Use Of A Conversion Table Towards Safe Implementation Of A Hyperglycemic Crises Protocol

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Introduction

Lenox Hill Hospital is a comprehensive acute care hospital facility located in New York City. It is recognized nationally for its outstanding patient care, as well as its innovative medical/surgical modalities.

Our Mission

To improve the health and quality of life for the people and communities we serve by providing world-class service and patient-centered care.

Our Vision

To be a national health care leader, committed to excellence, compassion and improving the health of the community.

Our Values

Excellence Innovation Caring Integrity

Diabetic ketoacidosis (DKA) and Hyperosmolar hyperglycemic state (HHS) are medical emergencies associated with increased morbidity, mortality and healthcare costs (Joslin, 2013). Prompt identification and proper management of these emergencies are imperative to improve patient outcomes and prevent death (Juneja, et al., 2009). Intravenous (IV) insulin is adopted for treatment of hyperglycemia in the critical care setting (DeSalvo, Greenberg, Henderson, & Cogen, 2012;ADA, 2017;Kreider & Lien, 2015). Its use is renowned for positive clinical outcomes however the risk of hypoglycemia and its accompanying negative sequelae are inherent. IV insulin drips necessitate enhanced critical thinking skills, vigilant monitoring of lab values, titration of fluid, electrolytes and insulin.

Definitions

DKA is characterized by hyperglycemia, ketosis/ketonemia, acidosis and volume depletion. The diagnosis of DKA should be made based on the 3 of the 4 following criteria:

a. hyperglycemia with blood glucose (BG) > 250 mg/dL
b. arterial pH < 7.30 and/or serum bicarbonate < 18 mEq/L
c. anion Gap > 12
d. presence of ketonemia and/or moderate ketonuria

HHS is characterized by:

a .hyperglycemia (usually BG > 600 mg/dL)
b. volume depletion (usually 8-10 liters)
c. hyperosmolality* (serum Osm > 320 mOsm/kg)
d. altered mental status
e. normal pH and serum bicarbonate > 15 mEq/L
f. small to absent ketonemia/ketonuria.
g. normal anion gap

Methods

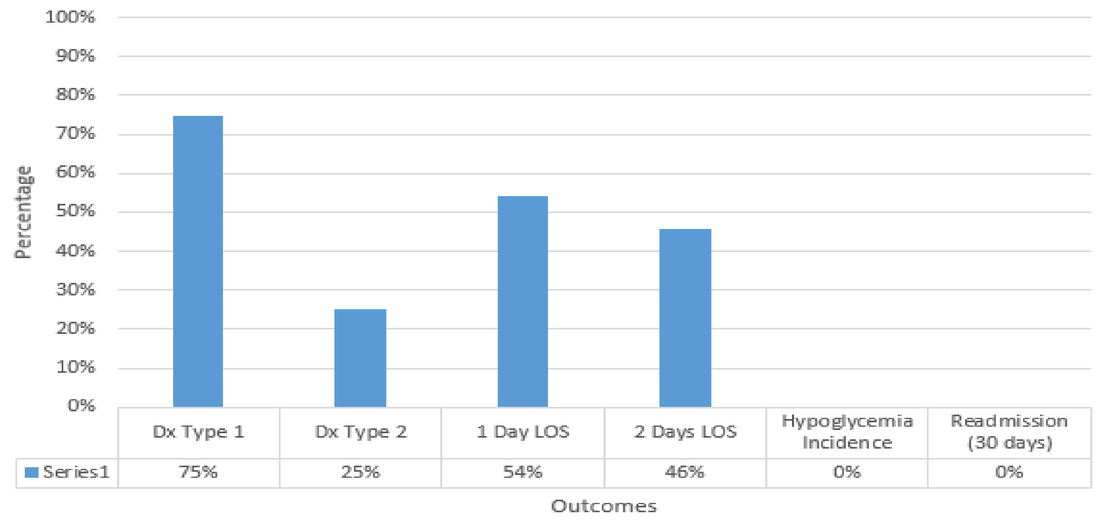
An interprofessional collaborative effort, based on evidenced based studies (DeSalvo, Greenberg, Henderson, & Cogen, 2012;Myers, Zilch & Rodriquez,2013) developed and sought to pilot a hyperglycemic crises protocol (on the critical care units) that facilitated an appropriate and timely management of patients presenting with DKA or HHS. Such interventions contribute to length of stay reductions and associated complications of an ICU admission. Every effort to restore patients to diabetic control must be advocated for. Preliminary hyperglycemic crises protocol drafts, piloted on critical care units, required nursing estimation for insulin titration thus impacting accuracy and patient safety. This latter practice could have had the potential to cause nurses to erroneously administer IV insulin drips. Immediate efforts to address this injurious practice were necessitated prior to patient harm occurrence.

This hyperglycemic crises protocol was presented to the nursing critical care collaborative council, an interdisciplinary team, for consideration, input, approval and stakeholder buy-in. The Chief Nursing Officer strongly advocated for clarification regarding scope of practice regarding IV insulin titration, by registered nurses, in the ICU setting. As a response, the New York State Office of Professional Licensure indicated that these tasks are definitely within critical care nurses scope of practice when accompanied by the facility to decrease medication errors. A conversion table was developed (by S. Patterson) in order to assure accuracy of insulin drip calculation while fostering an environment of safety for both staff and patients alike. Buy- in from staff was essential in the successful implementation of the pilot program which lead to the establishment of the protocol as an adjunct in the clinical management of patients presenting with DKA and HHS.

Results

INSULIN INFUSION TITRATION FOR BLOOD GLUCOSE Greater than 250 mg/dL			
CHANGE IN BLOOD GLUCOSE UP		CHANGE IN BLOOD GLUCOSE DOWN	
0 - 24 mg/dL	Increase drip by 15%	0 - 49 mg/dL	LEAVE drip at current rate
25 - 49 mg/dL	Increase drip by 30%		
50 -74 mg/dL	Increase drip by 40%	50 - 74 mg/dL	Decrease drip by 15%
75 - 100 mg/dL	Increase drip by 50%	75 - 100 mg/dL	Decrease drip by 30%
> 100 mg/dL	Bolus current rate then INCREASE drip by 30%	> 100 mg/dL	Decrease drip by 50% **

INSULIN INFUSION TITRATION (% to UNITS/HOUR CONVERSION CHART)							
CHANGE IN BLOOD GLUCOSE UP				CURRENT RATE (units/hour)	CHANGE IN BLOOD GLUCOSE DOWN		
Increase by this amounts in units/hour					Decrease by this amounts in units/hour		
+15%	+30%	+40%	+50%		-15%	-30%	-50%
+0.3	+0.6	+0.8	+1	2-2.9	-0.3	-0.6	-1
+0.5	+0.9	+1.2	+1.5	3-3.9	-0.5	-0.9	-1.5
+0.6	+1.2	+1.6	+2	4-4.9	-0.6	-1.2	-2
+0.8	+1.5	+2	+2.5	5-5.9	-0.8	-1.5	-2.5
+0.9	+1.8	+2.4	+3	6-6.9	-0.9	-1.8	-3
+1.1	+2.1	+2.8	+3.5	7-7.9	-1.1	-2.1	-3.5
+1.2	+2.4	+3.2	+4	8-8.9	-1.2	-2.4	-4
+1.4	+2.7	+3.6	+4.5	9-9.9	-1.4	-2.7	-4.5
+1.5	+3	+4	+5	≥10	-1.5	-3	-5



Conclusion

Resulting evidence, from internal diabetes dashboard, included decreased length of stay – which facilitated availability of precious ICU beds for other patients that warranted a higher level of care and decreased incidence of hypoglycemia in DKA or HHS patients admitted to the ICU. Ongoing education and competency evaluation is maintained annually via skills fairs, briefs, and huddles.

References

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