Centers for Medicare & Medicaid Services' Hospital Harm Measures for Severe Hypoglycemia and Hyperglycemia: Is Your Hospital Ready?

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Poor inpatient glycemic management is associated with increased lengths of stay and in-hospital morbidity and mortality. Improving inpatient glycemic outcomes can be difficult because there are no standardized benchmarks, and many hospitals lack the capacity to electronically extract and analyze glucose data. The Centers for Medicare & Medicaid Services recently proposed new electronic clinical quality measures to be incorporated into its mandatory Hospital Inpatient Quality Reporting Program. Among these measures is an assessment of hospital harm from severe hypoglycemia and severe hyperglycemia. Hospitals must be ready to collect the necessary data for these new measures by January 2023. The new measures could bring welcome attention to the need to implement guideline-based inpatient glycemic management. However, some hospitals that serve high-risk populations may be at risk for losing funding if they are unable to comply.

About 11.3% of the U.S. population has diabetes, and nearly 38% has prediabetes, according to the Centers for Disease Control and Prevention (1). Approximately 25% of all hospital inpatient days are incurred by people with a diagnosis of diabetes (2). One-third of these patients have another hospitalization within 1 year, with this subset accounting for >50% of total hospitalizations and hospital costs of patients with diabetes (3).

A person's outpatient diabetes regimen may be inadequate to manage blood glucose in the face of acute illness and changes in eating behaviors while in the hospital. Insulin remains the preferred treatment for hyperglycemia in hospitalized patients (4). Importantly, insulin is considered a high-alert medication by the Institute for Safe Medication Practices (5), as it bears a heightened risk of causing significant patient harm when used erroneously. Insulin-related medication errors are among the most likely to cause harm (6).

Despite the existence of published evidence-based guidelines for improving glycemic outcomes of hospitalized patients with diabetes (4), these are not implemented consistently for a variety of reasons. Most people with diabetes are hospitalized for reasons other than glucose management (7). As a result of competing priorities and a lack of sufficient training in recognizing poor glycemic management, care providers frequently exhibit therapeutic inertia with regard to adjusting insulin and other antidiabetic medications during a patient's hospital stay. This inaction leads to significant glucose variability that can affect health outcomes. If changes are made to a patient's diabetes management, these changes typically are more reactive (e.g., adding correctional insulin) instead of the proactive approach advocated in American Diabetes Association (ADA) and Endocrine Society guidelines, which involves the use of a basal-bolus insulin regimen (4,8,9). On the other hand, in the intensive care setting, there is still widespread use of outdated paper protocols that are neither provider friendly nor personalized for patients and thus can lead to errors and suboptimal glycemic outcomes.

Inpatient hyperglycemia is associated with numerous poor outcomes, including increased rates of infection, longer hospital lengths of stay, higher risks of intensive care unit admission, and increased in-hospital mortality (10–13). Hypoglycemia is similarly associated with adverse patient outcomes and increased mortality (14,15). Hyperglycemia and hypoglycemia, collectively called "dysglycemia,"

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frequently go hand in hand, as efforts to correct low glucose can lead to high glucose and vice versa.

There is no single laboratory test to assess overall glycemic outcomes in the inpatient setting, in contrast to the outpatient setting, for which A1C is considered an acceptable performance standard. Instead, hospitals must rely on multiple point-of-care and serum glucose measurements obtained over a variety of nutritional states during a patient's hospital stay. At Johns Hopkins Medicine, we have developed our own electronic health record (EHR) system dashboard for glucose performance metrics (also called "glucometrics") to enable ongoing surveillance and benchmarking (16,17). In 2008, up to 59% of hospitals surveyed indicated that they did not have an automated way of extracting and analyzing glucose data (18), although this has likely improved somewhat in the years since then. The same study also noted that there was no standardized definition for the threshold of hypoglycemia that should be considered clinically relevant among hospitalized patients. The ADA's *Standards of Medical Care in Diabetes* has adopted three levels of hypoglycemia (19), but it remains unclear whether these levels transfer well to inpatient care. Thus, even when hospitals can extract and analyze glucose data, there are no standardized glucometrics that would enable institutions to quantify their baseline performance and track the success of various quality improvement (QI) initiatives over time (20–23). This also means that it is difficult for monitoring agencies to compare hospitals' glycemic outcomes against each other. The Society of Hospital Medicine is working toward developing a way for hospitals to benchmark their performance in comparison with other institutions through its Glycemic Control Electronic Quality Improvement Programs (eQUIPS) (24). Additionally, the Centers for Medicare & Medicaid Services (CMS) recently proposed new electronic clinical quality measures (eCQMs) for dysglycemia to be incorporated into its mandatory quality reporting program for hospitals. In the remainder of this article, we describe and answer some common questions about the CMS eCQMs and what hospitals can expect as they are implemented.

What Exactly Are eCQMs?

The CMS is the largest funder of health care in the United States. Its payments accounted for 66% of all hospital payments in 2017 (25), with the remainder largely coming from private insurance companies. CMS plays a central role in developing measures that can be used to support health care delivery to its beneficiaries and beyond. Through a pay-for-reporting program known as the Hospital Inpatient Quality Reporting (IQR) Program, CMS mandates that certain quality measures be assessed and reported. Hospitals could be subject to 25% reduction in annual payment update increase for failure to report. The data collected through the IQR program is publicly available to consumers and health care providers online (26) to facilitate more informed health care decisions. Data on quality measures are collected or reported in a variety of ways, such as claims, assessment instruments, chart abstractions, and registries. Since 2016, hospitals have been required to report on some eCQM data as a portion of the IQR program. These metrics ideally are based on evidence that failure to meet identified benchmarks is likely to result in suboptimal clinical outcomes. The goal of these measures is to shift health care in the United States from a fee-for-service system to a value-based system.

In its annual update for fiscal year 2022, released in August 2021 (27), CMS included for the first time "hospital harm" glycemic measures in a list of 11 eCQMs. The definitions for these glycemic metrics are provided in Table 1 (28,29). Hospitals must report on three self-selected eCQMs in addition to a Safe Use of Opioids measure. Hospitals will need to start collecting data on these glycemic measures in January 2023.

What Are the Benefits and Challenges Associated With eCQMs?

Having the ability to automatically extract data on eCQMs from an EHR system instead of manually reviewing and summarizing population-level glucose data would help to reduce the reporting burden by requiring fewer human resources. Overall, eCQMs are considered an efficient mechanism for extracting quality information from EHR systems and do not require sampling, as the full population is included in the data.

However, despite the benefits of eCQMs, they do require structured data entry, and this burden can fall on already overworked health care providers and information technology (IT) experts. Therefore, it is essential for hospital administrators to partner with members of the care team such as physicians, nurses, and pharmacists while in the development phase to incorporate these into the daily workflows of clinicians. For example, providers will be tasked with accurately documenting whether a patient has a history of diabetes and whether a blood glucose value is erroneous and needs confirmation with prompt retesting. Additionally, an EHR glucose management tab or prompts for various thresholds of hypoglycemia and hyperglycemia could

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TABLE 1 CMS Hospital Harm eCQMs for Severe Hypoglycemia and Hyperglycemia

	eCQM for Severe Hypoglycemia	eCQM for Severe Hyperglycemia
Brief description	The proportion of inpatient hospitalizations for patients who are administered at least one hypoglycemic medication during the encounter, in which patients suffer the harm of a severe hypoglycemic event	The proportion of inpatient hospital days with the harm of a hyperglycemic event relative to the total of qualifying inpatient hospital days
Intention	To measure iatrogenic events triggered by the incorrect use of insulin or another hypoglycemic medication, as severe hypoglycemia is considered a largely preventable adverse event	To measure untreated and prolonged hyperglycemia that could inhibit a patient's ability to recover and thus to help hospitals prioritize early, evidence-based treatment of hyperglycemia
Numerator	The number of inpatient hospitalizations that include *1*) a severe hypoglycemic event during the encounter, defined as a laboratory or point-of-care blood glucose test result <40 mg/dL, *and 2*) a hypoglycemic medication administered within 24 hours before the start of the severe hypoglycemic event and during the encounter; only the first qualifying severe hypoglycemic event is counted in the numerator, and only one severe hypoglycemic event is counted per encounter	The number of inpatient hospitalizations with a hyperglycemic event within the first 10 days of the encounter. A hyperglycemic event is defined as *1*) a day with at least one blood glucose value >300 mg/dL *or 2*) a day during which blood glucose was not measured but that was preceded by two consecutive days during which at least one glucose value per day was ≥200 mg/dL
Denominator	The number of inpatient hospitalizations during which the patient received at least one hypoglycemic medication during the encounter; this includes administration of hypoglycemic medications in the emergency department or when the patient is in observation status at the start of a hospitalization	The number of inpatient hospitalizations during which the patient has at least one of the following: a diagnosis of diabetes made before or during the encounter; administration of at least one dose of insulin or any hypoglycemic medication during the encounter; or presence of at last one blood glucose value ≥200 mg/dL at any time during the encounter; this includes inpatient hospitalizations that began in the emergency department or with the patient in observational status
Exclusions	1. Events involving patients who are <18 years of age 2. Patients who have a blood glucose value <40 mg/dL with a subsequent retest value >80 mg/dL within 5 minutes (i.e., possibly spurious readings)	1. Events involving patients who are <18 years of age 2. Patients who have a hyperglycemic glucose value in the first 24 hours after admission (allowing for correction of hyperglycemia present at admission) *or* in the last partial days before discharge (may not be able to measure blood glucose the last day if it is only a few hours long)

allow providers to act on dysglycemia more efficiently, before a patient has a true blood glucose level <40 or >300 mg/dL.

Adoption of the CMS eCQMs has been slower than anticipated, in part because of a lack of local and federal IT resources and sluggish adoption of EHR systems in general across the country. More recent challenges have included competing priorities during the coronavirus disease 2019 pandemic. The software design for these platforms also requires some flexibility, as the eCQMs are updated annually.

What Does the Future Hold for Glycemic eCQMs?

Although these new glycemic eCQMs (i.e., hypoglycemia and hyperglycemia) are intended to be used simultaneously as a balance to minimize the potential for blood glucose variability, hospitals currently can choose to include one, both, or neither in their reporting.

Long-Term Goals of Glycemic eCQMs

Hospitals may not know what they don't know; thus, we speculate that the glycemic eCQMs were developed to increase awareness of the importance of inpatient glycemic management and thus to reduce hospital harms. Additionally, establishing benchmarks through the implementation of eCQMs will help hospitals measure their status quo and assess the impact of interventions they may implement to improve inpatient glycemic management. The hope is that these metrics will allow for more meaningful analysis of glycemic data to support QI and real-time clinical decision-making. Initiatives to reduce dysglycemia rates will not only prevent symptomatic hyperglycemia and hypoglycemia but may also help to reduce mortality rates and infection risks, decrease lengths of stay, and cut costs (10,30–34).

Necessary Preparations for Glycemic eCQMs

Hospital administrators should elicit the help of diabetes experts such as endocrinologists and diabetes care and

education specialists who are experienced in inpatient diabetes management and form an interdisciplinary inpatient glycemic management team if none exists. For example, in all three community hospitals within Johns Hopkins Medicine, board-certified inpatient endocrinologists (also called "endocrine hospitalists") oversee all diabetes-related QI initiatives (35). The hospital's chief quality officer and chief medical officer are frequently tasked by the CMS and other accrediting organizations with reporting on the quality measures. It will also be necessary to collaborate with data analysts or IT officers, as many hospitals currently do not have a system in place to extract and analyze electronic glucose data. Within the coming months, hospitals that intend to include the new glycemic eCQMs in their CMS reporting will have to work with their EHR analysts to develop such automated systems to get ready for data collection starting in January 2023 (Figure 1). Several third-party software developers may assist with this task by providing blood glucose data analytics as part of their service. Examples include Glytec (Glucommander), Monarch Medical Technologies (EndoTool), and Medical Decision Network (GlucoStabilizer) (36–38).

Finally, once an interdisciplinary team is formed (at Johns Hopkins Medicine, we call ours the Glucose Steering Committee) and a glucometrics dashboard is developed, glycemic data should be tracked monthly or at least quarterly. The expected deadline for reporting such data to CMS is January 2024. Before this, hospitals will have to review the data themselves and decide whether to report on these metrics as opposed to the other eCQMs (e.g., venous thromboembolism prophylaxis or discharge with antithrombotic medication for patients with ischemic stroke). Even if the glycemic metrics are not reported, the hope is that these data will raise awareness of the need for targeted clinician education and possible internal process changes within hospital systems.

Possible Future Directions

As noted above, these measures are currently self-selected but may become mandatory eCQMs in the future. Based on our experience with similar metrics, we speculate that hospitals should be mindful that, although these metrics are currently structured as pay-for-reporting measures, they could soon become pay-for-performance measures. Thus, having a system to compare performance with similar hospitals will be of great value in determining individual hospital glycemic goals.

Additional measures may be around the corner such as metrics for recurrent hypoglycemia and timeliness of treatment during an admission to reduce therapeutic inertia that leads to dysglycemia. Measures of glycemic time in range can be the next step in promoting a well-rounded approach to

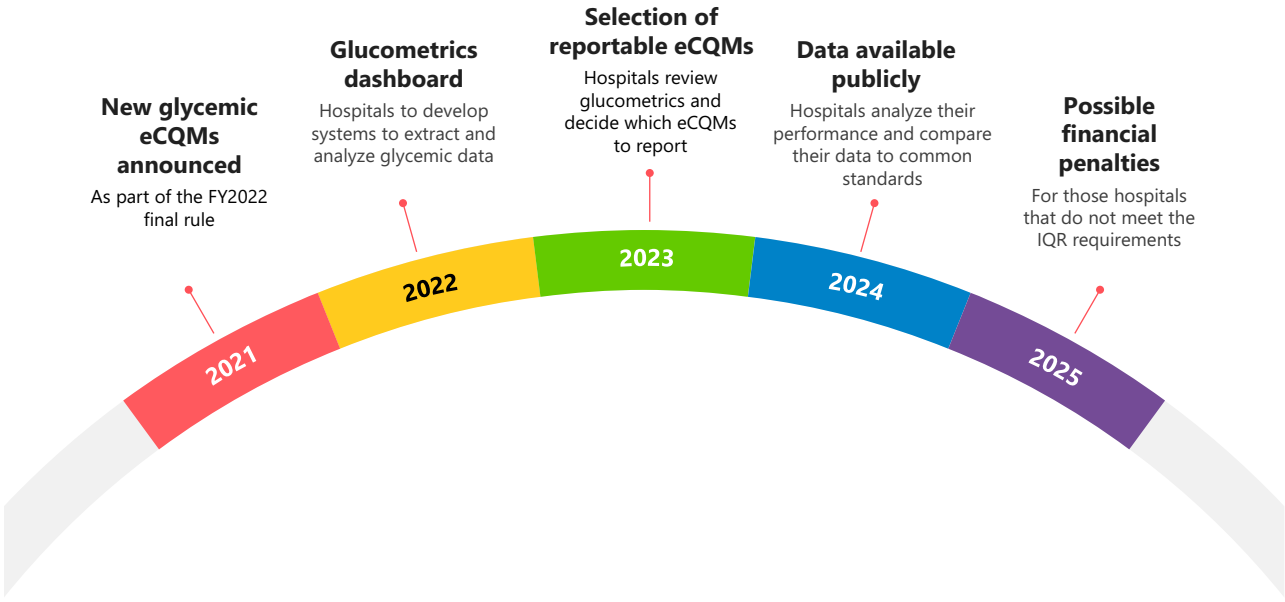

FIGURE 1 Hypothetical timeline of CMS hospital harms measures for severe hypoglycemia and hyperglycemia beginning with the August 2021 final rule announcement for fiscal year 2022. Subsequent steps include the development of automated data extraction and analysis capabilities in line with the proposed glycemic eCQMs (September 2021 to December 2022), implementation of eCQM data collection (January to December 2023), internal review of glucometrics to decide which eCQMs to report (February 2024), public availability of reported data (October 2024), and possible financial penalties for hospitals that fail to meet IQR reporting requirements (2025).

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reducing both hypoglycemia and hyperglycemia simultaneously (4,9). Most hospitals target a blood glucose range of 100–180 or 140–180 mg/dL before meals depending on clinical status and avoid blood glucose levels <100 mg/dL to reduce the risk of hypoglycemia.

Are Performance Measures Effective?

National programs that address the care of patients with sepsis, acute myocardial infarction, and heart failure have led to significant improvements in evidence-based care for those conditions. Similar quality reporting measures introduced in the past to standardize the use of venous thromboembolism prophylaxis in hospitalized patients led to the development of anticoagulation task forces in many hospitals. The hope is that the need to obtain and report glycemic eCQMs will inspire hospital systems to develop similar task forces and action plans.

Although many of the past programs mentioned above originated from the CMS, commercial insurers have also moved toward performance-based payment models. Proponents of the value-based model argue that having benchmarks for performance helps to prioritize quality over quantity of care and helps encourage best clinical practices. Using metrics that are publicly reported helps to improve transparency and provides an incentive for organizations to strengthen their reputation in the public domain. This practice encourages accountability and competition through reporting systems. As previously mentioned, the pay-for-reporting system for glycemic eCQMs will likely evolve into a pay-for-performance model in the future. Similar pay-for-performance models have been successful in reducing undesirable outcomes such as 30-day hospital readmissions (39).

Concerns about these systems stem from potential harm it could pose to hospitals that serve socioeconomically disadvantaged populations. Hospitals that treat a larger volume of low-income, high-risk patients who struggle to engage with the health care system may not perform well on pay-for-performance measures (40). Furthermore, administrative costs to develop automated systems to gather and verify necessary data may be substantial.

These measures in their current form may be helpful in bringing attention to the need to improve glycemic outcomes but do not directly inform us regarding how to bring about these improvements. They also lump data from noncritical and critical care units together, making in-depth analysis to identify areas with more room for improvement difficult. We also do not have any measures for more commonly encountered levels of hypoglycemia (i.e., <70 and <54 mg/dL). Thus, protocols developed to prevent hypoglycemia may only be aimed at preventing the most severe hypoglycemic events of <40 mg/dL, even though patients may have adverse events at higher blood glucose levels.

These measures are an evidence-based approach to improving patient outcomes and standardizing the quality of health care provided across hospitals and populations. The latter could be achieved by adjusting benchmarks for population characteristics (e.g., age, sex, and insurance status) (41). This approach would also allow hospitals with high overall levels of performance to identify and address gaps in care for certain subpopulations. When developing such systems, health care organizations should engage with CMS to ensure that there are safeguards in place to address social determinants of health.

Conclusion

The key to success with glycemic eCQMs will depend on how hospitals choose to partner with diabetes experts, quality and IT officers, physicians, advanced practice providers, pharmacists, and nurses in incorporating these new metrics into their QI initiatives. This strategy will involve careful development of algorithms that are user-friendly, thoughtful, and efficient in the way they analyze glycemic data. Ultimately, achieving high performance ratings on these metrics would help hospitals achieve or maintain a reputation for being a high-reliability health care organization.

DUALITY OF INTEREST

No potential conflicts of interest relevant to this article were reported.

AUTHOR CONTRIBUTIONS

S.A.K. reviewed the literature and prepared the manuscript. M.Z. supervised preparation of the manuscript and was involved in final revisions. S.A.K. is the guarantor of this work and, as such, takes responsibility for the integrity of the data presented and the literature review.

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Inpatient Diabetes Management

Preface: Inpatient Diabetes Management: Should We Make It Simpler?

Mihail Zilbermint, Guest Editor

Inpatient diabetes management is challenging for many hospitals and practitioners. Some large academic centers around the United States have specialized diabetes teams, diabetes technology such as continuous glucose monitoring (CGM) and telehealth consultations for inpatient use, and even endocrine hospitalists available to tackle the challenge of inpatient hyperglycemia (1–8). However, most people with diabetes in the United States receive their inpatient care at small community hospitals, where robust (and complex) guidelines and inpatient glycemic protocols may not have significantly changed the culture of glycemic management (9). Some hospital-based practitioners (i.e., hospitalists) practicing within an antiquated culture may rely solely on "sliding-scale" rapid-acting insulin to "correct" high glucose levels, and nurses are desensitized to hyperglycemic events, with a fasting glucose level of, say, 112 mg/dL sometimes being labeled as "low" and prompting a phone call to the provider asking to "hold all insulins."

The transition of care for people with diabetes from the hospital to home or a skilled nursing facility proves to be even more challenging than inpatient glycemic management and may include the task of medication reconciliation, the burden of obtaining prior authorizations, and patients' differing insulin requirements in the hospital versus at home, among other issues. I frequently teach endocrinology fellows that at least some antidiabetic medications and supplies listed in the electronic health record are incorrect until proven otherwise.

Additionally, I have discovered that some hospitalists are reluctant to initiate newer medications such as sodium–glucose cotransporter 2 inhibitors and glucagon-like peptide 1 receptor agonists at the time of discharge. This reluctance is not because the practitioners do not know about the glycemic, renal, and cardiovascular benefits of agents in these drug classes; rather, it is because they fear that these medications will not be covered by the patient's insurance plan or that prescribing one would generate a prior authorization request that would require extra effort on their part to secure approval.

Furthermore, hospital administrations are slow to adopt the latest diabetes-related technology for inpatient use because they may be concerned about additional costs, lack of insurance reimbursement, and unclear benefits.

So why is glycemic management still such a challenge? Are available practice guidelines too cumbersome and complex? Is the implementation of subcutaneous basal-bolus insulin therapy too difficult? How can we simplify inpatient protocols and management processes? Why is the discharge process for people with diabetes so painful for hospitalists? In this *Diabetes Spectrum* From Research to Practice section, we explore these and other questions and offer strategies for tackling these challenges together.

It is important to remember why glycemic management matters; it has been shown to improve patient outcomes, decrease mortality, decrease hospital lengths of stay and readmission rates, and reduce costs, which is especially important in the United States, which has one of the most expensive health care systems in the world (3). In this special article collection, leading experts in inpatient diabetes care share their "whys" as well as many valuable "hows."

One problem, at present, is that many hospitals don't know what they don't know. However, in August 2021, the Centers for Medicare & Medicaid Services (CMS) sought to address this knowledge gap by implementing electronic clinical quality measures (eCQMs) as part of its Hospital Inpatient Quality Reporting Program. Certain measures of hypoglycemia and hyperglycemia will be now reported to the CMS. In the first article in our collection (p. 391), Sara Atiq Khan and I help to decipher these new metrics. We speculate that eCQMs will bring greater attention to the need for guideline-based glycemic management in the hospital. Although it is unclear exactly when, once these metrics become pay-for-performance measures, hospitals will likely be forced to develop dashboards to track them and make efforts to reduce their rates of inpatient dysglycemia. Dr. Khan and I also outline the basic steps hospitals must take to ensure that they follow the new CMS rules.

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As expected, the use of diabetes technology has rapidly expanded in recent years (10). Many people with diabetes and their care providers are embracing the advanced features and improved glycemic outcomes possible through the use of diabetes devices such as CGM systems and advanced insulin pumps. Patients often now bring their devices to the hospital with them, which has increased the pressure on nursing, medical, compliance, and legal departments to develop and implement policies outlining safety measures and protocols for the safe use of these devices in the inpatient setting. In our second article (p. 398), Jillian Pattison et al. discuss best-practice guidelines for the continuation of personal diabetes technology use in the hospital and outline the specific roles of each diabetes care team member. They recommend screening patients on admission and involving a diabetes expert in the care of those who use diabetes technology. The authors provide additional recommendations about the use of automated insulin delivery systems, which connect an insulin pump and a CGM system with an algorithm to automatically adjust basal insulin delivery, and advise medical teams to prepare alternative diabetes management plans in case these systems become inappropriate for certain hospitalized patients.

In April 2020, in response to the coronavirus disease 2019 pandemic, the U.S. Food and Drug Administration expanded the availability and approved use of noninvasive patient monitoring devices. Several medical centers around the world have been studying CGM use in the hospital setting (11). Glucose telemetry systems are a promising alternative to periodic point-of-care blood glucose monitoring (BGM) with a traditional glucose meter, with many important advantages, including automatic measurements at 5-minute intervals, transmission of estimated glucose values to display devices, and even programmable alerts for impending dysglycemia. In their article (p. 405), Rebecca Rick Longo and Renu Joshi describe their successes and challenges with CGM use in the hospital and discuss the future of this modality for inpatient use. They showcase how robust CGM protocols may provide an opportunity for improvement in inpatient glycemic management. While reviewing current inpatient CGM guidelines, they point out that this technology should be used with select patients and must be maintained appropriately (including, in some cases, continuation of some BGM checks that may be required to document that the CGM system meets acceptable correlation criteria).

Our next article, by Samaneh Dowlatshahi et al. (p. 420), provides several clinical cases and some outside-the-box strategies for managing hyperglycemia in the noncritical care inpatient setting. The authors challenge current guidelines that all inpatients with hyperglycemia should be managed with basal-bolus insulin therapy (i.e., scheduled long-acting basal insulin, scheduled short-acting insulin with meals, and an insulin correctional dosing scale as needed). They describe their institutions' experience with basal insulin only. Interestingly, practitioners have found improved glycemic outcomes when using this approach compared with basal-bolus insulin therapy (12). Additionally, the authors share an example of one hospitalized patient who was receiving daily steroids and whose glycemia was well managed with just NPH insulin and a dipeptidyl peptidase 4 inhibitor. They argue that some available noninsulin agents may effectively reduce mean postprandial glucose in patients with steroid-induced hyperglycemia without the risk of hypoglycemia and thus may decrease excessive glycemic excursions. Could it be possible that simpler is better?

Hyperglycemia has been noted to occur in nearly half of hospitalized patients who are receiving enteral or parenteral nutrition regardless of their diabetes status (13,14). Preethi Polavarapu et al., in the fifth article in this series (p. 427), describe the strategies they use at the University of Nebraska Medical Center to manage glycemia in hospitalized patients receiving nutrition support. They discuss targeted insulin therapy that matches glycemic profiles of the modes of enteral nutrition delivery. For example, they recommend using intravenous insulin infusion for hemodynamically unstable patients; for hemodynamically stable patients, they suggest adding 80% of the total daily insulin dose as regular insulin in the bag with total parenteral nutrition. Alternatively, practitioners could calculate the dose of regular insulin for in-bag use based on an insulin-to-dextrose ratio of 1:20 for patients without diabetes and 1:10 to 1:15 for those with diabetes. These authors also share their strategies for hypoglycemia prevention (e.g., nurse-driven initiation of D10% infusion when artificial nutrition is interrupted).

When is it time to discharge a patient with type 2 diabetes? In our final article (p. 440), Andrew P. Demidowich et al. argue that the lasting impact of inpatient diabetes management is achieved at the time of discharge and encourage hospitalists and other health care providers to take the time to reconcile antidiabetic medications and develop easy-to-understand, successful discharge plans. The authors share a guiding motto: KISD—Keep It Simple on Discharge. They challenge diabetes care providers to learn a lesson from behavioral economics: that the more difficult a task is to accomplish, the less likely a person is to do it consistently over time. Their article outlines a general algorithm for selecting discharge regimens for people with

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type 2 diabetes that maximize glycemic, renal, and cardiovascular benefits and minimize barriers to performing self-care. The authors speculate that diabetes care providers should reduce the number of "pricks and sticks" (i.e., insulin doses and fingersticks for BGM) and encourage case managers to ensure that each patient's regimen is affordable.

I am hopeful that readers will enjoy this special section about effective inpatient diabetes management. It is possible that your institution may have different protocols and guidelines from those described herein. If so, I encourage you to not fear change and to consider trying these new strategies that have potential to improve patient care and outcomes.

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Instituting a Successful Discharge Plan for Patients With Type 2 Diabetes: Challenges and Solutions

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Achieving target inpatient glycemic management outcomes has been shown to influence important clinical outcomes such as hospital length of stay and readmission rates. However, arguably the most profound, lasting impact of inpatient diabetes management is achieved at the time of discharge—namely reconciling and prescribing the right medications and making referrals for follow-up. Discharge planning offers a unique opportunity to break through therapeutic inertia, offer diabetes self-management education, and institute an individualized treatment plan that prepares the patient for discharge and promotes self-care and engagement. However, the path to a successful discharge plan can be fraught with potential pitfalls for clinicians, including lack of knowledge and experience with newer diabetes medications, costs, concerns over insurance coverage, and lack of time and resources. This article presents an algorithm to assist clinicians in selecting discharge regimens that maximize benefits and reduce barriers to self-care for patients and a framework for creating an interdisciplinary hospital diabetes discharge program.

Diabetes and hyperglycemia are common in hospitalized patients, affecting ~25% of inpatients (1). People with diabetes may have a higher lifetime likelihood of hospital admissions and readmissions (1–7), nearly twice that of people without diabetes. Hospitals understand that this increased risk may have important financial implications (1,5,8). Interestingly, data on the importance of inpatient glycemic management have been conflicting (5,9,10). Implementation of specialized diabetes teams was found to reduce inpatient dysglycemia rates, infections, and even 30-day readmissions and lengths of stay in some studies (1,10–18).

Arguably the most important component of inpatient diabetes management is not the inpatient glycemic management at all, but rather determining the treatment regimen on discharge. The overwhelming majority of patients' lives are spent outside of the hospital setting, so, intuitively, the medications that patients take at home will have a much more significant cumulative impact than their medication regimen during hospitalization.

Guidelines for diabetes care in the hospital are published annually by the American Diabetes Association (ADA) and call for a "structured discharge plan tailored to the individual patient with diabetes" (19,20). For example, not all patients are discharged to home; some may require rehabilitation and could be transferred to a skilled nursing facility. Homeless patients may require a referral to a social service agency that provides temporary residence and/or shelter. Comorbidities such as chronic kidney disease, heart disease, or gastrointestinal (GI) disease can influence medication choices and patients' ability to perform self-care. Additionally, patients on insulin therapy represent a high-risk group for postdischarge complications and may require additional diabetes self-management education or resources (21,22).

Moreover, the moment of discharge presents a unique opportunity to reassess and revise a patient's home diabetes regimen. Hospitals should deploy algorithms to assist providers with making antidiabetes medication adjustments based on patients' admission A1C values (23). Additionally, new or worsening medical conditions (e.g., renal failure) or new prescriptions that are not compatible with the prior home regimen may necessitate an adjustment in diabetes outpatient therapy. However, therapeutic inertia is pervasive yet underrecognized (24). In a large study of admissions to U.S. Veteran Affairs hospitals, among patients with diabetes and a high A1C, only 22% received a change in outpatient diabetes therapy upon discharge (24). The reasons for therapeutic inertia are numerous and include anchoring bias, time constraints, unfamiliarity with other medications or treatment options, and provider burnout. Physicians tend to

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lock in or "anchor" to a patient's existing medications despite ample clinical evidence of chronically poor glycemic control. Also, clinicians may believe it is inappropriate to change an outpatient regimen managed by another clinician (24).

Systematically and reproducibly instituting a successful diabetes discharge plan for patients is challenging and requires considerable forethought and planning. In this article, we discuss barriers, strategies, and key steps to achieving this goal.

The Three Pillars of Successful Discharge Planning

There are three major components, or pillars, of diabetes care that must be addressed at discharge to help ensure lasting treatment success: medications, glucose monitoring, and outpatient education/resources. These are discussed in more detail below.

I. Medications

Prescribing medication is both an art and a science, particularly in diabetes management. Toward this end, the ADA guidelines offer a flexible treatment algorithm with different options depending on which factor(s) are most pressing in each patient (25). Similarly, we offer here a basic framework for medication selection at the time of discharge. Ultimately, however, the best treatment is the one adapted to the needs and wishes of the individual patient.

It is well known in behavioral economics that the more difficult a task is to accomplish, the less likely a person is to do it consistently over time. Conversely, the simpler or more convenient a task is to perform, the more likely a person will be to continue to do it well (26). It is no surprise that Amazon has become one of the largest, most successful companies in the United States because it has removed much of the "friction" of shopping. Ordering, paying for, and receiving products is simple, fast, and convenient and does not require much effort. This type of thinking should be applied to diabetes management and discharge planning as well.

Medication nonadherence is epidemic among diabetes patients, and >30% of patients perform limited self-care behaviors (27). It has been well studied that major factors associated with diabetes medication nonadherence include cost, insulin use, hypoglycemia, perceived treatment efficacy, and treatment complexity (28,29). Indeed, one study found that the greatest predictor of diabetes nonadherence was patients feeling that their "medicines are hard to take" (30). Therefore, a patient's inpatient basal-bolus insulin regimen should not be heedlessly continued upon discharge; rather, inpatient providers should thoughtfully choose a discharge regimen that removes the friction hindering successful medication adherence. This includes minimizing the number of times per day a patient has to take medications, while simultaneously keeping the treatment regimen simple and affordable.

It is important to note that the following discussion of medications is specific to patients with type 2 diabetes, even though some of the earlier principles may apply to all people with diabetes. Additionally, the following are the authors' suggestions, but ultimately the number and types of diabetes medications prescribed on discharge should be consistent with existing ADA guidelines (25).

To maximize performance of self-care behaviors, patients with type 2 diabetes should take all of their diabetes-related medications once daily, all at the same time if possible (31). A simple strategy is to consider starting one noninsulin medication for every 1% the patient's A1C is above target, up to three (or, rarely, four) medications. For example, for an A1c of 10%, consider starting three noninsulin diabetes medications (32). For an A1C >10–12%, consider also adding on insulin, as discussed further below (Table 1).

Metformin

Recommendation: start metformin extended release (ER) 750 mg daily with breakfast. After 1 week, if there are no significant GI side effects, increase dose to 1,500 mg (two tablets) with breakfast.

The ADA's *Standards of Medical Care in Diabetes—2022* (25) recommends metformin as the first-line agent in medically treating patients with type 2 diabetes. Recent reports have suggested that, in addition to promoting some weight loss and not causing hypoglycemia, metformin may have numerous other positive pleiotropic benefits such as anticancer, antiaging, anti-inflammatory, and cardioprotective properties (33–36). Metformin can be prescribed either as an immediate release (IR) formulation that should be taken twice daily or an extended release (ER) formulation that can be taken once daily. Metformin IR tablets comes in doses of 500, 750, 850, and 1,000 mg, whereas metformin ER tablets are available in doses of 500, 750, and 1,000 mg. Studies have shown that doses of metformin ER have comparable A1C effects to the equivalent daily doses of metformin IR (37,38).

All of the metformin IR doses are generic and therefore affordable. However, for metformin ER, it is important to realize that the 500- and 750-mg tablets are also generic and covered by most insurance companies, whereas the 1,000-mg tablet is only available as a brand-name product (e.g., Fortamet or Glumetza). Therefore, prescribing two metformin ER 1,000-mg tablets daily (2,000 mg total) can

TABLE 1 Sample Diabetes Discharge Medication Algorithm

Percentage Points A1C Is Above Target	Medications	
	Maximize Benefits	Minimize Costs
1	Metformin ER	Metformin
2	SGLT2 inhibitor	Pioglitazone
3	GLP-1 receptor agonist	Sulfonylurea
≥4	Basal insulin	Premixed insulin*

For each percentage point A1C is above target, providers should consider adding an additional medication, as listed above, to the treatment regimen (32). SGLT2 inhibitors and GLP-1 receptor agonists can be prescribed at lower A1C levels if other indications exist, as per guidelines (25). *If premixed insulin is initiated, the authors recommend not prescribing a sulfonylurea on discharge.

cost a patient several hundred dollars more than prescribing two 750-mg tablets daily (1,500 mg total). Moreover, the difference in A1C benefit between 1,500 and 2,000 mg daily is only ~0.3% (37). One may point out that patients could take four generic 500-mg tablets daily, but taking four pills and a protracted uptitration schedule (e.g., 500 mg for the first week, increasing by one tablet each week for the following 3 weeks) represents increased treatment friction and may be more likely to limit self-care than a simpler two-pill regimen of metformin ER.

The feared rare complication of metformin toxicity is lactic acidosis, which can lead to hospitalization or, rarely, death. Because metformin is renally cleared, a patient's renal function influences the decision of whether to initiate this medication, as well as selecting the final goal dose. Studies have suggested that at an estimated glomerular filtration rate (eGFR) >30 mL/min/1.73 m^2, a metformin dose of 1,000 mg daily poses minimal risk for developing lactic acidosis, and at an eGFR >45 mL/min/1.73 m^2 (chronic kidney disease [CKD] stage 3a or better), metformin 1,500 mg daily is safe (39,40).

With regard to side effects, at doses of 1,000 mg daily, metformin IR has significantly greater rates of nausea and a trend toward significantly more diarrhea. At doses ≥1,500 mg, the rates of GI side effects are similar between the IR and ER formulations (37). Another study found that patients who switched from twice-daily metformin IR to a once-daily metformin ER regimen had fewer GI side effects, equivalent metabolic benefits, and a greater preference for the ER formulation (41).

Given all of these considerations (i.e., cost, side effects, safety, and simplicity), if a patient has CKD stage 3 or better (≥30 mL/min/1.73 m^2), we recommend starting metformin ER 750 mg daily with breakfast. If a patient's eGFR is ≥45 mL/min/1.73 m^2, instruct the patient and write on the prescription for the patient to increase the dose after 1 week to 1,500 mg (two tablets) daily with breakfast. However, instruct the patient that if, at 1,500 mg, the patient develops intolerable GI side effects, decrease the dose back to 750 mg daily and discuss further with their outpatient provider.

Sodium–Glucose Cotransporter 2 Inhibitors

Recommendation: start a sodium–glucose cotransporter 2 (SGLT2) inhibitor if it is covered by the patient's insurance.

SGLT2 inhibitors do not have a profound effect on A1C lowering, with an expected reduction of approximately 0.5% (42,43). However, they all have been shown to reduce congestive heart failure (CHF) exacerbations, they have mild systolic blood pressure–lowering effects, and several agents in this class have renoprotective benefits as well. Additionally, this class of medications rarely causes hypoglycemia and encourages a potential weight loss of 3–5%, which is particularly beneficial in patients with overweight or obesity (44).

The eGFR cut-offs for initiating an SGLT2 inhibitor differ by medication and indication. In general, SGLT2 inhibitors are not dangerous at lower levels of renal function, but their glycosuric (and therefore glucose-lowering) effects become negligible (44). However, the renoprotective and/or cardioprotective benefits of canagliflozin, dapagliflozin, and empagliflozin remain at an eGFR ≤30 mL/min/1.73 m^2 (45–48). For this reason, U.S. Food and Drug Administration (FDA)-approved labeling allows for certain medications in this class to continue even if a patient's renal function worsens to CKD stage 4 or stage 5 (≤30 mL/min/1.73 m^2), as long as the patient is not on hemodialysis (49).

Therefore, if a patient needs additional A1C lowering beyond 1% (meaning that metformin alone will be unlikely to get the patient's A1C to goal), or if the patient has another indication such as CKD, CHF, or atherosclerotic cardiovascular disease, it is recommended to strongly consider also starting an SGLT2 inhibitor on discharge (25).

If cost remains an issue even after insurance coverage, one option is to prescribe the higher dose (e.g., dapagliflozin 10 mg or empagliflozin 25 mg) and instruct the patient to take only half of a pill each time. This half dose should still retain considerable cardioprotective, renoprotective, and weight loss benefits, with only a slight decrease in glucose-lowering potency (48,50,51).

Glucagon-Like Peptide 1 Receptor Agonists

Recommendation: start a glucagon-like peptide 1 (GLP-1) receptor agonist if it is covered by the patient's insurance.

GLP-1 receptor agonists, like SGLT2 inhibitors, have generated considerable excitement within the diabetes community

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for their glucose-lowering ability, lack of hypoglycemia, considerable weight loss effects, and potential cardio- and renoprotective benefits (52). However, not all GLP-1 receptor agonists are equivalent. Importantly, only dulaglutide, injectable semaglutide, and liraglutide have been shown to reduce major acute cardiovascular events (MACE). Other drugs in this class (oral semaglutide, exenatide ER, exenatide, and lixisenatide) did not reduce MACE in large clinical trials (53,54). Tirzepatide, a once-weekly GLP-1/gastric inhibitory polypeptide receptor agonist, has had impressive glucose-lowering and weight loss benefits, but whether it confers cardiovascular and/or renoprotective benefits is still unclear (55,56).

With regard to ease of use, oral semaglutide is the only oral GLP-1 receptor agonist formulation. However, patients must take the medication on an empty stomach while drinking no more than 4 oz (120 mL) of plain water and must not take any other medications, food, or drink for at least 30 minutes (57). Such restrictions may prove challenging to some patients. Injectable semaglutide, dulaglutide, and exenatide ER come as once-weekly formulations, whereas liraglutide and lixisenatide must be taken daily, and exenatide must be taken twice daily. Studies have shown that the once-weekly formulations have improved adherence compared with daily GLP-1 receptor agonists (58,59).

Dulaglutide and exenatide ER pens come as fixed-dose pens that are discarded after a single use. Conversely, semaglutide and liraglutide are multidose pens that must be dialed to the correct dose, similar to an insulin pen. There are pros and cons to each design. Some patients find the design of the dulaglutide pens very easy to use, with minimal steps and an attached pen needle, which can be particularly beneficial for those with poor eyesight, needle phobia, or dexterity issues (60). However, for the multidose pens, if a patient develops significant GI side effects even at the lowest dose, providers may instruct patients to dial a "microdose" by counting clicks (e.g., 8–9 clicks is ~0.125 mg, or half the typical starting dose of injectable semaglutide) (61). This "microdosing" of GLP-1 receptor agonists is not approved by the FDA but offers the potential for slower titration and reduced risk of GI side effects (62,63).

Some providers are hesitant to start a GLP-1 receptor agonist on discharge for fear of causing significant GI upset. Although these adverse effects may be common among patients, they are often transient. Moreover, severe side effects are rare, and establishing expectations on discharge is vital. Patients must be educated that certain foods such as large and/or high-fat meals can trigger worsening nausea or vomiting. Eating smaller and leaner meals (e.g., poultry or fish) and gradually increasing fiber intake may help to reduce the risk of untoward GI side effects (64).

If a patient's A1C is >9%, we strongly recommend adding a GLP-1 receptor agonist on discharge, provided that no contraindications exist and the cost after insurance coverage is not prohibitive. Studies have shown that GLP-1 receptor agonists prescribed at discharge have significantly greater A1C-lowering effects, weight loss, and less hypoglycemia than basal insulin (65). Prescribing once-weekly injectable semaglutide or dulaglutide is preferred because patients on this dosing regimen have demonstrated the greatest adherence compared with patients on other GLP-1 receptor agonists. Also, these drugs have demonstrated cardio- and renoprotective benefits in large clinical trials and are safe to use for any degree of CKD (66,67).

Basal Insulin

Recommendation: if needed, start once-daily basal insulin or twice-daily premixed insulin.

A combination of metformin, an SGLT2 inhibitor, and a GLP-1 receptor agonist can likely decrease A1C by ~3% (37,49,68). Therefore, if a patient's A1C is >3% higher than target, adding insulin may be necessary, especially if the patient required considerable basal insulin during the hospital stay. Some providers at this point would resort to starting the patient simply on basal-bolus insulin therapy and not bother with noninsulin antihyperglycemic medications. However, this strategy misses the vital nonglycemic benefits of metformin, SGLT2 inhibitors, and GLP-1 receptor agonists, as discussed above.

Moreover, once-daily basal insulin plus a GLP-1 receptor agonist has been shown to be as effective in getting patients to glycemic targets as a basal-bolus insulin regimen (69–72). Also, the simplified strategy of using a once-weekly GLP-1 receptor agonist plus once-daily basal insulin can improve patient acceptance and treatment adherence compared with the four or more daily insulin injections required in a basal-bolus insulin strategy (73).

For simplicity and efficacy, it is preferable to prescribe once-daily basal insulin (e.g., glargine 100 or 300 units/mL, detemir, or degludec) in a pen formulation that is covered by the patient's insurance. Affordability is a major issue with insulins, with the cheapest out-of-pocket basal insulin pen costing just under $100 for a box of five pens (Semglee [glargine-yfgn]) (74). However, if the provider chooses the wrong insulin (i.e., one that is not covered by insurance or falls into the Medicare drug plan coverage gap or "donut hole"), the cost could be as high as $900 or more (75). If cost is an issue, another viable option is to prescribe Walmart's ReliOn brand of premixed 70/30 NPH/regular insulin pens twice daily, which at the time of this writing cost $42.88 for a box of five pens (75).

What If Cost Is the Greatest Barrier to Self-Care?

An estimated 30 million people in the United States do not have medical insurance (76), and even for those who do, high deductibles and copays may still put many of the medications discussed above out of reach (77). For these patients, following the same general strategy above—one noninsulin medication for each 1% A1C is above target—can still be followed by using a combination of generic drugs and prescription discount cards to minimize costs.

First, begin with metformin, as discussed above. Both metformin IR and metformin ER are covered by most insurances with minimal out-of-pocket costs. For patients without medical coverage, a 1-month supply of metformin IR 2,000 mg (four 500-mg tablets) daily commonly ranges from $5 to $24, whereas a monthly supply of metformin ER 1,500 mg (two 750-mg tablets) daily is slightly more expensive, typically ranging from $11 to $30 depending on the pharmacy (78,79). For this reason, some providers prefer starting patients on metformin IR 500 mg daily for 1 week and then increasing the dose by one tablet per week as tolerated to a maximum dose of 1,000 mg twice daily.

Second, providers should consider adding the thiazolidinedione pioglitazone. Pioglitazone is dosed once daily, has negligible hypoglycemia risk, and has purported significant cardiovascular, renal, and β-cell protective effects (80,81). However, side effects (namely, water retention, weight gain, and bone loss) must be considered when deciding whether to prescribe this drug (82,83). In particular, this medication is contraindicated in patients with New York Heart Association class III or IV CHF, and clinicians should consider avoiding its use in any patient with CHF. Finally, there have been conflicting studies regarding the possibility of a slightly increased risk of bladder cancer in individuals taking pioglitazone (84–86).

After metformin ER and pioglitazone, providers can also consider adding a sulfonylurea such as glimepiride, glipizide, or glipizide ER. Sulfonylureas unfortunately carry a significant risk of hypoglycemia, with 2–3% of patients experiencing severe hypoglycemia requiring medical assistance. Therefore, they should be prescribed judiciously in the elderly or in individuals with advanced CKD (87,88).

If a patient's A1C is >10–12%, insulin is most likely necessary to mitigate glucotoxicity and bring the patient's glucose closer to goal (32). If the patient is uninsured or insurance copays for basal insulins are prohibitively expensive, the authors recommend prescribing ReliOn 70/30 NPH/regular insulin pens twice daily with meals, as discussed previously. Although a vial of NPH or premixed insulin can be purchased as cheaply as $25 (75), a box of pens provides 1,500 units of insulin (300 units per pen), whereas a vial only provides 1,000 units. Therefore, on a per-unit cost basis, the savings difference (35 units/dollar with pens vs. 40 units/dollar with vials) becomes negligible. Moreover, both pens and vials, once opened, must be discarded after 28 days. Because a box contains five pens, a single prescription could, in theory, last for several months depending on the daily dosage.

If premixed insulin is being initiated, metformin ER with or without pioglitazone may still be considered for their additional pleiotropic and insulin-sparing benefits. However, the authors recommend not including a sulfonylurea in the discharge regimen because of their long duration of action, which results in a high risk of hypoglycemia, especially in older adults. In some cases, patients report having significant post-lunch glycemic excursions on premixed insulin. To combat this issue, providers can consider also prescribing a short-acting insulin secretagogue (e.g., a meglitinide) to be taken just once daily with lunch (89).

II. Glucose Monitoring

Recommendation: consider prescribing a continuous glucose monitoring (CGM) system to patients with high A1C values or obesity or who are taking medications known to cause hypoglycemia.

Similar to medications, it is vital to consider simplifying glucose monitoring on discharge to reduce barriers and empower patients. Capillary blood glucose monitoring (BGM) with a traditional glucose meter is associated with significant diabetes distress, anxiety, and burnout (90). Many patients either fear needles or hate the pain that comes from repeated BGM, which limits self-care (91,92). Limited frequency of BGM, in turn, is associated with increased hospitalization rates and diabetes complications (93).

CGM may carry many advantages over traditional BGM. CGM sensors are easy to apply and much less painful than the fingersticks needed for BGM (94). Whereas fingerstick BGM only shows the glucose value at that moment in time, CGM demonstrates the direction in which the glucose level is trending, as well as the historical data. Additionally, the newer CGM systems (e.g., the FreeStyle Libre 2, FreeStyle Libre 3, and Dexcom G6 systems) allow for alarms to be set at particular glucose levels, which empowers patients to proactively prevent hypoglycemia and severe hyperglycemia (95). CGM systems have associated smartphone applications (apps), which enable patients to discreetly check glucose levels with minimal additional supplies and even share the results in real time with family members. This last feature can be particularly attractive for

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individuals with a history of hypoglycemia or the elderly, because other individuals can be notified of a hypoglycemic event and intervene on the patient's behalf if needed.

Studies have shown that CGM reduces hypoglycemic events, fear of hypoglycemia, health care visits, and A1C, while simultaneously increasing time spent in the target glycemic range, patient engagement, medication adherence, treatment satisfaction, and quality of life (92,96–98). Moreover, by having continuous real-time data, patients better understand how other lifestyle choices such as food and exercise affect glycemic outcomes, which in turn may motivate patients to make healthier choices (95,99).

Consequently, many patients with suboptimal diabetes management or obesity may derive benefit from being prescribed a CGM system. As with medications on discharge, it is imperative to determine whether the patient's insurance covers the CGM system. As of this writing, when using a prescription discount card, the cheapest out-of-pocket CGM system is the FreeStyle Libre 2 at approximately $130 per month ($65–70 per sensor) (100). Although expensive, this cost may be affordable for some patients who are willing and able to spend the extra money to forgo the anxiety and pain of BGM. Given that a box of 100 glucose meter test strips can cost the same or more (101), it is not surprising that several studies have found potential cost savings for patients in switching from BGM to CGM (102,103). Of note, the cheapest Walmart ReliOn brand glucose meter currently costs $9, and 100 ReliOn strips cost $18 (104).

If prescribing a CGM system on discharge, it is highly recommended that the patient be taught how to place and use a CGM sensor, as well as download the correct smartphone app before discharge if a smartphone is to be used in place of a reader or receiver.

III. Outpatient Education/Resources

It is unlikely for patients to master diabetes self-management after a single discussion with a provider or diabetes educator. Establishing continued care and education after discharge is an often-overlooked but essential component to encouraging patient engagement and treatment success (19). Key referrals are described below.

Outpatient Endocrinology Referral

Endocrinology specialty referral could be considered for any patient with diabetes, but specifically should be considered for those with elevated A1C, frequent hypoglycemia, or a new diagnosis of diabetes, as well as those newly starting insulin and those who have developed complications from diabetes (105,106). Unfortunately, in many areas of the United States, access to specialty diabetes care is limited, and wait times for appointments can span months (107). However, the increased adoption of telemedicine may help to bridge this care gap (108).

Outpatient Diabetes Self-Management Education

Diabetes self-management education and support (DSMES) is a service for people living with diabetes who want to learn how to cope with and manage diabetes (109). According to the ADA's guidelines, "All people with diabetes should participate in diabetes self-management education and receive the support needed to facilitate the knowledge, decision-making, and skills mastery for diabetes self-care" (110,111).

With the increased adoption of virtual communication, as well as the availability of online materials, patients no longer are restricted to local in-person diabetes outpatient education programs (or limited by the lack thereof). For example, the ADA offers a virtual Living With Type 2 Diabetes program at no charge, and the Association of Diabetes Care & Education Specialists (ADCES) has a website that offers assistance in finding in-person and online diabetes education programs (112,113).

Diabetes Support Groups

In addition to education, patients can benefit from support groups. Diabetes can be isolating and is associated with significant depression, anxiety, and burnout. Finding safe spaces in which to share experiences, learn from others who have had similar frustrations, and obtain social support has been shown to improve glycemic outcomes and increase physical activity, knowledge, optimism, confidence, and psychosocial functioning (114,115). Both the ADA and the ADCES have diabetes support directories and other resources online (116,117).

Medical Nutrition Therapy

Food plays a large role in determining a patient's glycemic outcomes, and nutrition therapy and education empowers patients to make healthier food choices and cooking decisions (118). Providers should refer patients with diabetes for individualized medical nutrition therapy provided by a registered dietitian who is knowledgeable in providing diabetes-specific nutrition therapy and education (110,119). Outpatient dietitian appointments can be expensive, so patients may need to contact their insurance carrier to see what services are covered by their plan.

Barriers to Excellent Discharge Care and Strategies to Overcome Them

Therapeutic inertia encompasses educational deficiencies for both clinical providers and patients, as well as health care system barriers (e.g., limited insurance coverage, the need for prior authorizations, and high costs of treatment). The ADA has spearheaded the effort to overcome therapeutic inertia and has developed a three-component model to achieve this goal: education, collaboration, and research (110).

One component necessary to overcoming therapeutic inertia is education and awareness for clinicians and the larger health care team (120). Because of their lack of experience with outpatient diabetes management, inpatient clinicians require ongoing education about the standards of care for diabetes, as well as treatment modalities—specifically pharmaceutical and technology updates. Examples of education that uses both educational and collaborative elements include diabetes-focused grand rounds; quarterly diabetes-related presentations for internal medicine teams, care management teams, patient access teams, and nursing staff; individual case reviews with interdisciplinary teams; and the development of a diabetes champion program (a 1-year diabetes care–focused education program for clinical staff) (4,121–124). Additionally, research demonstrates that empowering nonprescriber providers (i.e., pharmacists, nurses, and diabetes care and education specialists [DCESs]) results in reduced therapeutic inertia and greater achievement of glycemic goals (125).

Education for patients during hospitalization is also a key component of discharge planning. Diabetes can be confusing, complicated, and overwhelming for patients and their families. Barriers to care for people with diabetes include inadequate knowledge about treatment modalities, health literacy and numeracy deficits, social determinants of health, diabetes distress, and depression (126,127). Assessing and intervening on these issues can be achieved by different members of the care team, including DCESs, care managers, nursing staff, social workers, and prescribers (both hospitalists and endocrinologists). Topics to discuss can include the use of technology, medication administration, hypoglycemia prevention and treatment, community health resources, and continuation of education after discharge (e.g., referral for outpatient DSMES) (110). Assessing a patient's understanding of the treatment plan and ability to implement a new plan, using the teach-back method, is essential. A discussion regarding the burden of treatment is the first step in discharge plan development and should be completed on day 1. Additionally, screening for diabetes distress and depression is important (19). It is known that treatment-related distress often results in suboptimal self-care behaviors and that reducing the burden of treatment is an effective strategy to reduce diabetes distress (128).

Collaboration is another component of overcoming therapeutic inertia and tackling existing health care system barriers to optimal diabetes care. Once the discharge prescriptions and outpatient referrals have been determined, the assignment of tasks, with a clear delineation of responsibilities, is essential. Although the specifics must be decided at each institution, dedicated unit (or discharge) pharmacists and/or care management teams can assist with prior authorizations and determining the costs of proposed treatments.

One very important strategy for discharge is to start planning for discharge on day 1 of the hospital admission. Early initiation will allow for the determination of insurance coverage and costs, completion of prior authorizations, identification of available cost-saving processes, and determination of whether an alternative treatment regimen may be necessary. Table 2 outlines the tasks, responsible team members, and actions required for the development of safe and successful discharge plans.

In his book *The Checklist Manifesto*, Atul Gawande explains how many processes, and particularly those in the health care sector, have become so complex in modern society that it is impossible to consistently remember to do them all (129). The results are frequent unintended errors and poor outcomes. However, by instituting a simple tool—the checklist—in the workflow, even very complicated tasks can be accomplished successfully, reproducibly, and with minimal mistakes. In the hospital setting, a discharge checklist is an essential foundation of the discharge plan for patients with diabetes (Table 3).

A recent trend in acute care is the addition of endocrine hospitalist and inpatient diabetes management services to hospital systems. This model is solely inpatient-based and can consist of an endocrinologist plus an advanced practice provider, pharmacist, dietitian, nurses, and DCESs. Evidence shows that endocrine hospitalists and inpatient diabetes management teams can reduce readmissions and hospital lengths of stay and improve glycemic outcomes (1,17). Among the responsibilities of the inpatient diabetes management service is providing education for clinicians and nursing staff on discharge planning. The incorporation of this team into inpatient care can reduce therapeutic inertia and improve the long-term health of patients with diabetes.

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TABLE 2 Roles and Responsibilities for Successful Diabetes Discharge

Task	Team Member Responsible	Action
Assess burden of treatment	Bedside RN, care manager, provider	Screen for social determinants of health and diabetes distress
Assess financial burden	Bedside RN, care manager, provider	Review home medication list and inquire about affordability
Change discharge medications, as appropriate	Provider	Electronically send prescriptions to pharmacy
Investigate insurance coverage, cost, and financial assistance programs	Care manager, inpatient pharmacist, provider	Confirm cost/copay; based on financial assessment above, consider whether further medication changes are needed, using low-tier formulary, providing coupons, and providing patient assistance applications
Assess self-care knowledge	CDCES, bedside RN, provider	Provide inpatient education/DSMES and refer to continuing outpatient education/DSMES
Assess lifestyle and regimen match	CDCES, bedside RN, provider	Review typical day, meal times, and work schedule

CDCES, certified diabetes care and education specialist; RN, registered nurse.

Conclusion

Discharging patients with diabetes can be complicated, involves many decisions, and is fraught with numerous barriers and hurdles. With regard to prescriptions, the goal is to maximize benefits and medication adherence and minimize harm. Toward this end, providers should minimize the number of BGM checks and insulin doses required and ensure that the regimen is affordable and easy to implement for the patient. On a grander scale, executing a reproducibly successful discharge plan involves considerable forethought, planning, and education on the system level. Strategies to achieve a successful workflow include developing checklists, order sets, and template language; fostering collaboration; and clearly defining the roles of team members and specific necessary steps within the workflow.

TABLE 3 Sample Diabetes Discharge Checklist

Check as Completed	Task
☐	Confirm with patient/family/outpatient provider the home medication regimen.
☐	If diabetes is not well managed,* assess whether the patient would be willing to adjust the outpatient treatment regimen.
	Electronically prescribe:
☐	Medications
☐	Supplies (e.g., CGM system, glucose meter, glucose test strips, lancets, and syringes/pen needles)
☐	Confirm with pharmacist/care manager the cost of medications and supplies, prior authorization needed, and other medication and insurance details.
	Educate patient about:
☐	Medications (e.g., side effects and titration)
☐	Hypoglycemia prevention and treatment
☐	Insulin/GLP-1 receptor agonist injection technique
☐	BGM
☐	CGM
☐	Diet
	Make outpatient referrals as needed:
☐	Endocrinologist
☐	Diabetes education/DSMES
☐	Diabetes support group
☐	Registered dietitian
☐	Write discharge instructions for the patient.

*Diabetes can be considered not well managed if the patient's A1C is significantly above goal, the patient presents with a severe exacerbation of diabetes (e.g., hypoglycemia or hyperglycemic emergency), or if the patient reports having frequent hypoglycemia at home.

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AUTHOR CONTRIBUTIONS

All of the authors wrote, reviewed, and edited the manuscript. A.P.D. is the guarantor of this work and, as such, takes responsibility for the integrity and the accuracy of the article.

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