Implementation of Glucose Management Software in Cardiac Surgery Patients to Improve Postoperative Blood Glucose Control and Compliance with Surgical Care Improvement Project (SCIP) Measures

Amanda Zomp, PharmD[1]; Earnest Alexander, PharmD, FCCM[1]; Maresa Glass, PharmD, BCPS[1]; Ren Chen, MD, MPH[2]

Tampa General Hospital Department of Pharmacy[1], University of South Florida[2], Tampa, Florida

BACKGROUND

- Hyperglycemia has been associated with risk of surgical site infections (SSIs) in postoperative cardiac surgery patients[1-2]
- Blood glucose (BG) control after cardiac surgery has been shown to decrease SSIs as well as mortality, other post-operative complications, duration of mechanical ventilation, and intensive care unit (ICU) length of stay[3-10]
- Surgical Care Improvement Project (SCIP) was developed by CMS, the CDC, and the Joint Commission to decrease incidence of SSIs[11]
- SCIP measure INF-4 requires cardiac surgery patients to have blood glucose <200 mg/dL at 6am on postoperative days (POD) 1 and 2
- Computerized insulin protocols have been shown to achieve goal BG faster, with more time spent in the desired range compared with standard paper protocols[12-15]
- Computerized protocols can also decrease the incidence of hypoglycemia[13-15]
- Endotool® is an FDA-approved software developed to optimize insulin therapy by utilizing adaptive algorithms to provide individualized therapy[16]
- Endotool® was implemented in the cardiothoracic ICU in January 2011 due to concern over suboptimal compliance with SCIP measure INF-4

RATIONALE

- The available data suggest that the use of a computerized blood glucose management system (Endotool®) may improve our postoperative management of blood glucose following cardiac surgery, and therefore may also improve our compliance with SCIP measure INF-4

OBJECTIVE

- To analyze the impact of utilizing a blood glucose management software system (Endotool®) on compliance with SCIP measure INF-4, to improve postoperative blood glucose management for cardiac surgery patients on continuous IV insulin

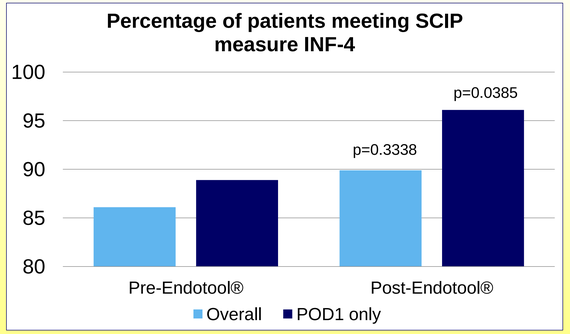
METHODS

- Single center, retrospective, observational, IRB-approved study
- Pre-Endotool® 8/10-12/10 and post-Endotool® 1/11-4/11
- **Inclusion criteria**
  - Age ≥ 18
  - Postoperative cardiac surgery patients
- **Exclusion criteria**
  - Length of stay >120 days
  - Preoperative infectious disease
  - Burn and transplant
  - Laparoscopic procedures
  - Concurrent clinical trial enrollment
  - Perioperative mortality
- Inclusion/exclusion criteria per Joint Commission standards
- **Outcomes**
  - Primary:
    - Percentage of patients meeting SCIP measure INF-4 on POD1 and POD2 pre- and post-Endotool® implementation
  - Secondary:
    - Percentage of patients meeting SCIP measure INF-4 on POD1 only pre- and post-Endotool® implementation
    - Percentage of patients meeting SCIP measure INF-4 on POD2 only pre- and post-Endotool® implementation
- **Statistical analysis**
  - Chi-square test or Fisher's exact test, as appropriate
- **Additional data collection points**
  - Steroid use
  - Duration of Endotool® (hours)
  - Nursing adherence with Endotool® recommendations
  - Time to blood glucose control on Endotool®

RESULTS

- Total n = 275
- n = 145 pre-Endotool®, n = 130 post-Endotool®
- Overall percentage of patients meeting SCIP measure INF-4 trended higher post-implementation of Endotool® than pre-implementation, at 89.9% and 86.1%, respectively (p=0.3338),see Figure 1
- On POD1 only, the percentage meeting the measure was significantly higher post-Endotool® implementation, at 96.1%, compared with 88.9% pre-Endotool® (p=0.0385), see Figure 1

Figure 1.



- 100% of patients in the post-Endotool® group that met the SCIP measure POD1, but not on POD2 were taken off Endotool® after <30 hours duration
- Reasons identified for uncontrolled blood glucose on Endotool®:
  - Endotool® discontinued before 6am on POD2 (66.7%)
  - Blood glucose goal not met until after 6am on POD1 (16.7%)
  - Nonadherence to Endotool® recommendations (16.7%)

CONCLUSIONS

- Endotool® usage to manage blood glucose in postoperative cardiac surgery patients increased compliance with SCIP measure INF-4
- Improvement may be further augmented by continuation of Endotool® for full 48 hours postoperatively, rather than early discontinuation
- Improvement in compliance with this measure may decrease SSIs, improve patient outcomes, and help ensure reimbursement for hospital stays

IMPLEMENTATION

- Continued use of Endotool® in the cardiothoracic ICU
- Implementation of a new protocol for continuation of Endotool® for 48 hours postoperatively
- Re-evaluation of SCIP measure INF-4 compliance

REFERENCES

1. Ascione R, Rogers CA, Rajakaruna C, et al. *Circulation*. 2008;118:113-123.
2. Latham R, Lancaster AD, Covington JF, et al. *Infect Control Hosp Epidemiol*. 2001;22: 607-612.
3. Albacker T, Carvalho G, Schiricker T, et al. *Ann Thorac Surg*. 2008;86:20-27.
4. Chaney M, Nikolov M, Blakeman B, et al. *Anesth Anal*. 1999;89:1091-1095.
5. Ghandi GY, Nuttall GA, Abel MD, et al. *Ann Intern Med*. 2007;146:233-243.
6. Hoedemaekers CW, Pickkers P, Netea MG, et al. *Crit Care*. 2005;9:R790-797.
7. Ingels C, Debaveye Y, Milants I et al. *Eur Heart J*. 2006;27:2716-2724.
8. Groban L, Butterworth J, Legault C, et al*J Cardiothorac Vasc Anesth*. 2002;16:405-412.
9. Koskenkari JK, Kaukoranta PK, Kiviluoma KT, et al. Ann *Thorac Surg*. 2005;80:511-517.
10. Lazar HL, Chipkin SR, Fitzgerald CA, et al. *Circulation*. 2004;109:1497-1502.
11. Rosenberger LH, Politano AD, Sawyer RG. *Surg Infect*. 2011;12:163-168.
12. Saager L, Collins GL, Burnside B, et al. *J Cardiothorac Vasc Anesth*. 2008;22:377-382.
13. Halpin L, Henry L, Dunning E, et al. *AACN Adv Crit Care*. 2010;21:146-151.
14. Davidson PC, Steed RD, and Bode BW. *Diabetes Care*. 2005;28:2418-2423.
15. Hovorka R, Kremen J, Blaha J, et al. *J Clin Endocrinol Metab*. 2007;92:2960-2964.
16. Endotool website. Available at: http://www.endotool.com. Accessed August 16, 2011.

Contact Information:
Amanda Zomp, PharmD
Tampa General Hospital, Tampa, FL
azomp@tgh.org

SCCM Critical Care Congress – Houston, Texas – February 4-8, 2012

Disclosures:
The authors and study personnel involved in this study do not have any personal or financial conflict of interest disclosures to make.