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Evaluating the Effectiveness of a Novel Personalized Health Education Approach for Hemodialysis Patients: A Four-Week Study Using a Widely-Used Communication App in Taiwan

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Abstract. Dialysis patients often have inadequate health literacy, affecting self-care and outcomes. This study used LINE app to provide personalized health education to Taiwanese dialysis patients and collected physiological data via wearables. While physical activity levels remained unchanged, participants' disease literacy significantly improved post-intervention. Patients' health literacy will evaluate by Health Literacy Questionnaire for Taiwanese Hemodialysis patients (HLQHD). The findings highlight technology-driven interventions' potential to enhance health literacy and disease management among dialysis patients.

Keywords. Wearable devices, personalized health education, health literacy, hemodialysis, chronic kidney disease, communication app, web crawler

1. Introduction and Methods

Chronic kidney disease patients with low health literacy face poorer outcomes and higher mortality risk [1]. Physical activity and sleep quality also significantly impact dialysis patients. This study utilizes the LINE app to deliver personalized health education to hemodialysis patients. It evaluates intervention effectiveness using HLQHD, SF-12 and Digital Effectiveness Questionnaire (DEQ) [2]. Wearables will collect data on patients' sleep and physical activity patterns.

The study recruited 34 hemodialysis patients from Min-Sheng Hospital in Taiwan using convenience sampling. During Dec. 2022 - Feb. 2023, 7 participants dropped out, leaving 27 remaining. These were divided into experimental (n=19) and control (n=8)

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groups. Both groups wore smartwatches and joined LINE account, but the control group didn't receive personalized health education.

The study developed Python web crawling programs using Selenium to retrieve data and BeautifulSoup to parse 1700 crawled articles. The articles were matched to 11 labels (e.g. "water intake", "hypertension") based on the HLQHD question stems and options. Based on each participant's pre-test results, incorrectly answered HLQHD questions were identified, and relevant articles were sent to participants 3 times weekly.

2. Results

The experimental group had a mean age of 52.68±8.05 years (see table 1), with 9 males (47.4%) and 10 females (52.6%), and mean DEQ score is 10.68±3.16. The control group had a mean age of 54.63±10 years, with an equal number of males and females (4 each, 50%), and mean DEQ score is 9.75±4.71.

Table 1. Changes before and after intervention on HLQHD, SF12

	Baseline mean(SD)	Week 12 mean(SD)	t	*p* value
HLQHD Experiment group	17.84(3.41)	19.58(2.65)	-3.154	0.005*
HLQHD Control group	19.00(4.63)	19.25(4.23)	-0.224	0.829
SF12 PCS Experiment group	41.53(8.44)	39.33(11.91)	1.220	0.238
SF12 PCS Control group	40.61(13.24)	37.31(9.83)	0.966	0.366
SF12 MCS Experiment group	51.12(9.38)	53.76(10.30)	-1.080	0.295
SF12 MCS Control group	54.48(5.49)	59.51(2.68)	-3.249	0.014*

3. Discussion

Pre-test results showed a significant gap in digital literacy scores. HLQHD scores didn't differ significantly in pre-and post-tests for digital literacy, suggesting it didn't affect the effectiveness of personalized education. The experimental group showed significant improvement in HLQHD average scores pre- to post-test, indicating personalized education enhanced disease literacy. Most participants agreed that wearing a smartwatch and receiving health information through LINE made them more attentive to their health.

4. Conclusions

Smartwatch intervention with personalized health education via LINE improved disease literacy in dialysis patients for better self-management but maintained physical activity. Future studies should refine interventions to enhance dialysis patients' quality of life.

References

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