Diabetes Excess Days in Acute Care (EDAC) Measure Submission to PQM: Supplemental Attachment

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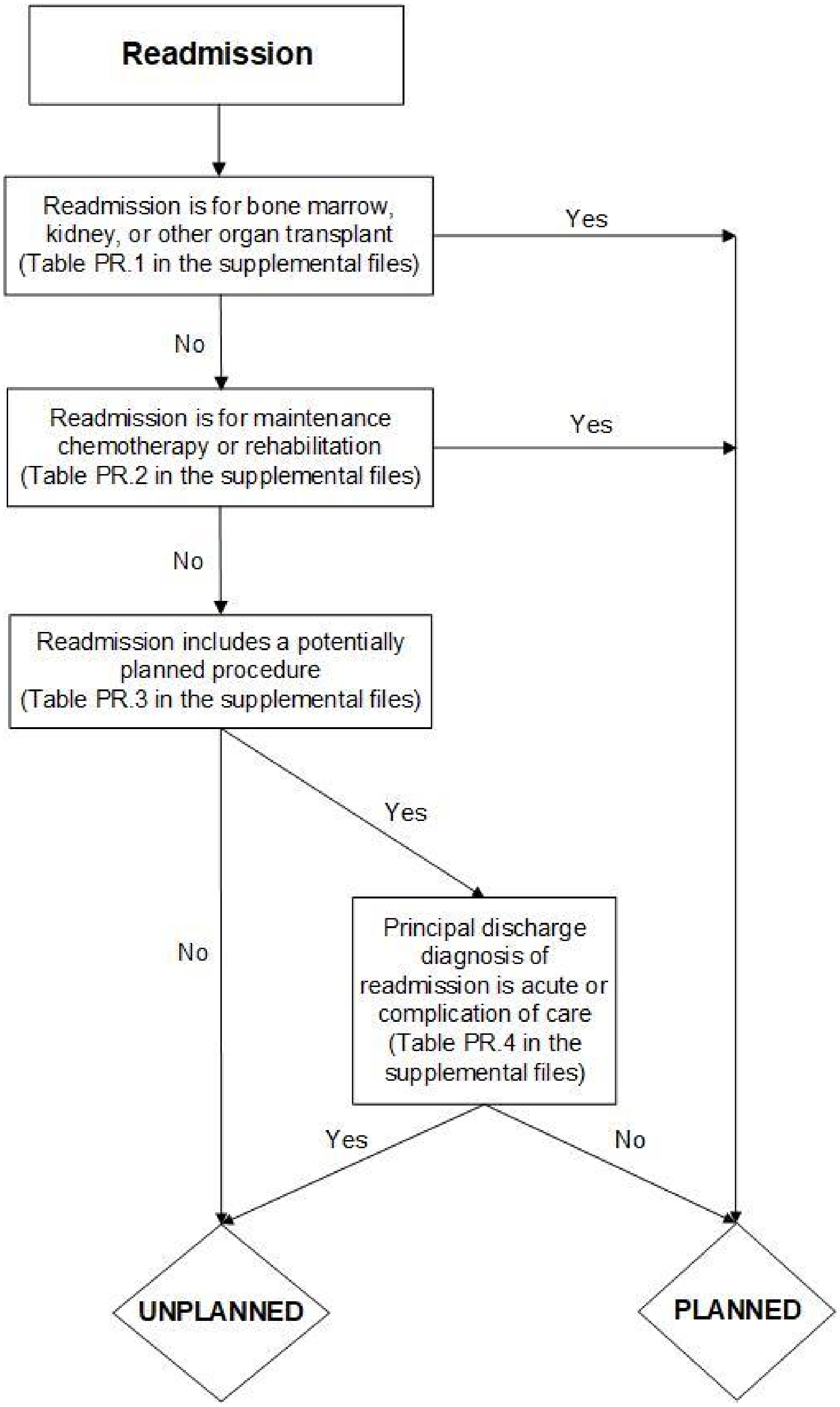
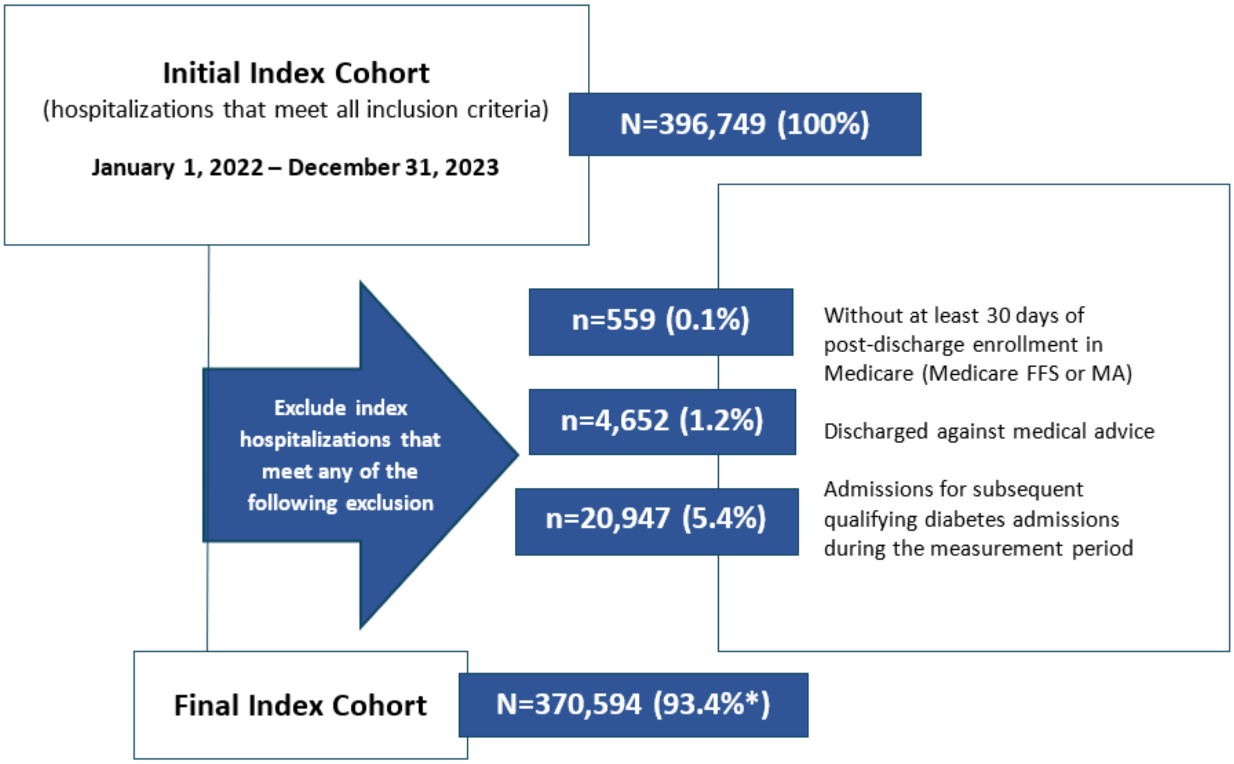
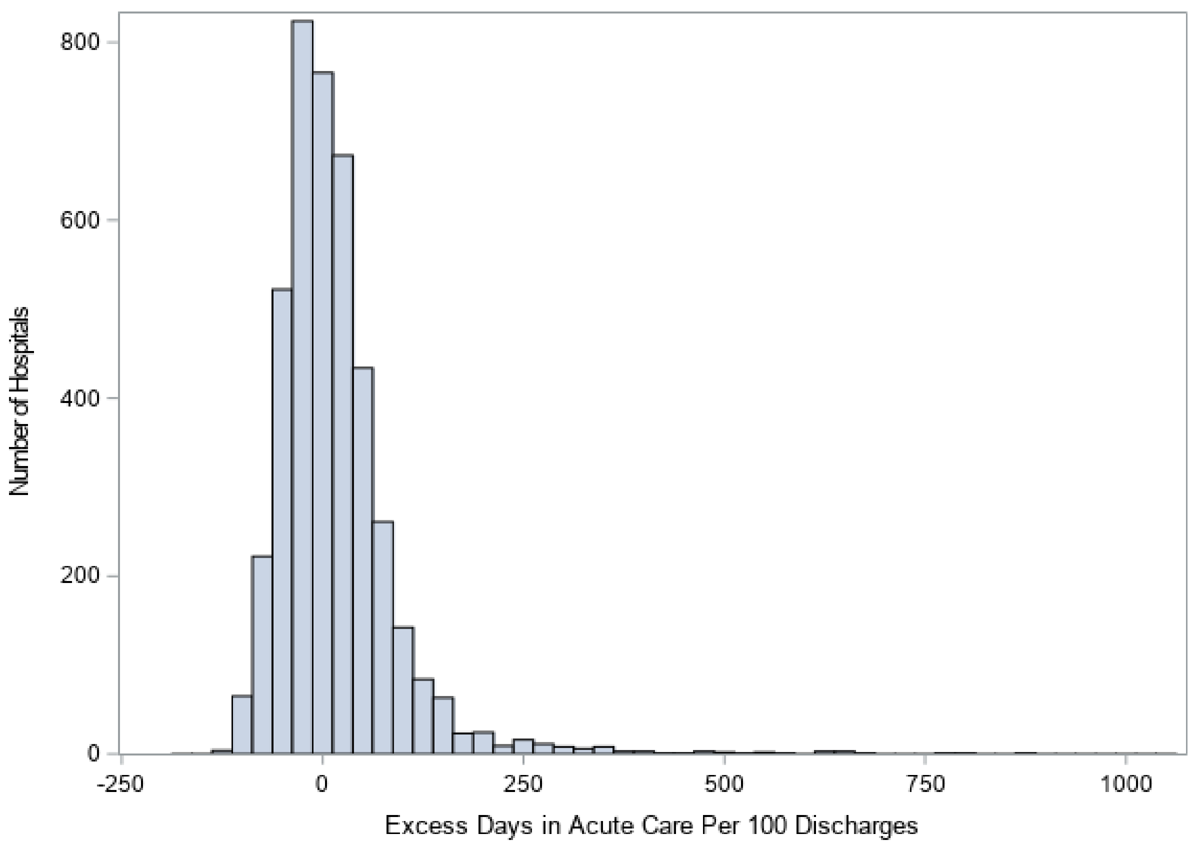


Figure 2. Diabetes EDAC: Index Cohort (January 1, 2022 – December 31, 2023)



** Admissions may have been counted in more than one exclusion category because they are not mutually exclusive.*

Figure 3. Diabetes EDAC: Histogram Displaying Hospital Distribution of Risk-Adjusted Measure Scores per 100 Discharges, January 1, 2022 - December 31, 2023 (N = 4,193)



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$$\frac{\sigma^2_{facility-to-facility}}{\sigma^2_{facility-to-facility}+\frac{\sigma^2_{facility-error}}{n}}.$$

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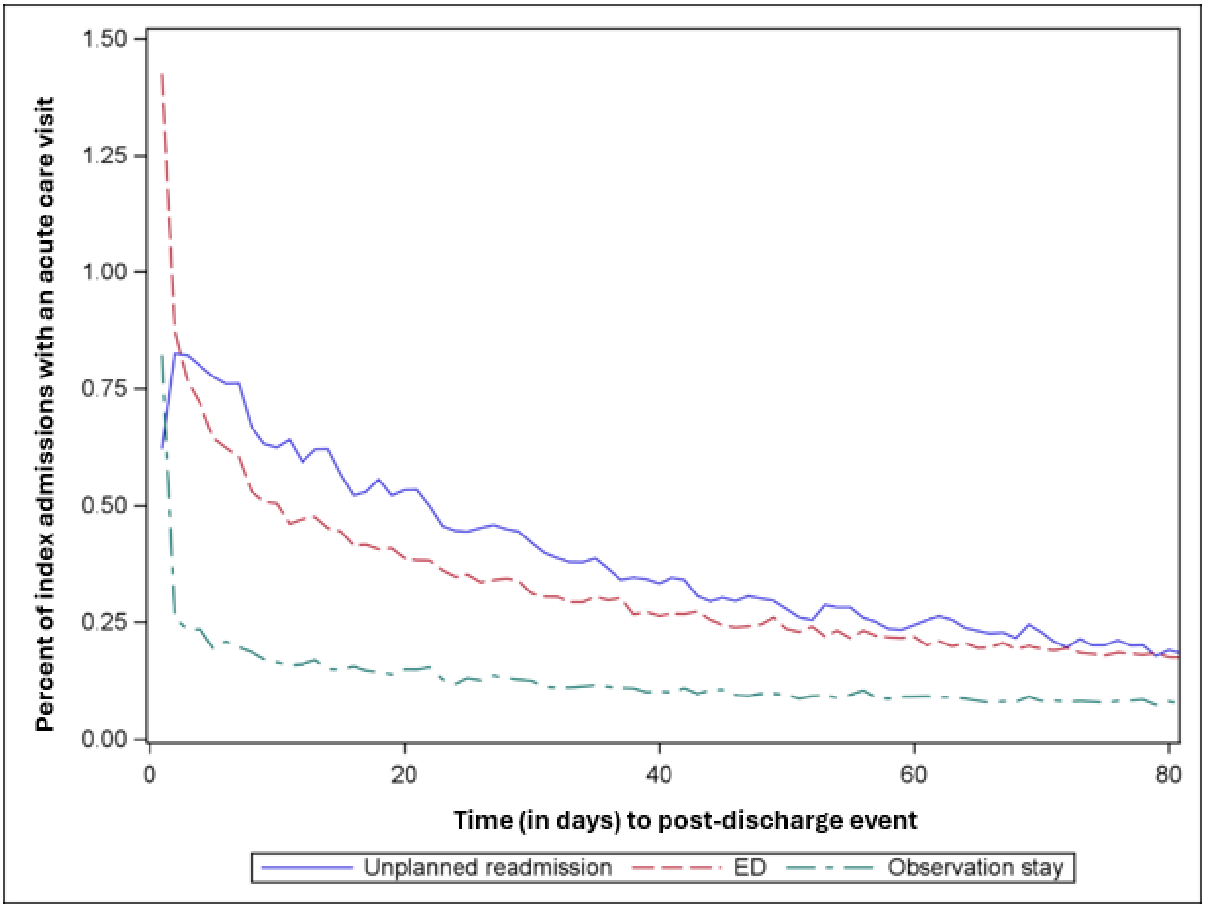

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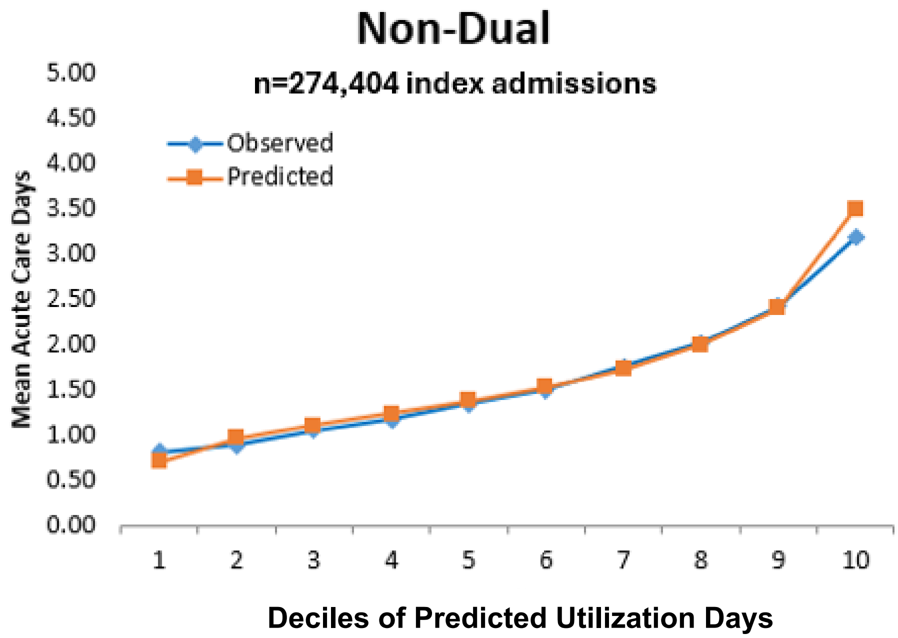

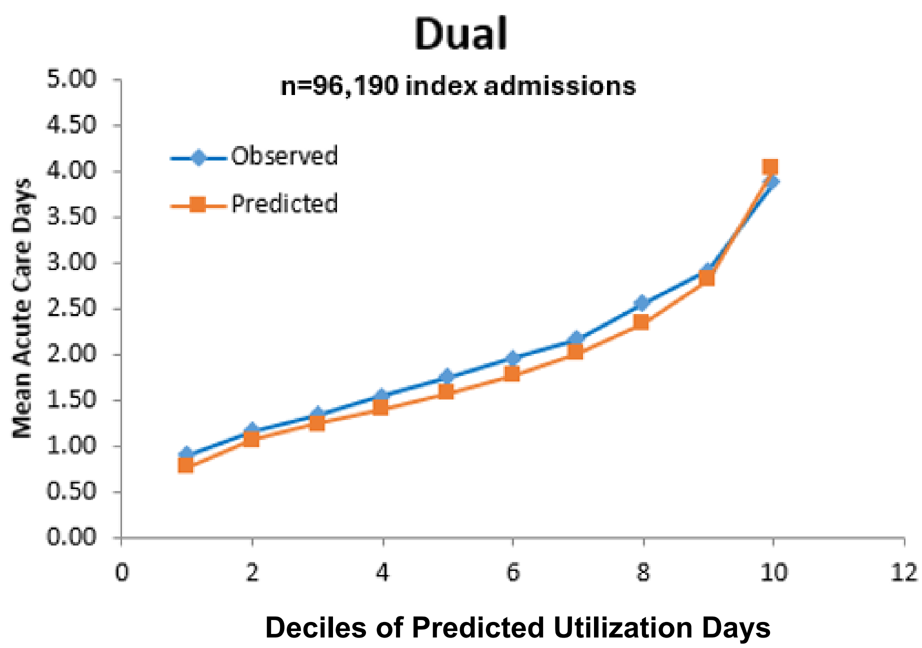

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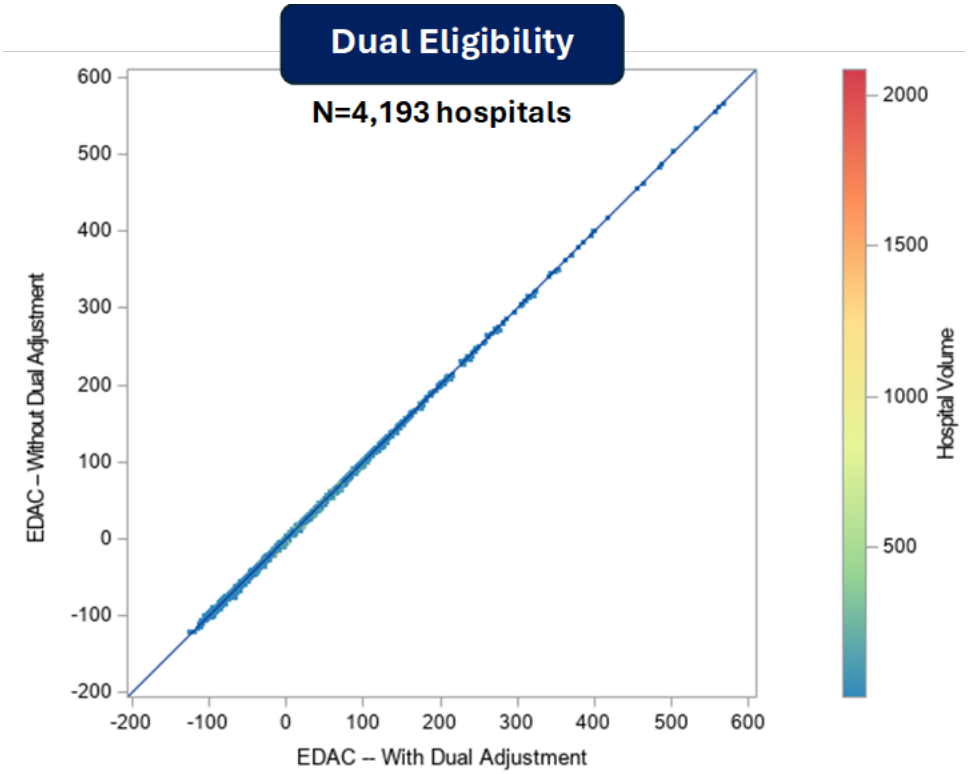

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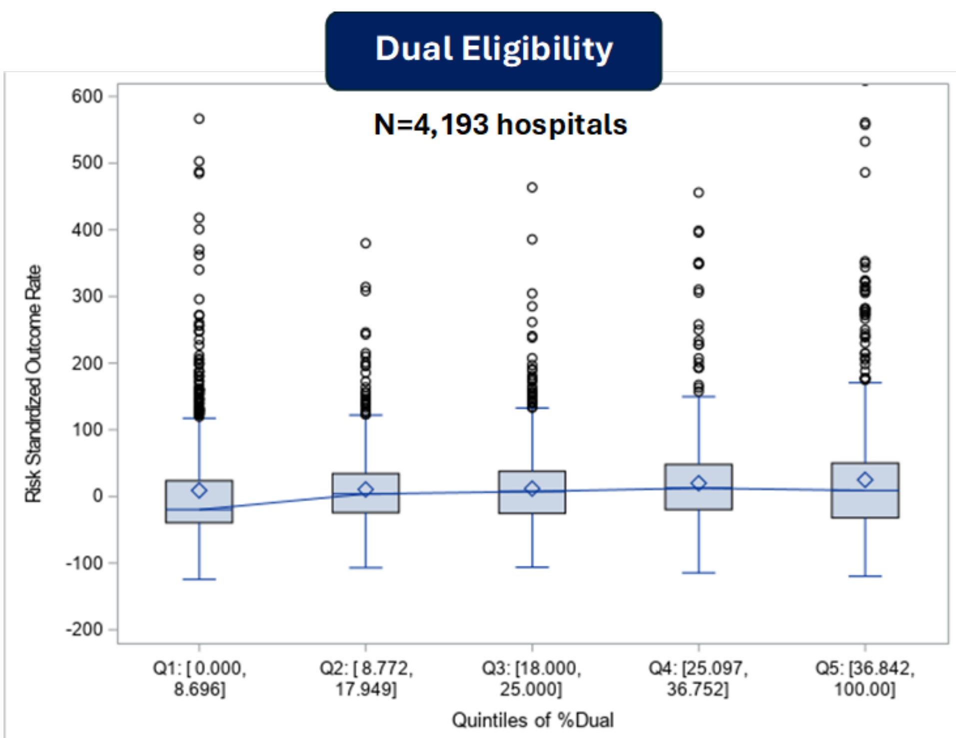
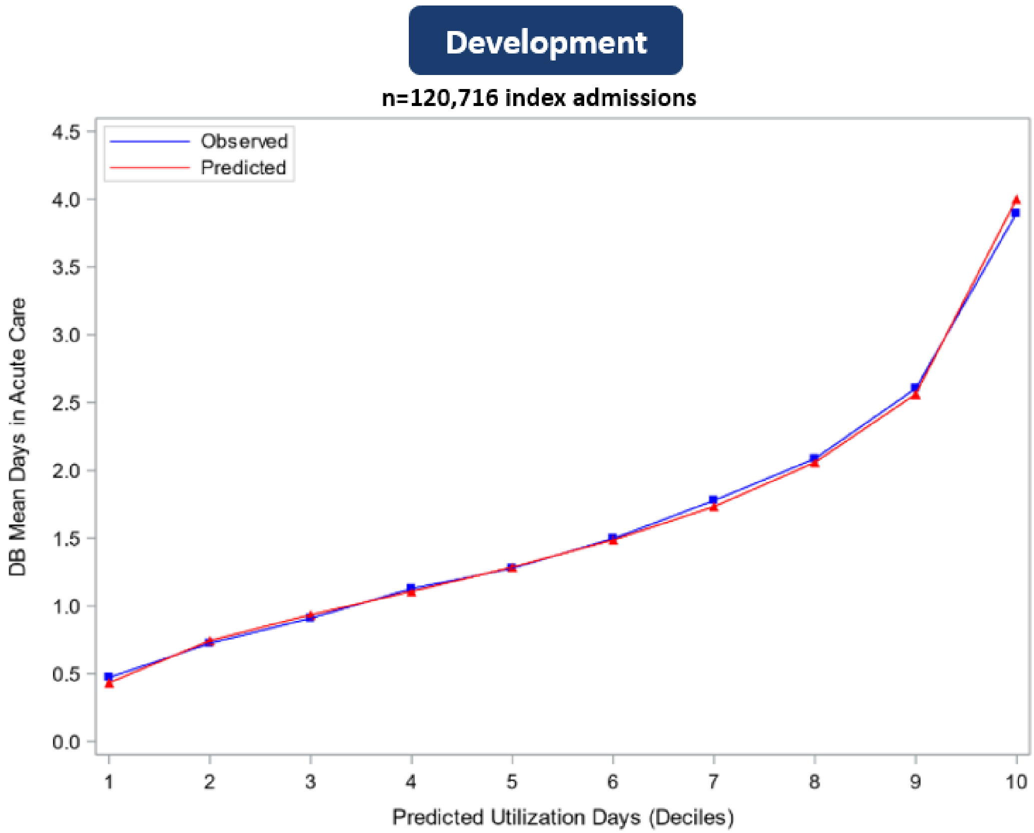
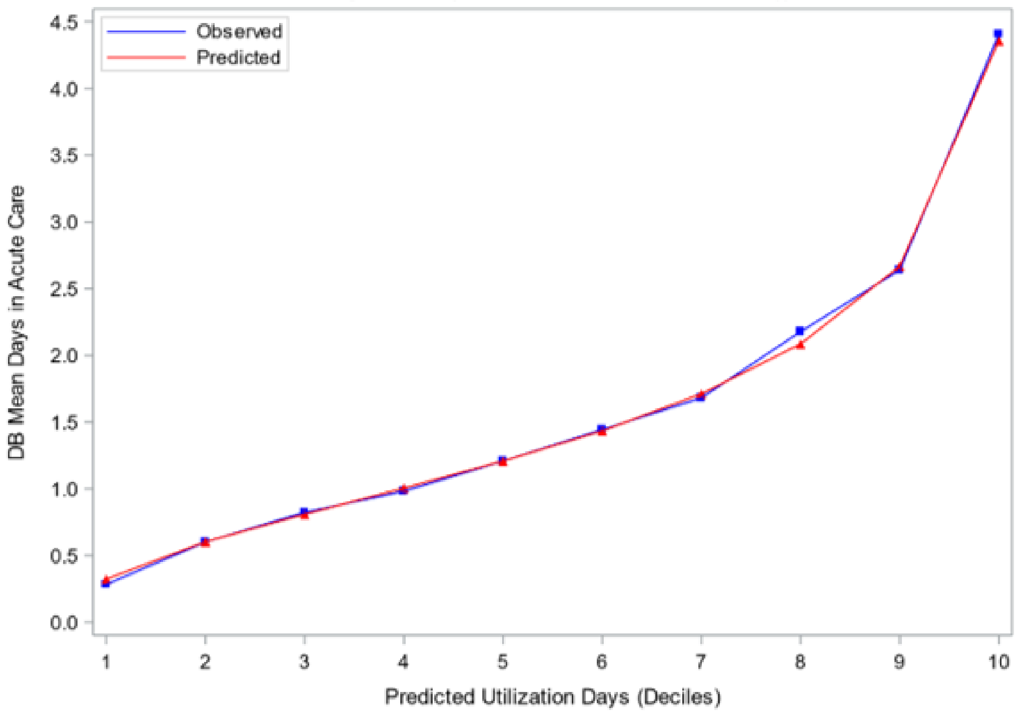


Figure 9. Diabetes EDAC: Initial Development and Validation Cohort Calibration Plot (January 1, 2022 – December 30, 2022)



Validation

n=51,427 index admissions



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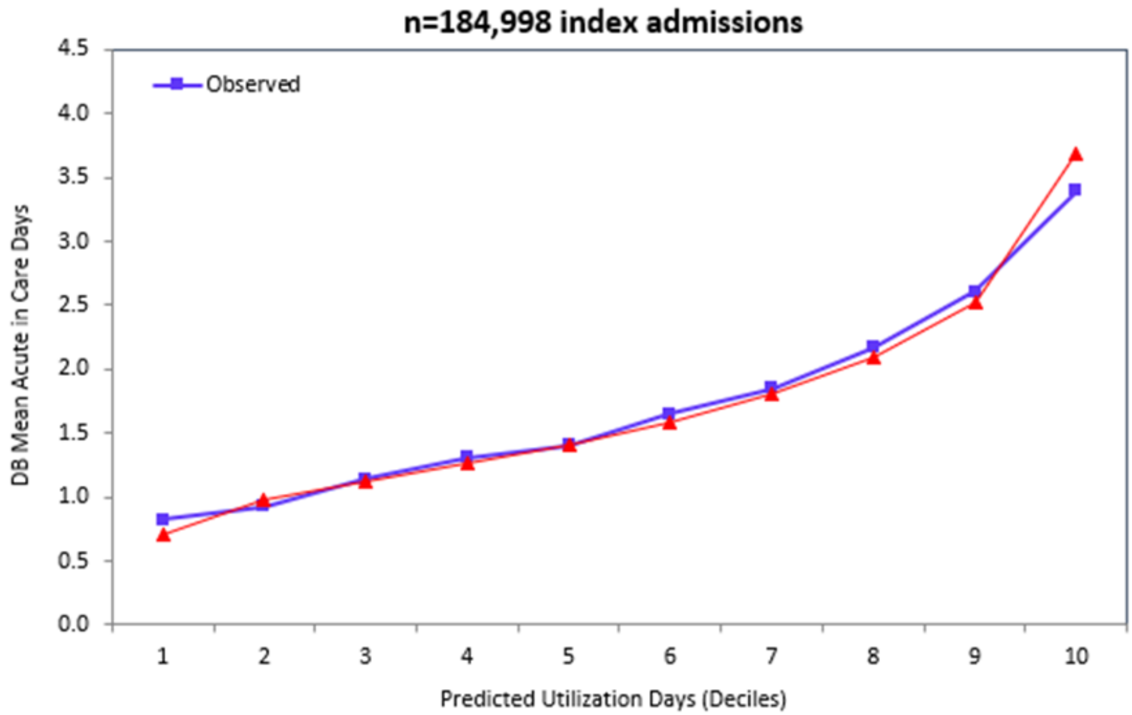

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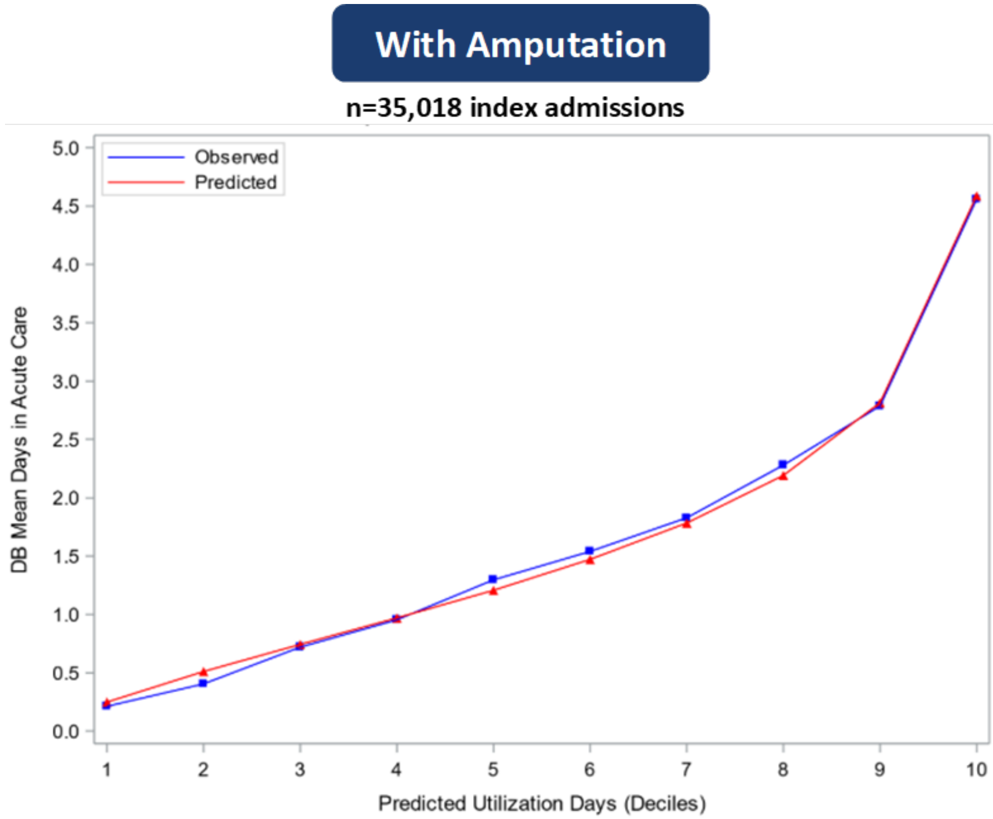
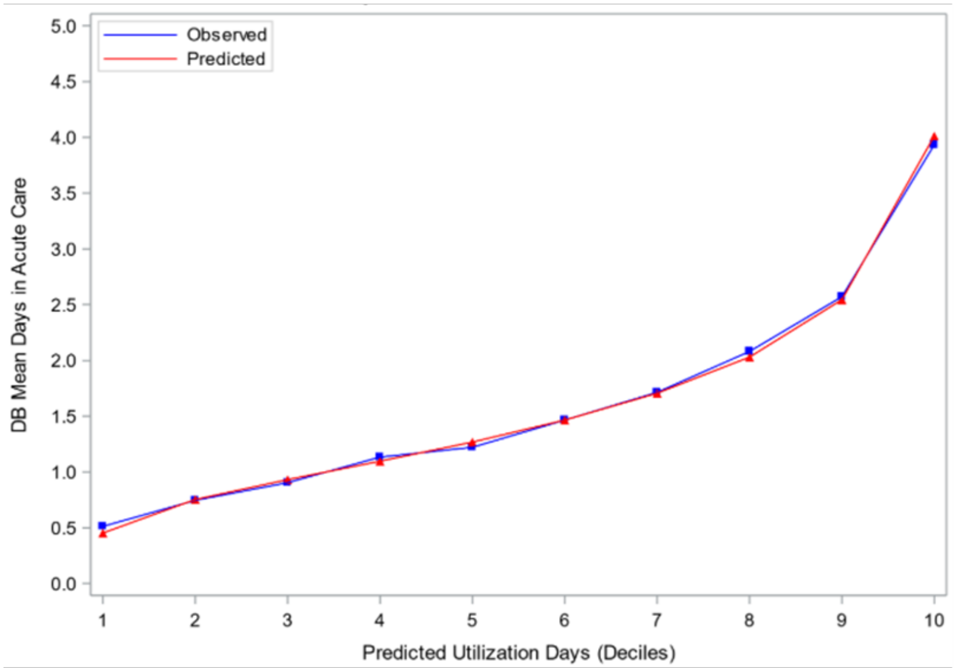


Without Amputation

n=137,125 index admissions



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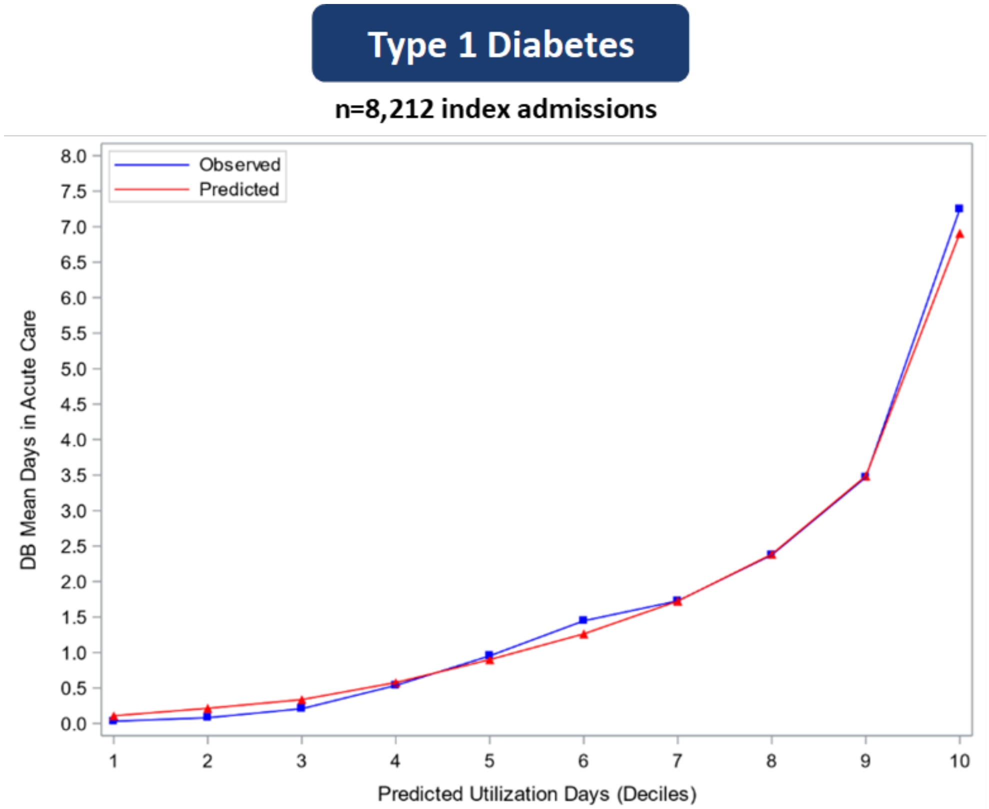
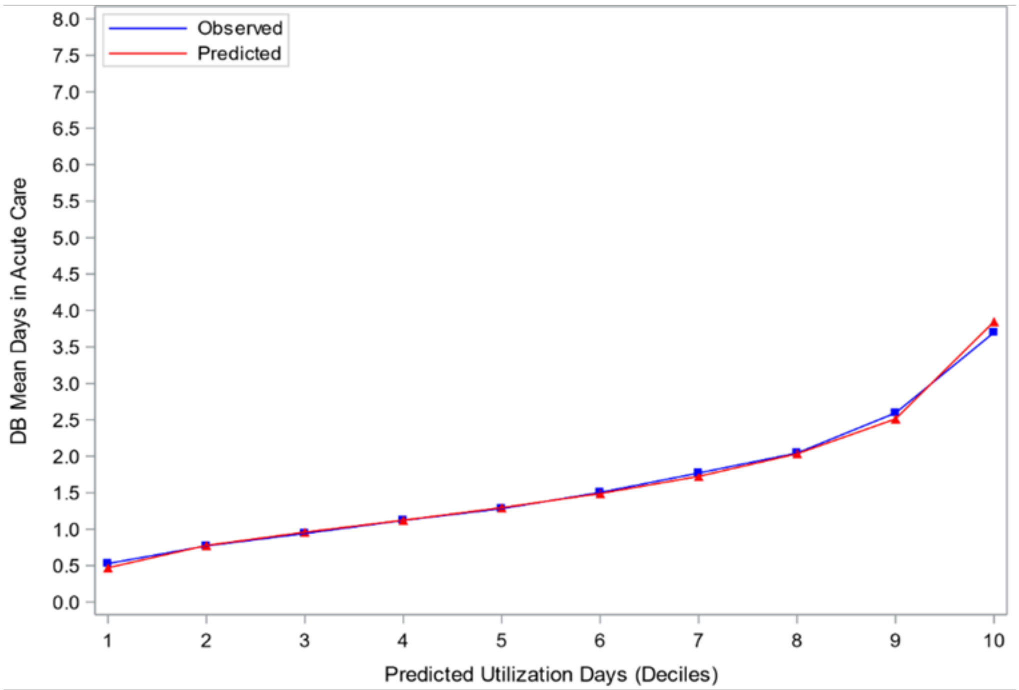


Type 2 Diabetes

n=163,220 index admissions



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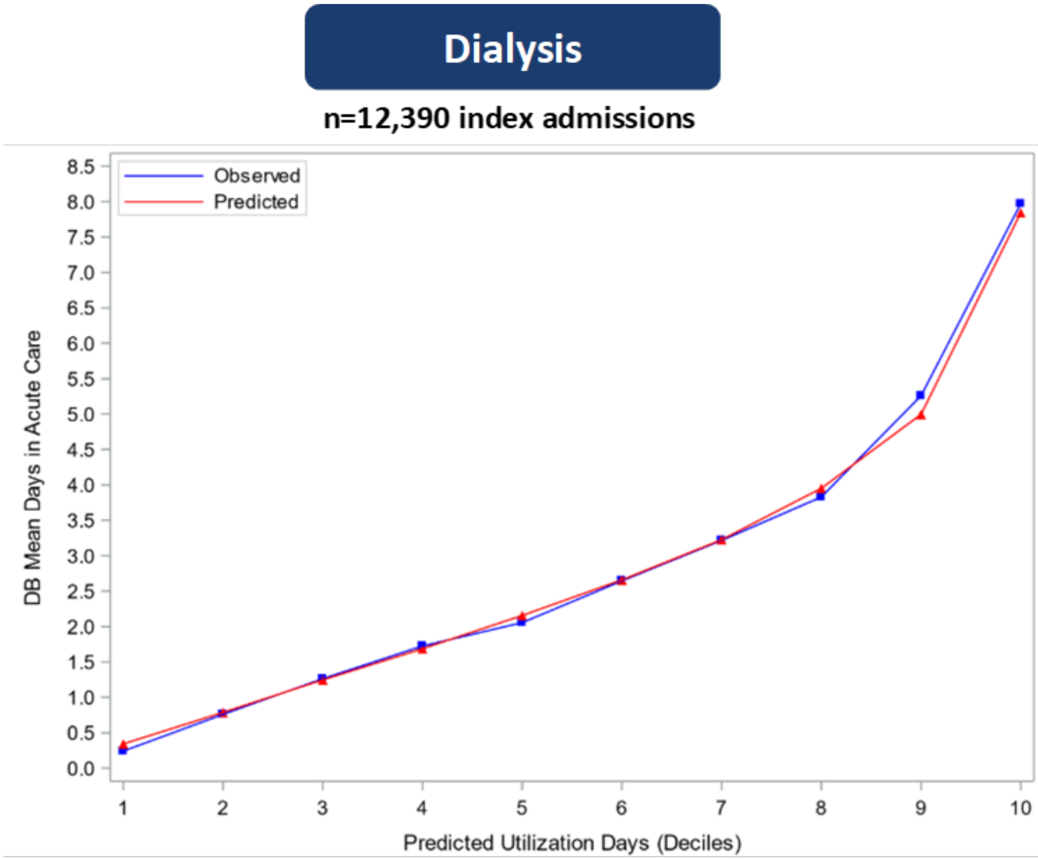


No Dialysis

n=159,753 index admissions

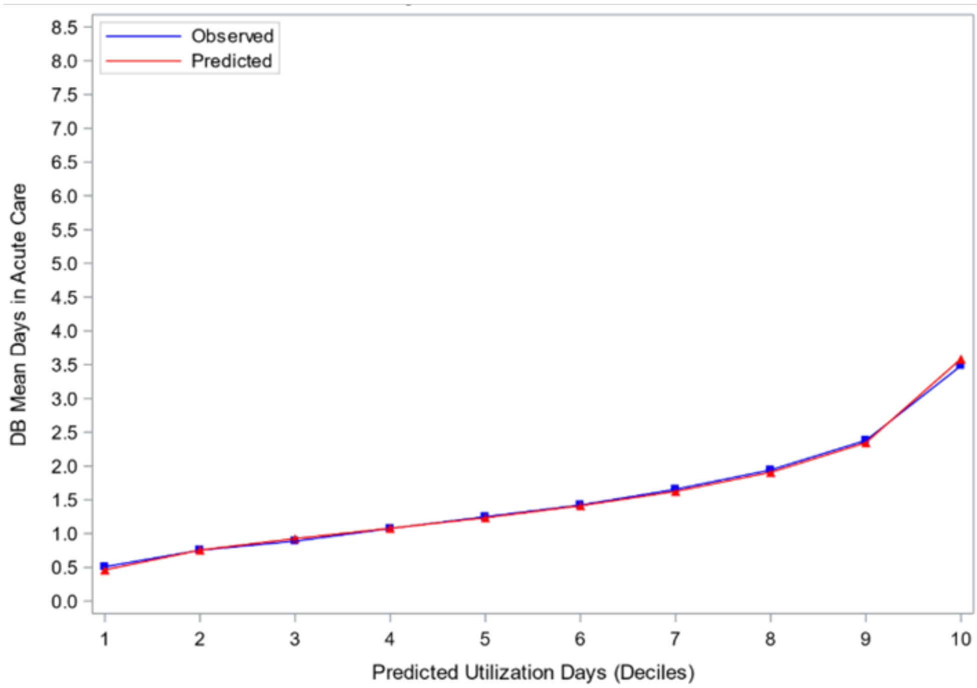
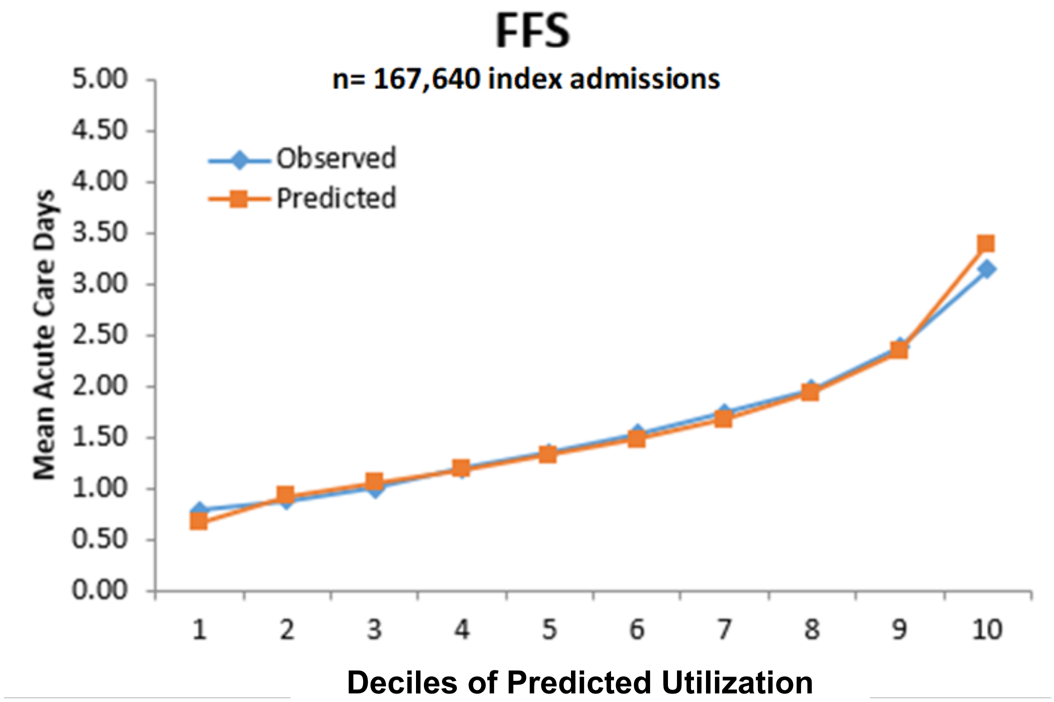
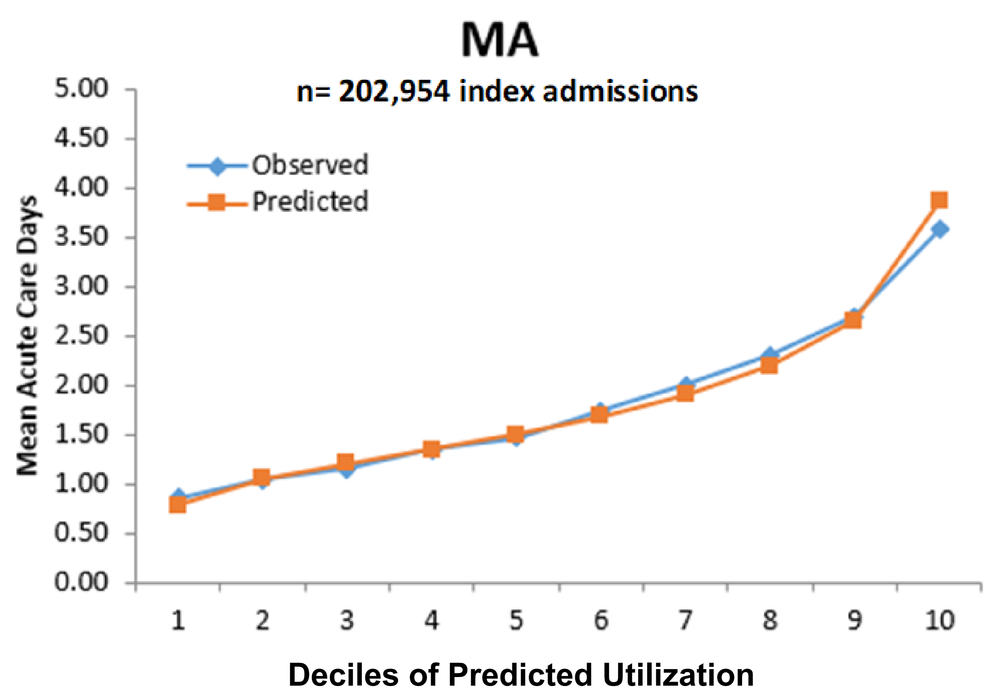


Figure 14. Diabetes EDAC: Calibration Plot for Fee-for-Service (FFS) and Medicare Advantage (MA) Patients at the Index Admission (January 1, 2022 – December 31, 2023)





Logic Model

The Diabetes EDAC measure assesses days spent in acute care within 30 days of discharge from an inpatient hospitalization for diabetes (diabetes with complications as the principal diagnosis). This measure is intended to capture the care transition quality provided to discharged patients hospitalized for diabetes by collectively measuring a set of adverse acute care outcomes that can occur post-discharge: emergency department (ED) visits, observation stays, and unplanned readmissions at any time during the 30 days post-discharge. To aggregate all three events, we measure each in terms of days. The outcome is adjusted to account for age and comorbidities and incorporates exposure time to account for survival times shorter than 30 days (for patients who die within 30 days of discharge). The measure is calculated for admissions for patients who are 65 years or older, are enrolled in Medicare Fee-For-Service (FFS) or Medicare Advantage (MA) and are hospitalized in non-federal short-term acute care hospitals. The final risk-adjusted measure scores are reported as the difference of the predicted minus the expected number of days in acute care per 100 discharges.

We note that because this is an outcome measure, the goal is to have data for hospitals to use that informs their quality improvement processes, but the outcome results do not dictate which processes hospitals choose to put in place. We also note that because this measure targets hospitalizations for patient with a principal diagnosis of diabetes, rather than with principal or secondary diagnosis of diabetes, the cohort of patients may disproportionately represent those newly diagnosed, those with difficulty self-managing diabetes because of barriers to supplies and medications that target ambulatory diabetes control, and those with inappropriate dosing of medications, rather than a population who becomes ill because of a complication of long-standing diabetes (kidney disease, peripheral vascular disease or cardiovascular disease). Therefore, below in the “activities” column, we state that hospitals should “apply the evidence base” because each hospital will need to address the root cause of any performance issues they see in their outcomes data against the existing processes and resources they have in place.

Inputs	Activities	Outputs	Outcomes	Impacts
• Patient voice and lived experience to inform personalized education and self-activation strategies. • Patient engagement tools (e.g., mobile apps, glucose monitoring devices) to support self-management and behavior change. • Performance data from multiple sources, including CMS's tailored reports that include key patient-level information to target quality improvement efforts, and including Electronic Health Records (EHR) and data collection systems for real-time tracking of diabetes hospitalizations. • Risk assessment tools and technology to detect post-discharge acute care utilization by diabetes patients (e.g., automated, machine-learning tools). • Highly trained and invested staff (clinical, QI, and leadership), as well as infrastructure, for data analysis and	• Tailoring diabetes education and transition of care to patient context. • Identifying community resources to bridge cultural and accessibility gaps. • Implementing evidence-based approaches to create patient care processes that address readmission and post-discharge acute care utilization (including but not limited to improving inpatient clinical management and discharge processes, including patient communication and engagement with care team).* • Conducting medication reconciliation at discharge. • Use of targeted remote glucose monitoring	• Standardized diabetes discharge and follow-up protocols, including medication reconciliation, individualized post-discharge patient education and self-management support (e.g., DSMES); ensure timely referrals to outpatient endocrinology and diabetes specialists • Wrap around services to ensure access to supplies in case of financial/payor barriers to access. • Staff receiving targeted training on best practices in diabetes care and quality improvement strategies. • Systems for technology-enabled follow-up, such as remote monitoring and telehealth check-ins established for high-risk patients.	**Short term:** • Improved provider communication with patients regarding diabetes care and self-management at discharge. • Increased provider use of telemonitoring, follow-up calls, or visits to support post-discharge diabetes care. • Increased adherence by hospital staff to evidence-based discharge planning protocols. • Greater utilization of standardized discharge checklists for patients with diabetes. • Increased use of technology (e.g., telehealth remote monitoring and check-ins, apps with wearable health trackers, smartphone applications) and in-home assistance (visiting nurses, community health workers/diabetes	• Improved patient quality of life. • Improved hospital processes for post-discharge planning and continuity of care. • Lower healthcare costs associated with diabetes-related hospitalizations. • Potential for improved continuity and sustainability of diabetes care programs through better care transitions. • Improved care delivery processes that support glycemic control and reduce risk of severe diabetes-related complications. • Broader impact (spill-over effect) across all clinical areas (reduced readmission/EDAC for multiple conditions).

Inputs	Activities	Outputs	Outcomes	Impacts
reporting. • Clinical guidelines for diabetes management (ADA, AACE, etc.). • Care transition programs and case management staff (to close loop on discharge instructions and perform medication recommendations). • Multidisciplinary team (endocrinologists, primary care, case managers, pharmacists, diabetes educators). • Evidence-based hospital-based interventions known to reduce post-discharge acute care, such as transitional care excellence programs.	and telehealth visits for high-risk patients (e.g., new to insulin therapy, at high risk for hypoglycemia, prior history of no-show visits). • Referring and linking of patients to Diabetes Self-Management Education and Support (DSMES) and other evidence-based diabetes self-management programs (e.g., for those with new onset diabetes or identified social needs) • Analyzing hospital data, tracking, and QI meetings to identify root causes for readmission and post-discharge acute care utilization by patients with diabetes overall or for subsets of patients (such as gaps in hospital discharge	• Dashboards or other forms of reports (for leadership, QI staff, and care teams) to track and communicate performance on post-discharge acute care utilization by diabetes patients, and the utilization of this data to develop processes for iterative feedback loops for QI improvement (along with measuring effectiveness of new processes).	educators) for high-risk patients with diabetes. • Greater connectivity to community resources designed to overcome access barriers. **Intermediate term:** • Increased number of patients receiving timely outpatient diabetes care. • Increased patient adherence to outpatient diabetes management. • Reduced rates of hypoglycemia. • Improved glycemic control levels. • Improved patient healthcare experience. • Decrease in number of patients using acute care (inpatient admission, observation stay, ED visit) after hospital discharge. **Long term:** • Reduction in days spent in acute care	• Better integration between hospital, ambulatory settings and community resources.

Inputs	Activities	Outputs	Outcomes	Impacts
	planning). • Training clinical and care transition staff on best practices in diabetes care, discharge communication, and use of new care processes identified through quality improvement. • Joining available Diabetes registries to receive data, trends analysis, benchmarking guidance, and QI resources. • Engaging multidisciplinary teams in ongoing quality improvement meetings to develop, test, and refine interventions.		within 30 days of discharge following an inpatient hospitalization for diabetes (including ED visits, observation stays, and unplanned readmissions). • Improved quality of care transitions for patients hospitalized for diabetes. • Enhanced use of outcomes data to inform hospital-specific quality improvement strategies for diabetes care transitions. • Improved clinical outcomes including downstream diabetes-associated complications. • Improved patient experience with staff communication, communication about medications, and discharge.	

* Post-discharge coordination efforts including transition of care programs with prior to discharge meetings, post-discharge telehealth visits within 48 hours and 7 days; pre-discharge pharmacist involvement for medication reconciliation and education around medication guidelines. May also require screening for economic disadvantage and prior to discharge referral to case managers, social workers and other resources in the community. This would ideally incorporate a follow-up plan to ensure post-discharge clinic visits (including primary care and endocrinologist), including referrals, visiting nurse services for monitoring blood sugar levels and to communicate about new medications and/or devices started while hospitalized.

Feedback Mechanisms
• Real-time dashboards are used to track acute care utilization among discharged diabetes patients, enabling timely identification of trends and outliers. • Hospitals benchmark their performance against peer institutions to identify gaps in diabetes-related readmissions and care transitions. • Patient-reported outcomes and experiences, such as confidence in self-management and satisfaction with discharge instructions, are collected to inform care improvements. • Regular multidisciplinary case review meetings are held to analyze post-discharge events and refine discharge planning protocols based on emerging data.
Assumptions
• Broad-based interventions to improve post-discharge care can be utilized similarly across different settings and geographic locations. • Hospital connectivity to post-discharge ambulatory settings. • Hospitals have systems in place to track and review diabetes-related hospital stays and post-discharge outcomes. • Post-discharge interventions (case management, telemonitoring) are available and feasible. • Provider buy-in for standardized discharge planning and follow-up protocols. • Necessary staff including administrative physicians, nursing, discharge coordinators, and ambulatory care clinic staff.
External Factors
• Policy and reimbursement models for diabetes care transitions (e.g., CMS, private payers). • Provider shortages, particularly endocrinologists and diabetes educators. • Evolution of diabetes technology (e.g., continuous glucose monitoring, AI-driven predictive analytics). • Patients have the ability and willingness to engage in self-management programs.

Summary: The Diabetes EDAC Measure focuses on improving post-discharge care for Medicare beneficiaries hospitalized for diabetes complications by reducing unnecessary acute care use, including unplanned readmissions, emergency department visits, and observation stays within 30 days of discharge. This logic model outlines a strategy for improving care transitions for older adults discharged from the hospital after being treated for diabetes complications. It focuses on reducing the number of days patients spend in acute care such as ER visits, observation stays, or unplanned readmissions—within 30 days of discharge. The model emphasizes using real-time data, patient feedback, and staff training to identify gaps in care and guide quality improvement efforts. It encourages hospitals to apply evidence-based practices tailored to their own systems, like better discharge planning, medication reconciliation, and follow-up support through telehealth or community programs. The goal is to improve communication with patients, support self-management, and make sure patients connect to outpatient care quickly. Over time, this should lead to fewer emergency visits, better diabetes control, and a stronger, more coordinated system between hospital and outpatient care and ultimately improving both patient outcomes and hospital performance.

References for this section align with the narrative presented in sections 6.2.1 and 2.2.

Conceptual Model

The goal of risk adjustment is to adjust for case-mix differences across the hospitals. Risk adjustment supports fair and accurate comparison of outcomes across measured entities by including an adjustment for factors such as patient age, comorbid diseases, and indicators of patient frailty, which are clinically relevant and have relationships with the outcome. In pursuing a risk adjustment approach that best leverages the data, we used a framework based largely on individual ICD-10 codes for risk adjustment. The main advantage of leveraging ICD-10 codes in place of alternative methods that employ an ICD-10 grouper (such as CMS's Condition Categories, or CCs) is the ability to address the clinical heterogeneity found in the broadly defined CCs. Our previous research indicates that the model performance of the mortality measures is significantly improved by using individual codes instead of CCs (Krumholz et al., 2019). The Diabetes EDAC measure adjusts for case-mix differences between hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the index hospitalization, are included in the risk adjustment. The process for determining patient comorbidities present at the time of the index admission from the index admission claim/encounter data uses a present-on-admission (POA) algorithm (see Section 5.4.2 of the full submission form for details).

The intent is for this measure to adjust for patient demographic and clinical characteristics while illuminating important quality differences. Therefore, this measure does not include an adjustment for social drivers of health because the association between social drivers of health and health outcomes can be due, in part, to differences in the quality of health care that these groups of patients receive (Silvestri et al., 2022). The measure does not adjust for patients' admission source or their discharge disposition (for example, skilled nursing facility) because these factors are associated with the structure of the healthcare system, not solely with patients' clinical comorbidities.

We also considered age, frailty, and an indicator for whether the admission was Medicare Advantage (MA) vs. Fee-for-Service (FFS). Based on evidence from the literature, expert input, guidance from the consensus-based entity for measure endorsement, the Assistant Secretary for Planning and Evaluation, input from other stakeholders, and prior testing results, we included a claims-based indicator of frailty in the final model. This indicator was developed for CMS's Multiple Chronic Conditions (MCC) measure. We did not include sex as a variable since sex can be considered a socio-demographic variable (Goodman et al., 2025). For the combined MA and FFS cohort, the risk-adjustment model was updated to include an MA indicator (versus FFS) as a main effect. This was to adjust for the generally higher prevalence of comorbidities in the MA cohort, especially among the pre-index variables that were derived from services in the outpatient setting (e.g., physician visits).

Clinical risk variables were selected using this conceptual framework together with a data-driven empiric approach as described in Section 5.4.2 of the full measure submission).

Economic Disadvantage

Because our risk variable selection process was based on an empirical approach using individual ICD-10 codes related to a patient's clinical status at admission and in the 12 months prior to admission, we separately considered variables related to economic disadvantage and their overlap with clinical risk factors. Although some recent literature has evaluated the relationship between these variables and the EDAC outcome, few studies directly address specific causal pathways or examine the role of the hospital in these pathways (see, for example: Hamadi et al., 2019; Kaiser Permanente Washington Health Research Institute, 2022; Rogstad et al., 2022; Joynt Maddox et al., 2019). Our conceptual model described below (and in the Supplemental Attachment) builds on published literature as well as our empirical analyses and identifies several overlapping pathways whereby patients may experience worse outcomes.

Conceptual Model for Clinical Factors and Factors Related to Economic Disadvantage

Our conceptual model described below builds on published literature as well as our empirical analyses and identifies several overlapping pathways whereby patients may experience worse outcomes. These pathways are not mutually exclusive.

- **Comorbidities and economic disadvantage:** Economically disadvantaged patients may have worse health at the time of hospital admission and patient comorbidities are known risk factors for post discharge acute care use in patients hospitalized for diabetes (Soh et al., 2020). Patients who have lower income/education/literacy or unstable housing may have a worse general health status and may present for their hospitalization with a greater severity of underlying illness (Owens et al., 2022). These factors, which are characterized by patient-level or neighborhood-/community-level (as proxy for patient-level) variables, may contribute to worse health status at admission due to competing priorities (restrictions based on job, lack of childcare, etc.), lack of access to care (geographic, cultural, or financial), or lack of health insurance. Given that these risk factors all lead to worse general health status, this causal pathway should be largely accounted for by current clinical risk adjustment. We note that patient comorbidities and economic disadvantage variables overlap in their contribution to a higher risk of the outcome, as shown by our empirical evidence (see Section 5.3) demonstrating the attenuating impact of model variables on the odds ratios for admissions with the dual eligibility (DE) variable.
- **Differential care:** A second pathway by which economic disadvantage may contribute to post discharge acute care risk is that patients may not receive equivalent care within a facility (Lusk, et al., 2022). It has been shown that for other conditions (acute myocardial infarction, pneumonia, and heart failures), that across almost all hospitals (>98% of hospitals with sufficient data for assessment), dually eligible patients have higher rates of post discharge hospital based care (readmission) when compared with patients who are not dually eligible patients in the same hospital (within hospital disparities), after accounting for comorbidities, and area level variables (Silvestri et al., 2022).
- **Low-quality hospitals:** Economically disadvantaged patients may receive care at lower quality hospitals. Patients of lower income, lower education, or unstable housing may not have the same access to high quality facilities, in part, because such facilities may be less likely to be found in geographic areas with large populations of patients with these factors (Fahrenbach et. al., 2020). Thus, patients with low income may be more likely to be treated in lower quality hospitals, which can contribute to an increased risk of

readmission. In addition, or alternatively, low quality hospitals may not implement evidence-based interventions to reduce the risk of readmission, such as post-discharge follow-up; economically disadvantaged patients are known to have lower rates of follow-up after discharge and higher rates of post-discharge acute care (Anderson et al., 2022).

- **Residual risk:** Economically disadvantaged patients may experience worse health outcomes only partially under the control of the healthcare system. Some economic factors, such as income or wealth, may affect the likelihood of readmission without directly affecting health status at admission or the quality of care received during the hospital stay. For instance, while a hospital may make appropriate care decisions and provide tailored care and education, a lower-income patient may still have a worse outcome post-discharge due to competing economic priorities or a lack of access to care outside of the hospital (Lusk et al., 2022).

These proposed pathways overlap and are complex to distinguish analytically. They also have different implications on the decision to risk adjust, or not, depending on the degree to which hospitals can mitigate the increased risk. Furthermore, the ongoing consolidation of the healthcare market puts more control, resources, and accountability on hospitals (that are now increasingly part of large multi-hospital systems) to invest in mitigating these risks (Levinson et al., 2024). However, in some markets, hospital systems choose to close facilities or limit access to care, based on financial decisions, rather than assessments of resource needs (Levins, 2023), including assessment of, and investment in programs that mitigate such needs.

Economic Variables Used in Testing

Based on the available literature and given the limited availability of valid and reliable variables that can be tested in claims data, we selected dual eligibility as a variable for testing.

Dual eligibility for Medicare and Medicaid is available at the patient level in the Medicare Master Beneficiary Summary File. The eligibility threshold for aged 65 or older Medicare patients considers both income and assets. There is also a body of literature demonstrating differential health care and health outcomes among dually eligible beneficiaries (ASPE, 2020).

Please see Section 5.4.2 for the details of the testing approach, results, and interpretation.

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