

EndoTool®:

Experience with a Computerized Insulin Dosing Program in Critically Ill Patients

Maresa Glass, PharmD, BCPS, Critical Care Pharmacotherapy Specialist



Hyperglycemia in hospitalized patients, irrespective of its cause, is undeniably associated with adverse outcomes. Hyperglycemia occurs in patients with known or undiagnosed diabetes, or it occurs during acute illness in those with previously normal glucose tolerance (stress hyperglycemia).

The diabetes group at Tampa General made several attempts at developing an insulin protocol for use with insulin infusions in critical care patients. These “paper” protocols were often difficult to follow and as a result, we had an almost 100% error rate with their use. We also found an unacceptably high rate of hypoglycemia (almost 50%) and poor management of hyperglycemia. In an effort to improve glucose control in our critically ill patients Tampa General purchased computerized insulin dosing software. After a trial period, this software was implemented in all the ICUs in August of 2008.

EndoTool® is an insulin dosing software program. It calculates the dose of IV insulin needed to quickly control blood glucose (BG) levels. It achieves this by actively modeling and adapting to individual patients’ responses to IV insulin, even those with fluctuating insulin requirements. EndoTool® integrates more than 30 unique algorithms and its sophisticated control mathematics ensure a low incidence of hypoglycemia.

In light of previously published studies evaluating the impact of tight BG control in critically ill patients and the ongoing debate over the ideal blood glucose range, adjustments were made to our hospital’s target blood glucose range. The target BG range was modified from 80-120 mg/dL to 90-150 mg/dL.

We have seen positive outcomes using the EndoTool® software. Over 70% of our blood glucose readings are now within our goal range. Our hypoglycemia rate (defined as a BG less than 60 mg/dL) is less than 0.3%.

We have also identified the need for improved glucose control once the IV insulin drip is stopped. EndoTool® can provide patient specific dosing recommendations for subcutaneous (SubQ) insulin to assist with transition off of the IV insulin drip once the BG is stable. Orders can be printed directly from the EndoTool program and placed on the chart. If plan is to transfer the patient outside of the ICU, SubQ insulin should be initiated prior to discontinuation of the insulin drip to avoid hyperglycemia once the patient leaves the ICU.

EndoTool® is currently available in all of the ICU areas including the Pediatric ICU. It can be used in patients weighing more than 35kg. It is not yet available for use in the L&D, PACU, or the emergency department.

If you have questions or would like more information on glucose management in the critically ill population please contact me at mglass@tgh.org.

Interdisciplinary Lean Process Team leads to Improved ER CT Turnaround Times

Keith Aldahondo, CT/MRI Manager

The volume of patients seen in the TGH Emergency Department (ED) runs between 75,000 and 80,000 per year. High numbers of patients leaving without being seen and long lengths of stay for both admitted and discharged patients indicated significant patient flow issues. To address these issues, the ED staff initiated a Lean Process Team that looked at ways to eliminate those activities that did not add value to the patient's ED visit and contributed to inefficiency and ineffectiveness. One significant item identified by the Lean Team was the heavy use of Computerized Tomography (CT), especially in trauma and possible stroke patients. During analysis of the data, these patients were frequently identified as outliers in the ED patient flow process. To deal with this concern, an interdisciplinary team was formed under the leadership of Keith Aldahondo, CT/MRI Manager, and Elizabeth Richard, Director of Decision Support. The team also included Dr. Rajendra Kedar M.D., Co-Director of Radiology, CT technologists, Radiology and ER nurses, decision support staff, ED transporters, and consultants from the Center for Transformation at USF. The sponsors of this project were David Robbins, VP Professional Services, and Denise Vanderwerf, Director of Imaging and Cardiac Services.



Defining the scope of the project was the Team's first task. This included defining the customer: ED physicians, patients, and staff. We then interviewed the ED physicians and asked what their expectations were and what circumstances led to their frustration. At this point a problem statement and goal were developed. The problem statement was: ED physicians are frustrated by ED CT turnaround times (TAT) greater than their expectations of two hours. The goal, based upon the problem statement, was to not only complete the exam in two hours, but to have the report to the physician in two hours. Meeting this goal would also improve the business case by increasing ED physician, patient and staff satisfaction, decreasing ED LOS, decreasing the percentage of patients leaving without being seen, and increasing ED visits and revenue.

The Team met and mapped out the CT processes to determine where the delays were occurring and what initial changes would be the easiest to implement in order to achieve early success. The Team then used a Lean tool called "trystorming", which is trying out the processes that are brainstormed. The first trystorm focused on the transport system. CT has a dedicated ER CT transporter who works three days a week during the busiest times of the day. It was thought that this was one of the CT strong points because of the use of dedicated staff; however, the data generated from Decision Support and analysis by USF consultants showed that TAT actually increased by 30 minutes. The crux of the issue was the many outliers that had to be taken into consideration. The focus then became the outliers, which were defined as "any exam report for which the ordering physician had to wait over four hours." This led to six successful overlapping trystorms:

- 1. Extended the CT hours of operation and scanned inpatients in the imaging center until 8:30pm.**
- 2. Utilized the Cardiovascular CT scanner as an ED scanner for patients who were not trauma or stroke alerts.**
- 3. Utilized a visual queue board for the technologist to follow up with the nurses and document delays.**
- 4. Considered as an outlier any report taking longer than one hour and had the circumstances analyzed by Dr. Kedar and reviewed with the attending radiologist.**
- 5. Placed oral contrast in Accudose dispensers in each pod throughout the ED.**
- 6. Changed oral contrast prep time from 90 minutes to 60 minutes.**

Implementation of the six trystorms over a three month period resulted in a reduction of the ED CT TAT average of 2 hours, 51 minutes to 2 hours, 15 minutes. We continue to make improvements in our TAT and on November 7, 2010 we had our lowest TAT of 91 minutes. We will continue to sustain and improve this process by consistent review of our daily TATs with the goal of decreasing outlier time from four hours to three hours. We had the opportunity to publish this Lean project in Imaging Economics and were made their cover story for the October 2010 edition. (<http://www.imageconomics.com/issues/2010-10.asp>).

TGH Pharmacy & Therapeutics (P & T) Committee UPDATE:

October 2010

Earnest Alexander, PharmD., Manager Pharmacy Services

**Please visit "tgh pharmacy" link for more details of the latest formulary decisions and access to the TGH Formulary.*



"tgh Pharmacy" and Micromedex – FORMULARY ADVISOR are available on the desktop of any computer in the hospital with an internet browser!

- **Docusate enema (Enemeez)**
 - The P & T Committee approved the addition of Docusate enema (Enemeez) to formulary with restricted use to neurogenic bowel protocol in spinal cord injury patients. Enemeez will replace bisacodyl (dulcolax) suppositories in the neurogenic bowel protocol, based on data reporting decreased fecal evacuation times comparatively. This results in reduced bowel care, attendant care, and nursing time for inpatients, as well as improved patient satisfaction, quality of life, and ability to participate in therapy.
- **Rosiglitazone (Avandia) FDA Actions**
 - Recent communication from the FDA regarding Avandia's cardiovascular risks and notice that the FDA is working on developing a Risk Evaluation Mitigation Strategy (REMS) for this drug was discussed. The use of this agent will require some form of patient education/acknowledgement of risks associated with use and may include the requirement for special training for physicians and pharmacies who prescribe and dispense the drug. More information to be provided as these REMS requirements are clearly defined.
 - Additionally, an overview of the FDA REMS process for high risk medications to be presented at next P & T Committee meeting along with further discussion of the evaluative/management process for medications with FDA REMS requirements.
- **Fentanyl (Duragesic) Patches**
 - Safety concerns were discussed related to fentanyl patches. The FDA black box warning for fentanyl patches (including contraindications and inappropriate patient populations) and specific FDA labeling outlining appropriate patients to receive therapy were highlighted.
 - The P & T Committee recommended additional education for medical staff and clinicians regarding the potential dangers with fentanyl patches. Additionally, a full medication utilization evaluation to be completed at TGH to evaluate how fentanyl patches are being used and to determine the level of compliance with FDA labeled dosing considerations.
- **Pharmaceutical Shortage Update**
 - A demonstration of the Micromedex Formulary Advisor database was provided to the P & T Committee. The Formulary Advisor contains TGH specific information including an updated drug product shortage table, IV administration guidelines (adult and pediatric), and a medication formulary. The creation of an icon called "tgh pharmacy" has been developed and links any user on any TGH computer located in patient care areas directly to this pertinent information. This bypasses the need to go through the Micromedex homepage and navigate to formulary advisor to see TGH specific information.



Please visit "tgh pharmacy" link on any patient care computer or Micromedex – FORMULARY ADVISOR for a complete and current list of pharmaceutical shortages





WE'RE ON THE WEB
WWW.TGH.ORG

TGH Welcomes our new Physicians



The physicians below were added to TGH staff: 11/30/2010

Soojong H. Chae, MD	Medicine/Gastroenterology
Rami K. Ghurami, MD	Plastic Surgery
Joann M. Gierbolini, MD	Radiological Services
Jesus Gonzalez-Bosquet, MD	Obstetrics/Gynecology
Guy W. Neff, MD	Medicine/Gastroenterology
Donald C. Sachs, MD	Neurological Surgery
Amarilis Sanchez-Valle, MD	Pediatrics
Timothy A. Weber, MD	Surgery/Neurology

KUDOS TO OUR PHYSICIANS!

Congratulations to the following physicians who were recognized by their patients in the form of personal letters to TGH leadership.

**Dr. Selim Benbadis, Dr. Fernando Vale, Dr. Cedric Sheffield, Dr. Tarik Haddad,
Dr. Mark Rolfe, Dr. John Cha, Dr. Luis Llerena, Dr. David Ciesla,
Dr. Jim Norman and Dr. Douglas Politz**



This newsletter is produced by Tampa General Hospital's Quality Improvement Department. All comments, responses or suggestions are welcome and should be directed to:

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