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Basal-Bolus Insulin Protocols Enter the Computer Age

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Abstract

Diabetes affects approximately one quarter of all hospitalized patients. Poor inpatient glycemic control has been associated with increased risk for multiple adverse events including surgical site infections, prolonged hospital length of stay, and mortality. Inpatient glycemic control protocols based on physiologic basal-bolus insulin regimens have been shown to improve glycemia and clinical outcomes and are recommended by the American Diabetes Association, the American Association of Clinical Endocrinologists, and the Society of Hospital Medicine for inpatient glycemic management of noncritically ill patients. The 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act will catalyze widespread computerized medication order entry implementation over the next few years. Here, we focus on the noncritical care setting and review the background on inpatient glycemic management as it pertains to computerized order entry, the translation and efficacy of computerizing glycemic control protocols, and the barriers to computerizing glycemic protocols.

Keywords

Basal-bolus insulin protocols; Inpatient glycemic management; Computerized order entry; Electronic decision support; Standardized insulin order sets; Hyperglycemia; High-dose glucocorticoid therapy; Enteral/parenteral nutrition; Immunosuppressive regimens

Introduction

The past decade has seen new interest in the development of inpatient glycemic control, triggered by a seminal trial of intensive glucose control in critical care patients [1], which has been called “the study that launched 1000 protocols” [2]. Although the utility of intensive glucose control has since been called into question, subsequent work has supported the importance of “good glycemic control” in both intensive care units and general medical and surgical settings [3]. Poor inpatient glycemic control has been associated with increased risk for multiple adverse events including surgical site infections, prolonged hospital length of stay, and mortality [4–6]. Large randomized controlled trials of basal-bolus insulin regimens in both medicine and surgical noncritically ill patients and intensive glucose control protocols in the intensive care unit have guided current standards of physiologic insulin regimens in inpatient glycemic management [7•, 8•, 9].

Computerized order entry and electronic decision support, if done properly, can facilitate and promote this movement toward appropriate insulin ordering and improved inpatient

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glycemic control. Here, we review the background on inpatient glycemic management as it pertains to computerized order entry, the translation and efficacy of computerizing glycemic control protocols in the noncritical care setting, and the barriers to computerizing glycemic protocols, all in the context of the recently federally mandated computerized physician order entry (CPOE). Readers may refer to recent reviews, including two in this issue in *Current Diabetes Reports*, for discussion of intravenous insulin protocols intended for use in the intensive care unit and perioperative settings [10•, 11, 12].

Background

In 2006, the American Diabetes Association (ADA) and American Association of Clinical Endocrinologist (AACE) convened a “Call to Action” consensus conference to address and outline successful implementation of programs to improve inpatient glycemic control. Emphasis was placed on institutional development of glycemic control protocols and standardized insulin order sets [13]. As of 2008, only 21% of US hospitals had fully implemented noncritical care glycemic control protocols, and 65% had partially implemented glycemic control protocols or were actively in the planning phase [14]. In 2009, the federal Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted. One of the core requirements for stage 1 of the HITECH Act for meaningful use is computerized order entry. Given the complexity of even simple insulin order sets, and in light of these new regulatory requirements, there will likely be a large movement toward implementing computer-based glycemic control protocols over the next few years.

Current Recommendations in Inpatient Glycemic Control

An estimated 25% of hospitalized patients carry the diagnosis of diabetes, and potentially up to another 18% to 25% of patients have undiagnosed type 2 diabetes [15, 16•, 17]. The RABBIT 2 (Randomized Study of Basal-Bolus Insulin Therapy in the Inpatient Management of Patients with Type 2 Diabetes) trial, published in 2007, and its surgical counterpart, published in 2011, have demonstrated the benefits of basal-bolus insulin compared with sliding scale alone for glycemic control in general medicine and surgical type 2 diabetes patients, respectively. The RABBIT 2 trial demonstrated improved glycemia without increased length of stay or rate of hypoglycemia in medical patients, whereas the surgical trial showed a reduction in infectious and composite adverse outcomes with minimally increased rates of hypoglycemia, and no excess severe hypoglycemia.

The ADA recommends the following standard of care for hospitalized patients with diabetes or hyperglycemia; details are outlined in a consensus statement published by the ADA and the AACE [18, 19]. All patients with diabetes admitted to the hospital should be clearly identified and have blood glucose monitoring. Patients with diabetes in the intensive care units should be started on insulin therapy if they demonstrate persistent hyperglycemia, with a glucose target range of 140 to 180 mg/dL for most patients. Intravenous insulin protocols should be shown to achieve the desired glucose range without increasing the risk for severe hypoglycemia. In noncritically ill patients, the ADA-AACE guidelines recommend scheduled subcutaneous insulin with basal, nutritional, and correction components. Patients at high risk for hyperglycemia (ie, high-dose glucocorticoid therapy, enteral or parenteral nutrition, immunosuppressive regimens, etc.) should have glucose monitored and hyperglycemia treated with the same glycemic goals and regimen as patients with known diabetes. All patients with diabetes should have hemoglobin A_{1c} (HbA_{1c}) checked if results within 2 to 3 months are not available. All patients with hyperglycemia in the hospital should have appropriate post-discharge follow-up [19].

To implement these recommendations, the Society of Hospital Medicine (SHM) Glycemic Control Task Force (GCTF) recommends forming multidisciplinary hospital-wide steering committees to develop glycemic control protocols to better integrate hospital formulary insulins, insulin ordering, and glucose monitoring with work flow practices [20]. The SHM GCTF emphasizes establishment of target blood glucose levels, standardization of glucose monitoring, incorporating nutritional management, prescription of physiologic basal-nutritional-correction dose insulin regimens, discontinuation of oral anti-hyperglycemic medications, standardization of hypoglycemia treatment protocols, incorporation of appropriate diabetes education/consultation, and coordinating glucose testing, nutrition delivery, and insulin administration.

Achieving adequate glycemic control often requires basal-bolus insulin regimens with medication dosing and administration dependent on nutritional intake and insulin sensitivity [21]. This represents a paradigm shift away from the use of sliding scale insulin alone, and has been a difficult concept to disseminate even with the availability of numerous written guidelines, review articles, and educational programs [22]. Despite attempts to simplify hyperglycemia protocols, they remain more complex than many other best practice-based disease-specific order sets for conditions such as chest pain and congestive heart failure. Moreover, overly aggressive application of the principles of basal-bolus insulin dosing can result in increased hypoglycemia [23•].

Glycemic Control Protocols Enter the Computer Age

CPOE is recommended by the Institute of Medicine to prevent medication-related errors and increase efficiency in medication administration [24]. Insulin is one of the top medications associated with medical error [25] and therefore is a logical medication to target for computerized ordering. It has already been shown that bundling of insulin, glucose monitoring, and diet orders into standardized paper-based glycemic control protocols in non-trial settings can improve glycemic control and patient safety [26]. Given the complexity of the ADA/SHM recommended components for an effective glycemic control protocol, it is logical to hypothesize that implementation of these protocols into CPOE, with the possibility of additional decision support, may further improve glycemic control and patient safety.

In general, well-designed CPOE systems have been shown to improve medication safety, quality of care, and improve compliance with provider guidelines and efficiency of hospital workflow [27]. By contrast, poorly designed CPOE protocols can impede quality and workflow [28, 29•]. Similarly, the effectiveness and safety of any insulin protocol varies according to the quality of the underlying protocol, and, as seen in the intravenous insulin protocol literature, there can be significant variation among protocols both in design and outcome [30].

Long before the HITECH Act, multiple groups set out to implement and test the efficacy of CPOE glycemic control protocols. The majority of the published studies evaluating the efficacy of these computerized glycemic control protocols are time series before-and-after studies that often take place in conjunction with hospital-wide implementation of CPOE. To our knowledge, there are only two published randomized controlled studies evaluating CPOE glycemic control protocols, both occurring in settings with established CPOE. In this review, we focus on a few representative observational studies as well as the two published cluster randomized trials.

Representative Observational Studies

In a multi-stage prospective observational study, Maynard et al. [31, 32] reported on the impact on clinical care and inpatient glycemia of a comprehensive glycemic control protocol

consisting of a subcutaneous weight-based basal and nutritional insulin order set, guidance for blood glucose monitoring, embedded hypoglycemia protocols, and standardized correction insulin tables [31, 32]. Shortly after establishing a paper-based glycemic control protocol, a CPOE system was introduced and a CPOE-based protocol was designed to mimic the paper-based one. This computerized protocol further limited sliding scale–alone insulin orders by making basal-bolus insulin mandatory for all insulin orders except one-time insulin orders. The CPOE protocol was also coupled to an insulin treatment algorithm with detailed recommendations for insulin dosing and titration based on nutritional status. Education for all clinical providers (physicians, residents, nurses) occurred at inpatient rounds and in-service training sessions throughout the study period to describe process and goals with each introduced intervention (paper protocol, CPOE protocol, algorithm). Maynard et al. [31, 32] showed that after implementation of their computer-based glycemic control protocol with linkage to a standardized insulin treatment algorithm (available for view within the hospital Intranet), there was an improvement in many metrics compared with the period before implementation: use of sliding scale–only insulin orders (26% after vs 72% before CPOE; $P < 0.001$), improved inpatient glycemic control (30.1% vs 37.8% of uncontrolled patient-days; $P < 0.005$), and reduced risk for hypoglycemia (RR, 0.68 after CPOE implementation; 95% CI, 0.59, 0.78).

Similarly, a retrospective study by Guerra et al. [33] evaluated glycemic control before and after a CPOE-based hyperglycemia inpatient protocol (CPOE-HIP) was implemented at a single institution. CPOE-HIP was developed to include formulary decision support limiting insulin to preferred neutral protamine Hagedorn (NPH) and regular insulin formulations in a weight-based basal-nutritional-correction regimen, and further provided no CPOE-populated option for stand-alone sliding scale insulin. Prior to implementation there was hospital-wide electronic dissemination of the protocol and extensive nursing in-service training with emphasis on insulin administration. The protocol also included prompts within the order set regarding ADA-recommended HbA_{1c} inpatient testing. After CPOE-HIP implementation there was lower patient-day weighted mean glucose (164.7 vs 175.5 mg/dL before CPOE-HIP; $P < 0.001$), increased rate of inpatient days with target glucose measurements between 70 to 150 mg/dL (46.1% vs 41.1%; $P = 0.008$), and decreased rate of patient-days with glucose measurements greater than 299 mg/dL (16.9% vs 13.8%; $P = 0.02$) [33]. Appropriate HbA_{1c} testing doubled. No difference was seen in the rate of hypoglycemia defined as blood glucose ≤ 50 mg/dL or in length of stay.

Randomized Controlled Trials

We performed a cluster randomized trial to test whether giving internal medicine resident physicians access to an electronic order set supporting basal-bolus insulin ordering in noncritical care type 2 diabetes patients improved glycemic control, compared with usual care among patients with hyperglycemia, at our tertiary care medical center with a home-grown CPOE system in use for over a decade [34]. All residents received inpatient diabetes management education (oral presentation and written materials) and instructions on how to prescribe and titrate basal-bolus insulin. The CPOE insulin order set suggested basal-bolus insulin initiation of weight-based basal glargine with nutritional and supplemental aspart similar to protocols recommended by Inzucchi [21] and tested in the RABBIT 2 trial [9]. The order entry page was linked to a weight-based insulin dose calculator and guided prescribers to give half the total daily dose in basal and the other half as nutritional insulin divided before meals. Even with this very basic CPOE insulin order set of stand-alone medication orders and minimal decision support, patients with uncontrolled type 2 diabetes cared for by the resident physicians with access to the electronic order template had lower mean glucose levels (195 vs 224 mg/dL in control group; $P = 0.004$) without increase in the rate of hypoglycemia.

A comprehensive glycemic control protocol delivered via CPOE was evaluated by Schnipper et al. [35•] in a cluster-randomized controlled trial on the general medicine service at a tertiary care medical center with a local CPOE system in use for years. All providers (residents and hospitalists) received training in subcutaneous insulin protocols, and residents received an additional case-based curriculum. Nurses on the study floors also received training in insulin administration, glucose testing, and patient education. The local CPOE protocol developed was comprehensive of diabetes care and included suggested orders for diet, HbA_{1c} testing, point-of-care glucose monitoring, basal (NPH or glargine), nutritional, and supplemental insulin, treatment of hypoglycemia, and endocrinology consultation, and was applied to all patients with known diabetes or persistent hyperglycemia. Access to the comprehensive CPOE diabetes order set resulted in lower patient-day weighted mean glucose (148 vs 158 mg/dL in control group; $P = 0.04$), less use of sliding scale insulin alone for glycemic control (25% vs 58% in control group; $P = 0.01$), and, importantly, no difference in rate of severe hypoglycemia (blood sugar < 40 mg/dL) [35•].

Although two of these published studies used locally developed CPOE systems, most commercially available systems such as Siemens Invision (Malvern, PA; used in the Maynard study) and Cerner PowerChart (Kansas City, MO; used in the Guerra study) can accommodate glycemic control order sets tailored to the institution in which they are to be used. Taken together, these studies demonstrate the benefit of well-designed CPOE hyperglycemia order sets to improve glycemic control without increasing rate of hypoglycemia. The latter is particularly important to note as “concern about causing hypoglycemia” is the most common barrier to implementation of glycemic control programs cited by hospitals [14]. Data on long-term adherence to and efficacy of these protocols are still needed.

Characteristics of Effective Electronic Glycemic Control Protocols

Based on ADA, AACE, and SHM recommendations for inpatient glycemic care, review of published studies, and our own experience, basic elements in design, decision support, and education should be considered when developing and implementing a CPOE insulin order set (Table 1).

Design and Decision Support Systems

Ideally, CPOE hyperglycemia protocols in noncritically ill patients should be comprehensive in design and use of decision support. Prompts for appropriate ordering of blood glucose monitoring, dietary orders, laboratory tests, and hypoglycemia treatment instructions should be automatically connected to medication orders. Workflow barriers to appropriate weight-based dosing of insulin can be addressed by embedding glycemic control protocols within the admission order set as well as by incorporating a weight-based insulin dose calculator [36]. Recommendations for starting doses of formulary-based basal, nutritional, and correction insulin should be easily accessible. Several correction insulin scales to reflect variability in insulin sensitivity should be offered. Lastly, efforts should be made to minimize the use of sliding scale insulin alone (without basal insulin) when hyperglycemia is present.

Education

As demonstrated by published studies, a cornerstone of effective and successful implementation of any glycemic control protocol is education of all staff regarding appropriate use and implementation of the protocol. Group-based didactic sessions coupled with online case-based curricula have been effective in improving inpatient glycemic control

in academic hospital settings [23•, 37]. Reminder e-mails, pocket cards, repeated nursing in-services, and mandatory online modules have also been employed to retain knowledge and improve use of inpatient glycemic control and decrease insulin administration errors [38•, 39].

Barriers to CPOE Glycemic Protocol Implementation

Even with the best design, implementation of a CPOE-based hyperglycemia protocol can be a challenging process, and the first iteration is never the last. Order sets need frequent adjustment to reflect user feedback and changes in evidence-based diabetes care [40•]; as in other care protocols, we would anticipate that changes diminish over time, and costs and time are saved, even as the guideline is individualized to patient needs [41]. Regular evaluation of prescriber utilization and frequent protocol refresher courses for all providers, not just new clinical staff, are needed to achieve sustained utilization [42]. In particular, coordination of care and clinical inertia are two major barriers to initial implementation of CPOE hyperglycemia protocols that need to be addressed to realize their effectiveness.

Coordination of Care

The minimum number of medication orders alone for initiation of the ADA/AACE/SHM recommended basal-bolus regimen is three, and this does not include orders for monitoring blood glucose, treatment of hypoglycemia, diet orders, and nutritional/diabetes education consults. As noted by the SHM GCTF, implementation of glycemic control protocols requires multidisciplinary input from many services including ordering providers (physicians, nurse practitioners, and physician assistants), nursing, pharmacy, nutrition, diabetes educators, case management, and information technology services. Significant coordination among all parties is necessary, such as coordinating glucose monitoring with nutrition delivery and insulin administration, even with the most robust CPOE protocols [31, 40•].

The degree of coordination and resources needed to implement successful hospital-wide glycemic control efforts is described by one academic hospital as a 5-year period of evolution of inpatient diabetes [40•]. This account is notable for the comprehensiveness of their efforts and the constant evaluation and progression of their electronic order sets and outreach efforts [40•]. Their efforts to address glycemic control began in 2005. By 2010, their team had developed a very robust electronic glycemic order set including weight-based basal, nutritional, and correction insulin with distinct order sets for patients who are eating, not eating, or receiving supplemental (enteral or parenteral) nutrition, a dedicated inpatient diabetes service, and ongoing nursing education. Overall glycemic control metrics improved with their interventions. The actual utilization and contribution of the CPOE order sets was not detailed in their account.

Clinical Inertia, Provider Utilization, and Workflow

Usability and workflow considerations are equally important as provider education and care coordination in implementation of CPOE glycemic control protocols. Primary factors for the strong clinical inertia in inpatient glycemic medication ordering include the ease of ordering sliding scale insulin alone and fear of iatrogenic hypoglycemia [43]. Prescriber time constraints, coupled with the fact that glycemic control may appropriately not be the top concern for the vast majority of hospitalized patients, means that efforts need to be made to integrate the glycemic control order sets into everyday workflow so that it supports, rather than detracts from, the care of the patient's primary reason for hospital admission.

Although basal-nutritional-correction insulin in trial settings provides better glycemic control than sliding scale alone, implementation in the real-world setting where the majority

of orders are not supervised by endocrinologists, has proven to be quite challenging. Even with basal-bolus-correction CPOE protocols, only about 30% of patients, in both trial and non-trial settings, have all three components ordered [35•, 42]. Prescribing insulin sliding scale alone as treatment for inpatient hyperglycemia remains common despite evidence that it leads to suboptimal glycemic care [44, 45].

Changing provider practice patterns begins by preventing provider “work-arounds” to the protocol and regular feedback from providers on how to make the order set more functional in their everyday work flow. Maynard et al. [31] and Guerra et al. [33] applied very different strategies to curb provider “work-arounds” of sliding scale-alone insulin ordering in their protocols. Maynard et al. [31] made ordering of insulin outside of the protocol cumbersome by limiting non-protocol insulin to one-time orders and reduced sliding scale-alone ordering from 72% to 26%. Guerra et al. [33] were able to nearly eradicate sliding scale-only ordering (22% pre-CPOE-HIP to 0.5% after CPOE-HIP) by eliminating pre-populated sliding scale orders. Both reduced sliding scale-only ordering, but taking away the ease of ordering pre-populated sliding scales was more effective.

Ease of access to order sets also affects provider utilization. In our small study, insulin order patterns were not significantly different between control and intervention groups: 30% ordered sliding scale alone and basal insulin ordering increased from 30% to 60% in both groups [34]. The utilization of our insulin order set was limited by technical inability to incorporate the glycemia order set in a location that would better facilitate workflow. Accessing this very basic order set required four additional mouse clicks from the provider order entry menu, a major barrier to adoption.

Similarly, in Schnipper et al.’s study, the intervention teams used their protocol in only 27% of their patients. Although only a small fraction of insulin orders originated from the order set, patients treated by the intervention group had significantly decreased odds of having sliding scale-only insulin orders (OR, 0.2; 95% CI, 0.1–0.5; $P = 0.01$) and increased odds of having adequate dose of nutritional insulin ordered (OR, 8.0; 95% CI, 1.4–45.7; $P = 0.004$) compared with the control team, which had the same initial educational exposure. In both studies, it may be that single or multiple uses of the order set was sufficiently instructive to support basal-bolus insulin ordering without the use of the order set. Regardless, integrating the glycemic control protocols into provider workflow by embedding them into a general admission order set increases order set utilization [36].

In general, if the order set is too cumbersome, prescribers will not use it. Those who know how to order basal-bolus insulin may bypass the order set altogether and just order each component separately, as seen in Schnipper et al.’s study [35•]. For those with less experience, the ability to bypass a structured order set could result in sliding scale-alone insulin orders and suboptimal glycemic control. Aside from deviating from recommended insulin regimens, bypassing structured order sets also obviates any built-in decision support such as blood glucose/HbA_{1c} monitoring and hypoglycemia treatment protocols. Workflow analyses are key to sustained and appropriate utilization of electronic protocols, and implementation of new protocol should be guided by organizational change theory frameworks, such as RE-AIM (Reach, Efficacy/Effectiveness, Adoption, Implementation, and Maintenance), to better support the culture change required to make headway in physiologic insulin ordering [46, 47].

Next Steps

The time pressure to achieve meaningful use of information technology with stage 1 of the HITECH Act has provided the impetus for hospitals to enter the computer age and implement CPOE over the next few years. We anticipate that as more hospitals adopt CPOE

systems, electronic inpatient glycemic protocols will become the new standard of care. For hospitals already using CPOE but without an inpatient glycemic protocol, development and integration of basal-bolus insulin ordering protocols should be an important consideration. Initial focus in both situations should be on implementation of CPOE glycemic protocols that are safe and easily incorporated into provider workflow.

Overall, the literature shows that glycemic control improves with implementation of CPOE glycemic protocols even though a minority of patients receive optimal basal-nutritional-correction insulin orders. Given the complexity of physiologic insulin ordering, a simpler alternative strategy might focus on increasing rates of appropriate basal insulin prescribing as an initial step, mirroring treatment in the outpatient setting, albeit with warnings not to use basal insulin to cover caloric requirements. Providers could subsequently be taught (or prompted) to add nutritional insulin based on patient response to basal-correction insulin in type 2 diabetes patients. An additional consideration favoring this approach is that basal insulin regimens are often easier to translate into post-discharge care plans. Although this approach is simpler, it will not meet the needs of type 1 or insulin-deficient type 2 diabetes patients, who would then need to have specific basal-bolus-supplemental order sets.

CPOE glycemic protocols will become the standard as we enter the HITECH era. Future innovations in computer-based glycemic control protocols should focus on improving decision support with a goal of improving clinical outcomes and patient safety. Decision support is paramount because insulin protocols are complex, and insulin administration requires attention to blood glucose monitoring as well as the timing and dosing of medications. Prompting orders based on clinical parameters, providing contingency orders based on nutritional status, and, ultimately, closed loop systems with automatic uploading of blood glucose values from point-of-care devices to CPOE systems could reduce human error in insulin administration.

Some potential future decision support improvements include:

- Prompts to reassess glycemic control insulin orders with auto-calculated weight-based insulin doses whenever nutrition/diet orders are changed.
- Identifying patients at high risk for hyper- or hypoglycemia based on clinically available data (ie, medical history, medication lists, laboratory data, nutritional status) and prompting providers to order appropriate glucose monitoring and hyperglycemia treatment on admission and throughout hospitalization.
- Identifying patients with persistent hyperglycemia from point-of-care and laboratory glucose results after admission and alerting ordering providers.
- Automatic upload of glucometer readings to CPOE and medication administration programs to improve workflow and decrease errors due to manual glucose entry.
- Standardization of transition protocols, be it transfer between care units, transitioning from infusion to subcutaneous insulin, or changes in diet (ie, parenteral to oral).

Conclusions

Translating safe, evidence-based hyperglycemia protocols in noncritical care settings with computer-based systems has further improved their safety and efficacy. At minimum, multiple studies have shown that well-designed and implemented electronic protocols improve overall glycemic control without increasing rates of hypoglycemia. Further automation that incorporates point-of-care glucose measurements and nutritional prompts may greater enhance safety and efficacy as inpatient hyperglycemia protocols enter the

computer age. More studies are needed to determine characteristics of effective long-term implementation and the impact of these computer-based hyperglycemia protocols on clinical outcomes and cost-effectiveness.

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Table 1**Key components of a comprehensive insulin CPOE protocol**

1	Facilitated ordering of appropriate blood glucose monitoring
2	Prompt to assess long-term control (hemoglobin A _{1c}) if no value is available within 2 to 3 months of admission
3	Incorporate nutritional management and dietary orders
4	Prompt clinicians to consider discontinuing oral anti-hyperglycemic medications
5	Prescribe physiologic (basal-nutritional-correction/supplemental) insulin regimens: <ul style="list-style-type: none"> a. Weight-based total daily dose of insulin divided into basal (long-acting) and nutritional (short-acting) for patients with hyperglycemia: <ul style="list-style-type: none"> i. Match nutritional insulin to nutrition intake ii. Include standing orders to allow nurses to hold nutritional insulin for nutrition interruptions and to modify nutritional insulin depending on actual nutritional intake iii. Correction insulin matched to an estimate of the patient's insulin sensitivity using pre-populated scales iv. Reduce correction-only (sliding-scale alone) insulin orders in hyperglycemic patients
6	Incorporation of a simple hypoglycemia protocol
7	Provide diabetes education and suggestions for appropriate consultation

CPOE—computerized physician order entry.

(Adapted from Society of Hospital Medicine, American Diabetes Association, and American Association of Clinical Endocrinologist recommendations [19, 20, 48•].)