SUSTAINABLE KIDNEY CARE

MO1053 DEVELOPMENT OF HOME DIALYSIS PATIENT SUPPORT SYSTEM USING CLOUD SYSTEM—I—SYSTEM DEVELOPMENT AND EVALUATION

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BACKGROUND AND AIMS: Due to COVID-19 and the aging of the Japanese population, it is becoming increasingly difficult for patients to travel to medical facilities. Although the utilization rate of communication networks and devices for the elderly is low, many people of all ages are now using the Internet. However, in Japan, there are no computer systems that directly connect medical institutions and people's homes because of the restricted connection of medical institutions to the Internet. Therefore, the utilization rate of the medical support system for home-based patients using the Internet is not high.

We have been developing a remote medical support system for home-based patients that is both safe and secure. Here, we focused on exercise support for dialysis patients at home, and developed and evaluated a dialysis patient exercise support system that can efficiently share information between patients and medical facilities regardless of where and when dialysis or exercise is performed.

METHOD: A system for sharing medical information was developed in the PHP programming language to use the Microsoft Azure cloud service. Figure 1 shows a schematic diagram of the developed system. All patient record data can be entered via drop-down menus. In addition, drainage packs and meal menus can be registered as images of up to 3 MB in size in the developed system. Pedaling exercise was added to this system. Patients used an ergometer to perform pedaling exercises, which allowed the amount of pedaling to be automatically entered into the system. A dynamo was connected to the ergometer to store electricity, which could be used to charge mobile devices and promote continuous exercise.

The developed system was evaluated by volunteers, consisting of 12 females and 4 males in their 20s, 2 males in their 30s, 1 female and 1 male in their 40s and 1 female and 2 males in their 50s. Web usability was assessed by task execution rate and the website usability scale (WUS).

Data were captured directly from the ergometer into records of the patient’s exercises.

RESULTS: The developed system allows medical professionals to view patient biometric data. The patients exercised with an ergometer, and the exercise data were automatically imported from the ergometer directly into the developed system in CSV format via e-mail. The amount of exercise could also be entered manually using the drop-down menus. These numerical data could also be displayed as a graph, thus making it possible to visually capture changes over time. In addition, as the amount of electricity obtained from exercise can be stored, it can be used to charge mobile devices.

There was no erroneous input because there was no keyboard input for data entry, and the subjects’ task completion rate was 100%. The system developed in this study can also be used by patients who are unfamiliar with personal computers. The second use of the developed system was easier than the first, and the evaluation of the patients was high. According to the WUS evaluation results in Figure 2f, the item with the greatest difference according to age group was ‘display’. The highest rated item was ‘response’. The average total evaluation for all age groups was ∼3.5, so further improvements are required for the display in the developed system.

CONCLUSION: We have added a function to encourage continuous exercise using an ergometer to our support system for home dialysis patients. The developed system not only allows home-based patient dialysis information to be input, output and displayed without errors, but also allows healthcare professionals to remotely check the data using graphs and photographs. In addition, it was possible to convert the exercise performed by the patient into electrical power that could be used to charge mobile devices, thus supporting the continuation of exercise for dialysis patients.

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DEVELOPMENT OF HOME DIALYSIS PATIENT SUPPORT SYSTEM USING CLOUD SYSTEM II—ADDITION OF EXERCISE THERAPY FUNCTION

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BACKGROUND AND AIMS: The number of patients requiring home dialysis in Japan is increasing due to COVID-19 and the aging of the population. Home haemodialysis has been performed in Japan since the 1960s. However, as of March 2019, there were 720 home haemodialysis patients in Japan, which is only 0.2% of the total number of dialysis patients. The possible causes are as follows.

The number of home haemodialysis patients has not increased markedly due to safety concerns as home haemodialysis patients perform dialysis at home, and the out-of-pocket costs are high. In addition, patients and caregivers must be able to manage themselves, and the burden on both patients and caregivers is heavy. Therefore, the Ministry of Health, Labour and Welfare (Japan) has advocated the need for home patients to share information with medical institutions to improve their quality of life, including COVID-19 measures. We have built a system to support home dialysis patients. Here, we have added an exercise therapy function to this system to encourage patients to continue exercising.

METHOD: The items recorded/displayed in the patient’s home peritoneal dialysis support system included records such as time, blood pressure, blood glucose level, urine volume, meal content, replacement start time, dialysate/plasma ratio, drainage volume, injection volume, water content and water removal and drainage. These inputs were entered via drop-down menus and displayed visually in graphs or by uploading images. The medical staff could see photographs of the affected areas and of meals entered by the patient. Patients could also share their opinions and treatment schedules with the medical staff at the medical institution. In addition, when exercising, the patients used an ergometer that allowed them to sit or lie down. The developed system incorporates records of the patient’s exercises. Data were captured directly from the ergometer into the developed system in CSV format and could also be entered manually via drop-down menus.

RESULTS: Using the developed system, we were able to enter and view patients’ vital data and display photographs showing the color and volume of the drainage pack. By viewing these photographs, the medical staff could confirm the photographs of the affected areas, the color of the packs and the contents of the patients’ meals. In addition, displaying the patient’s vital records in a graph allowed for visual evaluation over time, which was useful when giving advice to patients. Using the two-way communication function, patients were also able to share their opinions and treatment schedules with the medical staff of the medical institution. Patients can now consult with medical staff, making their homes more like part of the hospital and giving them greater peace of mind.

Figure 1 shows an example of the display of the developed system. Figure 2 shows an example of the patient’s pedaling exercise results input from the ergometer. The amount of pedal movement performed by the patient was conserved through the dynamo and used to charge mobile devices. This allows the patient to charge their mobile devices while exercising, thus encouraging them to continue exercising.

CONCLUSION: We have developed a support system for home haemodialysis patients that allows the input and display of patients’ vital records and consultation with medical staff online. We have added a function to the system to encourage home haemodialysis patients to continue exercising. By using the developed system, patients can now perform home dialysis, including continuous exercise safely and with peace of mind, and healthcare professionals can access all medical information of patients, including changes over time.

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