Design of a Mobile-based Diabetes Management System for Insulin Titration in Type 2 Diabetes: a Proof of Concept Study

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Initiation and titration of insulin treatment are resource intensive requiring frequent contact between the patient and the care provider team. Mobile health has shown potential in improving chronic care outcomes. The aim of this study was to demonstrate the proof of concept of a mobile-based system for insulin titration in type 2 diabetes.

Methods
Through a collaboration between CSIRO, Queensland Health, and the University of Queensland Centre for Online Health, a remote monitoring system was designed, developed, and piloted in Princess Alexandra Hospital. This system, which is based on a validated mobile health platform for home-based delivery of cardiac rehabilitation, comprises a mobile app, web-based database, and clinical dashboard. Blood glucose readings are auto-transmitted from a Bluetooth-enabled glucose meter to the mobile app, and from there are uploaded to the database. Insulin doses taken and meal times are entered manually and also uploaded to the database. Clinicians at the PAH diabetes clinic monitor blood glucose readings and insulin doses in relation to meal times through the clinical dashboard, and make recommendations to the patients remotely.

Results
At the time of submission, 3 of 5 patients had been recruited to the initial proof of concept trial. Over a two-week period, each participant uploaded on average 2.6 blood glucose readings per day and received feedback from the app in the form of colour-coded numbers, graphs, and charts, on their mobile phone. The clinicians used the dashboard to see the uploaded readings, quickly identify levels outside the recommended range, and send feedback messages and insulin dosage recommendations to the participants through the mobile app.

Conclusion
The mobile-based system for insulin titration was designed and functioned as intended. Feedback from the patients and the clinicians were used to improve the system. Lessons learned and practical implications for designing mobile health apps will be discussed.

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