

Oral Anti-Hyperglycemic to Insulin Conversion

Preliminary Plan

Proposal: Modify formulary designation status of oral anti-hyperglycemic medications to reflect 1 item as being formulary-restricted to non-diabetic related indications from each oral-antihyperglycemic drug class. Patients with a type II diabetes mellitus (T2DM) indication will be converted to injectable insulin therapy using Pharmacy & Therapeutics Committee Approved dosing guidelines.

A. Class Table for Oral Anti-Hyperglycemic Agents

Oral Anti-Hyperglycemic Agent Formulary Designation Status Proposal				
Drug Class	Generic Name	Trade Name	Dose/Strength	System P&T Committee Formulary Status Recommendation
Sulfonylureas	Glipizide	Glucotrol	5mg 10mg	Formulary-Restricted
	Glipizide ER	Glucotrol XL	2.5mg ER	Non-Formulary
	Glimepiride	Amaryl	1mg, 2mg, & 4mg	Non-Formulary
	Glyburide	Micronase, Diabeta	5mg	Non-Formulary
Biguanides	Metformin	Glucophage	500mg	Formulary-Restricted to non-diabetic indications
	Metformin ER	Glucophage XL	850mg	Non-Formulary
Thiazolidinediones	Pioglitazone	Actos	15mg 30mg, & 45mg	Formulary-Restricted
Dipeptidyl Peptidase IV (DDP-4) Inhibitors	Saxagliptin	Onglyza	2.5 mg & 5 mg	Formulary-Restricted
	Sitagliptin	Januvia	25mg, 50mg, & 100mg	Non-Formulary
	Alogliptin	Nesina	6.25mg, 12.5mg, & 25mg	Non-Formulary
	Linagliptin	Tradjenta	5mg	Non-Formulary

B. Exclusion Criteria

Oral Anti-Hyperglycemic to Insulin Conversion will be omitted for the following conditions:

- Mental health unit
- Outpatients and patients undergoing 23-observation stays
- Patients receiving oral anti-hyperglycemic agents for non-type II diabetes mellitus indications
- Patients <18 years of age
- Labor and delivery
- Post-acute care units
- Antepartum unit



Purpose: Limit inpatient use of oral and non-insulin injectable anti-diabetic medications from formulary.

Rationale: For inpatient management of hyperglycemia, national guidelines recommend the use of subcutaneous insulin for glycemic control using either basal insulin alone or combination with prandial insulin^{1,2,3}. The proposal is for a concise formulary that will allow for more effective, safe, and consistent inpatient glycemic control through the use of insulin alone.

Guideline Consensus: Insulin can rapidly control hyperglycemia and should be used for the majority of hospitalized patients. Other agents are not recommended due to substantial limitations regarding inpatient use and are suggested to be discontinued upon admission^{1,2,3}. Rapid titration of oral antihyperglycemics is not feasible and has shown no better glycemic control compared to a standard insulin regimen^{1,4}.

Action Plan: Based on these recommendations for best practice in the hospital setting, all oral and non-insulin injectable diabetic medication classes would be restricted from the inpatient formulary and only one agent from each oral-antidiabetic class would be formulary-restricted. All adult (defined as age >18) diabetic patients will be managed with insulin alone while admitted to the hospital. For patients that were previously treated with insulin at home, an equivalent dose can be continued dependent on the severity of illness and risk of hypoglycemia. For patients not on insulin at home, a weight based initial dose can be started and titrated to optimal glycemic control⁴. An appropriate weight based regimen of 0.25 units/kg/day to 0.5units/kg/day can be used to calculate initial total daily doses and titrate with response^{5,6}. Home diabetic regimens containing other agents would be halted upon admission, and be resumed post-discharge.

Process: Patients' home oral anti-hyperglycemic agents should be discontinued upon admission. Patients should be started on sliding scale insulin and their blood glucose levels monitored closely. If the provider wishes to start a basal/bolus insulin regimen while inpatient, the proposed insulin conversion for T2DM patients is as follows:

Subcutaneous Injection- NPH/Regular Insulin

- Suggested initial dose of 0.25-0.5 units/kg/day divided into 50% bolus & 50% basal. Patients who are NPO should be started on dose at the lower end of the dosing range. For some patients, correctional scale alone may be sufficient.
- NPH Should be dosed 50% of the total daily dose divided BID(CC) or q12h (for patients who are NPO or on continuous tube feeding)
- Regular insulin should be dosed 50% of total daily dose divided TID(cc) or q6h for patients who are NPO or on continuous tube feedings
- Glucose Monitoring
 - Accu-checks and correctional insulin will be ordered & monitored ACHS or every 6hr



Subcutaneous Injection- Glargine/Lispro

- Suggested initial dose of 0.25-0.5 units/kg/day divided into 50% bolus & 50% basal. Patients who are NPO should be started on dose at the lower end of the dosing range. For some patients, correctional scale alone may be sufficient.
- Insulin glargine should be dosed as 50% of total daily dose once daily (morning or evening)
- Insulin lispro should be dosed as 50% of total daily dose divided TID(CC) or q6h for patients who are NPO or on continuous tube feedings
- Glucose Monitoring
 - Accu-checks and correctional insulin will be ordered & monitored ACHS or every 6hr

Quality Monitoring: The multi-facility clinical pharmacy group will collaborate with quality department representatives from each individual site within the FMOLHS organization to determine the quantity of hypoglycemic episodes across the organization for inpatients for a specified period of time prior to this proposal being implemented and compare this to a specified period of time after this proposal has been implemented.

References:

- 1) Handelsman Y, Bloomgarden ZT, Grunberger G, et al. AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS AND AMERICAN COLLEGE OF ENDOCRINOLOGY – CLINICAL PRACTICE GUIDELINES FOR DEVELOPING A DIABETES MELLITUS COMPREHENSIVE CARE PLAN – 2015 — EXECUTIVE SUMMARY. Endocrine practice: official journal of the American College of Endocrinology and the American Association of Clinical Endocrinologists. 2015;21(Suppl 1):1-87.
- 2) Guillermo E. Umpierrez, Richard Hellman, Mary T. Korytkowski, Mikhail Kosiborod, Gregory A. Maynard, Victor M. Montori, Jane J. Seley, Greet Van den Berghe; Management of Hyperglycemia in Hospitalized Patients in Non-Critical Care Setting: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab 2012; 97 (1): 16-38.
- 3) American Diabetes Association. Diabetes care in the hospital. Sec. 14. In Standards of Medical Care in Diabetes 2017. Diabetes Care 2017;40(Suppl. 1):S120–S127.
- 4) Umpierrez GE, Pasquel FJ. Management of Inpatient Hyperglycemia and Diabetes in Older Adults. Diabetes Care. 2017 Apr;40(4):509-517.



5) Umpierrez GE, Smiley D, Zisman A, Prieto LM, Palacio A, Ceron M, Puig A, Mejia R. Randomized study of basal-bolus insulin therapy in the inpatient management of patients with type 2 diabetes (RABBIT 2 trial). *Diabetes Care*. 2007 Sep;30(9):2181-6.6.

6) Baldwin D, Zander J, Munoz C, Raghu P, DeLange-Hudec S, Lee H, Emanuele MA, Glossop V, Smallwood K, Molitch M. A randomized trial of two weight-based doses of insulin glargine and glulisine in hospitalized subjects with type 2 diabetes and renal insufficiency. *Diabetes Care*. 2012 Oct;35(10):1970-4. Epub 2012 Jun 14;

