The impact of implementation of software GlucoStabilizer on blood glucose control in the ICU

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ABSTRACT

Registered dietitians (RDs) work as part of a multidisciplinary care team involved with blood glucose control and patient care before, during, and after delivery of insulin. RDs provide essential team support to implement technological advancement and standardized care for patients receiving IV insulin infusion. This study examined if implementation of the GlucoStabilizer software program improved blood glucose control and reduced the amount of adverse events in patients receiving IV insulin infusion. The study examined provider satisfaction with the use of the GlucoStabilizer compared to paper-protocols to determine infusion rate. Retrospective data of hyper and hypoglycemic events was gathered and compared to data gathered post implementation of the GlucoStabilizer. Descriptive statistics were used to examine the relationship between adverse events and how the insulin infusion rate was determined.

Implementation of the GlucoStabilizer eliminated the need for paper-protocols and the need to calculate doses for insulin infusion thereby reducing human error and the number of adverse events. Results showed that there was a positive relationship between implementation of the GlucoStabilizer and blood glucose control in the medical intensive care unit of an acute care hospital.

INTRODUCTION

- Management of blood glucose is an important piece of patient care.

- The health care team, including the Registered Dietitian (RD), must work together to implement monitoring to establish target blood glucose goals.

- In critically ill adult patients, the Registered Dietitian (RD) should promote blood glucose control between 140 to 180mg per dL.[3]

- These recommendations have led to adoption of tight glucose control in a variety of intensive care unit (ICU) settings. However, barriers of adoption include the increased risk of severe hypoglycemia and the difficulty of achieving target goals in critically ill patients. [4]

- Currently many acute care settings rely on their health care staff to monitor and determine insulin infusion rates using a standard paper-protocol algorithm.[9] Saur, N et al. determined that converting from a paper-based protocol to software-guided dosing method for intensive insulin therapy, resulted in superior control of hyperglycemia and marked decrements in the incidence of hypoglycemia.[9]

- The purpose of this research is to determine whether the implementation and use of computer-based software, GlucoStabilizer, will assist care providers in managing tighter glucose control and reduce hypoglycemic events in the ICU.

RESEARCH QUESTION / OBJECTIVE

Will implementation of the GlucoStabilizer software improve glucose control and lower the incidence of hyper and hypoglycemic events in the medical intensive care unit of an acute care hospital?

METHODOLOGY

The Vigilanz system was utilized to develop a data mining criteria. Inclusions were made to gather POC BG's on adult patients 18 years and older receiving an IV insulin drip in the intensive care unit (ICU). Exclusions included patients receiving subcutaneous insulin and TPN. Outliers were determined based on adverse events. Hyperglycemic events were determined based on blood glucose values >/= 180 mg/dL and hypoglycemic events as blood glucose values </= 70 mg/dL.

- Retrospective qualitative data was gathered on the total number of patients in ICU on IV insulin therapy from Jan. 2014 with the use of the paper-protocol algorithm to determine the insulin drip rate. (N=29)
    - Hyperglycemic events were determined based on POC BG >/= 180 mg/dL.
    - Hypoglycemic events were determined based on POC BG </= 70 mg/dL.
- Post implementation of Glucostabilizer, data was gathered on the total number of patients in the ICU in IV insulin therapy from Mar. 2014. (N=21)
    - Hyperglycemic events were gathered and compared to Jan. 2014 data set.
    - Hypoglycemic events were gathered and compared to Jan. 2014 data set.
- Qualitative Results were determined through a provider satisfaction survey (N=39)
    -Pre-Implementation satisfaction survey on paper-protocol algorithms.
    -Post-Implementation satisfaction survey on GlucosStabilizer software and use of the carbohydrate coverage feature.

- Approval from the Research Compliance Oversight Pre-review Subcommittee was provided for this study. The study was deemed exempt by the Research Committee of St. Mary's Hospital & Regional Center.

RESULTS

January 1-31st, 2014: Total patients in ICU receiving an insulin drip rate determined by paper-protocol. (N=29)
    - Hyperglycemic events : (n=11), mean 234 mg/dL, max 309 mg/dL
    - Hypoglycemic events: (n=5), mean 60 mg/dL, min 42 mg/dl
March 1-31st, 2014: Total patients in ICU receiving an insulin drip rate determined by GlucoStabilizer. (N=21)
   - Hyperglycemic events: (n=3), mean 269 mg/dL, max 337 mg/dL
    - Hypoglycemic events: (n=1), 61 mg/dL
A total of 4 adverse events occurred in March compared January with a difference of 12 events. The use of the GlucoStablizer improved the number of adverse events occurring when compared to the use of a paper protocol algorithm

Results of this research determine the GlucoStabilizer initiative improved blood glucose control and lowered the incidence of adverse events in the medical intensive care unit of an acute care hospital.

Jan-14

Legend:
- Total # Patients on an insulin drip
- Total Adverse Events
- BG 180-199 mg/dL
- BG 200-300 mg/dL
- BG 300-500 mg/dL
- BG 69-60 mg/dL

Mar-14

Legend:
- Total # patients on an insulin drip
- Total Adverse Events
- BG 200-300 mg/dL
- BG 300-500
- BG 69-60 mg/dL

DISCUSSION

- Research findings support tighter blood glucose control and less hyper and hypo glycemic events with the use of the GlucoStabilizer compared to the use of a paper protocol.
- Survey findings suggest that providers feel more confident in blood glucose control with the use of the GlucoStabilizer compare to the use of a paper protocol.
- Despite need for detailed carbohydrate counting education, providers are able to cover PO CHO intake more accurately with the Carbohydrate Coverage setting.
- Glucose management and software implementation is a team effort. RD's, nurses, physicians, and other health care providers contribute their expertise to develop therapeutic regimens that help a patient achieve the best metabolic control. **Limitations:**
    - Did not exclude TPN patients, had to be done manually.
    - Did not consider time to reach BG target range
- **Future research:**
    - Longer time frame
    - Include adverse events related to carbohydrate coverage feature.
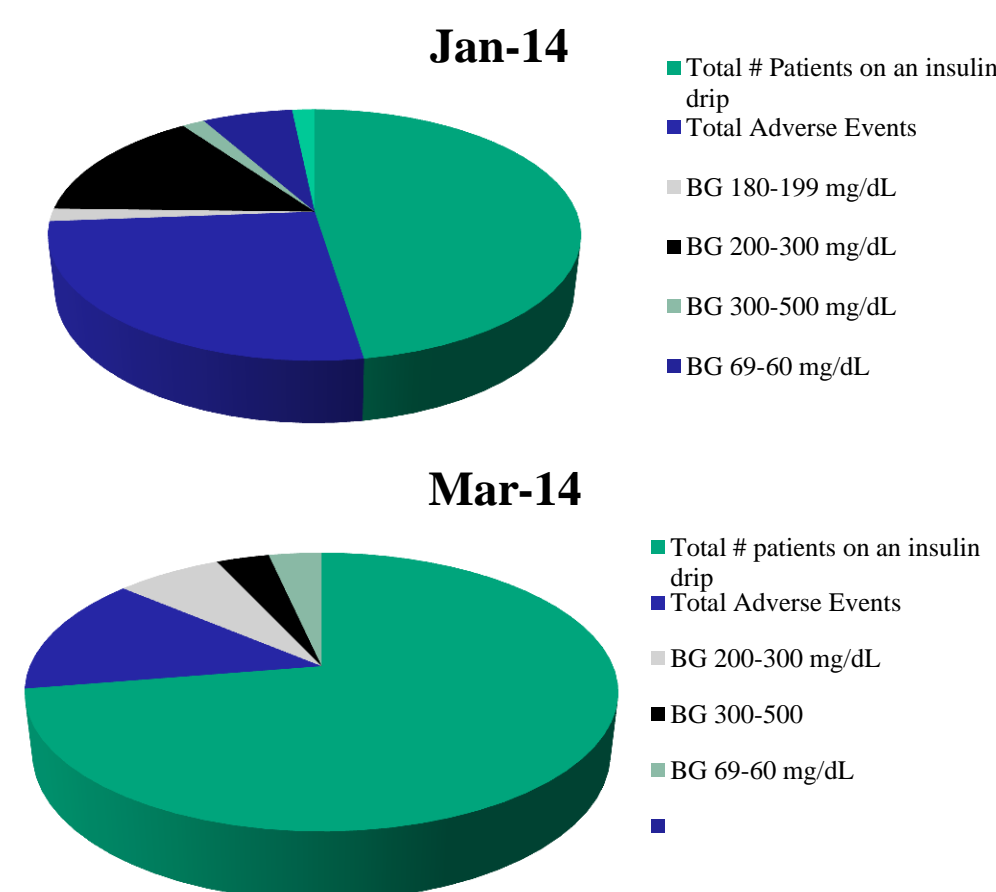
CONCLUSION

- Study demonstrates the value of the GlucoStabilizer in blood glucose management in the intensive care unit of an acute care facility.
- The results prove less hyperglycemic events with the use of the GlucoStabilizer compared to the use of paper-protocols .
- The results prove less hypoglycemic events with the use of the GlucoStabilizer compared to the use of paper-protocols.
- The results show an increase in provider confidence with collaboration of an RD and the use of the carbohydrate coverage feature.
- The results also show greater provider confidence in carbohydrate counting with the collaboration of an RD.

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