Use of telemonitoring via *Webdia*, a mobile device app, reduces HbA1c in type 1 diabetic children and adolescents

Philippe Klee[1,2]**, Catherine Bussien**[3]**, Montserrat Castellsague**[4]**, Christophe Combescure**[5]**, Mirjam Dirlewanger**[1,2]**, Céline Girardin**[1]**, Jean-Luc Mando**[6]**, Luz Perrenoud**[4]**, Carole Salomon**[7]**, Franck Schneider**[8]**, Valérie M. Schwitzgebel**[1,2]

[1] Pediatric Endocrine and Diabetes Unit, Department of Pediatrics, University Hospitals of Geneva, 1211 Geneva, Switzerland [2] Diabetes Center of the Faculty of Medicine, University of Geneva, 1211 Geneva, Switzerland [3] Department of Community Medicine, Primary Care and Emergency Medicine, University Hospitals of Geneva [4] Care directorate, University Hospitals of Geneva [5] Division of Clinical Epidemiology, Department of Health and Community Medicine, University Hospitals of Geneva [6] KM Koncept, 1255 Veyrier, Switzerland [7] Pediatric Research Platform, Department of Pediatrics, University Hospitals of Geneva [8] Division of Digital Communication, University Hospitals of Geneva

Background and aims

Prevention of type 1 diabetes (T1DM)-related complications is dependent on metabolic control. The recommended HbA1c values < 7.0% (58.5mmol/mol) are met only by a minority of children and adolescents. The aim of this study was to evaluate the impact of an interdisciplinary intervention comprising the use of *Webdia* on metabolic control of T1DM in children. *Webdia* is a patient-designed app that has a simple interface. It allows calculation of insulin doses, and numerous pictures representing different amounts of selected meals facilitate carbohydrate counting (**fig. 1**). In addition, all glucose values entered into the program are available to the child's parents and healthcare professionals, thereby allowing remote monitoring.
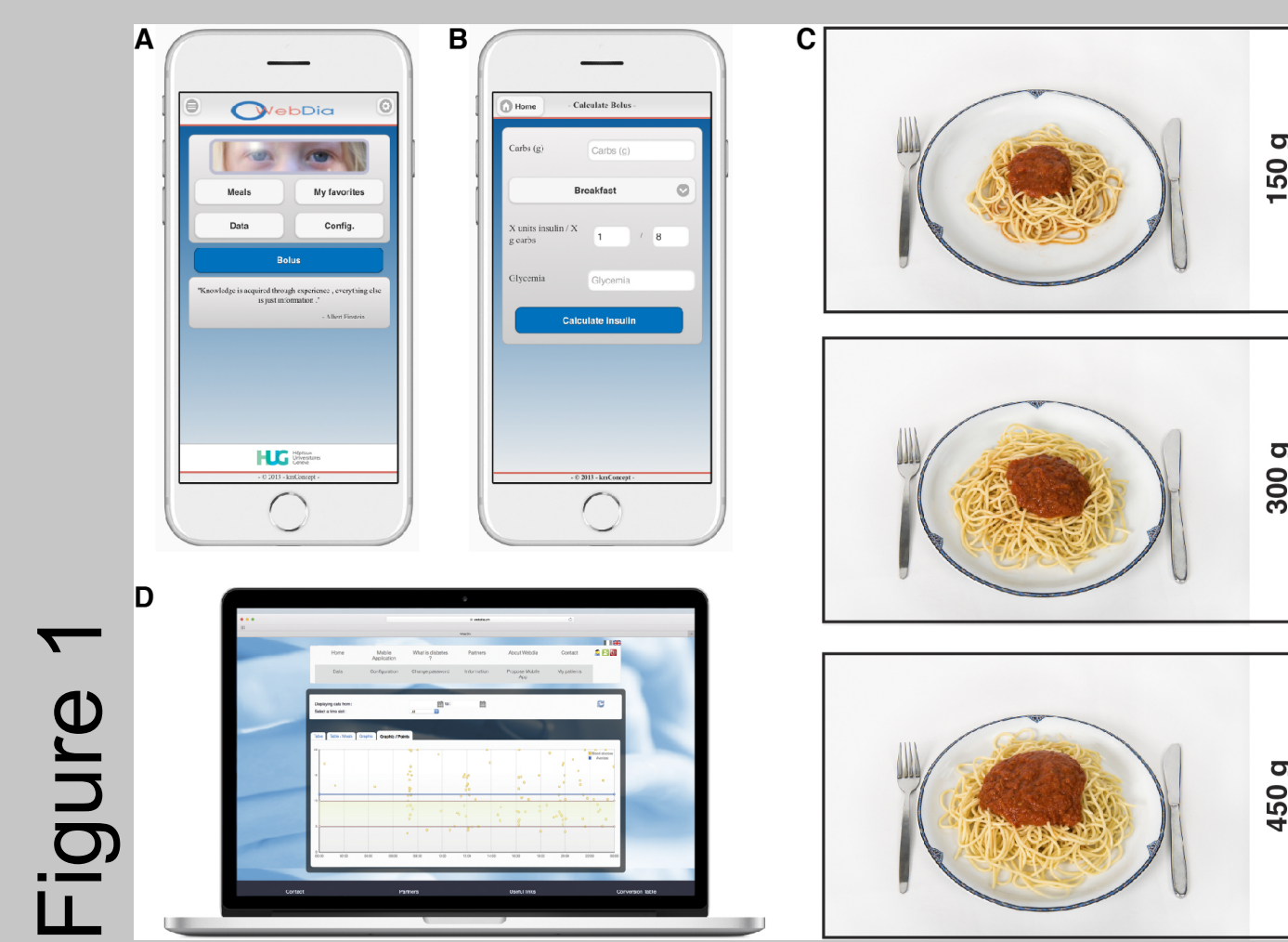

Figure 1

Research design and methods

55 patients aged 10 - 18 years were included into this single center, randomized, double crossover study. The intervention consisted of using *Webdia* during 3 months and getting a monthly feedback and adaptation of the treatment (**fig. 2**).Main outcome was modification of HbA1c. Secondary outcomes were the prevalence of hypoglycemia and quality of life (QoL).
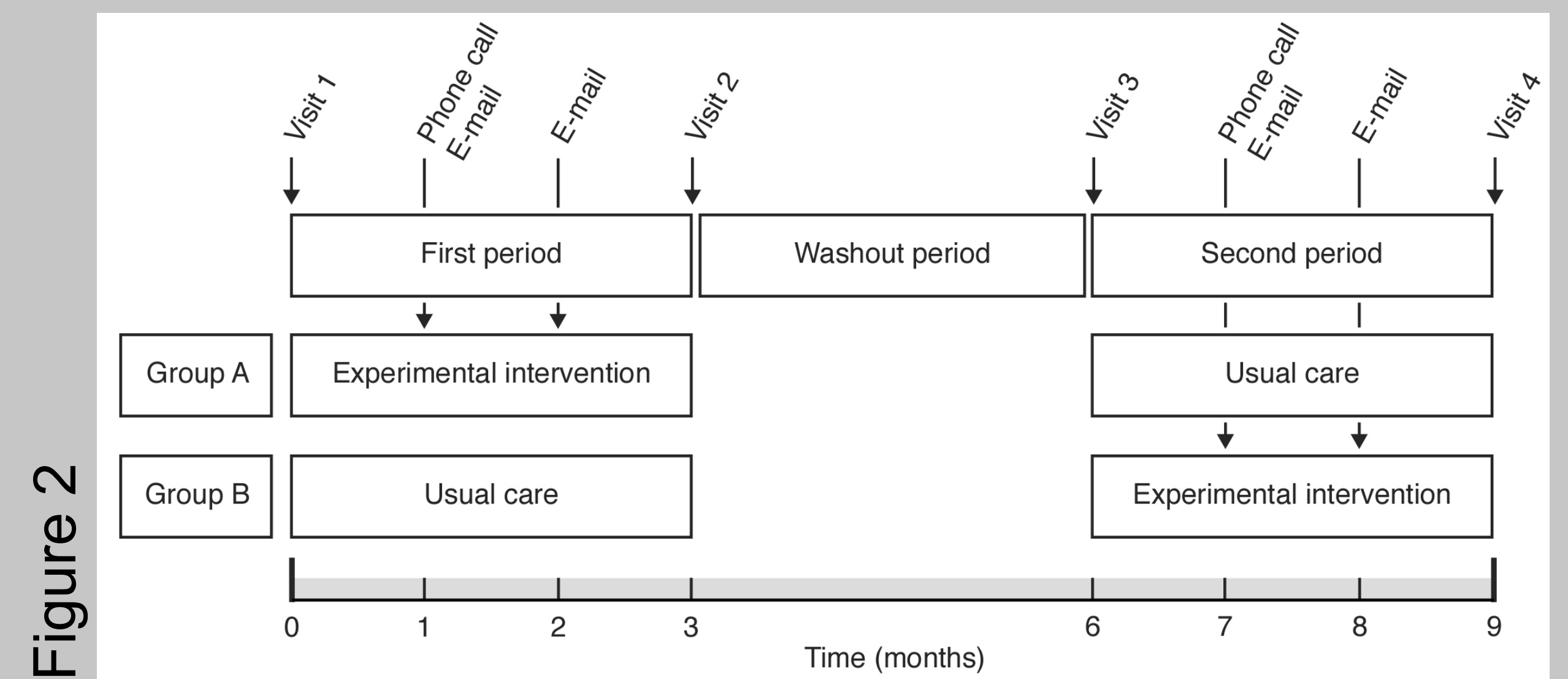

Figure 2

Results

Of the 55 included patients, 33 completed the study, 9 dropped out and 13 were excluded due to insufficient use of the app. Risk factors for insufficient use were older age and longer duration of T1DM (**table 1**).

Patient characteristics according to completion of the study   Table 1

	Completed study (n = 33) (60.0%)	Dropped out (n = 9) (16.4%)	Non compliant (n = 13) (23.6%)	*p* Noncompliant versus completed
Age (years)	13.3 (2.3)	12.8 (1.8)	15.1 (2.4)	0.024 [†]
Gender				
- Male sex	19 (57.6%)	6 (66.7%)	6 (46.2%)	0.484 *
- Female sex	14 (42.4%)	3 (33.3%)	7 (53.8%)	
BMI (kg/m^2)	20.1 (2.93)	19.7 (1.91)	23.5 (4.9)	
BMI Z score	0.40 (0.92)	0.55 (0.56)	0.88 (1.06)	0.127 [†]
Duration of diabetes (months)	52 (35)	70 (48)	86 (52)	0.014 [†]
Insulin dose (IU/kg/d)	0.93 (0.28)	0.86 (0.31)	0.91 (0.24)	0.876 [†]
Insulin delivery				
- Pump therapy	17 (51.5%)	5 (55.6%)	7 (53.8%)	0.887 *
- Multiple daily injections	16 (48.5%)	4 (44.4%)	6 (46.2%)	
Previous use of bolus calculator	7 (21.2)	2 (22.2%)	6 (46.2%)	0.091 *
Randomization				
- Group A	20 (60.6%)	3 (33.3%)	5 (38.5%)	0.175 [†]
- Group B	13 (39.4%)	6 (66.7%)	8 (61.5%)	
App use per day	2.47 (1.17)	NA	NA	
HbA1c (%)	8.0 (1.0)	7.8 (0.5)	8.6 (1.6)	0.085 [†]

Data are number (%) or mean (standard deviation). *BMI* bodymass index.
[†] T-test (2-tailed) * Pearson Chi-Square (2-tailed)

Three-months use of *Webdia*, combined with monthly feedback led to a significant reduction of HbA1c by 0.33%, as compared to a rise of 0.21% in the control group, in patients with HbA1c values > 8.0% at inclusion (**table 2**), without increasing the prevalence of hypoglycemia (8.52 +/- 9.45 hypoglycemia during last two weeks of intervention, vs. 7.62 +/- 6.37 during observation, *p*=0.680).

Effect of *Webdia* use on HbA1c in patients with initial HbA1c > 8.0%   Table 2

	Intervention (n = 16)	Usual care (n = 16)	*p* *
HbA1c change during observation (%)	− 0.331 (0.75)	+ 0.206 (0.79)	0.048

Data are mean (standard deviation). * Paired samples T-test (2-tailed)

QoL scores were not modified.
The app was well accepted by the 33 users who completed the study (**fig. 3**).
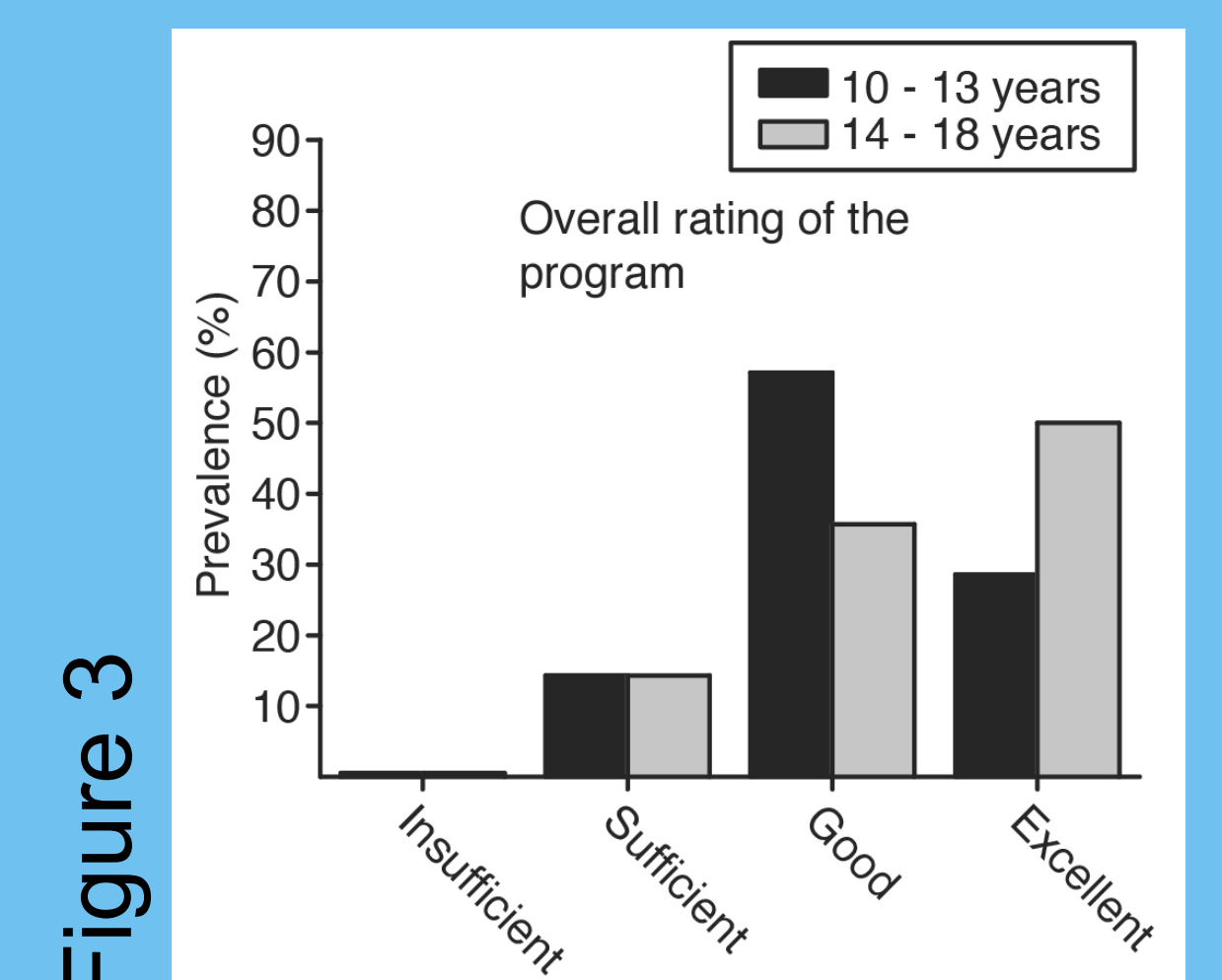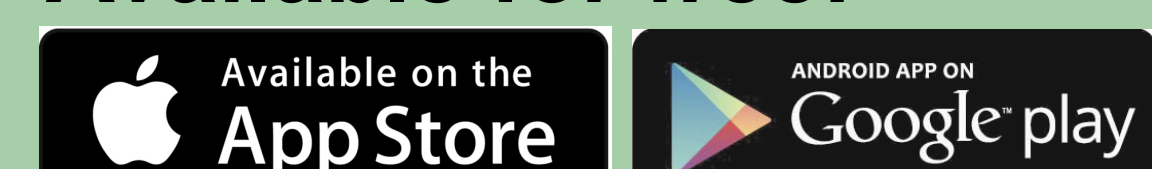

Figure 3

More information:

With the help of:

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Conclusions

The use of *Webdia*, a patient-designed mHealth application, in combination with an interdisciplinary intervention consisting of a specialized nurse intervention for the installation of the application and a medical intervention for regular review of blood glucose values and adaptation of the insulin regimen leads to a significant reduction of HbA1c in patients with initial HbA1C values > 8.0% (63.9mmol/mol), without increasing the risk of hypoglycemia.