

## Effectiveness of a toll-free telephone hotline for children and adolescents with Type 1 Diabetes. A 5-year study

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**Abstract.** In 1995 we introduced a 24-h 7-day-a-week toll-free telephone service and specific guidelines to help the patients at home to reduce the risk of diabetic ketoacidosis (DKA) progression during intercurrent illnesses. Five years later we analysed the calls received at this emergency telephone hotline service (ETHS). From 1 January 1996 to 31 December 2001 a total of 9.125 calls was recorded ( $5.1 \pm 4.2$  calls per day), but only 24% of them were veritable hot-line calls and were received from 767 patients or parents resulting in a mean of  $2.5 \pm 0.8$  calls per patient or parent. Fifty-nine percent of these users called from outside Parma's area. Their mean age ( $7.8 \pm 4.2$  years) and duration of diabetes ( $2.8 \pm 1.2$  years) were significantly lower ( $p < 0.001$ ) and shorter ( $p < 0.001$ ) compared to those ( $12.8 \pm 2.9$  and  $4.9 \pm 3.2$  years respectively) found in the population which called for no-emergency reasons. Twenty-two percent of the veritable hot-line calls were received on Saturdays and Sundays or holidays, in the morning (25%), in the evening (59%) or during the night (16%). Telephone care has been finally demonstrated to be an useful way to provide a continuous support for patients and their families in the management of diabetes in some critical situations. ETHS helps them to achieve and maintain a better metabolic control and to avoid DKA during acute intercurrent illness and consequently hospital admissions.

**Key words:** Type 1 Diabetes, hotline, telephone care

### Introduction

Diabetic ketoacidosis (DKA) is an acute complication that affects many children and adolescents with type 1 diabetes (T1D) both at disease onset and during an intercurrent illness (1) resulting in a significant human and economic toll (2). Most of deaths type 1 diabetes-related occurring in hospital and at home concern this condition (3, 4) and thousands of hospitalizations every year are due to DKA or its related complications (5).

DKA at T1D onset is a potentially preventable condition. In a previous study we have proved that most episodes of DKA at the onset of T1D could be

prevented using an educational approach targeted both school personnel and physicians (6).

Encouraged by the results of this prevention program, in 1995 we introduced a 24-hours 7-day-a-week toll-free telephone service and specific patient guidelines to help the parents at home to reduce the risk of DKA progression during intercurrent illnesses. The service was addressed to the patients followed at the Regional Center for children and adolescents with Diabetes of the University of Parma, Italy, because from 1990 to 1994 the admission rate for DKA intercurrent illnesses-related in this area was found to range from 6 to 10 cases per 100 children and adolescents with T1D per year, resulting in a total of 432

hospitalization days. The main reason of these admissions was due to the parents' worry not to find an available pediatrician with special experience in T1D and in the management of a child presenting hyperglycemia, glucosuria and ketonuria as a result of an intercurrent illness.

Previous experiences on telephone service as a mean of communication with a patient asking for assistance provided a better adherence to self-care and a decrease in admission rate (4-7, 10), but the reports on the use of 24-hours Emergency Telephone Hotline Service (ETHS) in pediatric T1D care are anecdotic, usually cover a short period of observation (11) and concern a restricted area (11). Our experience lasted 5 years and introduced facilities of communication as a toll-free telephone number which have never experienced before. At the beginning, the ETHS was planned as restricted to Parma's area but, because it was the only telephone service in Italy for children and young people with T1D, it came to cover a larger area with thousands of virtual users.

The results of this ETHS were analysed 5 years later.

### Research design and methods

At the beginning of the study, diabetes care was provided at our Center for 341 children and adolescents, but the number increased during the study with a rate ranging from 15 to 21 patients per year due to the new diagnoses. Finally, the children involved in the study were 421 (mean age  $10.8 \pm 3.8$  [range 2.1-19.8]; mean duration of diabetes  $4.5 \pm 3.5$  years [1 month to 16.1 years], mean HbA1c value 7.2 % [4.8-12.3]). All these patients were considered as potential users of a 24-hours ETHS N. 800848043) that Parent's Association for Diabetic Children and Adolescents of Parma donated to our Center.

Before discharging newly diagnosed diabetic patients and/or parents received an average of  $12 \pm 8$  hours of self-management education and 4 of them concerned a sick-day treatment at home. The sick-day rules included: never omitting insulin, monitoring of blood glucose and urine ketone bodies at 3-hours intervals, preventing dehydration and hypoglycemia

with frequent small quantity of sugar-containing fluids, providing additional fast- or rapid-acting insulin doses every 3 to 4 hours to manage hyperglycemia and ketosis. A booklet containing these practical guidelines was issued to all patients (12).

Each patient was also equipped (according to an act of the Italian Ministry of Health) with toll-free reagent strips for 3-daily measurements of capillary blood glucose, glucosuria and urine ketone bodies, finger pricking and reflectance meter. This equipment was monthly supplied by our Center. The parents were invited to collect on a diary the results of these tests when a body temperature  $\geq 38^\circ\text{C}$  occurred.

During the sick-days, the parents were encouraged, instead of going to hospital, to call the toll-free telephone number where a physician with experience in T1D treatment was 24-hours available to help them to manage metabolic decompensation. Written guidelines for an immediate medical call were issued to the parents and included: vomiting lasting more than 2 hours, blood glucose levels  $>300$  mg/dL and persistent ketonuria or  $\beta$ -HBA levels  $>0.5$  mmol/L for more than 4 hours, polyuria and polydipsia, signs of dehydration, ketotic breath, nausea and abdominal pain.

Pediatricians, physicians on duty and residents who had experience in the management of diabetes in children and adolescents were admitted to answer the telephone hotline. All operators worked at the Department of Pediatrics of the University of Parma, Italy, and had been previously trained to answer emergency calls with self-control as well to provide clear and concise explanations and advice, according to the guidelines delivered to the parents. Time and day of call, the reason for calling, patient's name, and diabetes-related data were recorded between 1<sup>st</sup> january 1996 and 31<sup>st</sup> december 2001.

Analysis of variance and Student's t test for the comparison of mean values and  $\chi^2$  test for the comparison of percentages were used.  $P < 0.05$  was considered significant. Data are reported as means  $\pm$  SD.

### Results

From 1<sup>st</sup> january 1996 to 31 december 2001 a total of 9,125 calls was recorded ( $5.1 \pm 4.2$  calls per day),

but only 24% of them were veritable hot-line calls. Thirty-eight percent of the total calls came from Parma's area and the remaining 62% from elsewhere in Italy. The 6,935 no-emergency calls concerned a wide range of topics on diabetes management: hypoglycemia prevention (36%), quality of life with diabetes (19%), fear for diabetes-related complications (15%) were the prevalent subjects. Three percent of calls were attributed to mythomaniac people.

The veritable hot-line calls were 2,190 and were received from 767 patients or parents resulting in a mean of  $2.5 \pm 0.8$  calls per patient or parent. Fifty-nine percent of these users called from outside Parma's area. Their mean age ( $7.8 \pm 4.2$  years) and duration of diabetes ( $2.8 \pm 1.2$  years) were significantly lower ( $p < 0.001$ ) and shorter ( $p < 0.001$ ) compared to those ( $12.8 \pm 2.9$  and  $4.9 \pm 3.2$  years respectively) found in the population which called for no-emergency reasons.

Twenty-two percent of the veritable hot-line calls were received on Saturdays and Sundays or holidays, in the morning (25%), in the evening (59%) or during the night (16%). Eight-nine percent of the hot-line calls concerned the management of diabetes during an intercurrent illness. Hypoglycemia-related phone calls were 11% and were especially performed during the night: only 1.59% concerned severe hypoglycemic events with convulsion (31 calls) or emiparesis (4 calls).

## Discussion

When the Telephone care service has been developed, the main aim were to give an answer to the requirement of the patients, their parents and practitioners to obtain a prompt help concerning emergency situations like hypoglycemic attacks or intercurrent illness in order to prevent acute decompensations. But we did not consider, at that time, that our hot line was the first and unique ETHS for children and adolescents with T1D in Italy. So we also received many calls from everywhere in our Country, which were not concerning the original target. Nevertheless, we gained good results on DKA prevention during an intercurrent illness and on the treatment of hypoglycemic episodes. In fact, none of the ETHS users calling from Parma's area were admitted to our De-

partment to obtain medical assistance.

From this point of view, ETHS has been demonstrated to be an excellent teaching tool to continue at home the education program and to be a psychological support in the management of Diabetes began in out patient clinic. In particular, the ETHS allowing the patient not to move to the hospital to solve his critical health problems, may be considered an affective way to improve the quality of life of children and adolescents with T1D and to reduce the family burden in occasion of an intercurrent illness.

In some cases we have found that ETHS was not always the best way to communicate because patients to physician relationship suffered from the lack of viewing each other and the users did not find the same physicians, as expected, when they called.

The health-care professionals admitted to answer should be trained to give short and synthetic advice and always the same answers to the same questions to avoid mistakes and insecurity in the users. Before promoting an ETHS, a Center devoted to the management of diabetes in children and adolescents, must be equipped with specific guidelines about the treatment of diabetes during critical situations and a health-care professional team experienced in the management of acute decompensations. Only in this way an ETHS may result in a highly effective service.

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Received: 3 March 2003

Accepted in original form: 20 March 2003

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