Successful utilization of a computer-guided glucose management system for a Surgical Care Improvement Project at a tertiary care hospital

J), Cardiac ICU (CICU),

Objective

To correlate use of a computer-guided glucose management system on national quality outcomes at a tertiary care hospital.

Background

Vidant Medical Center (formerly Pitt County Hospital) is a 950-bed tertiary care teaching hospital affiliated with the Brody School of Medicine of East Carolina University in Greenville, N.C.

The medical center provides acute, intermediate, rehabilitation and outpatient health services to more than 1.4 million people in 29 counties treating about 33,000 inpatients per year.

EndoTool[®] is a Computerized Glucose Control System

- Model Predictive Control software for optimal intravenous insulin dosing.
- Customizes insulin dosing to each patients unique physiology and individual response.
- Provides system, hospital, unit and medical director control over a range of patient parameters
- Provides post-use analytics for evaluation and improvement of quality measurement compliance and performance.

Surgical Care Improvement Project (SCIP)

- National Hospital Inpatient Quality Measures voluntary consensus standards for hospital care.
- Performance Measure SCIP-Inf-4 is defined as cardiac surgery patients with controlled 6 a.m. blood glucose (less than or equal to 200 mg/dl) on postoperative day one (POD 1) and postoperative day two (POD 2).

Hospital-Acquired Conditions (HAC)

HAC-8: Manifestations of Poor Glycemic Control Diabetic Ketoacidosis Nonketotic Hyperosmolar coma Hypoglycemic coma Secondary diabetes with ketoacidosis Secondary diabetes with hyperosmolarity

ICD-9-CM codes 250.10-250-.13 9 (MCC) 250.20-250.23 (MCC) 251.0 (CC) 249.10-249.1 (MCC) 249.20-249.21 (MCC)





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QI initiatives: HAC-8

Implementation of EndoTool on all ICUs and IUs					
Dates	Units				
December 2008	NeuroSurgical ICU (NSICU), Surgical ISCU (SICU)				
January 2009	Labor & Delivery, Medical ICU (MICU)				
February 2009	Cardiovascular ICU (CVICU), Cardiovascular IU (CVI Cardiac IU (CIU), Surgical IU (SIU), Neurosurgical IU				
December 2012	Medical IU (MIU)				





QI initiatives: SCI	P-4
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- Implementation of EndoTool on cardiac units
- Interdisciplinary review of failed cases
- Action steps:
- Staff meetings
- Group education
- Standardized protocol for IV to SQ transition

Failed Cases 2009-2013							
Total Cases	SCIP-Inf-4 Failed Numerator	SCP-Inf-4 Denominator					
2009 Q1	10	191					
2009 Q2	26	170					
2009 Q3	15	152					
2009 Q4	26	161					
2010 Q1	25	181					
2010 Q2	14	212					
2010 Q3	9	173					
2010 Q4	9	144					
2011 Q1	14	172					
2011 Q2	3	171					
2011 Q3	7	141					
2011 Q4	3	146					
2012 Q1	2	194					
2012 Q2	1	123					
2012 Q3	2	136					
2012 Q4	6	147					
2013 Q1	0	139					

Glycemic Control Achieved Safely and Effectively

Timing

All glucose

Within 15 m

Selected Units								
Units	Visits	Glucose Values	Num <40	oer of \ <60	/alues <70	Percer <40	nt of Re <60	adings <70
CICU	715	30325	20	188	1506	0.17	0.62	1.67
CVIC	3025	80137	17	246	929	0.02	0.31	1.16
CVIU	933	29102	7	83	296	0.02	0.29	1.02
MICU	1195	43456	17	146	412	0.04	0.34	0.95
SICU	921	38460	18	121	339	0.05	0.31	0.88

Time to Target				
Target (mg/dl)	Evaluable Visits	Average Time to Target (hours)		
130	6501	6.65		
140	6037	5.35		
150	5565	4.51		
160	5061	3.99		
170	4606	3.64		
180	4172	3.38		

Results

- Over a period of 4 years, more than 260,000 blood glucose readings were obtained from just over 8,000 patients.
- The computerized IV insulin infusion software program (EndoTool) was able to bring hyperglycemic patients to a glucose of ≤ 180 mg/dl within about 3 $\frac{1}{2}$ hours.
- There was minimal hypoglycemia with only 0.86% of the values < 70 mg/dl and 0.02% < 40mg/dl.
- Immediate and sustained improvement in SCIP was noted, starting at 88% in 2008 and reaching 99% in 2011, compared to the national average of 95%.
- Immediate and sustained reductions in hospital-acquired conditions improved from 0.083/1000 in 2008 to 0.032/1000 in 2011, compared to the national average of 0.058/1000.

Hypoglycemia Summary Data collected since December 2008								
	# of Patients	Glucose Values	Numk <40	oer of \ <60	/alues <70	Percer <40	nt of Re <60	adings <70
/alues	8078	260870	93	1017	3099	0.04	0.39	1.19
inutes	8078	260870	61	729	2232	0.02	0.28	0.86

Times to Takast

Blood Glucose Frequencies 260,870 glucose values, 8078 patients

Conclusions

- Use of a computerized software program (EndoTool) has been demonstrated to improve quality and safety as measured by two major outcomes:
- SCIP-Inf 4
- HAC-8
- Proper use of the program led to only 61 glucose values below 40 mg/dl out of more than 260,000 readings (0.02%).
- This data represents a doubling in cost savings and places the hospital in the top tier of all hospitals for SCIP-Inf-4 and HAC-8 in the U.S.