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Medical home implementation and trends in diabetes quality measures for AN/AI primary care patients

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ABSTRACT

Aims: Patient-centered medical home (PCMH) principles including provider continuity, coordination of care, and advanced access align with healthcare needs of patients with Type II diabetes mellitus (DM-II). We investigate changes in trend for DM-II quality indicators after PCMH implementation at Southcentral Foundation, a tribal health organization in Alaska.
Methods: Monthly rates of DM-II incidence, hemoglobin A1c (HbA1c) measurements, and service utilization were calculated from electronic health records from 1996 to 2009. We performed interrupted time series analysis to estimate changes in trend.
Results: Rates of new DM-II diagnoses were stable prior to ($p = 0.349$) and increased after implementation ($p < 0.001$). DM-II rates of HbA1c screening increased, though not significantly, before ($p = 0.058$) and remained stable after implementation ($p = 0.969$). There was non-significant increasing trend in both periods for percent with average HbA1c less than 7% (53 mmol/mol; $p = 0.154$ and $p = 0.687$, respectively). Number of emergency visits increased before ($p < 0.001$) and decreased after implementation ($p < 0.001$). Number of inpatient days decreased in both periods, but not significantly ($p = 0.058$ and $p = 0.101$, respectively).
Conclusions: We found positive changes in DM-II quality trends following PCMH implementation of varying strength and onset of change, as well as duration of sustained trend.

1. Introduction

Quality health care including regular preventive care (e.g. regular hemoglobin A1c [HbA1c] screening) can foster early disease identification and make the difference between maintaining quality of life or experiencing debilitating or even life-ending complications among people with Type II diabetes mellitus (DM-II) [1]. Self-management is also critical for positive health outcomes; thus healthcare providers can greatly improve

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outcomes by building relationships and strengthening communication with patients with DM-II, so as to align treatment options with patient choice [1–6]. Further, patients with DM-II often have comorbities, and care coordination across primary, specialty, and tertiary care is essential to understanding and improving patient health [1,7,8].

Given the need for self-management and complexity of healthcare needs for patients with DM-II, the patient-centered medical home (PCMH) model of health care has great potential for improving outcomes [2,8]. There are several principles of PCMH models which align with needs of patients with DM-II: patients have continuity of care with a personal physician and integrated care team (ICT); access is advanced to include same-day and electronic means; care is planned and managed with the patient at the center of care; self-care support is provided and includes pro-active quality of life focus instead of focus on treatment of disease symptoms after discomfort or illness; care is coordinated and tracked across primary, specialty, and tertiary care; and ICT performance (e.g. screening rates, chronic care management quality performance) is tracked with medical record data [9].

Southcentral Foundation (SCF) is a non-profit Alaska Native tribal health organization providing pre-paid primary care and other healthcare services to Alaska Native and American Indian (AN/AI) people living in the southcentral region of Alaska, including Anchorage and surrounding communities. SCF assumed management of primary care healthcare service in this region from the Indian Health Service (IHS) in 1998 and refers to AN/AI patients as "customer-owners" (COs) given patients receive care from and own the tribal health organization. A small portion of SCF customers (~2% in 2013) is non-AN/AI United States Public Health Service Commissioned Corps officers who work for SCF, but have no AN/AI ownership. Beyond primary care services, SCF co-manages the Alaska Native Medical Center (ANMC) campus which includes a range of specialty care clinics (e.g. diabetes specialty care), an emergency department, an urgent care center (ED/UCC), and a 150-bed Level II Trauma hospital serving AN/AI people across the state and a small number of non-AN/AI residents experiencing traumatic injury.

Following assumption of management, SCF held focus groups and interviewed COs to gather feedback for a redesign of its primary healthcare system. Several key changes were identified as high priority to COs and were rapidly implemented in August 1999. Changes, as follows, were components meeting modern principles of the PCMH care model, though SCF refers to its system as the Nuka system of care: advanced access; ICTs lead by a primary care provider (PCP) and utilizing case management; and when possible, CO-selected match to an ICT with family match encouraged and with high priority placed on continuity in care [10]. For SCF, advanced access was interpreted as same-day access with the assigned PCP whenever possible or another provider when not possible. In early stages of implementation, ICTs included a PCP (a doctor, internist, physician assistant or nurse practitioner), a certified medical assistant, a nurse (e.g. licensed practical nurse, registered nurse), and nurse case managers. Later enhancements included integrated behavioral health consultants and midwives.

In this effort, we investigate changes in trend for incidence and health outcomes related to DM-II for COs (including the small portion of other customers mentioned previously) before and after rapid implementation of PCMH components using data from 1996 to 2009. Health outcomes focus on HbA1c screening and service utilization. This study was approved by the Alaska Area and University of Alaska Anchorage Institutional Review Boards and received tribal approval from SCF and the Alaska Native Tribal Health Consortium (ANTHC).

2. Methods

2.1. Measures and sample

We investigate 5 DM-II measures calculated each month from March 1996 to December 2009 using data from the Resource Patient Management System [11] (RPMS), the electronic health record (EHR) used by the IHS and utilized across ANMC as the primary EHR during the study period. Each month, individuals included in analysis met the IHS "active user" definition with at least one visit to the ANMC campus in the previous 3 years [12] and if the RPMS address city at data extraction was on the road system within the Anchorage and Matanuska-Susitna Boroughs where AN/AI people had immediate access to the new Nuka system of care. RPMS maintains only the address of COs most current registration. Given quality issues for RPMS data prior to 1993 and past 3 year utilization requirements, March 1996 was the earliest date included and 2009 was the last complete year prior to data extraction. The data was provided by SCF as a de-identified database of monthly aggregated rates, so counts of individuals included in analysis are unknown. To estimate sample size, the IHS/SCF User population was 28,567 in 1998 and 45,375 in 2009 [13] with prevalence of DM-II estimated as 3.5% in 1997 [14] and 4.5% in 2008 [15].

The first measure investigated is rate per 1000 COs with a first diagnosis of DM-II (ICD-9 code 250.x0 or 250.x2) in the measurement month. Remaining measures focus on COs with DM-II, defined as those who had at least 2 DM-II diagnoses in the 24 months prior to the measurement month. Methodology requiring 2 diagnoses is consistent with definitions used by SCF and the IHS for quality assurance and improvement efforts related to COs with DM-II [12]. Other measures investigated include percent with annual HbA1c screening, percent with average HbA1c less than 7% (53 mmol/mol), average number of ED/UCC visits, and average number of inpatient days. Those COs not screened in the past year were considered to have HbA1c greater than 7% (53 mmol/mol), consistent with methodology found in the Healthcare Effectiveness Data and Information Set [16] and used by SCF in quality assurance efforts.

2.2. Statistical methods

We performed interrupted time series analysis on monthly measures to estimate baseline trend and changes in trend following implementation of the PCMH model of care at SCF. Analysis followed several steps. We first tested for autocorrelation using the Durban–Watson statistic (PROC AUTOREG,