Glucose monitoring and pump data management software operated on a personal digital assistant can contribute to improve diabetes control in CSII-treated patients

Gestion des données d'insulinothérapie par pompe et des résultats glycémiques : amélioration du contrôle du diabète assisté par logiciel sur ordinateur de poche

Keywords: CSII; Software; Type 1 diabetes; Data management; Glucose monitoring

Mots clés : Insulinothérapie par pompe ; Diabète de type 1 ; Logiciel ; Gestion de données ; Surveillance glycémique

The implementation of appropriate changes based on retrospective glucose monitoring and insulin doses is required to improve the metabolic control of patients with type 1 diabetes [1]. Noteworthy telecare is not widely developed and the availability of diabetologist and patients for visits do not often fulfill real care needs, especially when metabolic control is out-of-target. Tools supporting diabetes self-management might help patients in adopting a more intensive treatment without increasing the visit frequency. Pocket Compass 2.0 (PoCo) is a software generating reports on a personal digital assistant (PDA) that displays treatment data as graphs and tables. It was designed to facilitate patient self-analysis of continuous subcutaneous insulin infusion (CSII) data, the patients periodically downloading from their pump (bolus and basal rates) and glucose meter. The use of PoCo was assessed in 27 patients treated with an external pump, performing self-monitoring of blood glucose (SMBG) ≥20 per week and needing an improvement in treatment outcome. The objectives of this prospective 3-month multi-center pilot study were to determine if PoCo is suitable for clinical practice as well as in patient daily life, and to test the impact of a PoCo based self-management on metabolic control. No advice was given on the frequency of self-data checking on PDA.

Baseline patient characteristics were: age 39.5 ± 8.8, interquartile CSII duration 2.1–3.7–8.6 years, HbA1c (%) 7.9 ± 0.9, fixed and flexible professional activity 30 and 52%, respectively; 22% reported frequent moderate hypoglycaemia (>2 per week) during the month prior to inclusion. Meter and pump data transfer on the PDA (Palm OS) as well as the software use were mastered by patients in a short time. They considered the use of the system as easy (score 78 ± 20/100) and checked data every week or 2. All patients except one completed the study. Only minor and transient lifestyle changes were reported in a few patients for the 3-month study period. The global appraisal and the appraisal of the main reports by patients and investigators are shown in Table 1. Moreover according to patients the system was suitable for daily life (score 79 ± 16/100) and 92% of them reported it strengthened their motivation to perform frequent SMBG. They enjoyed the log-book on PDA, to have their results available at any time, reported a relief versus filling in a classical logbook and all except one wished to continue using the system.

The HbA1c decrease at 3 months was 0.33 ± 0.48% (P < 0.001), not related to CSII duration (P = 0.64) and baseline levels (P = 0.22); decrease was 0.41 ± 0.57% in the 14-patient subgroup with baseline values > 7.5 (P = 0.017). A trend to a 50% reduction in the number of patients experiencing hypoglycaemia more than twice a week was observed (P = 0.083). Clinically relevant changes in basal insulin rate, total bolus or total insulin per day were observed in 12/26 patients. No significant weight change (mean -0.7 kg) and no adverse events occurred. The 4-week SMBG results before the end of study were downloaded from the PDA using Accu-Chek® Smart Pix in 24 subjects (mean baseline HbA1c 7.9%): frequency 5.2 ± 1.6 per day, BG 142 ± 67 mg/dl; individual average BG levels (113–194 mg/dl) were correlated with HbA1c at 3 months (R = 0.58, P < 0.006). Of note BG levels were lower than expected from HbA1c levels at the end of study visit [2]. Therefore one could speculate that the change observed in HbA1c underestimated the ongoing metabolic improvement, and a longer-term decrease in HbA1c might be even more pronounced.

Pocket Compass is a self-management tool that enabled a significant improvement of metabolic control without inducing adverse events in this pilot study, and the study patients highlighted the software operated on a PDA was suitable for daily life and easy. As the assessment was conducted without patient assistant by health care professionals (no telecoaching, no extra visit), PoCo looks as able to help the patients in taking adequate decisions. Indeed standard care without frequent visits does not allow changes in the metabolic control of a majority of CSII-treated patients with suboptimal SMBG frequency and HbA1c levels as it was confirmed in our study patients when recruited. Alike no decrease in HbA1c has been reported in the period without treatment change in many cross-over studies conducted in CSII-treated patients with similar characteristics at baseline [3–6]. The reported experience illustrates that a self-analysis of treatment data every week (BG and bolus) could reinforce the impact of SMBG, help in insulin management and complete the changes decided at follow-up visits. The positive feed-back
related to the self-analysis of software reports likely promoted intensification of SMBG and reinforced patient motivation that might both explain the improved metabolic control after a 3-month use of PoCo [7]. The improvement of patient understanding on how the treatment acts, as well as a reinforcement of the patient motivation for CSII were pointed out by patients and investigators and could be the reason for facilitated patient motivation for CSII. As the investigated tool likely supported appropriate treatment and behavior changes, it could be helpful to reinforce the benefit of recently initiated CSII or to recover a better glucose control in case of relapse after a few years under CSII in clinical practice [1].

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**References**


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Table 1

<table>
<thead>
<tr>
<th></th>
<th>Improving treatment understanding by patients</th>
<th>Facilitating patient caregiver exchanges</th>
<th>Deciding appropriate bolus doses</th>
<th>Facilitating correction of hyperglycaemia</th>
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<tbody>
<tr>
<td>Care givers</td>
<td>10/12</td>
<td>9/12</td>
<td>8/12</td>
<td>8/12</td>
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<tr>
<td>Patients</td>
<td>69%</td>
<td>87%‡</td>
<td>83%§</td>
<td>73%§</td>
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</table>

**A - Global appraisal:**

*PoCo is a help in ...

<table>
<thead>
<tr>
<th></th>
<th><strong>B - Care giver questionnaires (12)</strong></th>
<th><strong>C - Patient questionnaires (26)</strong></th>
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<tbody>
<tr>
<td></td>
<td>Mean BG per period of the day (graph 30 days*)</td>
<td>Report relevance (VAS)</td>
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<td>Mean BG per period of the day (graphs 7 and 14 days*)</td>
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<td>General statistics</td>
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<td></td>
<td>Hypoglycaemia (statistics)</td>
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<td></td>
<td>Objective (graph)</td>
<td>67 ‡</td>
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<tr>
<td></td>
<td>Evolution (graph)</td>
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</tr>
<tr>
<td></td>
<td><strong>Objective (graph)</strong></td>
<td>68</td>
</tr>
</tbody>
</table>

BG: blood glucose; the answer rate was 100% except § (23/26), ‡ (24/26) and † (25/26).

* Patient number at the end of study.

‡ Preferred duration according to patients and investigators.

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