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

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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).

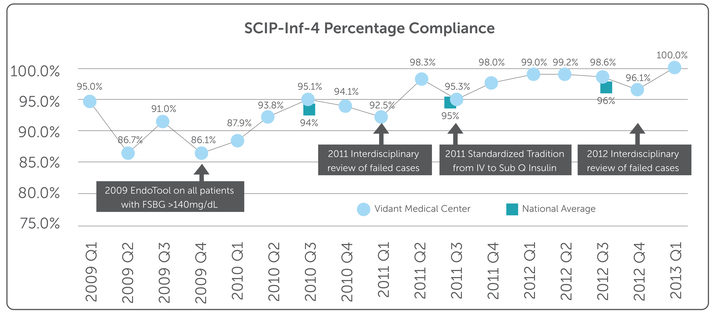
Hospital-Acquired Conditions (HAC)

HAC-8: Manifestations of Poor Glycemic Control	ICD-9-CM codes
Diabetic Ketoacidosis	250.10-250-.13 9 (MCC)
Nonketotic Hyperosmolar coma	250.20-250.23 (MCC)
Hypoglycemic coma	251.0 (CC)
Secondary diabetes with ketoacidosis	249.10-249.1 (MCC)
Secondary diabetes with hyperosmolarity	249.20-249.21 (MCC)

QI initiatives: HAC-8

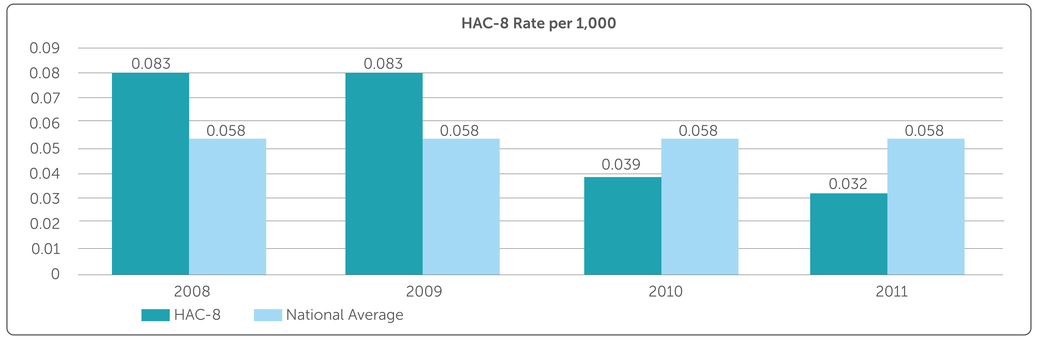
Implementation of EndoTool on all ICUs and IUs

Dates	Units
December 2008	NeuroSurgical ICU (NSICU), Surgical ISCU (SICU)
January 2009	Labor & Delivery, Medical ICU (MICU)
February 2009	Cardiovascular ICU (CVICU), Cardiovascular IU (CVIU), Cardiac ICU (CICU), Cardiac IU (CIU), Surgical IU (SIU), Neurosurgical IU (NSU)
December 2012	Medical IU (MIU)



Failed Cases 2009-2013

Total Cases	SCIP-Inf-4 Failed Numerator	SCIP-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



QI initiatives: SCIP-4

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

Glycemic Control Achieved Safely and Effectively

Hypoglycemia Summary Data collected since December 2008

Timing	# of Patients	Glucose Values	Number of Values <40	Number of Values <60	Number of Values <70	Percent of Readings <40	Percent of Readings <60	Percent of Readings <70
All glucose values	8078	260870	93	1017	3099	0.04	0.39	1.19
Within 15 minutes	8078	260870	61	729	2232	0.02	0.28	0.86

Selected Units

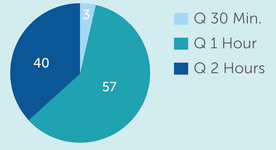
Units	Visits	Glucose Values	Number of Values <40	Number of Values <60	Number of Values <70	Percent of Readings <40	Percent of Readings <60	Percent of Readings <70
CICU	715	30325	20	188	1506	0.17	0.62	1.67
CVIC	3025	80137	17	246	929	0.02	0.31	1.16
CVIU	933	29102	7	83	296	0.02	0.29	1.02
MICU	1195	43456	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

Blood Glucose Frequencies

260,870 glucose values, 8078 patients



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 ½ 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.

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.

VIDANT™ Medical Center

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