Social Media-Delivered Patient Education in Enhancing Type 2 Diabetics Self-Management and Attitudes During the COVID-19 Pandemic: a Randomized Controlled Trial in Taiwan

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Study background

The development of effective diabetes education program in patients' self-management had been a challenge for healthcare professionals. The complicated pathology in diabetes required management not only on pharmacotherapy, but also patients' engagement in daily self-care. Previous studies demonstrated that patients with better disease-related knowledge, attitudes, practice and self-efficacy was associated with better glycemic control [1]. However, it was extremely difficult for patient to maintain the healthy life-style and self-management. The limited time and the health-care manpower in clinical settings became the main barrier to deliver proper diabetes education. The worldwide increasing prevalence rate of diabetes reflected the unmet needs in health education which called for an innovative and effective educational program.

The contents of diabetic education were very complicated as demonstrated by Diabetes Self-Management Education and Support (DSMES) and the American Association of Diabetes Educators 7 self-care behaviors (AADE7™). To cover all aspects required in day-to-day living with diabetes, the education was recommended to include healthy eating, regular physical activity, self-monitoring of blood glucose (SMBG), compliance with medications, problem-solving skills, healthy coping skills, and other risk-reduction behaviors [2]. It was theoretically proven to effectively enhance health outcomes [3-7], but it might not be efficient in the busy clinical settings. Previous study had reported the time needed for teaching diabetes self-care was around 4 hours per patient, which was not easy to achieve in clinical practice [8]. To addressed the pressure on face-to-face education burden, "remote" might be a potential key solution, which could be cooperated with the advancing technology.

Mobile health technology (mHealth) were increasingly being integrated into

health care to meet the demands of diabetic care. With the widespread adoption of technology services nowadays, application of mobile app and wireless sensors, including the text, multimedia messaging and patients' SMBG, was proven to be effective in enhancing health outcome, such as medication adherence, HbA1C and self-managements [9-13]. However, there had been no previous study developed diabetes educational program based on the social media with two-way communication.

Objectives

This study developed an educational program, Taipei Medical University-Line Oriented Video Education (TMU-LOVE), based on the AADE7™. The social media employed in the study was LINE (©LINE Corporation limited, Japan). It was one of the most popular and user friendly social media platform in Taiwan, with high acceptance up to 91.5% among the population above 50 [14]. The study aims were: (1) to evaluate the effectiveness of TMU-LOVE on A1C, knowledge, attitudes and self-care activities by observing the changes before and after intervention; (2) to study the impact of TMU-LOVE on change of knowledge for diabetes patient with high or low levels of health literacy; (3) to explore the association between diabetes patients' attitudes and self-care activities.

Design and methods

This randomized controlled trial (RCT) was carried out from July 2020 to Jan 2021. The study was conducted in the Endocrinology and Metabolism Clinic in Wan-Fang Hospital. Participants were randomly divided into either control or intervention

groups. The control group received usual care while the intervention group received usual care and TMU-LOVE health education. Data were collected at baseline and 12 weeks after enrollment. The study was approved by the Taipei Medical University Jointed Institutional Review Boards (TMU-JIRB No.: N201905088).

Inclusion Criteria

The patient met the following criteria were included if they

(1) Type 2 DM

(2) Age 20 or older

(3) Had at least 1 HbA1C data in the past 6 months

(4) Possessed a smart-cellphone

(5) HbA1C $\geq 6\%$

Exclusion Criteria

The patients were excluded if they had:

(1) Gestational diabetes

(2) Cognitive impairment

(3) No medication treatment but dietary control alone

Control Group

Patients in the control group received usual health care, including outpatient services with physicians, nurses and pharmacists. The consultation by certified diabetes educators (CDE) was referred by physicians as needed.

Intervention Group

In addition to usual health care, patients in the intervention group were asked to join

the TMU-LOVE education platform.

Sample Size Calculation

The sample size of this study was estimated using G-power (version 3.1, Heinrich-Heine-Universität Düsseldorf, Germany). Assuming a power of 80% with a two-sided alpha level for detecting the difference between the intervention group and the control group, at least 64 patients were needed for each group. Considering a 20% dropout rate, the study was designed to have at least 80 patients for each group, 160 patients in total.

Randomization

Patients were randomized in a 1:1 ratio according to the random allocation sequence generated prior to the study. Patients with odd numbers were allocated to the control group while even numbers were allocated to the intervention group. The trial was non-blinded because of its feasibility.

Program description

With advantages of social-media integration, TMU-LOVE was conducted as a platform using LINE. It allowed for a one-on-one chat room, graphic messages, and the ability to steer customers to certain websites [15]. The study created a graphic menu which was composed of six parts, including understanding diabetes, daily care, nutrition care, diabetes drugs, quizzes, and questions and answers (Q&A). Patients could click on the menu for corresponding information. The messaging feature of TMU-LOVE also allowed researchers to send educational videos and communicate with patients by text message, or voice or video call. Patients could ask questions, and the research team would response with a suitable explanation via TMU-LOVE.

The content of TMU-LOVE included 51 diabetes educational videos according

to the seven key points in AADE7™ [2]. The videos were produced by undergraduate students in the School of Pharmacy, Taipei Medical University (TMU) and then verified by two pharmacists. Each video lasted 2~3 minutes, and videos were divided into five categories: 10 on understanding diabetes, 10 on daily care, six on nutrition care, 21 on diabetes drugs and four on diabetes knowledge-related quizzes. There were 21 diabetes drug videos based on the formulary at Wan Fang Hospital, including metformin, acarbose, dipeptidyl peptidase-IV (DPP-IV) inhibitors, meglitinide, sulfonylurea, thiazolidinedione, sodium-glucose cotransporter-2 (SGLT2) inhibitors, and insulin. All of the videos are listed in Multimedia appendices 1 and are also available at the website of the TMU School of Pharmacy [16].

The program was designed for a 12 week duration, with two or three videos sent every week and a care message sent every 2 weeks to patients in the intervention group. All patients received the same videos except those for medications. Videos regarding a basic understanding of diabetes were arranged firstly in weeks 1~4. Those for daily care were begun from week 5, with six nutrition care videos scheduled in 6 different weeks. Each patient received the videos for their individual medications in weeks 4, 6, 7, 11, and 12. There were four quizzes scheduled in weeks 3, 6, 9, and 12. Patients could also access to all videos through TMU-LOVE whenever they wanted.

Data collection

Questionnaire assessments in this study included A1C, patients' knowledge about diabetes, self-care activities, attitudes towards diabetes and health literacy. All data would be assessed at baseline and 12 weeks after enrollment except for health literacy. Questionnaire utilized in this study composed of 5 parts, including personal information, Simplified True / False version of Diabetes Knowledge Scale (SDKS) [18], Summary of Diabetes Self Care Activities (SDSCA) [20], Diabetes Care Profile-

Attitudes Toward Diabetes Scales (DCP-ATDS) [18] and Newest Vital Sign (NVS) [23].

Patients' knowledge about diabetes was measured by True / False version of SDKS. It contained 24 items and was validated in previous studies [17,18]. The measurement of patients' self-care activity was done by using SDSCA, which consisted of 10 items. It asked patients how many days per week did they had performed the right behavior regarding to medication adherence, diet, exercise, self-monitoring blood glucose and foot care. Its validity was proven in previous studies [19, 20]. Patients' attitude towards diabetes was assessed by questionnaire DCP-ATDS, which was previously validated and translated [18, 21]. It contained 17 items which could be divided into positive attitude, negative attitude, self-care ability, self-care adherence and importance of care. Each item was five-point Likert scale as graded for strongly agree, agree, neutral, disagree and strongly disagree. For assessment of health literacy, we used NVS, which was developed and translated in previous studies [22, 23]. It consisted of 6 questions designed based on an ice-cream nutrition label to evaluate both the reading and numeracy level of patients.

Statistical analysis

Statistical analyses were conducted using SPSS (SPSS, Released 2009. PASW Statistics for Windows, ver. 28.0. Chicago, IL, USA). The study was performed by intention-to-treat analysis. Multiple imputation was employed to manage the missing values. All tests were two-tailed, with a significance level of 0.05. Differences in baseline characteristics were examined using descriptive analysis. The Kolmogorov-Smirnov (KM) test was used to verify whether the variables had normal distributions. According to the results of KM test, a Wilcoxon signed rank test or paired t-tests were

used to examine the differences in the pretest and post-test scores within a group, while a Mann-Whitney test or unpaired t-tests were performed to compare the differences between groups. An ordinal logistic regression model was applied to evaluate the association of health literacy with knowledge, attitudes, and self-care activities.

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