

Mémoire de Maîtrise en médecine

***Taking care of children with  
diabetes at obligatory school:  
School staff's, parent's and  
school nurse's perspective.***

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## ***Taking care for children with diabetes at obligatory school:***

### ***School staff's, school nurse's and parent's perspective.***

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#### ***Introduction***

Type 1 diabetes mellitus (T1DM) is the most frequent metabolic disease in children and adolescents, with a rising incidence(1). Auto-immune mediated beta cell destruction leads to insulin deficiency, requiring lifelong intensive management including daily frequent glucose measurement and insulin administration to avoid long-term micro- and macro-vascular complications (2). There are two types of insulin therapies, the conventional and the intensive insulin therapy. While it might seem easier to manage a conventional therapy in school because it requires fixed insulin and meal times, all recent studies showed the superiority of intensive therapy in long term complication rates (3)(4)(5)(6)(7). Technological advances for glucose monitoring and regulation as well as patient and family education programs have been developed to foster self-management as well as several technological methods have been developed. While children can perform some of the technical aspects of T1DM management, adult surveillance is required in some situations.

In most countries, school is compulsory for children into teenage years. For children with T1DM, managing diabetes in school can be challenging. Children must attend to normal school activities and requirements, yet potential acute complications such as hypoglycemia or hyperglycemia must be treated aggressively to avoid health problems and enable the child's learning and school performance (8). Thus, trained adults are needed to supervise children for

calculating and administering insulin, and assist with technical aspects as needed. However, there are a number of barriers to effective school-based management of T1DM: laws/regulations/policies to securing the rights of children with special needs at school (9)(10), specific recommendations from national/international diabetes associations (11) (e.g. “Safe at School Campaign” (<http://www.diabetes.org/living-with-diabetes/parents-and-kids/diabetes-care-at-school/>), written/web-based documents tracking T1DM (for example (<http://www.diabetesatschool.ca>) (12)(13)(14) and individualized patient protocols.

Data suggest that structured programs that increase access to trained adults responsible for non-medical diabetes care increases parental satisfaction (10). However, studies also indicate that school systems often struggle to follow structured guidelines, potentially increasing the risk for short- and long-term complications (8). Indeed, some students respond by reducing glycemic control with fewer Insulin injections (11).

The structure of compulsory education for school-aged children varies by country. Thus, while the challenges for self-management of T1DM are universal, individual programs aimed at supporting patients must be adapted to the local context. Five years ago the canton (state) of Vaud in Switzerland implemented a novel approach using Individualized Care Plans (ICP) to support T1DM self-management in schools. The aim of the present study was to analyze the impact of this structured program on children with T1DM by describing the actual situation of the global management of T1DM by evaluating the perception of the care and the knowledge of diabetes of key stakeholders in the school system – namely parents, school nurses and school staff.

## **Methods**

This cross-sectional study focused on the primary and secondary schools of the canton of Vaud, in Switzerland. The protocol was accepted by the local ethics committee, (CER-VD, Project ID: 2016-02086). Participants were provided with written information prior to an online survey and consent was provided by opt-in electronic participation.

## **Participants**

Key stakeholders were engaged for the study: 1) school staff 2) parents of children with T1DM and 3) school nurses working in the canton of Vaud. Parents were included if they met the following criteria: one or more children with T1DM followed at the Lausanne Children's Hospital, child enrolled in school in the canton of Vaud, and ability to read and write French. The questionnaire was sent to 10,371 school staff currently working in the canton of Vaud (72.6% women (15)). 131 families of children with T1DM followed at the Pediatric Endocrinology and Diabetes Unit from the Lausanne University Hospital were contacted. This represents 73.6% of the estimated 178 children with T1DM in school age in the canton of Vaud (estimation based on a prevalence rate of 1.93 cases of T1DM per 1,000 (16)). Eighty-one school nurses were employed in the canton of Vaud as of 2017, (92.5% women). A web link was sent to the professional email address for the school staff and nurses. The questionnaire for the parents was sent by postal mail or e-mail with the link to the web-based survey online version. The online questionnaires were hosted on a secure, firewall-protected server at the University of Lausanne to ensure the safety and the anonymity of the data.

## **Situation in Switzerland**

In Switzerland, school is compulsory, free, secular and public for children aged 4 to 15 years without discrimination. Primary school consists of eight academic years for children aged between 4 and 12, and secondary education consists of three academic years for children aged between 12 and 15. School and health systems vary by canton, leading to individually

tailored approaches of diabetes care at school (<http://www.swiss-paediatrics.org/sites/default/files/16-23.pdf>). Although teachers are informed of any chronic disease condition of the children attending their class, they are not expected to intervene in health care issues. In the canton of Vaud, the Pediatric Endocrinology and Diabetes Unit from the Lausanne University Hospital, with the support of the Cantonal Diabetes Program (CDP) created a structured protocol including audiovisual (DVD) and printed documentation like a poster reminding teachers and replacement teachers of the presence of a child with diabetes in the classroom (figure 1) (17). These documents as well as an individualized T1DM care plans that specify emergency interventions for hypo- and hyperglycemia are presented by specialized pediatric diabetes nurses in the presence of school staff, school nurses and the parents of the concerned child after diabetes manifestation or when changing the class/school (17).

### **Instruments**

In close collaboration with the School Health Promotion and Prevention Unit (Unit PSPS) we developed a custom questionnaire based on the study by Driscoll and all (18) which was adapted to address each stakeholder. The questionnaires were reviewed by the General Director of the Mandatory School (DGEO). The questions specifically addressed knowledge of documents/information/organization of T1DM in school (knowledge), the experience with diabetes in the school setting (care), roles of caregivers (care), and overall management (care)(see supplemental material).

The study questionnaires are available at:

- School staff: <https://wwwfbm.unil.ch/sondage/index.php/839473/lang-fr>
- Parents: <https://wwwfbm.unil.ch/sondage/index.php/583559/lang-fr>
- School nurses: <https://wwwfbm.unil.ch/sondage/index.php/544544/lang-fr>

## **Analysis**

We used descriptive statistics to present survey data. Comparisons between groups were performed using Student's t-test. We used percentages for multiple-choice questions and made comparative statistics with single-choice questions to observe if there was a significant difference in results (high probability against null hypothesis if  $p \leq 0.05$  or very high probability against null hypothesis if  $p \leq 0.01$ ). We used mean, deviation standard and range for continuous variables. Statpac® Statistics Calculator (StatPac Inc.) was utilized to perform statistical analysis and GraphPad Prism software® to organize and present the results.

## **Results**

In total, we collected 762/10,371 (7.3%) of questionnaires from the school staff. Of the 131 children with T1DM currently treated in the Pediatric Endocrinology and Diabetes Unit from the Lausanne University Hospital, we received 44 responses (33.6 %) from parents/guardians. Among school nurses, we collected 74/81 responses (91.4%). The characteristics of respondents are presented in table 1.

The school staff's group had been working on average for 17.8 years (Range: 1-42) and 82.2% (N=626) were women. 73.4% (559/762) taught in primary school and 34.5% (263/762) in secondary school. According to 749 school staff, 61.6% of the school staff (N=461) related working in a manner where the children are passive, 6.4% (N=48) in an active manner and 32% (N=240) related doing both. 99.5% (748/752) had knowledge of diabetes and 36.9% (278/753) had followed a focused training in diabetes. The number of students in their class in 2016-2017 was 19.2 (Range 2-28). 20.7% (N=155) of school staff had at least one child with diabetes in their class in 2016-2017, which was a good representation of the number of children with diabetes estimated previously. 235/762 (30.8%) of the school staff responding

to the online survey reported being involved in the care of a child with diabetes during their teaching care. Two-sample t-tests were performed to determine whether there were significant differences between school staff, parents and school nurses. There was a statistical difference between school staff and parents ( $p \leq 0.01$ ) and between school staff and school nurses ( $p \leq 0.01$ ) in the number of interventions related to diabetes needed in their entire career/life, mostly one to five times for school staff.

The parents' group was composed of a majority of women (81.8%,  $N=36$ ), lived mainly accompanied and was working part-time in 70% (range: 10-100%) of the cases for the mother and 90% (range: 80-100%) for the father. The average number of infants in the family is 2,4 (range: 1-4). The average age of their child with diabetes was 11 years old and the average age at the diagnostic of diabetes was 6 years old. For lunch, 45.5% (20/44) of children were considered autonomous. In 50% (22/44) of the cases, the parents took care of them for lunch and in 4.5% (2/44) another adult person. Among parents of children with T1DM, half (23/44, 52.3%) reported having to make interventions during school-time, up to ten times /year. There was a significant difference ( $p \leq 0.01$ ) with school staff in the number of interventions related to diabetes needed in their entire career/life, not with school nurses.

The school nurses' group was composed, on average, of professionals having worked for 10.6 years (Range: 0-30) and in 2 establishments (26 hours per week) with an average number of children covered of 1183 per nurse (Range: 80-2500). 16.4% (12/73) of the school nurses did not have any children with diabetes to follow in 2016-2017, 31.5% (23/73) had one, 47.9% (35/73) had 2-5, 4.1% (3/73) have 6-10. 94.6% of the school nurses (70/74) did not receive a specific training of T1DM in children. Among school nurses, 61/74 (82.4%) reported having intervened in a T1DM-related issue in their career. There was a significant difference ( $p \leq 0.01$ ) with school staff in the number of interventions related to diabetes needed in their entire career, not with parents.

### **Experience with diabetes in the school setting**

The primary intervention reported by school staff (163/235, 69.4%) was suggesting the child to eat something. One teacher stated that they suspected a child had diabetes based on observations of weight loss and polydipsia during the school year.

The most frequently reported issue by parents was a technical problem with diabetes management technologies (i.e. glucometer, insulin pump, continuous glucose monitoring system) (18/23, 78.3%). In most of the cases (19/23, 82.6%), the parent/guardian had to come to the school to resolve the problem. On average, parents came to their child's school approximately 8 times (Mean: 7.9, SD: 32.75, Range 0-210) per year to rectify a problem and they reported receiving approximately 5 (Mean: 4.6, SD: 9.66, Range 0-40) phone calls from the school per year. Some parents reported the necessity to regularly supervise the morning snack when their child was younger and lacked autonomy. One parent stated they had to stop working to care for their child – with significant financial implication.

The interventions reported by the majority of the school nurses were to create (60/61, 98.4%) or to modify (53/61, 86.9%) ICPs.

### **Knowledge of T1DM documents and information in schools**

We inquired about T1DM communication with stakeholder groups. In total, over half (24/43, 55.8%) of parents/guardians were satisfied with the level of communication they received from school, one parent did not answer. Eighteen parents (41.9%) felt that communication between school and parents was insufficient.

School nurses were involved in creating 79 novel ICPs for students with T1DM. This represents approximately 12% of all ICP created in the Canton of Vaud in one year. The ICP were known and used by 56.3% (398/707) of the school staff, and 95.9% (71/74) of the school nurses. Within the 67.5% (27/40) of the parents who were aware of the existence of this document,



the majority found it a good way to manage the diabetes of their child. There was a significant difference between school nurses and school staff ( $p \leq 0.01$ ) and between school nurses and parents ( $p \leq 0.01$ ) in the knowledge and the use of ICPs in their school.

### **Role of school personnel in T1DM management**

The distribution of roles related to T1DM care was defined as moderately well according to the school staff, and was well defined according to parents and school nurses (Figure 2). For 77.8% (593/762) of the school staff, their most pertinent role was to organize and adapt school trips. Even if they are not involved in medical care, some teachers mentioned in the free comments the need to personally intervene for measurements of glycaemia or for insulin injections, notably during school trips.

According to the school nurses, their most relevant role was to create the ICP (69/74, 93.2%).

### **Perceived overall T1DM management in school**

To examine stakeholder perceptions of the quality of T1DM management in school we asked respondents to complete a 5-point Likert type scale (bad to very good). Across groups, the overall T1DM management was perceived as “good” for the majority (Figure 3). The majority of the school staff and the parents identified formal meetings with all persons concerned, and suggested more informational support as ways to improve the overall T1DM management in school. Interestingly, 33/74 (44.6%) of school nurses thought no further changes were required, as they perceived that the overall management of T1DM was correct.

### **Impact of T1DM diabetes on school participation**

Approximately two-thirds of school staff (462/762, 67.4%) considered it possible for a child with T1DM to follow the same school program, at the same rhythm, as other children in the class (Figure 4). Some school staff (223/685, 32.6%) thought that a student’s school participation was more complex and influenced by a variety of factors - in particular, the child’s autonomy for self-managing T1DM. The majority of parents/guardians (39/44, 88.6%)

felt it was possible for a child with T1DM to follow the same school program, at the same rhythm as other children in the class while only 5/44 (11.4%) mentioned that it “depends on circumstances”. Notably, one parent cited that their child needed to repeat a grade two years, primarily due to medical issues related to T1DM and subsequently decided to quit school.

### **Specific T1DM management concerns by stakeholder group**

Regarding an emergency call system or school nurse intervention for severe emergencies (e.g. hypoglycemia), 485/762 (63.6%) school staff considered this important. A similar percentage of parents/guardians (29/44, 65.9%) stated that interventions should be done by anyone at school who had been trained in managing T1DM emergencies. Among school nurses, responses were variable between school nurses responsibility (50/74, 67.6%) and any trained adult (45/74, 60.8%).

For school trips, nearly half of the school staff (358/762, 47%) expressed a desire for an additional person trained in T1DM care to accompany the class on school outings. School staff rarely (78/762, 10.2%) refused to assume responsibility for a child with T1DM if the child was not completely autonomous in self-management. A small percentage (34/762, 4.5%) believed it was not their responsibility and were not obliged to make extra consideration or preparation for an extracurricular trip. In parallel, nearly half of parents/guardians (20/41, 48.8%) felt that the school trips are partially to moderately well organized enabling children with T1DM to participate. 10/44 (22.7%) of the parents mentioned in the comments that they had to organize “everything” themselves in order to allow the participation of the children in school trips.

## **Discussion**

Our study focused on the perspective of the three stakeholder groups taking care of diabetes of young children in a school setting: school staff, parents and school nurses. These actors secure the insulin treatment and recommend health control as advised by the specialized pediatric diabetes teams. The participation rate was moderate to low for school staff despite the high total number of completed questionnaires in this group. A relatively high proportion mentioned having had a child with diabetes in their class, probably resulting in a bias in the teacher response interpretation. Parental participation rate was as expected in this kind of study, whereas nurse participation was very high, potentially reflecting a specific interest in the subject (Table 1).

The overall perception of the quality of diabetes management was good for school staff and school nurses (significantly less for parents), with a low but significantly higher proportion of parents considering it bad (Figure 3). We were surprised by the relatively high percentage of teacher's expressing doubts that children with diabetes could follow the same school curriculum as children without diabetes, which differed significantly from parent's perception (Figure 4). Our study explored possible gaps, barriers and solutions for the inclusion of children with type 1 diabetes in schools.

### **Knowledge transfer/communication**

Therapeutic education programs have been adapted to different requirements: i.e. parental diabetes education and the information given to teachers differ in many theoretical and practical aspects. Indeed, well-defined and adapted knowledge transfer from highly specialized medical staff to the actual person in charge of a child with diabetes in a special setting is key for safety. Individual care plans seem essential in this process.

In our specific setting, a structured meeting with the specialized diabetes nurse, the school nurse, the teacher and parents is organized before a child with diabetes enters a new

school/class or after diabetes manifestation. During this meeting, the ICP is created and discussed in order to improve the knowledge of the involved persons. Whilst our study showed that school staff, school nurses and parents considered these meetings as important, we found a significant ( $p \leq 0.01$ ) discrepancy between the awareness of the existence of this document between school staff (56.3% awareness), parents (67.5%), and school nurses (95.9%). This could be explained by the fact that only one teacher or school representative is present at the discussion, and that the transmission to other teachers is lacking. In this context, the observation that 41.9% of the parents felt that communication between school and parents was insufficient implicates a revision of the current model, for example by better implicating parents in the creation and maintenance of the ICP.

Specific documents in printed, web or audiovisual (DVD, tablets) formats are available for parents and teachers. Surprisingly, our study identified a significant gap in school nurse formation: in fact, 95.9% responded not having received a specific diabetes formation, and most felt only moderately comfortable with the management of hypo- or hyperglycemia (>50% respectively). In the context of our findings that 63.6% of the school staff considered the intervention of the school nurse necessary in case of an emergency, which was confirmed by 67.6% of the school nurses, a better school nurse training and the inclusion of the responsible person in case of an emergency in the ICP seem mandatory.

### **The distribution of the roles**

The perception of the delineation of roles seems well defined for school nurses and more ambivalent for teachers and parents (Figure 2). Indeed, school nurses participate actively in organizational tasks but are rarely present in the event of technical issues or adverse events. For school staff and parents, the integration of the school nurse activity in diabetes management seems less clear. In the canton of Vaud, the School Health Promotion and Prevention Unit limits the support that can be given by the school staff to a child with diabetes

to remind the child to control blood glucose and to remind him/her to eat in case of hypoglycemia symptoms. Whilst teachers are not entitled to control blood glucose or to administer insulin, our survey demonstrates that this is in rare cases still done. In fact, standard diabetes management procedures in a non-autonomous child become difficult when no other designated school staff or diabetes nurse is present. The parents' perception that the overall diabetes management at school depends on the goodwill of the school staff including teachers is therefore of no surprise.

A special problem is the organization of school trips. Indeed, 48.8% of parents feel that these are partially to moderately well organized, and 10.2 % of school staff responders refuse to take responsibilities if the child is not autonomous. In a recent study, safety and satisfaction of parents related to the presence of trained, non-medical personnel capable of administering insulin or glucagon was shown to compare well to satisfaction of treatment provided by medical staff (18). This study concluded that trained non-medical staff could maximize safety of children with diabetes when a school nurse is not available. This concept is supported in our study by the perception of 47% of the school staff that an additional trained person should accompany a child during a school trip. Nevertheless, a challenging 22.7% of the parents mentioned that the task of finding suitable personnel relies on parental personal implication.

### ***The challenge of novel diabetes technologies***

Technologies developed to improve self-management, whilst easy to use for trained children and adults, require very specific handling. Indeed, technical problems with diabetes technology or pump or CGM warnings account for 78.3% of parental interventions at school, who had to come to school personally in 82% of the cases to solve the problem. This equals to our before mentioned observation that school nurses lack specific diabetes education, and advocates for specific continuous education for this professional group.

### ***Who should take care of diabetes at school?***

Whilst the current model relying on a close collaboration between the specialized pediatric diabetes nurse, the school nurse, the parents and the child to establish ICP seems to work well, our study highlights a significant gap in school nurse diabetes formation. The difficulty of identifying non-medical personnel at school means that the system relies on this professional group for diabetes interventions in school. School nurses need a more specialized formation, which is a challenge due to the rapidly changing diabetes technologies. Whilst modern electronic communication technologies and content management systems could ease individual school nurse diabetes education and possibly provide guided interventions in the case of technological problems without interfering with school organization, we feel that a novel approach identifying referent diabetes school nurses makes sense. In this model (Figure 5), the main diabetes knowledge transfer occurs between the specialized nurses working with pediatric diabetes teams and a limited number of referent school nurses. The referent school nurses would assume basic diabetes education of school nurses (using a program elaborated in collaboration with the pediatric diabetes center and the public health and school systems), and supervise school nurse interventions and support school staff with the implementation of the ICP. Furthermore, the referent school nurse could collaborate with the public health and school system to find solutions for special situations like school trips, where trained non-medical personnel could accompany individual cases. Finally, this model could close the knowledge gap of school nurses, reduce barriers of school staff in accepting children with T1DM in their class, and respond more adequately to special situations.

### ***Conclusion***

Modern diabetes management in schools requires a concerted structured organization involving health personnel and school staff as well as parents to determine the individual needs of a child with T1DM. Our study highlights the need to revise the knowledge transfer management between the caring stakeholders in order to fully integrate children in the school program. We propose a novel structured organizational approach that could close the knowledge gap of school nurses, reduce barriers of school staff in accepting children with T1DM in their class, and respond more adequately to special situations.

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**Table 1:** Demographics and characteristics of the stakeholder groups.

	School staff	Parents	School nurses
	<b>N= number of responses received to the question</b> <i>number of participants (percent)</i>		
<b>N</b>	<b>762</b>	<b>44</b>	<b>74</b>
<b>Participation rate</b>	7.3%	33.6%	91.4%
<b>Gender</b>	<b>N=757/762</b>	<b>N=44/44</b>	
Male	131 (17.3)	8 (18.2)	(7.5)
Female	626 (82.7)	36 (81.8)	(92.5)
<b>Number of students with diabetes followed</b>	<b>N=748/762</b>	-	<b>N=73/74</b>
None	593 (79.3) **	-	12 (16.4)
1	134 (17.9) **	-	23 (31.5)
2-5	21 (2.8) **	-	35 (48,0)
6-10	0 (0) **	-	3 (4.1)
<b>Do you already have to intervene or an intervention has been necessary at school for your child for something related to diabetes</b>	<b>N=762/762</b>	<b>N=44/44</b>	<b>N=74/74</b>
Yes	235 (30.8) **	23 (52.3)	61 (82.4)
No	527 (69.2) **	21 (47.7)	13 (17.6)
<b>Number of intervention for diabetes at school in all your career/life</b>	<b>N=227/235</b>	<b>N=19/23</b>	<b>N=61/61</b>
1 times	88 (38.8)	0 (0)	1 (1.7)
2-5 times	82 (36.1)	8 (42.1)	13 (21.3)
6-10 times	23 (10.1)	2 (10.5)	13 (21.3)
More than 10 times	34 (15)	9 (47,4)	34 (55.7)

\* There was a significant difference between the comparative groups at  $p \leq 0.05$ .

\*\* There was a significant difference between the comparative groups at  $p \leq 0.01$ .

**Table 2:** Perception of patient management at school. (Multiple answers to the questions were possible)

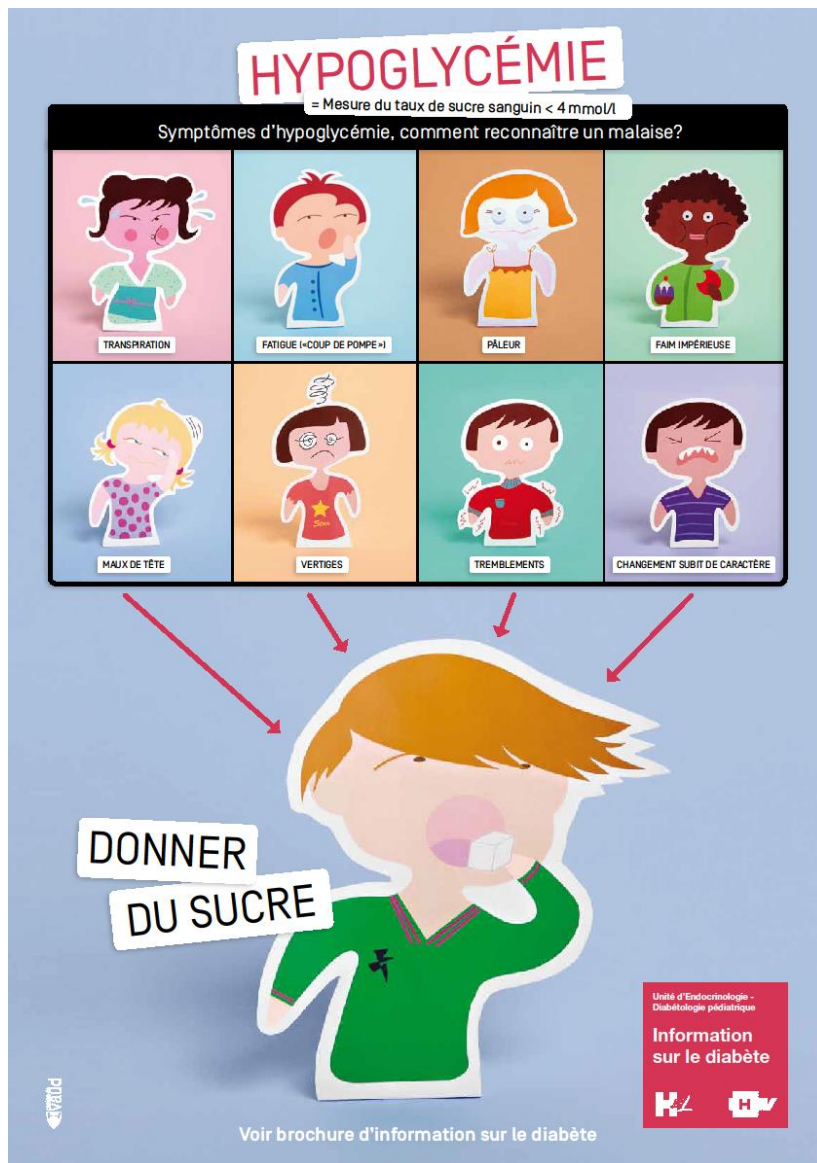
	School staff	Parents	School nurses
	<b>N= number of responses received to the question</b> <i>number of participants (percent)</i>		
<b>Did you receive a specific diabetes formation</b>	<b>N=753/762</b>		<b>N=73/74</b>
Yes	278 (36.9)**	-	3 (4.1)
No	475 (63.1)**	-	70 (95.9)
<b>To what extent do you feel comfortable to handle hypoglycaemia</b>			<b>N=73/74</b>
Totally comfortable	-	-	7 (9.6)
Very comfortable	-	-	19 (26.0)
Moderately comfortable	-	-	39 (53.4)
Not very comfortable	-	-	8 (11.0)
Not comfortable at all	-	-	0 (0)
<b>To what extent do you feel comfortable to handle hyperglycaemia</b>			<b>N=72/74</b>
Totally comfortable	-	-	4 (5.5)
Very comfortable	-	-	12 (16.7)
Moderately comfortable	-	-	40 (55.6)
Not very comfortable	-	-	13 (18.1)
Not comfortable at all	-	-	3 (4.1)
<b>What would you recommend to improve overall management</b>	<b>N=762/762</b>	<b>N=44/44</b>	<b>N=74/74</b>
Inter-professional meetings	30 (39.5)	22 (50)	24 (32.4)
Information leaflets	286 (37.5)	20 (45.5)	28 (37.8)
A better application of ICP	86 (11.3)	11 (25)	6 (8.1)
In school creation of ICP	-	-	12 (16.2)
More school nurses	177 (23.2)	12 (27.3)	17 (23)
School nurse formation	-	-	17 (23)
Overall management of diabetes is correct.	21 (27.7)	11 (25)	33 (44.6)
Others (open answers)	46 (6.0)	8 (18.2)	11 (14.9)

\* There was a significant difference between the comparative groups at  $p \leq 0.05$ .

\*\* There was a significant difference between the comparative groups at  $p \leq 0.01$ .

**Table 3:** Perception of the distribution of roles at school. (Multiple answers to the questions were possible)

	School staff	Parents	School nurses
	<b>N= number of responses received to the question</b> <i>number of participants (percent)</i>		
<b>What are your main roles concerning child with diabetes</b>	<b>N=762/762</b>		<b>N=74/74</b>
Supporting the child	386 (50.7)	-	53 (71.6)
Camp organization	593 (77.8)	-	33 (44.6)
Being actively present in the case of an emergency	515 (67.6)	-	39 (52.7)
Creating the ICP	-	-	69 (93.2)
Supporting and teaching the school staff	-	-	67 (90.5)
Injecting insulin	-	-	7 (9.5)
Checking blood glucose	-	-	9 (12.2)
I have no role.	10 (1.3)	-	-
To help with nutrition	-	-	5 (6.8)
Others	23 (3.0)	-	18 (24.3)
<b>In your opinion: Who should care for children at school in an emergency case</b>	<b>N=762/762</b>	<b>N=44/44</b>	<b>N=74/74</b>
Health professionals	485 (63.6)	12 (27.3)	50 (67.6)
Non health professionals with specific formation	348 (45.7)	29 (65.9)	45 (60.8)
Teacher	-	-	44 (59.5)
Anyone on the spot	148 (19.4)	7 (15.9)	11 (14.9)
Parents	-	-	22 (29.7)
Director of the school	-	-	1 (1.4)
Others	26 (3.4) Teachers: 6 (0.8)	6 (13.6) Teachers: 2 (4.5)	-



**Figure 1:** Symptoms of hypoglycemia and how to react to low blood sugar. Printed document created by the Pediatric Endocrinology and Diabetes Unit from the Lausanne University Hospital, with the support of the Cantonal Diabetes Program (CDP) for school staff education.

## Perception of the quality of role delineation in schools

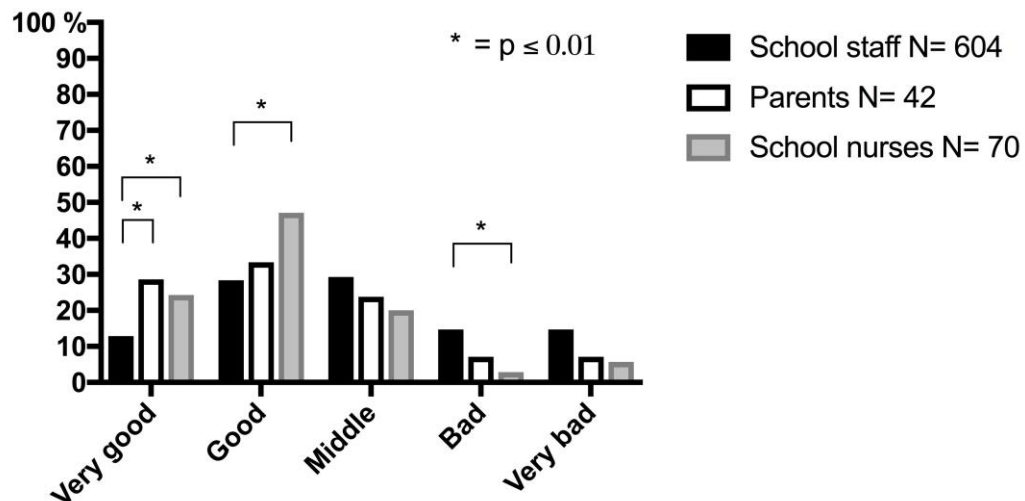


Figure 2: Quality of the role delineation according to the different stakeholder groups. We notice that only 604/762 school staff, 42/44 parents and 70/74 school nurses answered to this question. The role delineation is qualified as middle for the school staff, and good for parents and school nurses. Two-sample t-tests between proportions were performed to determine whether there were a significant difference between school staff, parents and school nurses. There was a significant difference at  $p \leq 0.01$  between school staff and parents and between school staff and school nurses for the answer “very good”. There was a significant difference at  $p \leq 0.01$  between school staff and school nurses for the answer “good”. Finally, there was a significant difference at  $p \leq 0.01$  between school staff and school nurses for the answer “bad”. There was no other significant difference for this question.

### Perception of the quality of overall management of diabetes in schools

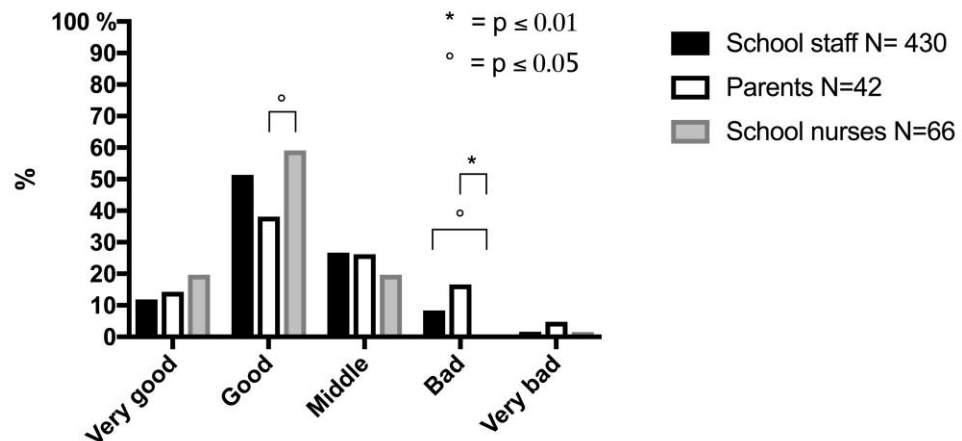
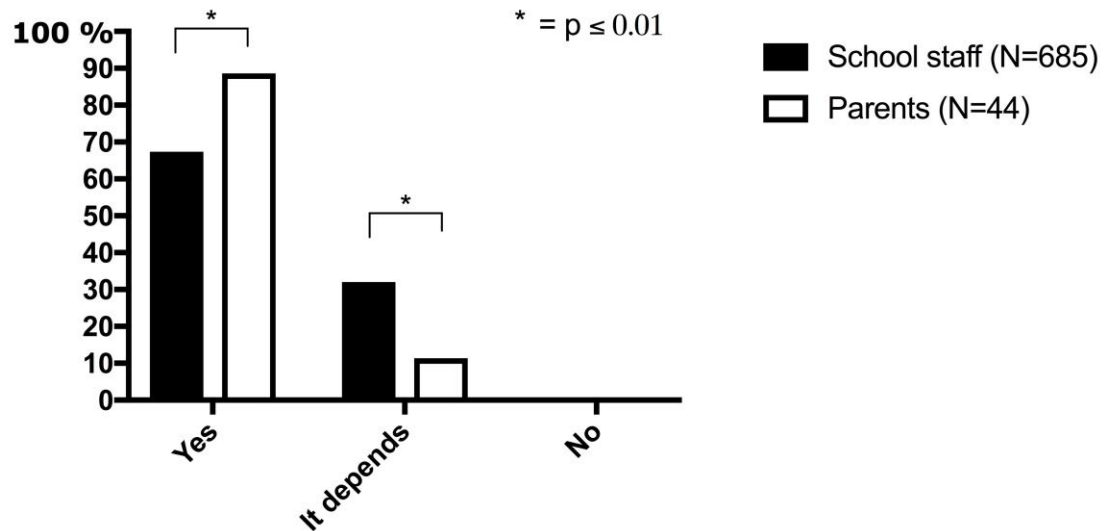


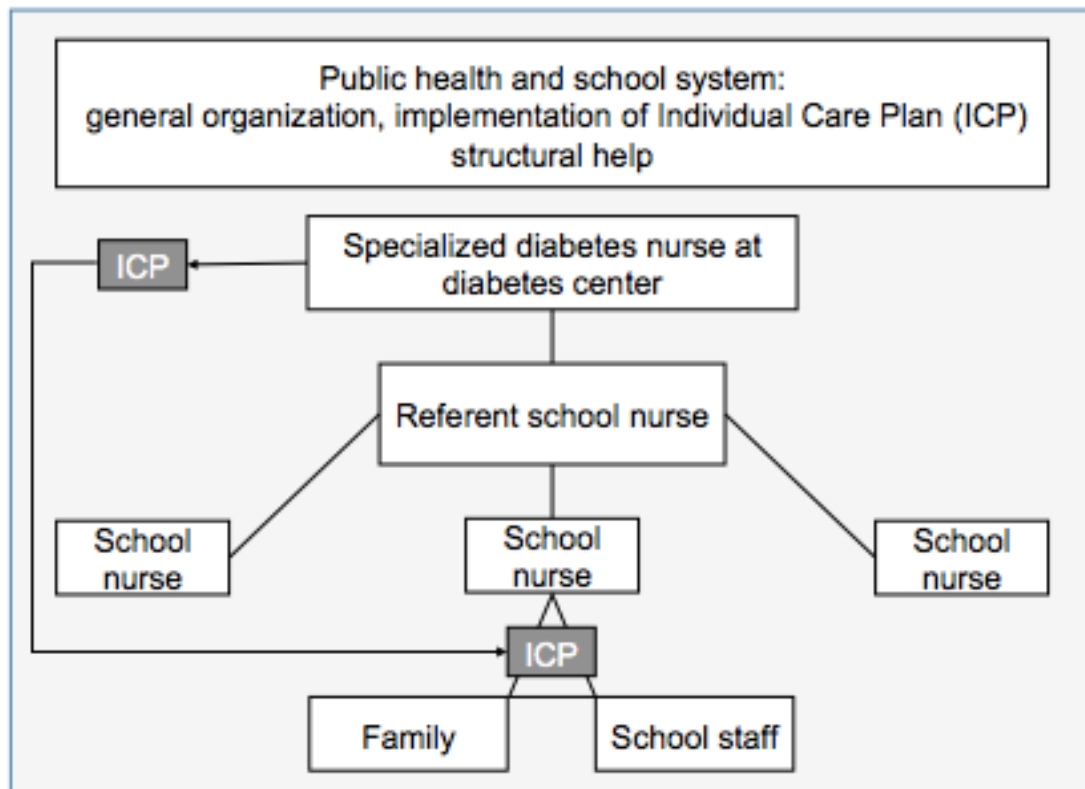
Figure 3: Qualification of the global management of diabetes in school according to the different groups. We can notice that only 430/762 school staff, 42/44 parents and 66/74 school nurses answered to this question. The three groups state that the overall management of diabetes is good. Two-sample t-tests between proportions were performed to determine whether there were a significant difference between school staff, parents and school nurses. There was a significant difference at  $p \leq 0.05$  between parents and school nurses for the answer "good". Finally, there was a significant difference at  $p \leq 0.05$  between school staff and school nurses and at  $p \leq 0.01$  between parents and school nurses for the answer "bad". There was no other significant difference for this question.



### Is it possible for a child with T1DM to follow the same school program as children without T1DM?



**Figure 4:** Perception of school staff and parents related to the possibility of a child with diabetes to follow the same school program as children without T1DM. School staff and parents think that it is possible for a child to follow the same school program. We can notice that only 685/762 school staff answered to this question. A two-sample t-test between proportions was performed to determine whether there was a significant difference between the school staff and the parents. The t-statistic was significant at  $p \leq 0.01$ .



**Figure 5:** Organizational model where the main diabetes knowledge transfer occurs between the specialized diabetes nurses working with pediatric diabetes teams and a limited number of referent school nurses. The referent school nurses would assume basic diabetes education of school nurses, supervise school nurse interventions and support school staff with the implementation of the ICP. Furthermore, the referent school nurse could collaborate with the public health and school system to find solutions for special situations like school trips, where trained non-medical personnel could accompany individual cases.