\chi^2$ test, $P < .001$). Most of these excess visits were to otolaryngologists. In the 3- to 9-month period after study entry, children with a first febrile seizure were 3 times as likely as the control children to have 1 or more visits to an otolaryngologist ($\chi^2$ test, $P < .001$). Twenty-six percent of children with a first febrile seizure had 1 or more visits (median, 3; range, 1-12) within 3 to 9 months of their initial seizure, as compared with 12% of febrile controls and 5% of afebrile controls. At the time of the initial emergency department visit, however, there had been similar rates of otitis media diagnosed between the febrile seizure patients (39% [29/75]) and the febrile controls (35% [53/150]) ($P = .62$).

Figure 1. Hospital admission rates. E indicates study entry.

Figure 2. Physician visit rates. E indicates study entry.

There was a significant reduction in the use of pediatricians’ services following a first febrile seizure. The reason for this change in utilization is unclear. Within our area, pediatricians provide predominantly consultative and emergency care. Families may require these services less often after surviving a perceived life-threatening event.

We were surprised that the experience of a febrile seizure had so little effect on subsequent health care utilization. In 1964, Green and Solnit12 developed the construct of the “vulnerable child.” This concept implies that after a child has recovered from a potentially fatal medical condition, there is a marked discrepancy between the child’s normal health, development, and growth and the parents’ enduring and unfounded perception that the child continues to be at risk for serious illness and premature death. It is likely that a continuum of child vulnerability or overprotection exists for children with ongoing medical conditions.22-25 This mismatch between perceived vulnerability and true vulnerability may lead to increased use of health care resources.15,16 One study examining the persistence of child vulnerability in premature infants demonstrated that, by school age, the current perception of health is more related to current ratings of health rather than past health events.20 In our study, even if children with febrile seizures were initially perceived as vulnerable, their families did not respond by seeking excessive physician and hospital visits after the acute event.

The intervention offered to febrile seizure patients in our emergency department during the original study period was not completely standardized. All children were assessed by a pediatrician, most parents saw a short instructional slide-tape presentation about the benign nature of febrile seizures,27 and many stayed overnight in an observation unit attached to the emergency department. We have some evidence that, following this intervention and up to 2 weeks later, most families had retained the basic facts about febrile seizures, although family routines were still disrupted.28

The children with febrile seizures and their families afterward were more likely to visit their family practitioners and pediatricians within 3 months, and subsequently receive specialist care. It may be possible that these...
visits reinforced the benign nature of febrile seizures and had a reassuring effect on their families, resolving any parental perception of vulnerability.

Because of the pattern of medical practice in our area and the emotional upset caused by a first febrile seizure, we suspect that most patients who present for medical evaluation would come to our emergency department, suggesting that our children with febrile seizures were a representative regionally based cohort.

Likewise, the selection of control groups should be commented on. For case-control studies of health care utilization, control groups are ideally drawn from a population accessing health care at the same time and location as the cases. In our original study, the 2 control groups were selected to examine the risk factors for fever independently from those for febrile seizures, and seemed ideal for the subsequent purpose of examining health care utilization. As there were no significant differences between the 2 control groups, they were combined for final analysis in that study. For this study, we chose a priori to analyze the 2 control groups together as we had done previously, while presenting the graphic results separately to demonstrate the similarity of the 2 control groups.

During the study period, the Canadian universal health care system allowed all children access to physician and hospital services. There is no parallel private health care system in our province. We used comprehensive databases to count all hospitalizations and all reimbursed physician visits. The accuracy of Canadian health administrative databases for basic demographic and visit data has been documented. Hence, the results likely reflect all hospitalizations and physician contacts for this cohort of children.

Although we are confident about the accuracy and completeness of our primary results, a note of caution must be addressed on those derived from post hoc analyses. We did not make any adjustment for multiple statistical testing of results derived from graphic analysis, raising the possibility of type I errors. Furthermore, these findings, even if valid, may be a result of local area practice. Therefore the discovery of increased visits to otolaryngologists and decreased visits to pediatricians after a first febrile seizure requires independent confirmation before generalization. If confirmed, these findings provide a fascinating insight into the clinical course of febrile seizures.

We conclude that even if a febrile seizure renders a child vulnerable in the parents’ eyes, it does not lead to long-term increased use of health care resources. Dealing with the fears of parents is important; however, physicians caring for children can be reassured that management decisions for families and their children with febrile seizures need not be driven by any concern that these children will subsequently use excess health care resources.

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