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A Quality Improvement Project: Improving the Clinical Practice for Assessing Hemoglobin A1C on Admission in Diabetic Ketoacidosis Patients Admitted to the Intensive Care Unit

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A Quality Improvement Project: Improving the Clinical Practice for Assessing Hemoglobin A1C on Admission in Diabetic Ketoacidosis Patients Admitted to the Intensive Care Unit

A DNP Project Submitted to the

Graduate Faculty

of Jacksonville State University

in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Nursing Practice

By

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Jacksonville, Alabama

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Abstract

Background: Diabetic ketoacidosis (DKA) is a life-threatening problem that affects people with diabetes. Early treatment and adherence to guidelines are crucial in preventing DKA. The American Diabetes Association (ADA) publishes annual guidelines for effective DKA management, and the Education Recognition Program National Benchmarks program can help maintain adherence to the published guidelines. Improving the intensive care unit (ICU) admission process enhances the quality of care to DKA patients and improves progress towards national benchmarks.

Purpose: This quality improvement project aimed to improve Hemoglobin A1C (HbA1c) evaluations in DKA patients admitted to the ICU.

Methods: The intervention of triggering HbA1c orders on patients admitted to the ICU with DKA was supported by Roy's Adaptation Model theoretical framework and the Leveraging Resources Model methodology. To implement this, a new HbA1c order was created in the electronic health record (EHR) to be triggered by providers when DKA patients are admitted to the ICU. The project compared no-HbA1c orders vs triggered HbA1c orders.

Results: The EHR prompt improved orders for HbA1c tests for patients with DKA admitted to the ICU, leading to a 2.5% increase in ADA compliance within three months.

Conclusion: Adding a prompt to the electronic health record is a cost-effective and efficient strategy for meeting national benchmarks in DKA management.

Keywords: diabetic ketoacidosis, intensive care unit, dka protocols, hemoglobin a1c

Acknowledgments

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Table of Contents

A Quality Improvement Project: Improving the Clinical Practice for Assessing Hemoglobin A1C on Admission in Diabetic Ketoacidosis Patients Admitted to the Intensive Care Unit

In the United States, 37.3 million people, or 11.3% of the population, have diabetes (Centers for Disease Control and Prevention [CDC], n.d.). Despite the availability of resources, funds, and education, diabetes prevention and awareness remain stagnant (Rampulla & Joynauth, 2020). Managing diabetes is a complex task, with a staggering cost of about $25 billion annually. Unfortunately, diabetes and its complications, including diabetic ketoacidosis (DKA), affect around 13.1% of adults, or 2,350,321 individuals, making it a pressing significant complication that requires more attention (Barski et al., 2023; Besen et al., 2023; CDC, n.d.).

Managing DKA patients in the Intensive Care Unit (ICU) can be challenging due to the complexity of adhering to evidence-based practice (EBP) recommendations. DKA management involves continuous intravenous (IV) insulin infusion, IV fluids, rigorous monitoring of vital signs, hourly blood glucose testing, frequent laboratory checkups, and Hemoglobin A1c (HbA1c) assessment (Khan et al., 2023). Moreover, patients with DKA are at risk of several treatment-related complications, including hyperglycemia, hyperkalemia, and cerebral edema (Barski et al., 2023; Besen et al., 2023; Khan et al., 2023). Following EBP is associated with better care quality and improved healthcare outcomes. Hyperglycemic episodes are often discovered incidentally upon admission and can result in severe complications if not adequately managed. DKA complications can lead to additional health problems, resulting in higher medical costs and significant challenges for healthcare providers (American Diabetes Association [ADA], 2022; Barski et al., 2023; Besen et al., 2023). Stress, lack of funds, and healthcare literacy cause stress induced hyperglycemia episodes (ElSayed et al., 2024). Furthermore, guidelines recommend evidence-based management of DKA patients in the ICU, improving facility protocols and

national diabetic benchmarks and enhancing patient clinical outcomes (ADA, 2022; Barski et al., 2023; Besen et al., 2023).

Background

DKA is a severe medical condition that patients may avoid with proper care and management of their diabetes. According to Lizzo et al., (2022), the United States Diabetes Surveillance System, disclosed hospitalization rates for DKA increased from 2009 to 2014, with the most significant increase seen in individuals under 45 yeaFrs old. DKA is the most common hyperglycemic emergency and can affect people in different regions, with higher prevalence rates among vulnerable populations (Lizzo et al., 2022; Mrosak et al., 2023). In 2017, 220,340 patients were diagnosed with primary DKA, translating to 61.6 cases per 10,000 admissions. Patients with a mean age of 38.4 years had a higher incidence rate per 10,000 admissions. The total charges among DKA inpatient care in 2017 were $6,757,748,178, with a mean cost of $30,836.19. The average length of hospital stay in DKA patients was 3.22 days. Among DKA patients in the US (Virdi et al., 2023), there were 835 deaths, which translates to a mortality rate of 0.38%. The number of DKA cases per 10,000 admissions was 107.2, with 39.1 deaths. Mortality rates among DKA patients increased with age, with indigent patients having the highest mortality rate of 84.9 deaths per 10,000 cases. Initial treatment, guideline adherence, and increased diabetes surveillance can help prevent DKA (CDC, n.d.; ElSayed et al., 2024; Lizzo et al., 2022; Mrosak et al., 2023).

Problem Identification

Patients with DKA who require admission to the ICU within the project implementation site do not receive routine screening of their HbA1c levels on admission at an acute care facility in the Southeastern United States. Furthermore, the facility's benchmark for participation in the

assessment of HbA1c during hospitalization set by the ADA Education Recognition Program National Benchmarks (ERPNB) is below the national average (ADA, 2022). According to the 2022 TeleTracking Healthcare Command Center report, in 2021, 20% of hospital admissions had DKA diagnoses (TeleTracking, 2024). The number of DKA patients readmitted within 30 days of hospital discharge at the implementation site increased from 16% in 2021 to 31% in 2022. Additionally, the data showed that the benchmark for HbA1c tests on admission in the DNP project facility from 2021-2022 was 60% on the national average of 75.3% (ADA, 2022; TeleTracking, 2024; Virdi et al., 2023).

Problem Statement and PICOT Question

EBP is necessary for appropriate healthcare decisions in specific clinical circumstances (ADA, 2022); however, healthcare facilities lack adherence due to limited awareness, protocol unfamiliarity, and disagreement with the current evidence-based content (Semenkovich et al., 2019). It is concerning that facilities have fallen behind in compliance with the clinical guidelines for DKA management (Ramphul & Joynauth, 2020). Non-adherence to EBP protocols by the facility affects clinical performance, and patient care, and leads to increased readmissions and non-compliance with national guidelines set forth by the ADA for treating DKA patients appropriately (Willmington et al., 2022). Bridging the gap in clinical practice prompted the following PICOT question: In patients with DKA admitted to the ICU, does adding a standing order for HbA1c on admission compared to current practice improve HbA1c benchmark results over eight weeks?

Review of Literature

Databases were reviewed, including Medline, Cochrane, PubMed, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL), to gather pertinent evidence-based

supporting literature and peer-reviewed articles. The following keywords proved helpful on DKA; diabetes, diabetic ketosis, ketoacidosis, quality improvement, DKA management, beyond HbA1c, benchmark and guidelines, hospital admission, and ICU management, DKA ICU patients.

The Importance of Guidelines in the Inpatient Management of DKA

Achieving optimal glycemic control is crucial for patient outcomes and requires strict adherence to the DKA guidelines. Neglecting these guidelines can lead to severe complications that can compromise patient health. Therefore, healthcare professionals must prioritize following these guidelines rigorously and consistently (Edholm et al., 2020; ElSayed et al., 2024; Kempegowda et al., 2019; Lizzo et al., 2022; Ramphul & Joynauth, 2020). Specifically, repetitive assessments of HbA1c in these patients can help clinicians better understand the effectiveness of their interventions, leading to more informed decision-making and improved patient outcomes. Given the importance of HbA1c in managing diabetes and related conditions, healthcare providers must stay in unison and up to date with the latest evidence-based guidelines and recommendations. By doing so, they can ensure that they provide the highest quality care to their patients and improve their chances of achieving better health outcomes (ADA, 2022; Khan et al., 2023; Virdi et al., 2023).

Barriers to DKA Guidelines Adherence

Inpatient glycemic control can be challenging for healthcare providers, and their practice may be influenced by personal knowledge, training, and beliefs (Zaiton et al., 2019). The stress of hospitalization for patients can also disrupt glycemic control, especially if the guidelines are not followed, adding to the complexity of patient management (Blok et al., 2022; Poldrugovac et al., 2023). EBP guidelines help clinicians incorporate knowledge and evidence-based care into

practice (Willmington et al., 2022; Zaiton et al., 2019). Compliance with evidence-based guidelines is influenced by factors such as the work environment, awareness of the guidelines, organizational priorities, and management goals (ElSayed et al., 2024). These factors can either facilitate or hinder adherence to the guidelines, and it is essential to address them to ensure optimal patient outcomes (Blok et al., 2022; Poldrugovac et al., 2023). Healthcare providers often encounter challenges when incorporating EBP findings into their patient care practices. The two most common obstacles clinicians face are a lack of knowledge and authority and a shortage of skills and abilities. Furthermore, a patient's personal beliefs, lack of accountability, and lack of healthcare literacy can hinder the implementation of evidence-based interventions in patient care (ElSayed et al., 2024; Healy et al., 2023; Zaiton et al., 2019).

National Benchmarks

According to ADA (2022), The Education Recognition Program National Benchmarks (ERPNB) is the national program that guides participants through the establishment and supports adherence to the 2022 National Standards Benchmark Recognition. Implementing national benchmarks can help a facility understand its strengths and weaknesses and optimize internal processes. Healthcare facilities can choose various approaches to benchmarking; therefore, standardized goals include increased efficiency, revenue, and customer and employee satisfaction (Barbazza et al., 2021; ElSayed et al., 2024; Poldrugovac et al., 2023; Willmington et al., 2022). The ERPNB is a performance-driven recognition that exemplifies the impact of quality, service, and patient satisfaction (ADA, 2022). Encouraging continued national benchmark participation is achieved by empowering facilities to incorporate national guidelines standards that would help the entire hospital (ADA, 2022; Barbazza et al., 2021; ElSayed et al., 2024; Poldrugovac et al., 2023; Willmington et al., 2022).

Participating in HbA1c national benchmark adherence programs has several benefits, including improved care and health status reporting, alignment with quality improvement and population health goals, and access to ADA resources and support healthcare providers must participate in national benchmarks designed to improve adherence to practice guidelines for DKA management. Furthermore, following these national benchmarks can help reduce readmission rates related to complications from diabetes (ADA, 2023, Guzman et al., 2020; Willmington et al., 2022).

Integrating national benchmarks for managing patients with DKA is a crucial feature that supports the ADA (2022) and CDC (n.d.) guidelines. These benchmarks serve as the standard of care blueprint for improving care quality while promoting better health outcomes. By integrating these benchmarks into their systems, healthcare facilities are held to a higher standard of care, ultimately benefiting patients with DKA. These benchmarks help to ensure that patients receive the appropriate care at the right time, which can help to prevent complications and improve overall health outcomes.

Theoretical Framework

Roy's Adaptation Model (RAM) serves as the theoretical framework for this project (Butts & Rich, 2022). The RAM guides the transition from confirming the problem through implementing the intervention to an HbA1c standing order in the Electronic Health Record (EHR) (McConnell, 2020; Mrosak et al., 2023). The RAM lists four ways in which people adapt: physiological, self-conceptual, role-functional, and interdependent (Hansen & Dysvik, 2022; Wang et al., 2020; Younas & Quennell, 2019).

Implementing a standing order for HbA1c through Computerized Provider Order Entry (CPOE) in the EHR involves the physiological model, which deals with the physical aspects of

the process. The success of this model depends on the collaboration with the hospital informatics team to create a linked standing HbA1c order in the EHR upon admission (ElSayed et al., 2024; Swindle et al., 2023).

The purpose of the role function is to ensure the success of each role in the Doctor of Nursing Practice (DNP) project, including project committee members, critical care specialists, stakeholders, and the informatics director (Wang et al., 2020). The RAM interdependence relates to the stakeholders' behavior and relationships as process change is refined based on HbA1c results and learning that the stakeholders are integral in supporting change and encouraging staff to accept the new process. The team changes successful elements and repeats until achieving the project aim, sharing outcomes with stakeholders (Wang et al., 2020). The RAM supports positive interdependence through competence, development, resources, and adaptation to enhance the evaluation of HbA1c for DKA patients and improves performance benchmarks (Butts & Rich, 2022; ElSayed et al., 2024; Hansen & Dysvik, 2022).

Quality Improvement Methodology

The methodology chosen for this project is the Leveraging Resources Model (LRM). This model highlights three essential phases in ensuring project success: stakeholder involvement, mutual goal establishment, and shared vision cultivation. Butts & Rich (2022) and Cheng (2021), hold considerable influence in shaping the project plan.

During the stakeholder involvement phase, it is vital to establish a shared goal agreed upon by all parties involved. It is vital to involve committee members, critical care specialists, stakeholders, and the informatics director to allow a clear and well-structured agenda to guide goals and minimize conflicts. In the mutual goals establishment phase, participants develop shared objectives, which include achieving a 100% implementation rate of HbA1c tests on

admission while increasing the participation percentage in the ADA benchmark (Willmington et al., 2022). In the shared vision cultivation phase, the LRM provides transparent guidance to stakeholders, enabling them to project a shared vision of implementing the HbA1c test, increasing compliance with the HbA1c test on admission, achieving the ADA benchmark HbA1c participation percentage, and fulfilling professional obligations to patients (Butts & Rich, 2022; Cheng, 2021). The LRM provides a structured approach that helps organizations plan, test, and implement changes to improve patient outcomes and create sustainability by using resources to strengthen the DNP project (Butts & Rich, 2022; Cheng, 2021; Hansen & Dysvik, 2022).

Project Design

The DNP project implementation site was an acute care hospital with 27 ICU beds located in the Southeastern U.S. The patient population included individuals who were age 18 or older, socioeconomically disadvantaged, underinsured, elderly, racial or ethnic minorities or those with certain medical conditions. Vulnerable patient populations often have health conditions that can worsen due to inadequate healthcare. Patients with DKA and other medical problems receive specialized care in the ICU, where they receive around-the-clock medical and nursing attention.

The DNP student proposed an ambitious project to improve compliance with the ADA benchmark in the ICU by implementing HbA1c tests for DKA diagnoses. The educational Institutional Review Board has approved the project (see Appendix A) and the DNP student completed protection of human subjects training (see Appendix B). The facility provided a letter of support for this project. The DNP project took place in three phases. During the project's first phase, the DNP student was responsible for spearheading the education of stakeholders on the practical implementation of computer systems. The primary objective was to ensure that the

stakeholders fully comply with the implementation of the new HbA1c standing order on admission and tracking with standard software, and that it can be sustained indefinitely. To achieve this, the DNP student led an instructional program that will provide stakeholders with hands-on training on the computer system. The program equipped stakeholders with the necessary skills and knowledge to operate the system efficiently. Furthermore, the DNP student presented data to stakeholders, including the new system's benefits, its functionality, and how it improved the current processes.

Throughout the education process, stakeholders had the opportunity to ask questions and provide feedback. The DNP student addressed any concerns or issues the stakeholders had to ensure they were compliant with the new system. In phase two, a meeting was held in February 2024 to establish a mutual goal for the project. The DNP student presented data from the facility's central data hub report, discussed necessary changes, and implemented a standing order for HbA1c tests using the EHR system for DKA patients. This involved creating an automated process to ensure that HbA1c tests are ordered for relevant patients.

Phase three of the project involved committee members monitoring closely for any resistance and errors that may occur. The committee conducted video conferences, analyzed data, tracked order entries for compliance in the EHR system, and evaluated the data received to assess the HbA1c standing order participation percentage. To maintain security, all pertinent paperwork and documents were double-locked and only accessible to authorized personnel with encrypted credentials. The results were then compared to the ADA benchmark percentage and displayed on the ICU employee board. The primary goal of this phase is to guarantee the project's complete implementation and ensure all relevant stakeholders adhere to the HbA1c standing order. Furthermore, the project was completed by the end of March 2024. The HbA1c

percentage will measure outcomes and track ICU employee board compliance using secondary EHR system data. This provided essential data that can be used to assess the project's success and make any necessary changes to ensure compliance with the ADA benchmark is achieved.

Project Results and Evaluation

According to the latest report, the facility's compliance rate for the ADA benchmark was 60%, lower than the national average of 75.3%. However, by examining HbA1c data from a sample of 90 DKA patients, it was discovered that the ordering percentage rate of HbA1c was 92% out of 100% between January and April 2024. This resulted in a 2.5% improvement in HbA1c orders during the project implementation, bringing the facility closer to the national average and demonstrating significant progress.

Conclusion

The QI project implemented evidence-based practices recommended by the ADA to address a gap in HbA1c order entry for DKA patients in the ICU. The LRM phases guided the project in improving compliance with the ADA benchmark among DKA patients. Nonetheless, the intervention successfully increased compliance with the ADA benchmark by 2.5% and improved HbA1c baseline order entry rates in DKA patients admitted to the ICU. The informatics team developed electronic provider pop-ups that work with Hba1c lab monitoring to serve as reminders for DKA patients admitted to the ICU. Stakeholders and the chief of critical care have committed to this change and will provide monthly updates on compliance with Hba1c orders protocol use. Risk management and critical care will continue to monitor EHR records for HbA1c usage and implementation issues to improve compliance and reduce provider error indicators. The process change could be enhanced by identifying additional unit educators and monitoring ongoing order entry for future sustainability. The participants and facility gained

valuable insights into the impact of HbA1c order entry in DKA patients while meeting ADA benchmarks, which may inspire future initiatives. The critical care team will continue reinforcing the process change recommendations while the unit nurse leader will sustain the HbA1c order entry process and reevaluate as necessary.

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Appendix A

JSU IRB Approval Letter

Institutional Review Board for the Protection of Human Subjects in Research
203 Angle Hall
700 Pelham Road North
Jacksonville, AL 36265-1602

November 7, 2023

Tiara Lawson
Jacksonville State University
Jacksonville, AL 36265

Dear Tiara:

Your protocol for the project titled "A Quality Improvement Project: Improving the Clinical Practice for Assessing Hemoglobin A1C on Admission in Diabetic Ketoacidosis Patients Admitted to the Intensive Care Unit" protocol number 11072023-03, has been approved by the JSU Institutional Review Board for the Protection of Human Subjects in Research (IRB).

If your research deviates from that listed in the protocol, please notify me immediately. One year from the date of this approval letter, please send me a progress report of your research project.

Best wishes for a successful research project.

Sincerely,

Sarah Donley
Human Protections Administrator, Institutional Review Board

Appendix B

CITI Training

CITI PROGRAM

Completion Date 21-Aug-2023
Expiration Date 21-Aug-2026
Record ID 57678026

This is to certify that:

Tiara Lawson

Not valid for renewal of certification through CME.

Has completed the following CITI Program course:

Social and Behavioral Responsible Conduct of Research
(Curriculum Group)
Social and Behavioral Responsible Conduct of Research
(Course Learner Group)
1 - RCR
(Stage)

Under requirements set by:

Jacksonville State University

CITI
Collaborative Institutional Training Initiative

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