Journal of Posthumanism
2024
Volume: 4, No: 1, pp. 273–281
ISSN: 2634-3576 (Print) | ISSN 2634-3584 (Online)
posthumanism.co.uk

DOI: https://doi.org/10.63332/joph.v4i1.3529

The Impact of Nutritional Education on Diabetes Outcomes in Inpatient Settings

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Abstract

Diabetes Mellitus (DM) is a chronic metabolic disease which can lead to various complications such as cardiovascular disease, nephropathy, and neuropathy. It is expected to affect 592 million by 2035. Nutritional education and therapy have gained importance in recent years besides antidiabetic drugs. Individuals with diabetes should be referred to a registered dietician to receive diabetes nutrition education once the diagnosis is confirmed. Diabetic patients experience higher hospitalization rates for both diabetes-related and unrelated conditions, as well as increased 30-day readmission rates compared to those without diabetes. Hospital stays offer a valuable opportunity not only for accurate diagnosis and treatment but also for delivering self-management education to diabetic patients. However, evidence evaluating the role of nutritional education in inpatient diabetes patients is rare. The aim of this review is to explore current evidence focusing on the impact of nutritional education on diabetes outcomes in inpatient settings. Studies showed that nutritional education significantly reduces fasting blood sugar levels, glycated hemoglobin HbA1c, BMI, and the risk of microvascular complications and cardiovascular disease. Different models for providing inpatient diabetes education have been introduced, each with different frameworks and effects. These models can be classified into diabetes non-specialty care education models, diabetes-specialty diabetes care models and technology-enabled education models. Interdisciplinary diabetes care model and the Chronic Illness Management Program are examples of inpatient diabetes education models that included nutritional education; however, these models showed debatable results. Most existing research either focuses on outpatient nutritional education or on general inpatient diabetes education without addressing the distinct role of nutrition. Further research is needed to explore and validate the effectiveness of inpatient diabetes nutritional education.

Keywords: *Nutritional Education, Diabetes, Inpatient, Diabetes Education, Diabetes Nutritional Education.*

Introduction

Diabetes Mellitus (DM) is a chronic metabolic disease which can lead to various complications such as hypertension, arteriosclerosis, cardiovascular disease, nephropathy, neuropathy and diabetic retinopathy (1). It is a prevalent disease, and its incidence is increasing globally. According to the International Diabetes Federation, diabetes mellitus is expected to affect 592 million by 2035 (2). DM can be managed by multiple options including antidiabetic and insulin therapy, nutritional intervention, exercise, and psychological intervention (1).

Besides the importance of antidiabetics and insulin therapy, nutritional therapy along with

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nutritional education have also gained importance. Nutritional education is crucial and involves education, counseling, and diet management (3, 4). The National Institute for Health and Care Excellence recommended that nutritional education for diabetes patients should be an essential component of diabetes care (5). Individuals with diabetes should be referred to a registered dietician to receive diabetes nutrition education once the diagnosis is confirmed (6). Nutritional education interventions should be personalized and delivered by healthcare professionals who possess specialized knowledge and skills in nutrition (5, 7). Multiple studies evaluated the effects of nutritional education on diabetes outcomes such as glycated hemoglobin (HbA1c), body mass index (BMI), blood pressure, and postprandial blood glucose. Studies showed that nutritional education significantly reduces fasting blood sugar levels, glycated hemoglobin HbA1c, BMI, and the risk of microvascular complications and cardiovascular disease (8, 9).

Diabetic patients experience higher hospitalization rates for both diabetes-related and unrelated conditions, as well as increased 30-day readmission rates compared to those without diabetes (10). These readmissions are often partly due to gaps in diabetes-related knowledge, nutritional understanding, and essential self-care skills, such as correctly taking prescribed medications (11). As such, hospital stays offer a valuable opportunity not only for accurate diagnosis and treatment but also for delivering self-management education to diabetic patients. Although hospitals have traditionally been viewed as less-than-ideal settings for education, an emerging and diverse body of evidence indicates that inpatient diabetes education—alongside improved communication of discharge instructions and active patient involvement in medication reconciliation—may help lower early readmission rates and lead to better health outcomes (12-14). However, evidence evaluating the role of nutritional education in inpatient diabetes patients is rare. The aim of this review is to explore current evidence focusing on the impact of nutritional education on diabetes outcomes in inpatient settings.

Methods

A comprehensive literature search was conducted in Medline (via PubMed), Scopus, and Web of Science databases up to Jan 5, 2024. Medical Subject Headings (MeSH) and relevant free-text keywords were used to identify synonyms. Boolean operators (AND', OR') were applied to combine search terms in alignment with guidance from the Cochrane Handbook for Systematic Reviews of Interventions. Key search terms included: "Nutritional Education" OR "Diabetes Nutritional Education" OR "Diabetes Education" OR "Dietary Education" AND "Inpatient" OR "Inpatients" OR "Hospitalized Patients" OR "Inpatient Settings" AND "Diabetes Mellitus" OR "Diabetes" OR "Type 1 Diabetes" OR "Type 2 Diabetes" Summaries and duplicates of the found studies were exported and removed by EndNoteX8. Any study that discusses the impact of nutritional education on diabetes outcomes in inpatient settings and published in peer-reviewed journals was included. All languages are included. Full-text articles, case series, and abstracts with the related topics are included. Case reports, comments, animal studies and letters were excluded.

Discussion

Diabetes Nutrition Education

Nutritional education is of pivotal importance for diabetes patients; it includes education, counseling, and diet management (3). It can be provided in different forms such as group, individualized, self-help group, and web-based education. Both general and specific dietary information can be provided across different durations of educational interventions. In recent years, multiple nutritional intervention methods have been introduced including dietary carbohydrate restriction, web education intervention, nutrition therapy, and remote therapy intervention (15-18).

Multiple studies evaluated the effects of nutritional education on diabetes outcomes such as glycated hemoglobin (HbA1c), body mass index (BMI), blood pressure, and postprandial blood glucose. Studies showed that nutritional education significantly reduces fasting blood sugar levels, glycated hemoglobin HbA1c, BMI, and the risk of microvascular complications and cardiovascular disease (8, 9). A recent systematic review and meta-analysis evaluated the effect of various ways and different content of nutritional education on HbA1c (4). HbA1c is a significant indicator of glycemic control as it is strongly correlated with average blood sugar levels in diabetes patients. It also can be an important indicator for the reduced risk of complications (19, 20). Therefore, HbA1C is an appropriate indicator to evaluate the clinical effects of nutritional education.

Thirty-six studies were included in this systematic review and meta-analysis and results showed that HbA1c levels were lower in the nutritional education interventions group compared with the control group (4). This result indicates the effectiveness of nutritional education interventions and exercise in glycemic control as emphasized in further studies (18, 21). Furthermore, studies have shown that repetitive and long-term nutritional education interventions that involve follow-up management are more effective than short-term interventions (21). As HbA1c reflects average blood glucose levels over about three months, nutritional education that lasts at least four months is required. Continuous blood glucose regulation is important especially for individuals with diabetes to prevent complications. Maintaining HbA1c levels below 6.5% over a six-year period has demonstrated to decrease the risk of complications, including microvascular issues (22). Thus, nutritional education interventions lasting four months or more, along with continuous follow-up, are necessary.

Analyses of both face-to-face and remote (web- and mobile-based) educational interventions have shown that each approach can be effective (4). Notably, individual face-to-face education demonstrated low heterogeneity across studies and yielded large effect sizes. Experimental studies reported reductions in HbA1c levels ranging from 1.0% to 2.0% in patients with type 1 and type 2 diabetes following individualized nutrition education (23, 24). Additionally, systematic reviews have confirmed that web-based education interventions also result in decreased HbA1c levels (16). These findings suggest that individualized education is particularly effective and should be recommended for individuals with diabetes.

Inpatients Diabetes Education

The American Diabetes Association (ADA) recommends that all diabetes patients admitted to the hospital should be assessed for diabetes self-management skills and need for support and that they should receive diabetes self-management education and support when needed (25). Diabetes

organizations have declared various recommendations for the content of diabetes education in the hospital (25-27). These recommendations for inpatient education mainly focus on "survival skills". Survival skills should prepare patients for discharge and equip them to safely manage their diabetes at home until they can receive more comprehensive guidance in the outpatient setting (11).

Recommendations for survival skills self-management education include the following: understanding of diabetes as a disease, acknowledging individual glycemic goals, ability to monitor blood glucose levels at home, identification of symptoms, signs and management of hypo- and hyperglycemia, nutritional education for optimizing glycemic targets, acknowledge of timing and administration method of prescribed diabetes medications, sick day rules, and when to call a health care provider or go to the Emergency Room or Urgent Care (11). Furthermore, inpatient diabetes education models should also involve a discharge plan that supports continuity of care by connecting patients with outpatient diabetes education and/or providers, recognizing that the transition from hospital to home is particularly difficult for this population and linked to a high risk of adverse outcomes (11).

Additionally, the Joint Commission updated its certification requirements for inpatient diabetes care, mandating that healthcare providers should receive specialized education and training for managing hospitalized patients. It also requires providing inpatient diabetes education focused on essential survival skills for the newly diagnosed patients or those with knowledge gaps (28). Furthermore, the American Diabetes Association (ADA) and the American Association of Clinical Endocrinologists (AACE) indicate the importance of diabetes educators as they can play a pivotal role in providing the needs of hospitalized diabetes patients, especially during the discharge process (27).

The American Association of Diabetes Educators (AADE) also recommended involving a diabetes educator on inpatient care teams to improve patient care (29). Despite these recommendations, inpatient diabetes educators' presence is still rare. In 2017, the AADE performed a national survey and found that only 24% of diabetes educators were working in inpatient settings (30). The rising numbers of diabetes patients and their high hospitalization rates make it challenging to reach all hospitalized diabetes patients and to evaluate and achieve their education needs. Thus, multiple hospitals recently started to implement inpatient diabetes education care delivery models to overcome these challenges.

Different models for providing inpatient diabetes education have been introduced, each with different frameworks and effects. These models can be classified into diabetes non-specialty care education models, diabetes-specialty diabetes care models and technology-enabled education models (11). Technology can also be integrated into both specialty and non-specialty care models to improve education delivery. The design and implementation of these models are often influenced by the availability—or absence—of diabetes specialists such as endocrinologists and diabetes educators, as well as by staffing resources (11).

Inpatients Diabetes Nutritional Education

An interdisciplinary diabetes care model for inpatient diabetes education, including nutritional

education, was developed at Vidant Medical Center in Greenville (31). The model had a vision statement "to deliver coordinated care to meet the needs of patients and their families, to provide the right care and education at the right time, and to position the program for long-term sustainability". It aimed to provide diabetic patients with concise and clear instructions on diabetes survival skills. Providing survival skills education during hospitalization is essential to ensure a safe transition to community resources for ongoing and enhanced diabetes self-management education (32). The model focused on teaching four diabetes survival skills: medications, glucose monitoring, hypoglycemia recognition and treatment, and post-discharge contact information. Although nutritional education is not considered a survival skill, the model developers recommended nutritional referrals for all patients with new-onset diabetes and are available to others on request (31).

The patient education team consisted of front-line staff nurses, advance practice nurses, pharmacists, registered dietitian nutritionists (RDNs), case management staff, and a patient/family advisor was convened to review and provide feedback on the model (Figure 1). The nurse's role was to assess patient's educational needs, aiming that patient verbalizes understanding of diabetes survival skills. Pharmacist role was to resolve medication safety issues to ensure patient with complex medication issues safety. Nutritionist role was to assess patient's nutritional needs and to ensure that patient verbalizes understanding of nutrition principle for diabetes (31).

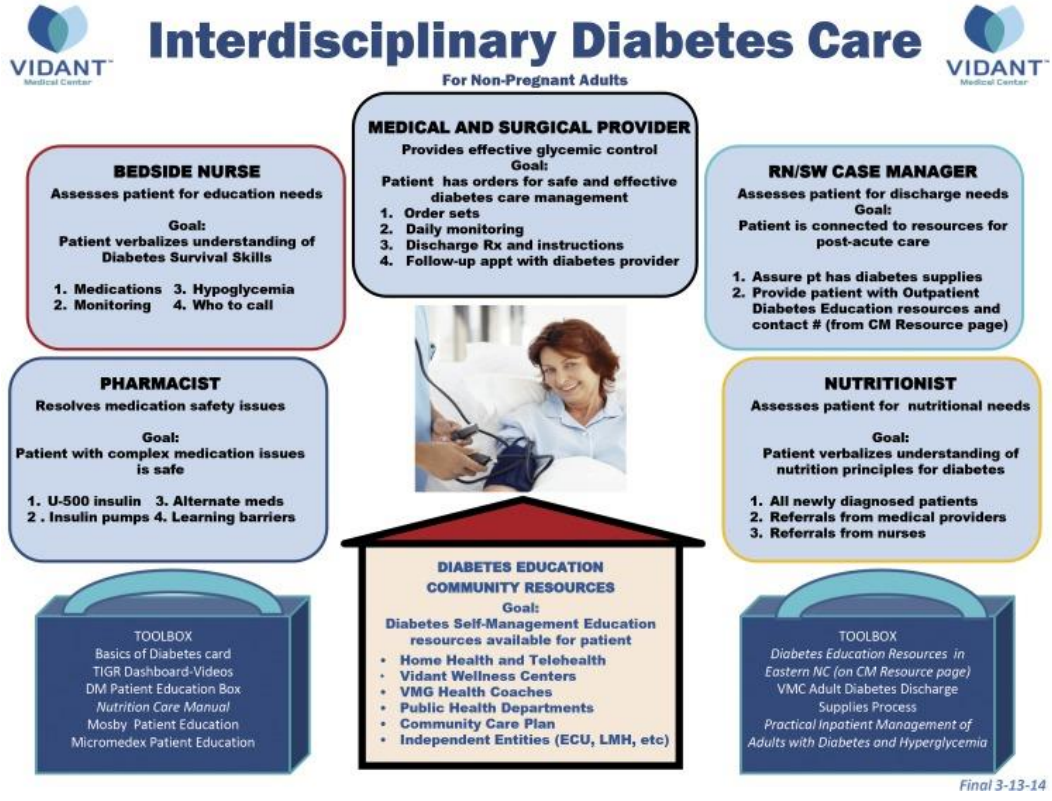

Figure 1. The Interdisciplinary Diabetes Care model (31).

Various steps were taken to operationalize the education model: RDNs were granted access to written nutrition education materials from the Academy of Nutrition and Dietetics' *Nutrition Care Manual*. This access enabled the delivery of personalized nutrition education using standardized resources. Additionally, a revised nutrition screening and consultation process was introduced to better identify patients newly diagnosed with diabetes. As the model was rolled out, RDN consultation volume increased by 2%, a change that was effectively managed within existing staffing levels. A simplified 1-page handout, "The Basics of Diabetes," that was developed and supported by visual aids and badge tags for nurses. Electronic health record (EHR), in-room video education, and supply kits were also added to streamline patient education (31). Furthermore, EHR consultations orders and algorithms were provided to pharmacists to support complex diabetes cases, and comprehensive community resource guides were provided to case managers to ensure patients' access to affordable medications and education post-discharge. Clinical staff received an inpatient diabetes management handbook and standardized insulin order sets to help them deliver consistent care and discharge planning (31).

Length of stay (LOS), 30-day readmission rates for diabetes patients, and cost-effectiveness were chosen as important metrics for outcomes associated with this interdisciplinary education model. The medians of LOS for diabetes as the primary and secondary diagnosis were similar before and after intervention, indicating that the model has no effect on mean LOS. Furthermore, the readmission rate after intervention was similar to the readmission rate before intervention, whether diabetes was the primary or secondary diagnosis. These results also indicate that the model has no significant effect on readmission rates. On the other hand, the education model resulted in substantial annual cost savings to the organization. Notably, Newton et al. reported comparable outcomes (33).

The Chronic Illness Management Program (CIMP) is another multidisciplinary model for inpatient diabetes education, including nutritional education, developed by Marchetta et al (34). They evaluated the effect of this model on physiological indicators of diabetes control, psychosocial outcome measures, and health care utilization of youth with type 1 diabetes (T1D) who showed failed diabetes management despite outpatient treatment. The model aimed to provide patients and their families with structured, comprehensive strategies including physical, medical, psychological, and nutritional factors to effectively manage their illness, improve quality of life, and achieve patient/family-centered goals of care (34).

The model integrates classroom instruction, hands-on learning, community reintegration, and psychotherapy to support patients with diabetes. Each patient received daily medical oversight, 24/7 nursing care, and support with insulin management, carbohydrate counting, and glucose monitoring. Diabetes education was provided for 60 minutes daily on weekdays by a pharmacist or nurse, along with 60 minutes of weekday nutritional counseling by a dietitian. Patients also participated in individual and group psychotherapy (up to three 30-minute sessions weekly), occupational and physical therapy (30 minutes each, five times per week), recreational therapy (60 minutes, six days per week), and child life therapy (60 minutes, three days per week). Weekly activities included community integration, case management, and team feedback meetings. Caregivers received weekly nutritional education sessions: 60 minutes each of diabetes education, nutrition counseling, and family therapy (34).

The CIMP showed significant effectiveness in improving illness management in patients with T1D by improving physiological and psychosocial outcomes. Furthermore, patients showed improved perceptions of diabetes-related health behaviors, overall knowledge of their condition, mental health symptoms, and less disease-related distress. The model creates a supportive environment where peers and staff offer daily opportunities for disease management without the conflict, frustration, or negative emotions that often arise in interactions with caregivers. Additionally, peer camaraderie helps reduce feelings of isolation commonly experienced by these young individuals (34).

Wexler et al. performed a randomized trial to evaluate the effects of inpatient diabetes management, education, and discharge transition (IDMET) program on the glycemic control and hemoglobin A1c (HbA1c) in patients with type 2 diabetes up to 1 year after hospital discharge (35). An endocrinologist and nurse practitioner certified diabetes educator (NP CDE) completed the IDMET which included three components: diabetes management by an endocrinologist by recommending medications and following the patient for the duration of the inpatient stay; diabetes education provided by NP CDE focusing on diabetes survival skills and insulin teaching, including how to test blood sugar, how to keep daily records, how to draw up and inject insulin, symptoms, signs and management of hypo- and hyperglycemia, diet education, sick day rules, and foot and skin care; diabetes transition where diabetes discharge medication instructions printed on a single page template was provided for the patients that included the regimen and suggested changes in meals and activity. Patients also received nutritional counseling and education by inpatient dietitians upon discharge (35).

Results showed inpatient diabetes management, nutritional education, and improved discharge transition planning improved glycemic control up to 12 months after hospital discharge in insulin-naive patients with uncontrolled diabetes but did not affect post-discharge glycemic control in patients treated with insulin prior to hospital admission (35).

Conclusion

Although nutritional education proved effectiveness in diabetes mellitus management, evidence evaluating its impact particularly in inpatient settings is still lacking. Furthermore, current evidence mainly focuses on nutritional education in outpatient settings or on inpatient diabetes education without addressing the distinct role of nutrition. The scarce studies available showed promising results from structured and interdisciplinary and models that include nutritional education; however, these results can't yet be generalized. Thus, future research should focus on exploring and validating the effectiveness of inpatient nutritional diabetes in improving clinical outcomes and long-term disease management.

References

Kim MK, Ko SH, Kim BY, Kang ES, Noh J, Kim SK, et al. 2019 Clinical Practice Guidelines for Type 2 Diabetes Mellitus in Korea. Diabetes & metabolism journal. 2019;43(4):398-406.

IDF Diabetes Atlas, 7th ed.: International Diabetes Federation,; [

Silva FM, Kramer CK, de Almeida JC, Steemburgo T, Gross JL, Azevedo MJ. Fiber intake and glycemic control in patients with type 2 diabetes mellitus: a systematic review with meta-analysis of randomized controlled trials. Nutrition reviews. 2013;71(12):790-801.

Kim J, Hur MH. The Effects of Dietary Education Interventions on Individuals with Type 2 Diabetes: A Systematic Review and Meta-Analysis. International journal of environmental research and public health. 2021;18(16).

National Institute for Health and Care Excellence: Guidelines. Type 2 diabetes in adults: management. London: National Institute for Health and Care Excellence (NICE)

Copyright National Institute for Health and Care Excellence, 2015.; 2015.

Gianfrancesco C, Johnson M. Exploring the provision of diabetes nutrition education by practice nurses in primary care settings. Journal of human nutrition and dietetics : the official journal of the British Dietetic Association. 2020;33(2):263-73.

Dyson PA, Kelly T, Deakin T, Duncan A, Frost G, Harrison Z, et al. Diabetes UK evidence-based nutrition guidelines for the prevention and management of diabetes. Diabetic medicine : a journal of the British Diabetic Association. 2011;28(11):1282-8.

Yang SH, Chung HK, Lee SM. Effects of Activity-Based Personalized Nutrition Education on Dietary Behaviors and Blood Parameters in Middle-Aged and Older Type 2 Diabetes Korean Outpatients. Clinical nutrition research. 2016;5(4):237-48.

Long-term effects of lifestyle intervention or metformin on diabetes development and microvascular complications over 15-year follow-up: the Diabetes Prevention Program Outcomes Study. The lancet Diabetes & endocrinology. 2015;3(11):866-75.

Economic costs of diabetes in the U.S. in 2012. Diabetes care. 2013;36(4):1033-46.

Nassar CM, Montero A, Magee MF. Inpatient Diabetes Education in the Real World: an Overview of Guidelines and Delivery Models. Current diabetes reports. 2019;19(10):103.

Magee MF, Khan NH, Desale S, Nassar CM. Diabetes to Go: Knowledge- and Competency-Based Hospital Survival Skills Diabetes Education Program Improves Postdischarge Medication Adherence. The Diabetes educator. 2014;40(3):344-50.

Healy SJ, Black D, Harris C, Lorenz A, Dungan KM. Inpatient diabetes education is associated with less frequent hospital readmission among patients with poor glycemic control. Diabetes care. 2013;36(10):2960-7.

Rubin DJ, Donnell-Jackson K, Jhingan R, Golden SH, Paranjape A. Early readmission among patients with diabetes: a qualitative assessment of contributing factors. Journal of diabetes and its complications. 2014;28(6):869-73.

Huang J, Qin S, Huang L, Tang Y, Ren H, Hu H. Efficacy and safety of Rhizoma curcumea longae with respect to improving the glucose metabolism of patients at risk for cardiovascular disease: a meta-analysis of randomised controlled trials. Journal of human nutrition and dietetics : the official journal of the British Dietetic Association. 2019;32(5):591-606.

Hou C, Carter B, Hewitt J, Francisa T, Mayor S. Do Mobile Phone Applications Improve Glycemic Control (HbA1c) in the Self-management of Diabetes? A Systematic Review, Meta-analysis, and GRADE of 14 Randomized Trials. Diabetes care. 2016;39(11):2089-95.

Snorgaard O, Poulsen GM, Andersen HK, Astrup A. Systematic review and meta-analysis of dietary carbohydrate restriction in patients with type 2 diabetes. BMJ open diabetes research & care. 2017;5(1):e000354.

Razaz JM, Rahmani J, Varkaneh HK, Thompson J, Clark C, Abdulazeem HM. The health effects of medical nutrition therapy by dietitians in patients with diabetes: A systematic review and meta-analysis: Nutrition therapy and diabetes. Primary care diabetes. 2019;13(5):399-408.

Wei N, Zheng H, Nathan DM. Empirically establishing blood glucose targets to achieve HbA1c goals. Diabetes care. 2014;37(4):1048-51.

Clarke PM, Gray AM, Briggs A, Farmer AJ, Fenn P, Stevens RJ, et al. A model to estimate the lifetime health outcomes of patients with type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS) Outcomes Model (UKPDS no. 68). Diabetologia. 2004;47(10):1747-59.

Philis-Tsimikas A, Fortmann A, Lleva-Ocana L, Walker C, Gallo LC. Peer-led diabetes education programs in high-risk Mexican Americans improve glycemic control compared with standard approaches: a Project Dulce promotora randomized trial. Diabetes care. 2011;34(9):1926-31.

Ohkubo Y, Kishikawa H, Araki E, Miyata T, Isami S, Motoyoshi S, et al. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: a randomized prospective 6-year study. Diabetes research and clinical practice. 1995;28(2):103-17.

Franz MJ, Powers MA, Leontos C, Holzmeister LA, Kulkarni K, Monk A, et al. The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. Journal of the American Dietetic Association. 2010;110(12):1852-89.

Evert AB, Boucher JL, Cypress M, Dunbar SA, Franz MJ, Mayer-Davis EJ, et al. Nutrition therapy recommendations for the management of adults with diabetes. Diabetes care. 2014;37 Suppl 1:S120-43.

15. Diabetes Care in the Hospital: Standards of Medical Care in Diabetes-2019. Diabetes care. 2019;42(Suppl 1):S173-s81.

Clement S, Braithwaite SS, Magee MF, Ahmann A, Smith EP, Schafer RG, et al. Management of diabetes and hyperglycemia in hospitals. Diabetes care. 2004;27(2):553-91.

Moghissi ES, Korytkowski MT, DiNardo M, Einhorn D, Hellman R, Hirsch IB, et al. American Association of Clinical Endocrinologists and American Diabetes Association consensus statement on inpatient glycemic control. Diabetes care. 2009;32(6):1119-31.

APPROVED: Revisions to Advanced Certification Requirements for Inpatient Diabetes Care. Joint Commission perspectives Joint Commission on Accreditation of Healthcare Organizations. 2016;36(11):8-10.

Role of the Diabetes Educator in Inpatient Diabetes Management. The Diabetes educator. 2018;44(1):57-62.

Rinker J, Dickinson JK, Litchman ML, Williams AS, Kolb LE, Cox C, et al. The 2017 Diabetes Educator and the Diabetes Self-

Management Education National Practice Survey. The Diabetes educator. 2018;44(3):260-8.
Hardee SG, Osborne KC, Njuguna N, Allis D, Brewington D, Patil SP, et al. Interdisciplinary Diabetes Care: A New Model for Inpatient Diabetes Education. Diabetes spectrum : a publication of the American Diabetes Association. 2015;28(4):276-82.
Shepperd S, Lannin NA, Clemson LM, McCluskey A, Cameron ID, Barras SL. Discharge planning from hospital to home. The Cochrane database of systematic reviews. 2013(1):Cd000313.
Newton CA, Young S. Financial implications of glycemic control: results of an inpatient diabetes management program. Endocrine practice : official journal of the American College of Endocrinology and the American Association of Clinical Endocrinologists. 2006;12 Suppl 3:43-8.
Marchetta CM, Maruyama R, Galifi L, O'Reilly C. Evaluating a multidisciplinary inpatient program for youth with type 1 diabetes mellitus. Pediatric diabetes. 2020;21(7):1232-9.
Wexler DJ, Beauharnais CC, Regan S, Nathan DM, Cagliero E, Larkin ME. Impact of inpatient diabetes management, education, and improved discharge transition on glycemic control 12 months after discharge. Diabetes research and clinical practice. 2012;98(2):249-56.