

## BUILDING A BUSINESS CASE FOR INPATIENT DIABETES MANAGEMENT TEAMS: LESSONS FROM OUR CENTER

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### INTRODUCTION

Patients with diabetes mellitus are at increased risk for hospitalization and negative outcomes during admission. Moreover, hyperglycemia in-hospital or a diagnosis of diabetes is associated with increased complications, in-hospital mortality, and hospitalization costs (1). Unadjusted annual per capita health care expenditures in 2017 for in-hospital care are estimated at \$4,966 for patients with diabetes and \$1,202 for those without diabetes (2).

While guidelines detailing appropriate glycemic targets exist (3-5), translating guidelines into clinical practice is challenging. Employing a dedicated inpatient diabetes management program (IDMP) can improve glycemic parameters and economic outcomes in the hospitalized patient with diabetes and/or hyperglycemia. Providing such a service requires hospital systems to invest upfront. Therefore, it is important to develop a strong business case to garner institutional support. At our hospital, a multifaceted IDMP comprising a dedicated inpatient diabetes consultative service (DCS) and a multidisciplinary glucose steering committee (GSC) to oversee development and implementation of policies, protocols, uniform insulin

ordersets, and educational initiatives was instituted in a step-wise fashion in 2006. Others have detailed their experiences implementing an IDMP (6,7) and Magee and Beck (8) provided excellent strategies for developing a business case for an IDMP. Since then, several studies have emerged providing compelling data regarding drivers of cost for providers seeking to improve the quality and value of care for hospitalized patients with dysglycemia. In this commentary, we provide a narrative review of evidence that IDMPs produce outcomes that enhance value and we review our hospital's experience in building a business case to support such teams.

### Factors Driving Cost

The factors driving cost in hospitalized patients with diabetes include increased length-of-stay (LOS) and financial penalties for a high 30-day readmission rate. Numerous studies suggest that dysglycemia during hospitalization is associated with increased LOS (9-11) and a higher 30-day readmission rates (12-15). Particularly notable, Estrada et al (11) examined patients undergoing coronary artery bypass surgery and found that each 50 mg/dL increase in glucose was associated with 0.76 additional days of hospitalization post-operatively, a \$2,824 increase in hospital charges, and a \$1,769 increase in hospitalization cost, after adjustment for diabetes status and pre-operative mortality score. Given the above examples, the key question is whether the institution of an IDMP reduces LOS and 30-day readmission rates. There are definitive data suggesting that components of an IDMP reduce LOS and readmission (discussed below).

### Effect of Inpatient Diabetes Management Programs

In Table 1, we summarize studies that have examined interventions that improve hospital LOS and readmission rates and provide program builders with the data that busi-

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ness administrators often request. Together, these studies strongly suggest that LOS and/or readmission rates decline after initiation of a DCS (16-21), institution of educational policies and glucose management protocols (22-24), and/or implementation of a comprehensive IDMP (25). Notably, Newton et al (25) reported substantially reduced costs related to reductions in catheter-related bloodstream infections (CR-BSI) in medical ICUs after implementing an IDMP, amounting to over \$6,000/1,000 CR-BSI event-days. Furthermore, they found that an IDMP was associated with reduced LOS such that there were 1,788 “saved days” leading to improved throughput, with a value of \$2.2 million representing a 467% return on investment (25). Also, Simmons et al (18) reported a pilot intervention involving diabetes educators, endocrine and psychiatry consultants, and well-being practitioners targeted towards patients with type 1 diabetes admitted with either hyper- or hypoglycemia. While they noted dramatic reductions in readmission rates, they found a rapid rebound in readmissions after the pilot program ended due to loss of funding (18), strongly suggesting that ongoing commitment is needed to maintain quality and value of care.

#### Building a Business Case for an IDMP

Based on the published data noted above, we believe a strong business case can be made for an IDMP. We recommend the following steps in order to develop a well laid-out plan, making such programs attractive to hospital administration, and increasing the likelihood of program success: (1) obtain data on key metrics (LOS, 30-day readmissions, glucose related safety events and mortality), (2) identify high risk units not meeting metrics, (3) define case volumes in these units to determine which units may benefit most from IDMP, (4) develop goals statement and metrics for success, (5) quantify financial impact of not meeting defined targets, and (6) outline IDMP components and estimate provider FTEs for DCS.

#### Institution of a DMT in Large Tertiary Care Academic Medical Center

As an example of this approach, we determined which admission diagnoses and services had excess LOS in patients with diabetes. For our hospital, cardiac surgery was a logical target to pilot our program due to the high volume of patients with diabetes and high LOS in these patients. Therefore, at our institution, an IDMP was deployed in 2006 as part of a multifaceted strategy using evidence-based interventions from the literature, that would enable us to achieve our goals of improving certain glucometrics (e.g., frequency of hypoglycemia) and use of basal-bolus insulin versus sliding scale only insulin. The components of this strategy were introduced in a staged manner and included: (1) a diabetes consultation service (DCS), comprising a medical director (MD) supervising specialist advanced practitioners (NPs) who provided consultations regarding hyperglycemia management across the hospital, (2) a hospital wide hypoglycemia policy, outlining a specific detailed step-wise approach floor nurses can initiate to ensure patient safety, (3) a diabetes nursing super-user educational program, providing monthly educational meetings to nurse “super-users” who become experts and leaders on their units to ensure appropriate implementation of hospital policies, (4) a hospital-wide hyperglycemia orderset and policy development along with formulary restriction of regular insulin, ensuring more uniform insulin prescribing policies to reduce errors, and (5) a decision support tool to improve choice of insulin regimen, providing prescribers with a resource to optimize insulin dosing. A multidisciplinary glucose steering committee (GSC) was formed with representation from nursing, pharmacy, nutrition services, and information technology which met monthly to quarterly to oversee glucose management related policy and orderset development, educational initiatives, and electronic decision support review. Evidence clearly suggests that these efforts also improve relevant

**Table 1**  
Intervention Studies Showing Significant Cost Savings After Institution of Diabetes Consultative Service (DCS), Educational Policies and Protocols, and Comprehensive Diabetes Management Programs (DMPs)

Intervention	Clinical outcomes relevant to costs	Estimates or actual cost savings
Specialized DCS	Improved glycemic control (16-18) ↓ LOS (16-21) ↓ Readmissions (16-18)	(1) Based on reduced LOS, \$3,529/patient/admission (16), (2) ~\$2,500 tariff savings/patient/year (18), (3) Postulated cost savings for calendar year \$2.975-\$3.570 million (21)
Diabetes education policies and protocols targeting nurses, prescribers, and patients	↓ LOS (22-24) ↓ Readmissions (24)	Cost analysis not available
Comprehensive DMPs	↓ LOS (25)	(1) Based on reduced catheter related bloodstream infections: \$6,197.5/1,000 events (25), (2) Return on investment 467% (based on likely improved throughput) (25)

Abbreviation: LOS = length of stay.

glucometrics and patient-related economic outcomes. We have found that this step-wise intervention resulted in a 19% reduction in hypoglycemia frequency between 2006 to 2009 among adult, nonobstetrical patients with diabetes and hyperglycemia in the non-ICU setting (26). Interestingly, our analysis suggested that the institution of a nursing super-user educational program had the greatest impact on hypoglycemia frequency (27). Currently our hospital provides the following support for the IDMP: 0.2 provider FTE medical director, 2 FTE NP, 0.2 FTE administrative support, 0.5 FTE research coordinator, and 0.4 FTE quality improvement nurse. An important aspect of our program has been step-wise growth. At the outset, high-risk units were targeted, and the DCS consisted of 1 NP with a medical director as noted. At our hospital, the focus has been on improved quality metrics, including the reduction of hypoglycemia and avoidance of sentinel events related to glucose management. In 2015, a 240 bed community hospital within our system initiated an IDMP modeled on the above example. Key components included: (1) diabetes nursing “champion” to drive nursing education, (2) a dedicated endocrinologist to drive implementation of hyper- and hypoglycemia protocols, adoption of uniform subcutaneous insulin orderset, and provision of educational sessions (“lunch and learn”) to both providers and nurses, (3) inpatient DCS, and (4) the formation of a GSC. To support this initiative the hospital provided 1.0 provider FTEs and a general commitment to allow nursing champions time for educational work. Two years after the IDMP was established, it is gratifying to note that the inpatients co-managed by the DCS, mean LOS decreased by 27%. Mean 30-day readmission rate decreased by 10.71% ( $P=0.046$ ). Potential cost of care savings were estimated at \$953,578.56, from January, 2016 to May, 2017 (28).

### Challenges

There are other hurdles in convincing health systems to invest in IDMPs. Notably, among these is the lack of uniform national benchmarks for many of the aforementioned glucometrics. The absence of hospital reporting requirements for glucometrics may hinder some administrations from investing in these programs at the expense of other programs that address reportable measures.

### CONCLUSION

In conclusion, the balance of data supports the institution of a multilevel approach to the management of dysglycemia in hospitalized patients to positively impact both drivers of cost, namely, LOS and hospital readmissions, as well as clinical outcome metrics. Glucose management champions can make strong cases to hospital leadership to invest in dedicated teams targeted at high-risk units based on guidance presented in this manuscript. Such teams should be established in conjunction with a

multidisciplinary glucose steering committee to oversee creation and refinement of nursing and provider educational initiatives, hyper- and hypoglycemia policies and insulin orderset development.

### DISCLOSURE

The author has no multiplicity of interest to disclose.

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