Original research

Real-world comparison of HbA$_{1c}$ reduction at 6-, 12- and 24-months by primary care provider type[☆]

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A B S T R A C T

Aims: To assess differences in hemoglobin A$_{1c}$ (HbA$_{1c}$) over time in diabetics treated by internal medicine physicians using the chronic care model (IMP-ancillary) or an advanced practice nurse (APN-IMP).

Methods: Retrospective, 2-group comparative design using administrative databases and matching of IMP-ancillary and APN-IMP subjects 2:1 based on patient age ($\pm$3 years), gender and race. Subjects were diabetics treated $\geq$2 times during 2007–2010, had $\geq$1 follow-up visit 6-months from baseline and $\geq$2 HbA$_{1c}$ levels. HbA$_{1c}$ levels were assessed longitudinally using linear mixed effect models. Pearson chi-square and two-sample t-tests compared groups on patient characteristics.

Results: A total of 774 patients were identified. After matching 93 APN-IMP patients with 176 IMP-ancillary patients (N = 269), there were no differences between groups in demographics; however, baseline mean (SD) HbA$_{1c}$ was higher in APN-IMP group, p < 0.001. Compared to baseline, at follow-up there were no between-group differences in HbA$_{1c}$ levels at 6 and 12 months; at 24 month follow-up, APN-IMP tended to have a large decrease in HbA$_{1c}$ compared to the IMP-ancillary group; mean difference (95% CI), −0.26 (−0.56, 0.05) p = 0.097.

Conclusion: Compared to baseline HbA$_{1c}$, patients treated by APN-IMP and IMP-ancillary provider groups had equivalent reductions in HbA$_{1c}$.

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1. Introduction

In medical ambulatory care, chronic medical conditions, such as diabetes mellitus, are often managed by physicians in a group practice, using a chronic care model (CCM). The CCM is based on four key pillars: self-management support, delivery system design, decision support, and clinical information systems [1]. Care delivery is patient-centered, using a coordinated

care approach with inter-professional collaboration to meet patient needs. The goal is to deliver personalized care that is coordinated and efficient, and results in quality outcomes [2]. To meet patient needs, physicians may consult with ancillary service providers (educators, nutritionists, cardiac rehabilitation specialists and social workers) or invite advanced practice nurses (APN) to be part of the group practice team. When APNs are brought into ambulatory internal medicine group practices (IMP), they may be the sole non-physician provider in the group. Although chronic care APN practices were supported in delivering quality care [3,4]; it is unknown if an individual APN within a group practice (APN-IMP) has similar or better outcomes compared to physicians within the practice who use ancillary support (most commonly, diabetes educators and nutritionists; IMP-ancillary) to achieve CCM goals.

1.1. Chronic diabetes care within the chronic care model

The CCM has been a widely accepted standard for improving outcomes in adults with diabetes [5]. Nutting et al. [6] reported that when elements of CCM were incorporated in primary care practices, clinicians experienced higher levels of recommended processes and better diabetes care outcomes. Similarly, when CCM was incorporated into primary care practice, diabetics had improved quality of life [7]. When the CCM was compared with other care models, patients with diabetes in the CCM group had a marked decline in HbA_{1c} in the short term (-0.6%, $p = 0.008$) [8], over a 1-year period [9], and at 3 years [8]. Further, in regression analysis, 54% of CCM participants had HbA_{1c} levels under 7 percent at follow-up, compared with 49% of controls [10]. Researchers learned that glycemic control was associated with the number of program visits and number of diabetes classes attended by patients [11], raising evidence that a patient-centered diabetic program of personalized care benefited patients.

Evidence for efficacy of CCM in IM practices is compelling, but there is a gap in research literature on changes in HbA_{1c} among type 2 diabetics receiving care by a single APN working in a real-world, group-based primary care practice. Most research studies took place in acute settings and lipid clinics (secondary prevention), and patient management was not led by APNs [12]. A Cochrane collaboration review panel supported control of diabetes by primary care APNs after finding increases in recommended preventive care practices, such as eye and foot exams, and optimal diabetes control [13]. In patients with type 2 diabetes who receive primary care, reduction in HbA_{1c} may vary by group practice provider collaborations (APN-IMP versus IMP-ancillary).

1.2. Specific aims

In a Cleveland area primary care clinic, it is common for a single APN to work within a group-practice of internal medicine physicians (IMP). In diabetes care, it is unknown if HbA_{1c} levels differ over time when patients are treated by a single cardiovascular specialty APN and multiple IMP using the CCM team model or multiple IMP using ancillary consult services, as needed. Thus, the primary aim of the study was to examine HbA_{1c} levels at 3 follow-up time points (6-, 12- and 24-months)

based on care provider services delivery. The secondary aims were to examine changes in HbA_{1c} levels from baseline to each follow-up period within-groups. This research was guided by 2 questions; (1) are there differences in HbA_{1c} levels between APN-IMP and IMP-ancillary groups after 6-, 12-, and 24-months of care? (2) Is there a significant change in mean HbA_{1c} level from baseline to each follow-up period within groups for both APN-IMP and IMP-ancillary? To answer research questions, patients were matched in each care provider group based on age, gender and race.

2. Methods

2.1. Design

This research used a retrospective, 2-group comparative design and medical record methods. The study design was selected to provide results that would be applicable to real-world practices and also, to prevent internal threats to validity that could occur when healthcare providers know their actions are being monitored.

2.2. Subjects

Patients had a medical history of type 2 diabetes mellitus and ambulatory visit history of care delivery by APN-IMP and IMP-ancillary. The healthcare center Institutional Review Board approved this study prior to initiation.

2.3. Setting and sample

The setting was a preventive chronic care clinic in an ambulatory center that was owned and operated by a large multihospital healthcare system in Cleveland, Ohio. The IMP had 15 physicians, 2 part-time physician assistants, and 1 full-time cardiovascular-trained APN with prescriptive privileges who provided care and billed patients independently of IMP. All personnel were employees of the healthcare system. As part of usual-care, APN responsibilities were similar to IMP responsibilities in completing medical histories, physical examinations and treatment plans. The APN initiated and changed medication therapies, made referrals, provided patient education, and had hospital admitting privileges. Patients were assigned to the APN by physicians within or external to the group practice, including referrals by family medicine practices, cardiology and endocrinology specialists, and by schedulers in a call center. Both APN and IMP providers had schedules with similar time allotted per patient and had the same documentation expectations. The primary difference was that the APN was more likely to provide consultation and education to patients without using ancillary providers.

The target populations were all IMP and the APN who treated patients who met inclusion and exclusion criteria. The sample population of patients were those with diabetes who attended clinic from 2007 to 2010 and had a visit diagnosis billed as international classification diagnosis-9 code 250. Patient inclusion criteria were age 18–85 years at time of first visit, living at home, confirmed type 2 diabetes for at least 2 months prior to baseline data collection, a minimum of 2