Utilization of Computer-Guided Insulin Dosing Reduces Hypoglycemia Adverse Drug Events, Length of Stay and Hospitalization Costs at a Large Pacific Northwest Health System

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OBJECTIVE

Determine whether use of the eGlycemic Management System® (eGMS®)*, an EHR-integrated software platform for intravenous and subcutaneous insulin dosing in the acute care setting, results in improved clinical and financial outcomes among hospitalized patients.

METHOD

CHI Franciscan (CHIF), an 8-hospital, 1,200-bed health system in Washington State, struggled with adoption of basal-bolus insulin despite development of standardized insulin order sets and staff education initiatives. As a participant in Washington State Hospital Association's Adverse Drug Event Quality Initiative for glycemic control, rates of hypoglycemia at CHIF were shown to be higher than other hospitals in the state.

In January 2018, CHIF implemented eGMS® for prescriber-directed insulin dosing. In preparation, the CHIF Glucose Steering Committee coordinated:

- Revision and optimization of insulin order sets.
- Education and training for nurses, providers and pharmacists.
- Augmentation of pharmacist role to identify patients for eGMS® insulin titration.
- Data collection to support glycemic outcome metrics.
- Monthly data and process reviews by the Glucose Steering Committee.

An initial retrospective analysis examined length of stay and hospitalization costs among patients with a top-5 ranked discharge diagnosis of diabetes (DM) and those with an admission diagnosis of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycemic state (HHS). This analysis compared patients treated using standard protocols, i.e., a non-eGMS® usual care control group (September 2017 through April 2018) to patients treated using eGMS® (January 2018 through April 2018).

A subsequent retrospective analysis compared incidence of hypoglycemia ADEs (defined as a blood glucose value <50 mg/dL following administration of a hypoglycemic agent) and rate of in-range blood glucose values 70-180 mg/dL before eGMS® implementation (September 2017 through December 2017) to after eGMS® implementation (January 2018 through December 2019).

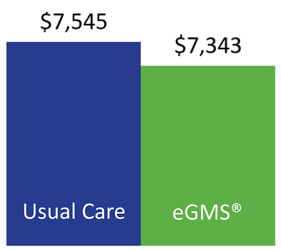
RESULT

When comparing eGMS® to standard protocols (usual care), length of stay was 0.5 days less and hospitalization costs were $202 less among patients with a top-five ranked discharge diagnosis of DM; likewise, length of stay was 1.4 days less and hospitalizations costs were $982 less among patients with an admission diagnosis of DKA or HHS.

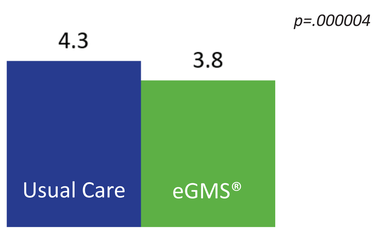
Incidence of hypoglycemia ADEs declined from an average of 7.1% in the quarter before eGMS® implementation to an average of 4.0% after eGMS® implementation (in the most recently-reported quarter), for a overall reduction of 43.7% (p<0.001).

Rate of in-range blood glucose values declined from an average of 65.6% in the quarter before eGMS® implementation to an average of 63.7% after eGMS® implementation (in the most recently-reported quarter), for a overall reduction of 1.9% (p<0.001).

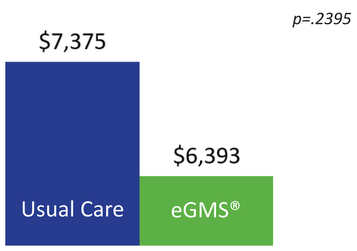
Hospitalization Costs: Patients With Top-5 Ranked Discharge Diagnosis of DM



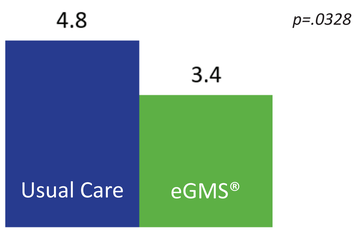
Length of Stay (Days): Patients With Top-5 Ranked Discharge Diagnosis of DM



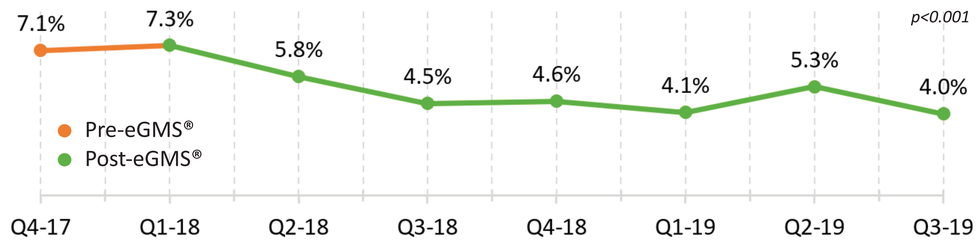
Hospitalization Costs: Patients With Admission Diagnosis of DKA or HHS



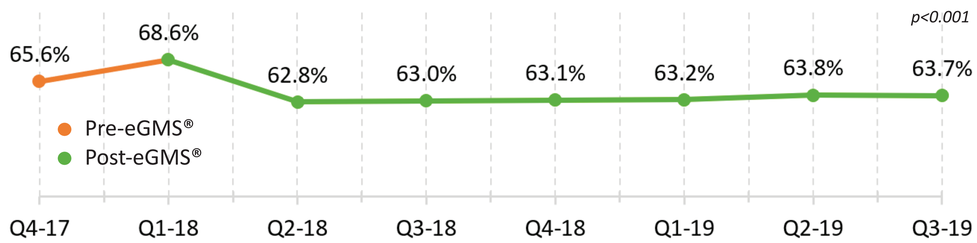
Length of Stay (Days): Patients With Admission Diagnosis of DKA or HHS



Incidence of Hypoglycemia ADEs (BG <50 mg/dL After Hypoglycemic Agent)



Rate of In-Range Blood Glucose Values (70-180 mg/dL)



CONCLUSION

Incorporation of eGMS® into inpatient care delivery is an effective catalyst for improvements in glycemic outcomes and length of stay and recommended for any health system challenged to achieve best practices in glycemic management. At CHIF, we experienced a marked reduction in incidence of hypoglycemia ADEs concurrent with a minimal reduction in the rate of in-range blood glucose values. We also experienced significant reductions in length of stay among patients with an admission diagnosis of DKA/HHS or top-5 ranked discharge diagnosis of DM; furthermore, our financial analysis showed a downward trajectory in costs per case for these populations. Next steps will focus on optimizing the rate of in-range blood glucose values through provider education and continued quality initiatives.