New Outcomes Data:

DIABETES MANAGEMENT IN THE PERIOPERATIVE SETTING (HOW SWEET IS TOO SWEET?)

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The summer 2006 cover article of *The Official Journal of the Anesthesia Patient Safety Foundation* (APSF's newsletter) reads "Perioperative Hyperglycemia Raises Risks." The article explains that glucose intolerance/hyperglycemia commonly arises from surgical stress, and pursues the notion that dozens of studies to date have demonstrated an increased morbidity and mortality in diabetics versus non-diabetics. In addition, it is explained that non-diabetics in the perioperative or ICU setting can develop a "pro-inflammatory cytokine-mediated" hyperglycemia that can predispose to adverse outcomes. In the non-diabetic population, this process is stimulated by glucagon, glucocorticoids, catecholamines, and growth hormone; all of these mechanisms predispose toward insulin resistance and glucose intolerance (1).

Conventional wisdom has heretofore dictated that the biggest concern for anesthesiologists and surgeons was making sure their diabetic patients (both insulin-dependent and non-insulin-dependent) did not experience clinically significant hypoglycemia because of an altered medication regimen and pre-operative fasting. Today, these concerns are still present, but the medical community's attention to maintaining "tighter" blood glucose management during the acute perioperative process is ratcheting up. In fact, clinicians are no longer routinely telling diabetics "we'd rather see you a little bit high than low for surgery." The reason: It appears that even acute hyperglycemia induces a depression of immune function, neutrophil activity, and physiologic response to endotoxin.

The bulk of the data that currently exists in publishable form has come from the cardiac patient population. Here it is shown that patients followed from the operating room to the ICU, and kept on a continuous insulin drip to maintain blood sugar levels below 150 mg/dl, had improved outcomes (2). Other studies have likewise demonstrated the decreased incidences of atrial fibrillation, recurrent ischemia, and wound infection in patients whose blood sugar levels were kept under 200 mg/dl. In one study, an increase of 20 mg/dl in the "mean intraoperative glucose level" was associated with a thirty percent increase in untoward perioperative outcomes (3).

Similarly, ICU studies have demonstrated that maintaining a stringent range for blood glucose levels (i.e., 80–110 mg/dl) profoundly improves patient outcomes: decreased neuropathy, decreased onset of acute renal failure, decreased infection rates, shorter intervals on the ventilator, and a decreased hospital mortality of as much as thirty-four percent (4).

The cumulative effect of continued research into this area of medicine has resulted in recommendations that extend far beyond the clinical subgroups of cardiac surgery and ICU patients. In fact, despite conclusive outcomes evidence (as of early fall 2006), recommendations are beginning to arise from diabetologists, intensivists, surgeons, and anesthesiologists that tighter blood sugar management across all clinical categories — in all patients — may be a good thing. Their goal: to use these early evidence-based, data-driven results to make a significant dent in the number of perioperative complications seen in hospital inpatients and ambulatory surgical patients.

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Clearly, making changes to long-ingrained patterns of clinical practice is difficult. At Johns Hopkins University, the chair of the Bayview Medical Center, Frederick E. Sieber, MD, recently made this statement when interviewed: "I know of no studies dealing with intraoperative glucose management [in the routine anesthetic population]. Certainly the data are compelling in the ICU patient. We are instituting glucose control in the ICU, but do not do this in the OR as there is little evidence to support it, and it is very labor intensive." Along similar lines, a recently released abstract on glucose management in orthopedic surgery patients (October 2006, American Society of Anesthesiologists Annual Meeting, Chicago, Mraovic, B. et al, Thomas Jefferson University) noted the complexities of applying new hospital glucose management protocols in perioperative patients. Specifically, Mraovic found that the hospital guidelines of frequent glucose monitoring were not utilized in 86 percent of patients. Furthermore, a deficit in patient education about the effects of poor blood sugar management on outcomes was noted. The Thomas Jefferson data supports the position made by the Johns Hopkins chair — namely, that the logistics of implementing new, complex, across-the-board protocols for strict perioperative blood glucose management can be difficult at best.

An additional method of diabetic detection and monitoring in the clinical setting may be found in the Hemoglobin A1c test (indicates a patient's blood sugar control over the past two to three months)*. In effect, this assay measures the level of glycosylated hemoglobin (i.e., the amount of glucose irreversibly bound to hemoglobin molecules). Since the normal lifespan of red blood cells 90–120 days in vivo, this test can deliver a valuable "picture" of how well a patient's glucose management has been in the recent past (as opposed to the immediate "snapshot" of a fasting blood sugar level). The hemoglobin A1c level of 8 percent has been associated with a cumulative/average blood sugar level of 205 mg/dl. Although it may be desirable to see patients maintaining Hb A1c values of seven or less, many new protocols are laying down the gauntlet at an Hb A1c level of 8 percent. In performing pre-op testing of known diabetics, anything over 8 percent is being seen as an indicator of "poor control" and being referred to the internist or endocrinologist for better education and tighter management. Although guidelines will differ from patient to patient based on co-morbid conditions, the type and length of surgery, and the consensus between surgeon and anesthesiologist, many practitioners will consider surgical case cancellation in known diabetics with Hb A1c values over 8 percent. [Newer, portable machines now allow the "spot" testing of Hemoglobin A1c levels at the point of care in hospitals and surgical centers.]

A cross-section of journal articles and commentaries reveals a common experience in facilities that routinely check every patient's fasting blood glucose pre-operatively. Some are finding upwards of 20 percent of patients have undiagnosed diabetes. It is noteworthy that anesthesiologists in the ambulatory surgical setting are particularly concerned with instituting insulin therapy to patients who have never been diagnosed with diabetes, and/or those who will be discharged home shortly after surgery. The fear here is of post-operative hypoglycemia. Understandably, it is particularly vexing for clinicians to agree on guidelines for stricter perioperative glucose management in the context of persuasive, yet still incomplete, clinical data.

Part of the impetus for change in the management of glucose levels in hospital and general surgical patients is as a result of government initiatives. Starting in 2007, hospitals will be "asked" to provide more quality data on indicators relating to clinical outcomes (see the Department of Health and Human Services Hospital Compare website at www.HospitalCompare.hhs.gov). Hospitals will

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need to report steps taken to mitigate/prevent surgical-site infections, post-operative myocardial infarctions, post-operative pneumonia, intensive care variables, pediatric asthma, overall mortality rates, and incidence of perioperative thromboembolism. The Hospital Compare program, an outgrowth of the Hospital Quality Alliance (public-private partnership of 19 organizations, hospitals, and the federal government) will provide this data to consumers. If hospitals do not report on this data, there will be consequences regarding inpatient payments from Medicare (CMS). There will likely also be a similar initiative for outpatient services.

The following is a sample, simplified approach to managing hyperglycemia in surgical "outpatients" (i.e., patients planning on returning home the "same day" after surgery; patients not already in a monitored setting where more comprehensive, ongoing diabetic management is taking place):

- Every known diabetic receives an HbA1c level test — ideally checked within 7–10 days prior to surgery. Every patient over the age of 30 years receives a fasting blood sugar (FBS) "stick" (if no fasting BG has been performed within two weeks prior to surgery).
- Unknown diabetics, with an abnormal FBS > 200 mg/dL, receive a spot HbA1c test.
- If HbA1c > 8 percent, the surgeon and anesthesiologist will talk and come to an agreement as to whether to delay or proceed with the case.
- If the FBS is greater than 250 mg/dL, there is strong consideration for case cancellation; the patient is referred back to their PCP. All final decisions regarding case cancellation remain open to discussion between the surgeon and anesthesiologist. **SDP**

* The HbA1c value is an index of mean blood glucose over the past 2–3 months. This number is weighted to the most recent blood sugar levels. The HbA1c test result reflects the past 30 days as ~50 percent of the A1C, the preceding 60 days as ~25 percent of the value, and the preceding 90 days as ~25 percent of the value. The body is continuously destroying and replacing red blood cells (hence, it does not take a full 120 days to detect a clinically significant change in HbA1c following a significant change in mean blood glucose).

References

1) APSF Newsletter, Summer 2006, Volume 21, No. 1, 23-36.
2) Furnary AP, Wu Y, Bookin SO. Effect of hyperglycemia and continuous intravenous insulin infusions on outcomes of cardiac surgical procedures: The Portland Diabetic Project. Endocr Pract 2004;10(Suppl 2):21-33.
3) Gandhi GY, Nuttal GA, Abel MD, et al. Intraoperative hyperglycemia and perioperative outcomes in cardiac surgery patients. May Clin Proc 2005;80:862-6.
4) Pittas AG, Siegel RD, Lau J. Insulin Therapy for critically ill hospitalized patients: a meta-analysis of randomized controlled trials. Arch Intern Med 2004;164:2005-11.

ic exam and cervical smear (BMJ 2006 Jul 22;333(7560):171 full-text).

From the Cervical cancer screening (including Pap smears) summary, *Pap smear technique*:

- speculum exam without feet in stirrups reduces stress during gynecologic exams (level 1 [likely reliable] evidence) and may not limit cervical smear quality (level 2 [mid-level] evidence) (*not yet reviewed by FNP Smith)
  - 197 adult women undergoing routine gynecologic exam and cervical smear were randomized to exam with stirrups vs. exam with feet on edges of exam table extension
  - comparing with vs. without stirrups on 100-mm visual analog scales
    - mean score for sense of vulnerability 13.1 vs. 23.6 ($p < 0.05$)
    - mean score for physical discomfort 17.2 vs. 30.4 ($p < 0.05$)
    - mean score for sense of loss of control 17.7 vs. 23.1 (not significant)
  - no significant differences with vs. without stirrups for cervical smear quality
    - 0 vs. 2 smears inadequate for evaluation ($p = 0.16$)
    - 15 vs. 16 smears did not contain endocervical cells ($p = 0.84$)
- Reference: BMJ 2006 Jul 22;333(7560):171 full-text, editorials can be found in BMJ 2006 Jul 22;333(7560):158 + BMJ 2006 Jul 22;333(7560):173, commentary can be found in BMJ 2006 Aug 5;333(7562):304 **SDP**