ORIGINAL RESEARCH

Nurses' self-efficacy and knowledge: A pre- and post-study on reeducation for patient self-management of Type 2 diabetes mellitus

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ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is a chronic health condition with the potential for poor health outcomes that can be limited by good patient education and self-management approaches. Nurse-led diabetes self-management education (DSME) can reduce hospitalizations, support optimal blood glucose levels, and lower hemoglobin A1C. The goal of this study was to establish and maintain expertise for long term care (LTC) facility nurses in DSME. The project's purpose was to determine whether DSME increases LTC nurse knowledge about T2DM management, and whether it increases self-efficacy of LTC nurses to deliver DSME discharge training.

Methods: This project utilized a quasi-experimental prospective comparative pre and posttest design to examine the effect of DSME training for licensed practical and registered nurses practicing in Chicagoland LTC facilities. Knowledge was measured utilizing a pre-and-posttest survey before and after the educational intervention and analyzed with the Wilcoxen signed-rank test. The online survey included a questionnaire to assess nurses' knowledge about T2DM and DSME and self-efficacy for delivering DSME. Descriptive statistics analyzed demographic data and questionnaire responses. Data analysis was performed IBM's Statistical Package for the Social Sciences.

Results: Ten participants completed the survey. Post-test scores increased following the education session with a p-value (.03689) for the variable "knowledge in treating low blood sugar," suggesting the DSME educational training increased LTC nurse knowledge. The average-pre-post-confidence level scores were significant (p = .01198), indicating that education on T2DM and DSME increases nurse knowledge about T2DM management and increases their self-efficacy for delivering T2DM education.

Conclusions: This study demonstrated a link between T2DM management knowledge and DSME education programs for LTC nurses. The study's findings emphasize the need for ongoing education to increase nurse knowledge, self-efficacy and confidence for providing T2DMcare to improve patient outcomes.

Key Words: Type 2 diabetes mellitus, Self-management, DSME, Long-term care, Nursing home management, Nurse, Nursing

1. INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a chronic health condition that has the potential for serious adverse health outcomes. Co-morbidities may be prevented with vigilant self-management of T2DM. With guidance from nurse education intervention, complications such as cardiovascular disease, kidney failure, lower-limb amputations, and adult blindness can be prevented or well-controlled.[1] Nurses need to keep

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current with T2DM treatment standards because the prevalence of T2DM is rising rapidly with an increasingly older, overweight, and obese population.[2] T2DM is more common in older adults, with a high prevalence in long-term care (LTC) facilities, and it is linked to a significant disease burden and higher medical costs.[3]

Nursing care goals for patients include efficient and effective management of T2DM and a good quality of life staying out of the hospital. The condition requires many self-management decisions,[4] including basic skills such as meal preparation, and more complex skills such as blood glucose testing and adjusting insulin doses.[4] Nurses are responsible for comprehensive education for patients and families about T2DM management. Nurses have reported that a lack of adequate knowledge to provide T2DM care was a significant issue which was negatively impacting patients' experiences with T2DM.[5] According to Kaya and Karaca,[6] this gap in practice indicated the need for practical and theoretical training programs, such as DSME to encourage nurses to provide quality T2DM care. The DSME provided as the combined effort of the interdisciplinary healthcare professionals, such as by doctors, nurses, and dietitians. The DSME has not only been shown as the cost-effective management program, but also aims at reducing hospital admission/readmissions.[4]

To ensure that nurses are up to date and knowledgeable about current T2DM management, the Diabetes Mellitus self-management education (DSME) was implemented to provide an improved foundation for nurses to effectively teach persons with T2DM how to navigate their care and best manage their condition. The DSME is the ongoing process of facilitating knowledge, skills, and ability for T2DM self-care.[7] People with T2DM who receive nurse led DSME have demonstrated hemoglobin A1C reductions of at least 1%.[7] The ideal T2DM education includes a multi-disciplinary healthcare team focused on self-management. Beyond managing the disease, the team includes support for implementing essential coping and behavioral skills.[4] Social work, dietitians, endocrinologists, psychologists and pharmacists may all participate in teaching and guiding the patient and family. It is crucial that all healthcare providers are well educated and current so that they can promote DSME within their care setting to promote patient mastery of care and compliance. Clinical results, health condition, and quality of life are reportedly all improved when patients actively collaborate with the medical staff.[4] A DSME methodology improves patients with T2DM, healthcare professionals, and other patient outcomes in addition to medication adherence.

T2DM is a serious healthcare concern and healthcare providers' knowledge of the condition must be enhanced[5] to improve direct care and teach patients and families. Therefore, the knowledge gap among the nurses must be addressed. Nurses should have the adequate knowledge required to provide Type 2 Diabetes Mellitus education and DSME management activities. A nurse's ability to deliver high-quality DSME and Type 2 Diabetes Mellitus care reduces the likelihood of negative consequences.[5] Improved nurse knowledge about Type 2 Diabetes Mellitus and DSME leads to reduced Type 2 Diabetes Mellitus associated complications and poor Type 2 Diabetes Mellitus management.[8]

Beyond knowledge, nurses' self-efficacy is important in providing education for patients. The Bandura self-efficacy theory developed by the psychologist Albert Bandura has defined self-efficacy as people's beliefs in their capabilities and knowledge to exercise a plan of action in prospective situations. The people's beliefs in their efficacy are developed by four main sources of influence which include; mastery experiences, vicarious experiences, social persuasion, and emotional states. The theory is applied to the study based on the principle that nurses with a high self-efficacy level can provide more efficient and effective Type 2 Diabetes Mellitus education to LTC discharging diabetic patients. In the DSME project, self-efficacy was assessed in terms of the nurse's self confidence to perform efficient and effective professional Type 2 Diabetes Mellitus education and DSME teaching to patients with Type 2 Diabetes Mellitus at discharge from a LTC facility.

The DSME intervention learning can facilitate optimum self-care for patients, with nurses participating in a multidisciplinary approach for the best care for patients. The proposed purpose of this project is to evaluate DSME use for LTC facility nurses who deliver discharge teaching to patients with Type 2 Diabetes Mellitus.

The goal of this study was to establish and maintain expertise for long term care (LTC) facility nurses in DSME. The project's purpose was to determine whether DSME increases LTC nurse knowledge about T2DM management, and whether it increases self-efficacy of LTC nurses to deliver DSME discharge training.

2. Materials and methods

2.1 Sample and setting

Participant nurses were recruited from a LTC health facility in the Chicago area that provides post-hospital rehabilitation and skilled nursing care. Participants were contacted directly by the research team and recruited with an email and informative letter describing the purpose and aims of the study, participant role in the study, plus a survey link for participation. Participants were informed about the anticipated time

for each part of the study: pretest (15-20 minutes), video-based education illustration (15-20 minutes), and the posttest (15-20 minutes). Inclusion criteria were licensed LTC nurses (licensed practical nurses or registered nurses) practicing in the state of Illinois who provide discharge teaching to patients with T2DM, and who can read and comprehend the English language (the educational illustrational video and pre-test post-test will be in English. Exclusion criteria were nurses not fluent in English language. Ten nurses from the LTC facility were included in the study.

2.2 Methodology

The study used A quasi-experimental prospective comparative pre and posttest design with an educational intervention (video based) derived from the literature and validated by a team of nurse practitioners. To evaluate the effectiveness of the video-based educational illustration, a test of thirty-five questions was administered both before and after the T2DM and DSME training to the LTC nurses. The survey consisted of the five demographic questions, followed by a questionnaire focusing on the nurse's T2DM and DSME knowledge and self-efficacy for managing patients with T2DM. The survey methodology was consistent with the clinical question and allowed flexibility for the content questionnaire to aid with quantifying the data for statistical analysis by utilizing a five-item likert scale.

2.3 Statistical analysis

Statistical analyses was used to determine the effect of the T2DM and DSME program on the LTC nurses' self-efficacy and self-knowledge about T2DM and DSME.

Knowledge about T2DM and DSME was measured utilizing a pre-and-posttest survey before and after the educational intervention and was analyzed using the Wilcoxen signed-rank test. The online survey included a questionnaire that was used to assess nurses' knowledge about diabetes and DSME, as well as their self-efficacy for delivering diabetes education. Descriptive statistics were used to analyze demographic data and questionnaire responses. Data analysis was performed IBM's Statistical Package for the Social Sciences (SPSS-IBM).

2.4 Ethics and human subject protection

Ethical approval was obtained from the university IRB prior to launch of the survey. Prior to starting the survey, consent was obtained from all the participants. All survey responses were anonymous. All data was stored and handled in secure files. There were no physical risks associated with this study. Survey information was voluntary and anonymous. The participants were able to withdraw from the study at any point.

3. Results

Ten people participated in the survey with 100% pre and post survey completion rate. Of the participants 50% identified as female and 50% identified as male. Half of the participants were Asian, 20% White or Caucasian, 20% African American, and 10% other minor ethnicity. The majority of participants (80%) held a bachelor's degree and 20% hold an associate degree. Most participants were under the age of 50 (60%), with half of participants having 5-10 years of nursing experience and 30% having fewer than five years of experience. The majority (80%) of the participants had some knowledge about diabetes and reported experience with caring for patients with diabetes, daily, and 20% reporting they have not primarily taken care of the diabetic patient daily (see Table 1).

The pre-test average rating for LTC nurse participants' knowledge in preventing high blood sugar pretest was (AVG:3.5). Similarly, for preventing low blood sugar the pre-test rating was (AVG:3.6). Comparison of pre-and-posttest average scores for knowledge in treating high blood sugar level, demonstrate an increase of 8% (AVG:3.9) in the posttest rating after the training. For the average knowledge in treating low blood sugar level, in parallel with high blood sugar, the confidence level rating improved among 18% of the participants (AVG:3.8). Of the total participants 13% of the participants reported increased knowledge in treating low blood sugar post T2DM after DSME education.

Table 1. Demographics

Variable	Participants (N = 10)
AGE	
19-29	3 (30)
30-49	3 (30)
50-59	2 (20)
70-89	2 (20)
GENDER	
Male	5 (50)
Female	5 (50)
ETHNICITY	
White	2 (20)
Black	2 (20)
Asian	5 (50)
Other	1 (10)
EDUCATION	
Associate	3 (30)
Bachelors	7 (70)
PRACTICE YEARS	
Less than 5	3 (30)
5-10	5 (50)
11-15	2 (20)

The Ranks Data, from the output of the Wilcoxon signed-Rank test revealed that LTC nurses achieved significantly more knowledge for the variable, "knowledge in treating low blood sugar) and significantly increased nurse confidence scores p value (.1198). and favorable outcome on the post-test following the education session. These results indicate that the DSME training for LTC nurses did improve their knowledge regarding management of T2DM and increases nurses' confidence, self-efficacy, and self-knowledge for T2DM management. The Wilcoxon signed-Rank Test was performed with a significance value of $p < .05$ are reported in Table 2. Data demonstrates a significant increase in "knowledge in treating low blood sugar" following the intervention. The other content areas showed increases in knowledge, however the increases were not statistically significant.

Table 2. Wilcoxon signed-rank test results comparing pretest and posttest results for Type 2 Diabetes Mellitus Self-Management Education training for LTC nurses

Variable	*p*-value (< .05)	Decision
Nurse knowledge in treating Type 2 Diabetes Mellitus	0.07186	Fail to Reject Null
Nurse current knowledge of Type 2 Diabetes Mellitus	0.1489	Fail to Reject Null
Nurse knowledge of hyperglycemia and its management	0.1489	Fail to Reject Null
LTC nurse confidence and self-efficacy in knowledge and treatment of hypoglycemia	0.03689	Reject Null
LTC nurse knowledge for preventing long-term complications	0.07186	Fail to Reject Null

Notes. **Hypotheses for variables 1-3** are H0: Type 2 Diabetes Mellitus self-management education (DSME) does not improve long-term care (LTC) nurse knowledge to treat and manage Type 2 Diabetes Mellitus and Ha: DSME improves LTC nurse knowledge to treat and manage Type 2 Diabetes Mellitus. **Hypotheses for variable 4** are H0: DSME does increase LTC nurse confidence, self-efficacy, and self-knowledge for Type 2 Diabetes Mellitus management and treatment. Ha: The Type 2 Diabetes Mellitus self-management education **increases** nurse confidence, self-efficacy, and self-knowledge for Type 2 Diabetes Mellitus management and treatment. For the 5th variable (Pre VS Post) the DSME improved LTC knowledge to manage Type 2 Diabetes Mellitus.

4. Discussion

The aim of this study was to implement evidence-based T2DM and DSME education to LTC nurses and to raise their self-knowledge and self-efficacy in these areas. The objectives were achieved and there was some improvement of knowledge of T2DM.

The American Diabetes Association (ADA) Standards of Medical Care in T2DM which is acknowledged as a marker of high-quality T2DM care, presented proof in favor of the staff training. Black & Duval (2019) conducted a focused review study to analyze the effect of nurse' training on the patient outcome. Their findings revealed that structured discharge planning for diabetic patients, as recommended by the American Diabetes Association enhances the transition of care for diabetic patients.[9] Furthermore, it emphasized the significance of team-based patient-centered care in achieving excellent patient outcomes.[9]

Several studies have evaluated the effectiveness of T2DM self-management education program and improving nurses' knowledge and skills in managing T2DM. However, these studies have reported mixed results, with some showing significant improvement while others showing no significant changes. The result of this study showed slight significant improvement in nurses' confidence and so vacancy in managing T2DM after the re-education program. It was safe to assume that nurses' T2DM and DSME re-education could enhance nurses' knowledge, skills, and efficacy and attitude towards T2DM management.

This study highlights the importance of continuous education for healthcare professionals to improve patient outcomes. T2DM is a complex disease that requires multidisciplinary care, including nursing care. therefore, investing in nurse education can lead to better patient outcomes and improve quality of life for individuals living with T2DM. Furthermore, this study provides valuable insight into how regularly re-education can positively impact nurses' confidence levels managing patients with T2DM. Other factors such as access to resources and support from healthcare team also play a crucial role in managing high blood sugar and diabetic patients.

Limitations

Several limitations were encountered in this study. These include a small sample size, lack of control groups, and short follow up periods. Therefore, we cautiously draw conclusions about the effectiveness of T2DM self-management education program and improving nurses' knowledge to treat T2DM. More rigorous studies with larger sample sizes and longer follow-up periods are needed to provide conclusive evidence on the effectiveness of diverse self-management education program in improving nurses' knowledge and skills in managing T2DM. This model sample size limits the generalizability of the findings and makes it challenging to draw

conclusions about the effectiveness. The experiment was further restricted by the limited sample size of only ten participants and the patient demographics.

While there are certainly limitations associated with small sample size, this study provides valuable insight. Keeping DSME in the nursing practice sphere, especially LTC is critical. Future studies should aim for larger sample sizes to increase their statistical power and improve their ability to detect meaningful differences between the variables and hence the accuracy of the scientific research.

5. Conclusion

The proposal objective for this study was to develop and facilitate a DSME education program for LTC nurses to reeducate and increase their knowledge regarding T2DM and DSME. Hence, improving their confidence and knowledge to deliver DSME discharge teaching to their patients with T2DM. The study did yield favorable outcomes supporting slight increase in nurses' knowledge and nurses' confidence in treating and managing T2DM. In conclusion, a valid T2DM self-management education program for LTC nurses is a promising intervention for improving nurses and knowledge of treating high blood glucose. More rigorous studies with larger sample size and control groups are needed before drawing any definitive conclusions about its effectiveness.

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Authors contributions

SALINA DESAI is a DNP student who designed the research study and collected data. Drs. Byrd and Siarkowski Amer reviewed the data and provided extensive editing to produce the final manuscript. All authors read and approved the final manuscript.

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Conflicts of Interest Disclosure

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Obtained.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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