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Diabetes management unawareness: what do bedside nurses know?

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ABSTRACT

Background: Nurses are responsible for critical aspects of diabetes care.
Purpose: The purpose of this study was to examine nurses' knowledge of inpatient diabetes management principles before and after a structured diabetes education program.
Methods: In this descriptive, correlation study, 2250 registered nurses working in a quaternary health care center completed a 20 question assessment. The assessment was administered pre and post attendance at a 4 hour diabetes management course.
Findings: Nurses' knowledge of inpatient diabetes management principles was low. There was no correlation between knowledge scores and age, education, employment status, years of experience or clinical specialty.
Conclusions: In general, our findings suggest that nurses do not feel comfortable and are not adequately prepared to make patient care decisions or provide survival skill education for patients with diabetes in the hospital.

Diabetes management principles for the hospitalized patient have changed rapidly over the past several years, specifically in the area of blood glucose (BG) targets and insulin regimens (NICE-SUGAR Study Investigators, 2009). The ability to stay abreast of all of these changes presents a challenge for most bedside nurses. Inadequate knowledge of recent trends in diabetes management can affect the quality and safety of the hospitalized patient with diabetes, resulting in longer lengths of stay and increased readmission rates (American Diabetes Association, 2013). The purpose of this study is to examine nurses' comfort, familiarity, and knowledge of inpatient diabetes management principles and to explore areas where knowledge gaps persisted even after completing a 4-hour educational intervention.

1. Review of literature

Nurses and physicians confront daily challenges of safely managing BG levels in hospitalized patients (Cook et al., 2007). In one study, hyperglycemia was present in 38% of patients admitted to the hospital, 26% of whom had no history of diabetes (Umpierrez, Smiley, Zisman, & Prieto, 2007). The issue of tight glycemic control (BG levels maintained at < 110 mg/dl) in the hospitalized patient has received much attention since Van den Berghe first published her positive results of aggressive BG control in a surgical ICU in 2001 (Van den Berghe et al., 2001). However, subsequent studies have reported conflicting and contrary findings suggesting that tight glycemic control results in an increased risk of hypoglycemia (Turchin et al., 2009; Umpierrez et al., 2007). In 2004, Clement, Braithwaite, Magee, Ahmann, Smith, Schafer and Hirsch published a technical review which evaluated the evidence for glucose control and made recommendations for treatment and monitoring as well as strategies for patient education (Clement et al., 2004).

Several studies have been published related to inadequate diabetes management knowledge of nurses and physicians (Derr, Sivanandy, Bronich-Hall, & Rodriquez, 2007; Gerrard, Griffin, & Fitzpatrick, 2010; Modic et al., 2009; Rubin, Moshang, & Jabbour 2007). Knowledge deficits have been identified in relation to use of insulin (Umpierrez et al., 2007). Other studies identified knowledge deficits in the areas of insulin therapeutics, food and diabetic drug interactions, prevention of diabetes complications and current drug treatment for patients with diabetes (Gerrard et al., 2010; Griffis, Morrison, Beauvis, & Bellafountaine, 2007; Modic et al., 2009).

2. Methods

The purpose of this descriptive study was to examine nurses' comfort, familiarity, and knowledge of diabetes management principles for the hospitalized patient and to explore areas where knowledge problems persisted after completing a 4-hour educational program.

Designed by two inpatient certified diabetes educators (CDEs), the curriculum was based on a previously conducted needs assessment,

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adherence to a hypoglycemic rescue protocol and insulin error data. The four topics covered within the course were hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skills. The teaching strategies used in the class included a pre-assessment test, lectures, strategic questioning, and case studies. Following presentation of course content, a posttest was administered, allowing attendees to identify areas for further improvement.

2.1. Specific aims

The specific aims of this research were the following:

- Specific aim 1: Is there a relationship between age and level of knowledge demonstrated on the Diabetes Management Knowledge Assessment Tool (DMKAT)?
- Specific aim 2: Is there a difference in level of knowledge demonstrated on the DMKAT based on education or years of experience?
- Specific aim 3: Is there a difference in the relationship between nurses' self-rated comfort and familiarity and level of knowledge demonstrated on the DMKAT?
- Specific aim 4: Is there a gain in knowledge of inpatient diabetes management principles as demonstrated on the DMKAT after a diabetes course?

2.2. Procedure

Level of knowledge related to diabetes was assessed via pretest immediately prior to a 4-hour diabetes management course and again at the completion of the course. The course included content on hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skill.

Participation in this study was voluntary. Tests were anonymous and the Institutional Review Board (IRB) approved this study. The completed pre and posttests were collected by the researchers, and data were entered into SPSS (version 19) in preparation for data analysis.

2.3. Settings and sample

The study was conducted in a large 1200 bed health care center in the Midwest. Participants included registered nurses in all specialties except the operating room and neonatal intensive care unit. Nurses included in this study were clinically active in any role; staff nurse, nurse manager, clinical instructor, or clinical nurse specialist; regardless of work status: full time or part time were included. The course, offered 32 times over a 4-month period, resulted in a convenience sample of 2250 nurses.

2.4. Instruments

The research team developed a tool that measured nurses' comfort, familiarity, and knowledge of diabetes management principles of the hospitalized patient, titled "The Diabetes Management Knowledge Assessment Tool" (DMKAT). Content for the DMKAT was developed through a review of the literature and information from guidelines and standards of care published by the American College of Endocrinology (AACE) and the American Diabetes Association (AACE Diabetes Mellitus Clinical Practice Guidelines Task Force, 2011; Standards of Medical Care in Diabetes 2010).

Comfort was defined as a sense of confidence in performing a skill or using knowledge, and was measured by summing the score of eight items. Comfort scores could range from 0 to 80 with higher scores indicating greater levels of comfort. Construct validity was assessed using principle component analysis with varimax rotation, which confirmed a one-factor solution. Reliability of this scale was .87.

Familiarity was defined as knowledge or mastery of a skill measured by summing the next six items in the DMKAT. Familiarity scores could range from 0 to 60 with higher scores indicating greater familiarity. Principle component analysis with varimax rotation confirmed a one-factor solution in support of construct validity. Reliability of this measure was .78. Comfort and familiarity were only assessed prior to the course.

The knowledge portion of the DMKAT included 20 multiple choice questions and measured nurses' knowledge in four content areas of diabetes management presented in the class: hyperglycemia, insulin therapeutics, hypoglycemia prevention and management, and diabetes survival skill teaching. Five questions assessed major concepts presented in each content area. Each correctly answered questioned scored one point. Total scores ranged from 0 to 20 with a higher score indicating more knowledge. Content validity was assessed through consensus using a modified two-stage Delphi technique. Fifteen inpatient CDEs from local hospitals served as content experts. Content validity index for the final instrument was .95. The content experts agreed that an acceptable mean item score (for group) and whole test score (individual and group) of 80% or higher indicated acceptable knowledge of diabetes management skills for the hospitalized patient. This instrument was administered as both pretest and posttest assessment during the 4 hour class.

2.5. Data analysis

Data were analyzed using SPSS version 19.0. The sample was described by measures of central tendency (mean, median and standard deviation, frequency and percentage). Pearson's correlation was used to examine relationships for continuous level data (age) and Spearman's was used to assess nominal level data (education level and years of experience). Analysis of covariance (ANCOVA) controlling for age was used to examine baseline differences in knowledge related to education level and years of experience. Finally, a paired *t*-test was used to examine changes in knowledge. Because of the large sample to control for the likelihood of a type I error, the significance level was set at .01 rather than .05.

3. Results

3.1. Sample characteristics

The final sample consisted of 2250 registered nurses (Table 1). Nurses in this study were most often female 86.4%, Caucasian 80.9%, and worked full time 71.1%. The mean age of nurses in this sample was 36.2 ($SD = 10.9$). Years of experience was nearly equally divided between those with more than 5 years' experience (48%) and those with five or fewer years of experience (52%). All nursing specialties were represented except neonatal intensive care nurses and operating room nurses. Critical care nurses were the greatest in attendance ($n = 423$; 18.8%), followed by cardiac nurses ($n = 410$; 18.2%) other specialties including subacute and ambulatory ($n = 264$; 11.3%) and medical nurses ($n = 226$; 10.0%) (Table 2).

3.2. Results

Specific aim 1: Using Pearson's correlation, we found a negative correlation ($r = -.182$; $p < .001$) between age of the nurse and level of knowledge demonstrated on the DMKAT, with scores decreasing as age increased. Using Spearman's correlation, we found that age was correlated with education level ($r = -140$; $p < .001$) and with years of nursing experience ($r = .759$; $p < .001$). Nurses with more education and those with the most experience were older than those with less education and less experience.

Specific aim 2: Analysis of covariance (ANCOVA), controlling for age was used to determine if there were differences in level of