Seamless recording of glucometer measurements among experienced diabetic patients – a study of usability and perception

M. Jahn[1], P. Rasche[2], A. Mertens[2], T. Miron-Shatz[3], A. Kribben[1], S. Becker[1]

[1] Klinik für Nephrologie, Universitätsklinikum Essen, Universität Duisburg-Essen, Essen, [2] Lehrstuhl und Institut für Arbeitswissenschaft, RWTH Aachen, Aachen, [3] Center for Medical Decision Making, Business School, Ono Academic College, Kiryat Ono, ISRAEL

Purpose

Self-measurement and documentation of blood-glucose are critical elements of diabetes management, particularly in regimes including insulin. In this study, we analyze the usability of iBG-STAR, the first blood glucose meter connectable to a smartphone. This technology records glucometer measurements, removing the burden of documentation from diabetic patients. This study assesses the potential for implementation of iBG-STAR in routine care.

Methods

Twelve long-term diabetic patients (4 males; median age of 66.5 years) were enrolled in the usability study via self-help groups.

Results

N=4/12 reported diabetic polyneuropathy. Reported subjective mental workload for all tasks related to iBG-STAR was on average lower than 12 points, corresponding to the verbal code 'nearly no effort needed'. A "Post Study System Usability Questionnaire", evaluated the glucometer at an average value of 2.06 (SD=1.02) on a 7-Likert-scale (1='I fully agree' to 7='I completely disagree') for usability.

These results represent a positive user-experience. Patients with polyneuropathy may experience physical difficulties in completing the tasks, thereby affecting usability. Technologically savvy patients (n= 6) with a positive outlook on diabetes assessed the product as a suitable tool for themselves and would recommend to other diabetic patients. **Tab. 1** shows typical statements on usability of iBG-Star by patients. **Tab. 2** shows statements on possible extended functionality.

Fig. 1: Blood glucose meter iBG-Star; A: Micro USB Connector; B: Slot to insert testing strip; C: Liquid Crystal Display; D: 30 pol connector for Apple devices; E:Interaction button for standalone use; F: Inserted blood glucose testing strip

Fig 2. Mean subjective mental effort during initial contact and blood glucose measurement (Rating Scale of Mental Effort; 0–150 points scale).
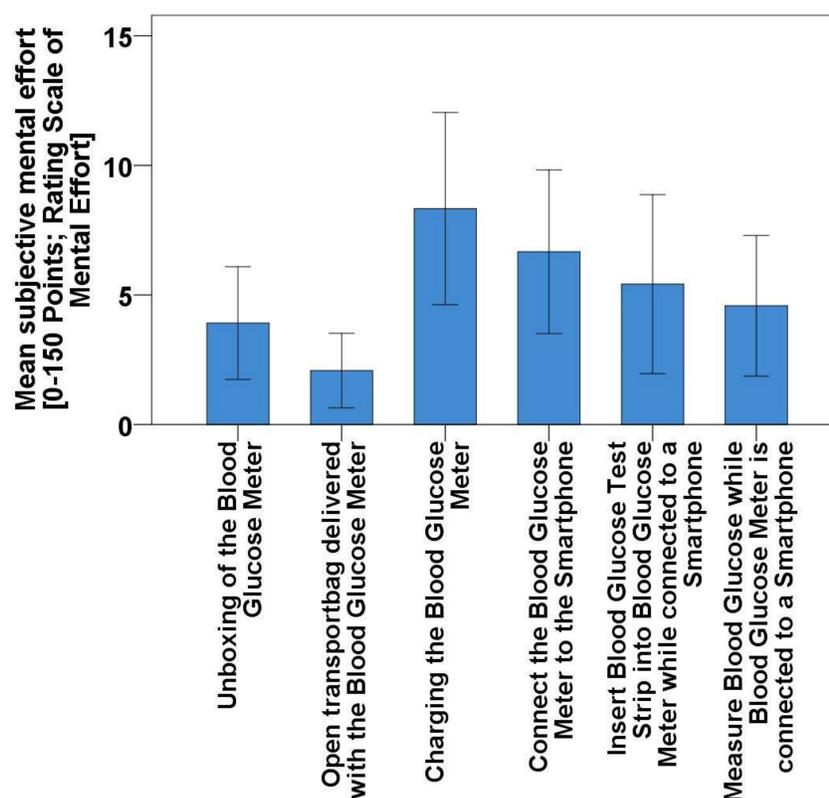
Error bars: +/- 1 Standard Error of the Mean

Tab. 1. Typical statements on usability of iBG-Star by patients.

Statement	Number of times mentioned in the interviews (N = 12)
"Automated documentation would be a great benefit for me."	12
"The display of the glucometer itself is rather small and contrast is not sufficient."	5
"With this glucometer I have to carry too many separate items with me (lancet for pricking the fingertip, testing strips, device, smartphone)."	5
"Automated data storage reduces my personal costs (in effort) for documentation."	3

Tab. 2. Statements on possible extended functionality.

Statement	Number of times mentioned in the interviews (N = 12)
"I would appreciate being able to document physical activity or personal nutrition within the app."	11
"I disapprove of direct transmission of data to my health insurance and the implementation of a bonus-malus program to foster therapy adherence based on this data."	10
"I would appreciate if the system supported my physical activity or diet."	8
"I would appreciate if the system (Smartphone + App) instructed me on how to use it (enough blood, testing strip okay, etc.)."	6

Conclusion

The main barrier to regular use was treating physicians' inability to retrieve digitally recorded data. This barrier was due to a shortcoming in interoperability of mobile devices and medical information systems.