Reducing/Preventing Hypoglycemic Risk Through Evidence-Based Practice

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Reducing/Preventing Hypoglycemic Risk Through Evidence-Based Practice

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Proposed Removal of Sulfonylureas From Hospital Formulary

Background:

One of the major concerns with sulfonylurea utilization in the hospital are their extremely long half-lives of 16-24 hours, resulting in prolonged hypoglycemia (Barrueto, 2010). This is especially the case in patients with acute or chronic renal issues, and patients with altered nutritional intake (such as NPO and loss of appetite) (Vigersky, 2013) (Clement, 2013).

Duesenberry CM and colleagues completed a study observing adults who took a sulfonylurea during their hospitalization. They found that 19% of patients ingesting a sulfonylurea also had one or more incidents of hypoglycemia during their stay (Duesenberry, 2012). Adrian Jennings did a similar study spanning six months in which 41 out of 203 hospital patients (20.3%) on a sulfonylurea experienced symptoms of hypoglycemia (Jennings, 1989).

It has been documented and confirmed that three other hospitals have officially removed sulfonylureas from their drug formularies to some degree. They include Memorial Sloan-Kettering Cancer Center, Spectrum Health System, and Redland Community Hospital.

Methods:

The study was conducted in two major portions, literature reviews and data collection. The first step in the process was evaluating scholarly work that attempted to make the public mindful of the risks that are associated with sulfonylurea use in an hospital setting. Subsequently, posts made by certified diabetes educators on the American Association of Diabetes Educators website were examined, networking with educators that have removed sulfonylureas from hospital formularies, or those in the process of doing so.

The number of patients from LVHN that ingested a sulfonylurea during their inpatient stay from July 2013-March 2014 was collected. In addition, all patients that had at least one hypoglycemic event during their hospitalization from July 2013 - March 2014 were also collected. The number of days and events each patient was hypoglycemic was also provided. By the use of excel one was able to match patient account numbers between the two lists. This produced data on patients that were prescribed a sulfonylurea and experienced at least one hypoglycemic event.

Sulfonylureas on Lehigh Valley Health Network Formulary	
-Glimepiride (Amaryl)	-Glyburide micronized (Glynase)
-Glyburide (Micronase/Diabeta)	-Glipizide
-Glipizide XL	-Glipizide/Metformin

*See handout for contraindications and precautions for each drug

Results:

The American Diabetes Association defines hypoglycemia as a blood glucose level less than 70 mg/dL (Moghissi, 2009). Both LVHN campuses, Cedar Crest and Muhlenberg, had a significantly high percent of patients with sulfonylurea induced hypoglycemia, 18.7 and 16.2 respectively. Producing data that corresponds with other sulfonylurea-induced hypoglycemic scholarly work indicates that this matter is prevalent at Lehigh Valley Health Network. Additionally, both hospitals had substantial ratios of total days and events blood glucose less than 70 mg/dL stimulated by a sulfonylurea. At the Cedar Crest campus these were 1.73 and 2.8, and 1.53 and 2.5 at Muhlenberg campus respectively.

An LVHN diabetes management quality improvement goal:
Reduce Hypoglycemic Rates

Campus	Cedar Crest	Campus
Percent Patients having Sulfonylureas Induced Hypoglycemia	18.7%	16.2%
Total Days BG <70 mg/dL per Sulfonylurea Induced Hypoglycemia	1.73	1.53
Total Events BG < 70 mg/dL per Sulfonylurea Induced Hypoglycemia	2.85	2.5

Notes: -All patients had diabetes, 18 years of age or older, and were non-pregnant
-Data collected was from LVHN inpatient admissions from July 2013-March 2014

Conclusion:

The importance of this proposal is to reduce hypoglycemic risk. Hypoglycemia can be fatal, cause brain death, lead to confusion, loss of consciousness, and result in seizures (Vigersky, 2013). By removing and/or reducing sulfonylurea use in the hospital setting one may minimize this risk.

This research indicates that we are not maximizing the quality of care provided by keeping these drugs on formulary. Moreover, increased costs begin to become a concern when one episode of hypoglycemia increases the length of stay by 2.8 days (Turchin 2009). Consequently, two of the three "Triple Aim" aspects are not met while this drug is available for use.

Hypoglycemia Algorithm Proposed Revision

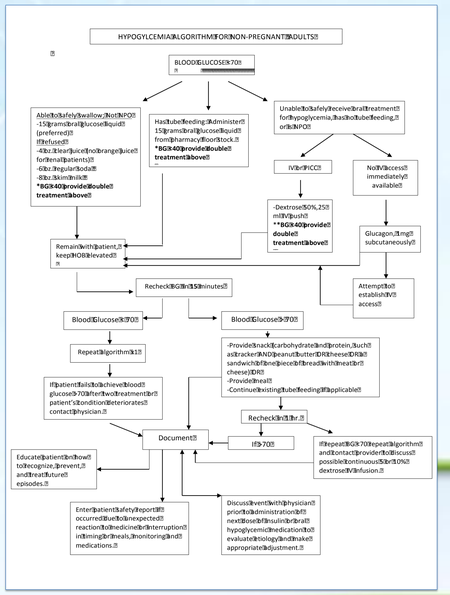
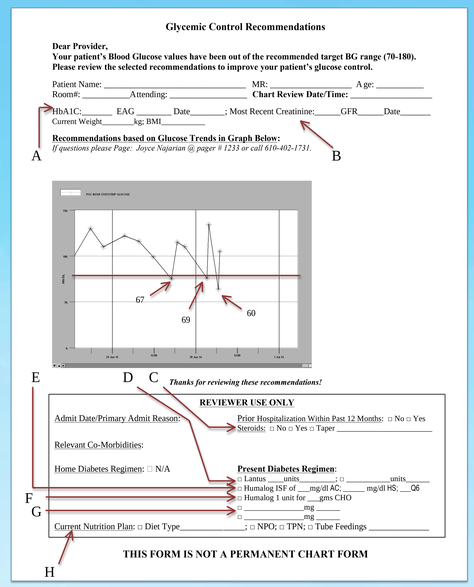


Chart Review and Data Entry



Glycemic Control Recommendations

Dear Provider,
Your patient's Blood Glucose values have been out of the recommended target BG range (70-180).
Please review the selected recommendations to improve your patient's glucose control.

Patient Name: _____ MR: _____ Age: _____
Room#: _____Attending: _____ **Chart Review Date/Time:** _____
HbA1C:_____ EAG _____ Date_____; Most Recent Creatinine:_____GFR_____Date_____
Current Weight_____kg; BMI_____

Recommendations based on Glucose Trends in Graph Below:
If questions please Page: Joyce Najarian @ pager # 1233 or call 610-402-1731.

A B

67 69 60

E D C *Thanks for reviewing these recommendations!*

REVIEWER USE ONLY

Admit Date/Primary Admit Reason: Prior Hospitalization Within Past 12 Months: □ No □ Yes
Steroids: □ No □ Yes □ Taper _____
Relevant Co-Morbidities:
Home Diabetes Regimen: □ N/A
Present Diabetes Regimen:
□ Lantus ____units_____; □ _____units_____
□ Humalog ISF of ___mg/dl AC; _____ mg/dl HS; ___Q6
□ Humalog 1 unit for ___gms CHO
□ _____mg _____
□ _____mg _____
Current Nutrition Plan: □ Diet Type_____; □ NPO; □ TPN; □ Tube Feedings _____

F G

THIS FORM IS NOT A PERMANENT CHART FORM

H

Note: All patients have diabetes

A. A1C: Measures glycosylated hemoglobin, target is less than 7%
B. Creatinine: Provides insight on kidney function, generally 1.4 mg/dL or higher issues concern
C. Steroids: Increases BG, if tapering off should also see decrease in insulin use
D. Lantus: Long acting insulin, basal insulin
E. Humalog ISF: Insulin adjusting for out of range BG, correctional insulin
F. Humalog: Insulin provided that correlates with carbohydrate ingestion during meals, nutritional insulin
G. Other drugs prescribed for diabetes: Prandin, Tradjenta, Humalog 75/25, 70/30 Insulin, Insulin U-500, NPH, IV Insulin, Sulfonylureas, Glucophage, Actos
H. Type of nutritional plan for each patient, concentrating on if the patient has a constant carbohydrate moderate diet

Levaquin Induced Hypoglycemia Update

Levofloxacine AKA Levaquin: class of fluoroquinolone, an antibiotic (Kanbay, 2009)

-FDA acknowledges it can cause changes in blood sugar while also taking oral anti-diabetes agents or insulin (Medication Guide Levaquin 2008).

- "If you have diabetes and you get low blood sugar while taking Levaquin, stop taking Levaquin and call your healthcare provider right away" (Medication Guide Levaquin 2008)

-Mechanism of fluoroquinolones glycemic irregularities is not distinctly known

-What is known is that there are many reports of fluoroquinolone-induced hypoglycemia

- There are also few reports of hyperglycemia created by fluoroquinolones

2 possible mechanisms of fluoroquinolon-induced hypoglycemia:
1. Pharmakinetics mechanism:
Proposed drug–drug interaction
Between fluoroquinolones and antihyperglycemic medications
Gatifloxacin, Ciprofloxacin, and Levofloxacin with Glyburide (most common), Glimepiride, pioglitazone (with glyburide), and repaglinide
Common system to be affected by a drug-drug interaction is a system called cytochrome P-450 isoenzyme system
System which oxidizes in the liver and kidneys
One of the isoenzymes is CYP2C9, metabolizes glyburide, glimepiride, and glipizide
The fluoroquinolones interact with the CYP isoenzymes inhibiting the oral agents metabolism
Preventing the clearance and thereby inducing hypoglycemia
Author admits this is an unlikely mechanism

2. Pharmadynamic-
Over-stimulated beta cells in the pancreas is the more practical mechanism for fluoroquinolone-induced hypoglycemia
Potassium channels play a major role in allowing the islet cells of the pancreas to secrete insulin
If and when these channels get blocked, it causes the cell to depolarize. Consequently, voltage-sensitive calcium channels are opened and calcium will rush into the cell; thereby 'activating' the beta cells.
A release of insulin and decrease blood glucose will follow
Fluoroquinolones inhibit the potassium channels in the beta cell's membrane. Thus maintaining the activation of the cell and continual insulin secretions.

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