

THE DEVELOPMENT OF HIGH-TECH BLADDER AND BOWEL DIARY AS A MODERN STRATEGY OF EXCRETION IN INNOVATIVE CLINICAL INFORMATICS

Hypothesis / aims of study

A patient-completed bladder diary is one of most recommended tools to assess bladder habits. An epidemiological study demonstrated patients with pelvic floor disorders reported voiding dysfunction, constipation (59.5%, 12.6%, respectively)¹. The diary is required to focus on both bladder and bowel problems and collect precise data in daily life as an excretion management tool. With the recent advancements of Internet of Things (IoT), the web-based portable devices into the medical field are expected to improve patients QOL, including health management, education and assessment. However, although web-based assessment has become technically possible, to our knowledge, there are no studies about the assessment system evaluated via cloud service for the patients with bladder and bowel dysfunction. The objective of this pilot study was development of a patient-centred excretion management for early detection of health and monitoring their daily excretion.

Study design, materials and methods

This study was prospectively designed. Since we organized the research system, recruited specialists from many different fields for developing HIGH-TECH bladder and bowel diary (**HIGH-TECH B&B diary**). Two urologists and a physiotherapist were involved for selecting clinical outcome measures for excretion. An IoT specialist from Laboratory of information media environment was responsible for the development of a tablet device and cloud-based system. A Research Coordinator from university research administrator worked for operational management. We regularly held meeting for the service conceptualization.

The realization of entire systematic composition in this study:

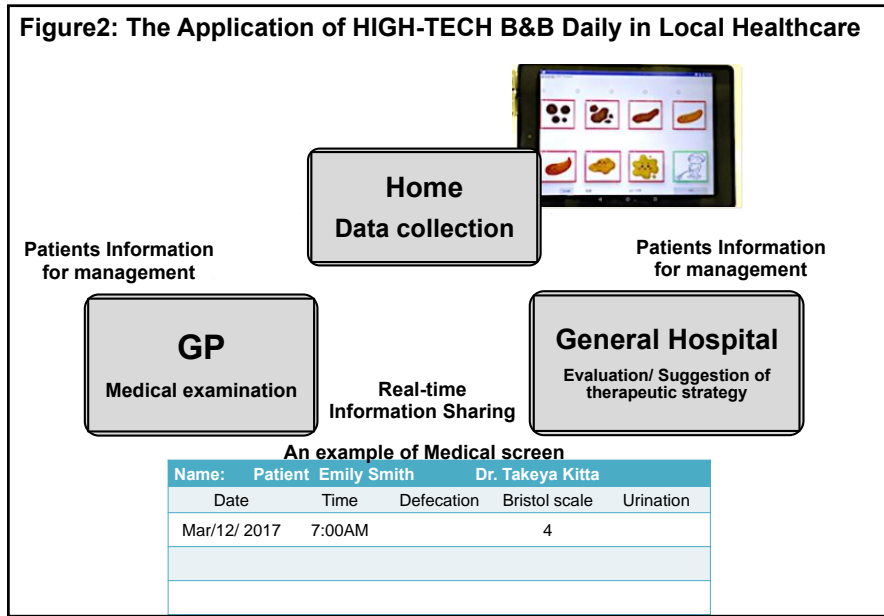
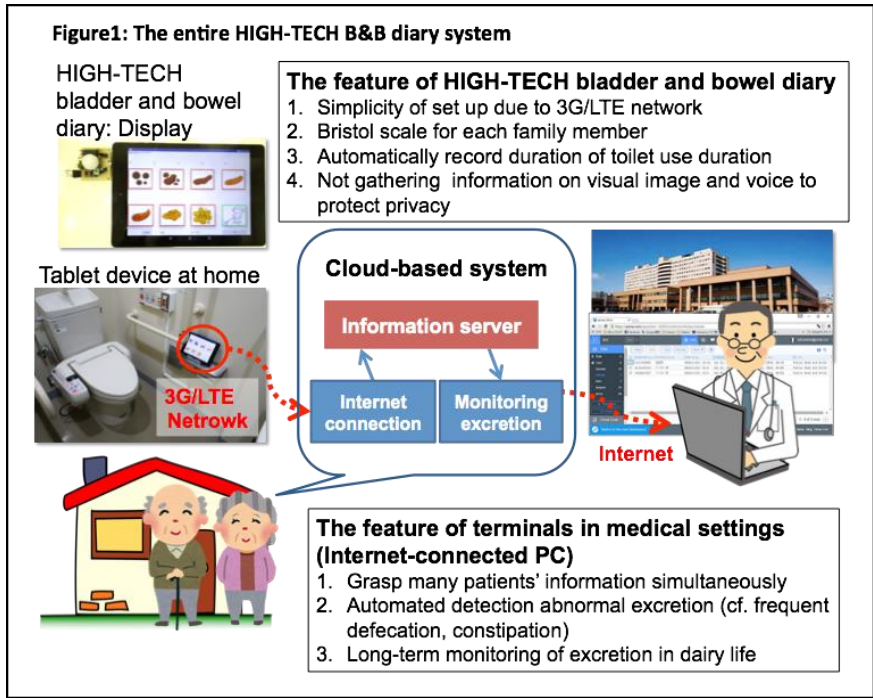
1. Selecting outcome measures for excretion in daily life
2. Developing cloud-based system in a highly secure fashion
3. Installing sound recorder and human detecting sensor
4. After the alpha version of tablet device completed, two healthy adult volunteers were involved in providing feedback in preliminary evaluation in the pilot study.

Results

The basic cloud-based system and the prototype of a tablet device have launched as alpha version that was introduced in the media in 2016 (Figure1). Bristol scale can be recorded by selecting stool-form icon on tablet screen. It was confirmed that the cloud-based system could store collected data from the individual tablet device, and transfer to the server in the medical institution with Blockchain technology. The system can automatically detect frequency of urination and defecation per day and toilet use time and duration by human detecting sensor. The feasibility and accessibility of tablet device were evaluated through recruited volunteers' feedback. We clarified the 3 problems including the feasibility for elderly users (appropriate graphic-design, features and ease of use), the simplification of connecting to a power source and the modification of human detecting sensor, based on the preliminary evaluation.

Interpretation of results

This study was the first attempt to establish cloud-based monitoring system of bladder and bowel diary in urological field. The development of a prototype tablet and cloud-based system has been successful in the beginning phase. The mobile device-based system was previously reported in a spine outpatient clinic². The response rate of mobile system was higher than that of paper system despite of the same contents of the questionnaire. Also the review focusing on demonstrated that portable device can offer considerable benefits for patient care³. The health care professionals can follow patient's precise updated data through cloud-based storage and file-sharing. In this study the tablet device was composed of Bristol scale and distinction between defecating and urinating as patient-reported outcomes. The displayed each icon was selected on the touch screen. Toilet use duration was measured automatically with human detecting sensor. Although the development of utilizing hardware is needed, basic features were installed into individual device. Also we adopted Blockchain that provides assurance for safety of internet connection between patient's home and medical institution to prevent information leak. The additional data can be recorded at anytime in highly secure environment, and electronic medical record systems will be adopted with Blockchain in near future. This preliminary study was the starting point of improvement projects, which resulted in basic operating features of **HIGH-TECH B&B diary** in daily life. It will be needed to improve usability of system quality toward application of **HIGH-TECH B&B diary** to local healthcare centers (Figure2).



Concluding message

This is the first study to pilot the development of cloud-based evaluation system that is technologically advanced to observe bladder and bowel habits. The usability will be improved in future research for the trial introduction of the system into local area.

References

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3. Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. *Pharmacology & Therapeutics.* 2014. 39(5): 356-64.

Disclosures

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