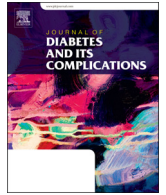




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An expanded prevention quality diabetes composite: Quantifying the burden of preventable hospitalizations for older adults with diabetes

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ABSTRACT

Aim: To expand the existing United States Agency for Health Research and Quality (AHRQ) Diabetes composite (AHRQ-DC) to include additional preventable hospitalizations specific or relevant to diabetes.

Methods: A cross-sectional analysis of 834,696 veteran patients with diabetes aged ≥ 65 years in 2012. An Expanded Diabetes Composite (Expanded-DC) was developed utilizing: (1) the diabetes-specific category: the AHRQ-DC (short-term and long-term complications, uncontrolled diabetes, lower extremity amputations) and two proposed conditions: hypoglycemia and lower extremity ulcers/inflammation/infections (LEU) and (2) the diabetes-relevant category: the AHRQ-Acute Composite (dehydration, pneumonia, urinary tract infections) and one proposed condition, acute kidney injury (AKI).

Results: The study population was 98% male, 80% White, 10% Black, and 5% Hispanic; 71% had complex comorbidities. There were 64,243 (77.0 admissions/1000 patients) hospitalizations in the Expanded-DC, compared to 13,523 (16.2) in the AHRQ-DC, a 4.7 fold increase. Hospitalizations from AHRQ-Acute Composite and the three proposed conditions added 79% to the Expanded-DC. LEU and hypoglycemia added 39% to the diabetes-specific category. AKI added 18% to the diabetes-relevant category. Blacks incurred more preventable hospitalizations (85.9) than Whites (74.7); as did patients with complex comorbidities (93.6) versus those without (34.6).

Conclusion: The AHRQ-DC substantially underestimates rates of clinically important preventable hospitalizations in older diabetes patients.

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1. Introduction

According to the most recent National Diabetes Statistic Report, 25.2% of the United States (US) population over 65 years of age, or 12.0 million persons, have diabetes in 2015.¹ In 2012, the major cost component of diabetes care was inpatient care (43% of the total medical cost); and 64% of in-patient hospital days related to diabetes complications or general medical conditions with excess prevalence were incurred by adults 65 and older.² Identification of rates for preventable hospitalizations that are specific for diabetes or have excessive prevalence in patients with diabetes is therefore important for population health surveillance to assess and improve public health strategies to decrease diabetes related morbidity. Preventable hospitalizations are defined as hospital admissions for acute or worsening chronic conditions

that might not have required hospitalization if they had been managed successfully in ambulatory care settings.³

The US Agency for Health Research and Quality (AHRQ) preventive quality indicators (PQIs) are a set of surveillance measures to identify and quantify the prevalence of preventable hospitalizations.⁴ They are intended to be used as inexpensive and accessible public health screening tools to evaluate the annual prevalence as well as multi-year trends of specific preventable hospitalizations. This information can be used at local, regional, and national levels to identify opportunities to improve care and address potential disparities in care both in communities and in healthcare systems.

The existing PQIs reported for diabetes include uncontrolled diabetes, diabetes short-term complications, diabetes long-term complications, and lower extremity amputations (LEA). They are currently designated as the AHRQ Prevention Quality Diabetes Composite (AHRQ-DC).⁴

However, diabetes is also associated with, and may have increased prevalence of other common medical conditions that are potentially preventable in older adults. These conditions include dehydration, bacterial pneumonia, and urinary tract infections (UTI). For example, the Centers for Disease Control and Prevention (CDC) estimated that other than age ≥ 65 years, diabetes was the most common indication for

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receipt of the 23-valent pneumococcal polysaccharide vaccine, with 20% of all cases in 2009 compared to 10% of cases in 1998–1999.⁵ UTI in patients with diabetes had 8.2% prevalence in 2009, of whom 10% had UTI related hospitalizations in the same year and 34% had UTI in prior year.⁶ These conditions are already included in the AHRQ Prevention Quality Acute Composite;⁴ we propose that they should be considered for separate reporting and surveillance for older adults with diabetes.

Additionally, there are other serious yet potentially preventable hospitalizations for clinical conditions that are not designated as AHRQ PQIs; they include acute kidney injury (AKI), hypoglycemia, and lower extremity infections, inflammation, and/or ulcers that did not result in amputations during the hospital stay (LEU). In 2013, the AKI incidence rate in Medicare patients with diabetes and chronic kidney disease (CKD) was 203.1 per 1000 patient years, much higher than those with CKD only (140.3), diabetes only (50.1), and those with neither condition (23.7).⁷ The incidence of lower extremity infections among Medicare beneficiaries with diabetes was 6.0% compared to 0.5% for LEA.⁸ Hypoglycemia is another short-term complication; hospitalizations for hypoglycemia exceeded those for hyperglycemia in older adults in recent years.⁹ The epidemiological data warrant hospitalizations for these conditions to be considered for distinct PQIs.

Therefore, our overarching goal was to develop and evaluate an Expanded Prevention Quality Diabetes Composite (Expanded-DC) that would allow for a more accurate estimate of potentially preventable hospitalizations incurred by older adults with diabetes. Our primary study objectives were to estimate and compare the rates of preventable hospitalizations in the AHRQ-DC and Expanded-DC. Our secondary objectives were to evaluate potential racial-ethnic disparities in estimates of preventable hospitalizations, and to separately assess rates among those with and without coexisting complex comorbid conditions.

2. Subjects

Patient-level electronic medical records were utilized in the study and it was approved by the Institutional Review Board of the New Jersey Health Care System under the USA Department of Veterans Affairs for exemption of informed consent and HIPAA Authorization.

3. Materials and methods

3.1. Study population and data sources

We identified the USA Veterans Health Administration (VHA) Veteran patients with diabetes who were ≥ 65 years at the beginning of calendar year 2012 as the study population. The data sources were patient-level data from VHA and Medicare files. Diabetes was determined using data from the prior two years based on a previously validated approach.¹⁰ Patients enrolled in Medicare managed plans in years 2011 and 2012 were removed because their medical records from the managed plans were not available.

3.2. Outcome measures

Our conceptual framework (Fig. 1) for an Expanded-DC includes diabetes specific and diabetes relevant categories. Preventable hospitalizations for the diabetes specific category were identified utilizing PQIs from the current AHRQ-DC (PQI #93): short-term diabetes complications (PQI #1), long-term diabetes complications (PQI #3), uncontrolled diabetes (PQI #14), and LEA (PQI #16).⁴ Additionally, we proposed to evaluate hospitalizations for hypoglycemia as well as LEU as they were not clearly identified in the AHRQ-DC based on the International Classification of Diseases, 9th revision, clinical modification (ICD-9-CM) codes.

The diabetes relevant category includes dehydration (PQI #10), bacterial pneumonia (PQI #11), and UTI (PQI #12), from the existing AHRQ Prevention Quality Acute Composite (PQI #91) and AKI as a proposed PQI.⁴

AKI was determined using code 584.9, the only code billable to Medicare. Hospitalizations linked to activities of dialysis within prior three months were not considered as AKI.¹¹ When developing our methodology, we ascertained that the ICD-9-CM codes used to define admissions for hypoglycemia were not consistent with the most current accepted methodology. In the study, we identified hypoglycemia based on previously developed methodology, which has been utilized to evaluate hospitalization for hypoglycemia among Medicare beneficiaries using administrative data.^{9,12} The AHRQ category of diabetes long-term

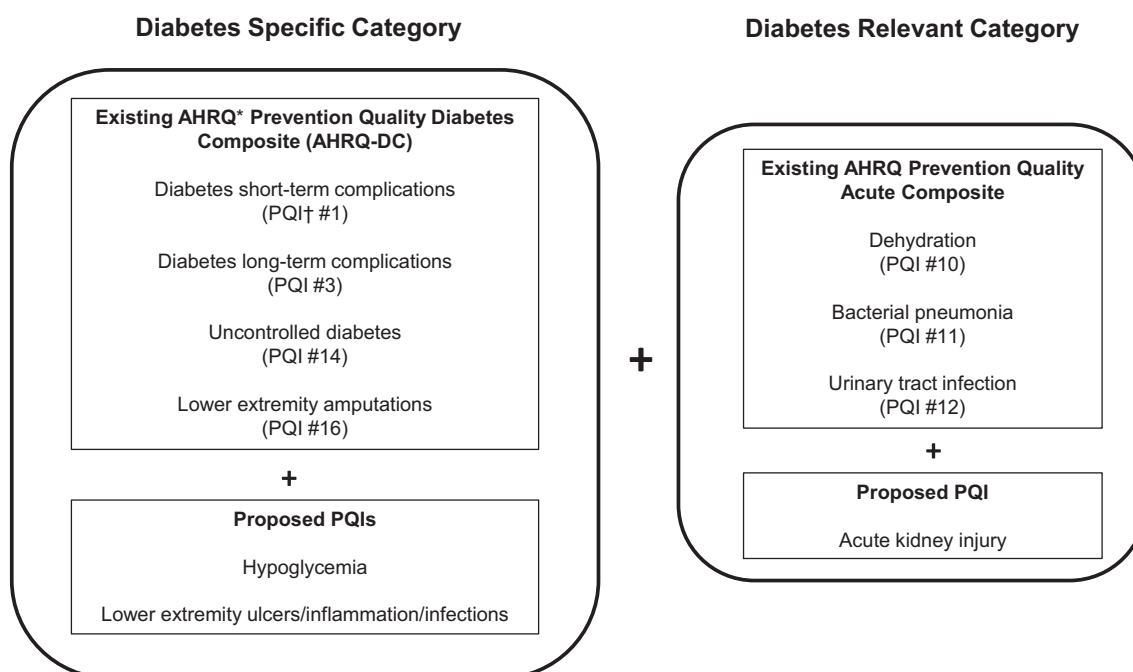


Fig. 1. The conceptual framework of the expanded prevention quality diabetes composite *AHRQ stands for the Agency for Health Research and Quality. †PQI stands for Prevention Quality Indicator (from AHRQ).

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