Nurse Practitioners, Physician Assistants, and Physicians Are Comparable in Managing the First Five Years of Diabetes

BACKGROUND: Increasing use of nurse practitioners and physician assistants is a possible solution to the shortage of primary care providers in the US, but the quality of care they provide is not well understood. Because of the scope of practice laws, only a few studies included direct comparisons between nurse practitioners or physician assistants and physicians with similar independence and patient populations.

OBJECTIVE: This study set out to determine whether patients managed by primary care nurse practitioners, physician assistants, or physicians had similar hemoglobin A1c levels at comparable times in the natural history of diabetes. The scope of practice of the 3 provider types is similar in the Veterans Health Administration.

METHODS:

- Authors- Supported in part by the Veterans Affairs (VA). Some authors declared potential duality of interest due to their activities involving manufacturers of diabetes medications.
- Funding- Provided by FDA, NIH, CF awards.
- Design- Retrospective cohort of the national Veterans Health Administration (VHA) Corporate Data Warehouse.
- Duration- At diagnosis in 2008, during 4 years of follow-up, and at initiation of oral medications and insulin.
- Enrollment-
    - n=19,238 patients, 95.3% male, 77.7% white, mean age 68.5 years.
    - n=15,050 (78.2%) managed by physicians (MD).
    - n=2,821 (14.7%) managed by nurse practitioners (NP).
    - n=1,367 (7.1%) managed by physician assistants (PA).
    - Some patient characteristic differences (age, sex, race, BMI) were statistically but not clinically significant.
- Inclusion criteria-
    - Veterans with newly diagnosed diabetes in 2008. Defined by ICD code or outpatient Rx of a diabetes drug.
    - Continuous primary care from 2008 to 2012.
    - More than 75% of primary care visits with NPs, PAs, or MDs.
    - At least 1 hemoglobin A1c measurement within 12 weeks before or 6 weeks after diagnosis.
    - At least 1 hemoglobin A1c per year from 2008 to 2012.
- Exclusion criteria-
    - Less than 50% of primary care visits with either NPs, PAs, or MDs.
- Outcomes- Hemoglobin A1c levels at comparable time points in the natural history of diabetes- at diagnosis, initiation of first and second oral medications, initiation of insulin, and 4 years of follow-up.
- Data handling- Not applicable.
- Statistical analyses-
    - For group comparisons among different provider types, *Chi-square* tests evaluated nominal variables.
        - Chi-square: compares two or more independent (unpaired) groups of nominal (categorical) data.
    - Analysis of variance and 2-tailed *t* tests evaluated means of continuous variables.
        - Parametric: for continuous, normally distributed data. Assumes population variances are equal and observations are independent.
    - Kruskal-Wallis and Wilcoxon rank-sum evaluated median values of outcomes not normally distributed.
        - Nonparametric: for ordinal data or as alternatives to the t-test or ANOVA for continuous-level data.
        - Wilcoxon rank-sum: compares two independent (unpaired) groups.
        - Kruskal-Wallis: comparing three or more independent (unpaired) groups.
    - Statistical analysis of A1c outcomes is reported as median values due to right skewing of A1c distributions. Multivariate regression analyses were conducted for A1c outcomes to adjust for variations in characteristics.
- P values- All analyses were conducted using R. *P* values < .05 were considered statistically significant.
    - Pearson r is parametric for continuous, normally distributed data.
    - Spearman rank-order r is nonparametric for ordinal data or continuous, not normally distributed data.
- Power- Not addressed.

RESULTS:

- A total of 15,841 patients were prescribed glucose-lowering medications.
    - 15,301 (96%) had at least 1 oral medication. → 14,635 (96%) had an A1c at initiation.
    - 5,889 (37%) had at least 2 oral medications. → 5,271 (89%) had an A1c at initiation of the second oral drug.
    - 2,769 (17%) were prescribed insulin. → 2,245 (81%) had an A1c at initiation of insulin.
- Hemoglobin A1c- Within each time period, values were averaged if patients had multiple tests. A 5-year mean A1c was calculated from all levels reported from diagnosis in 2008 through 4 years of follow-up in 2012 for each patient.
- Median A1c- Comparable at diagnosis (6.6% NP, 6.7% PA, 6.7% MD, $P > .05$) and after 4 years (all 6.5%, $P > .5$).
- Median time from diagnosis to initiation of oral drugs or insulin- No difference among the 3 provider types.
- A1c levels at initiation of the first (7.5-7.6%) and second (8.0-8.2%) oral medications was similar among the 3 provider types after adjusting for patient characteristics (all $P > .05$).
    - Being male and African American were independently associated with higher A1c throughout the duration of the study and during initiation of all diabetes medications.
- Initiation of insulin- NPs started insulin at a lower A1c (9.4%) than MDs (9.7%), which remained significant after adjustment ($P < .05$).
    - Despite statistical significance, these differences in A1c were not clinically significant, much less than the 0.5% hemoglobin A1c difference that correspond to an increased risk of developing diabetic retinopathy (from the Diabetes Control and Complications Trial).
- Adverse effects- Not addressed. Could consider patient satisfaction, hypoglycemia, blood pressure, cholesterol, eye care, foot care, vaccinations, cardiovascular events, microvascular end-organ damage, hospitalizations, etc.
- Diabetes specialist clinic- 4.8% of PA's patients visited, compared with 7.0% of NP's and 7.6% of MD's ($P < .001$).
- Compliance- Not addressed.

STRENGTHS:
- The VHA is the largest integrated health care system, as well as the largest employer of NPs and PAs in the nation.
- Stronger study design compared to past evaluations of diabetes care. Studies were limited to cross-sectional analyses of single hemoglobin A1c levels without time point comparisons.
- 98% of patients with diabetes medication prescriptions had their A1c tested within the diagnosis time frame.
- Visit provider type concordance was greater than 75% for all groups (82.3% for NPs, 78.9% for PAs, 92% for MDs).

LIMITATIONS:
- Almost 80% of veterans (15,000 of ~20,000) were managed by physicians.
- Unknown provider-allotted appointment time with patients.
- Unknown post-visit physician input is incorporated into diabetes management by NPs and PAs.
- Pharmacists were not included. Although pharmacists lack provider status, the VA allows collaborative practice.

CONCLUSIONS:
At diagnosis and during 4 years of follow-up, diabetes management by nurse practitioners and physician assistants was comparable to management by physicians. The authors stated that minimal differences in hemoglobin A1c outcomes are unlikely to be due to differences in patient complexity. It is not known how the patients were stratified to each provider type. Because of confounding factors from the study, it is uncertain how mid-level providers compare to physicians when providing care for chronic conditions like diabetes.

Further prospective, randomized, controlled trials would be helpful to determine the extent to which our findings will apply to other practice environments. Pharmacist involvement could be included as well.

REFERENCE: Yang Y, Long Q, Jackson SL, Rhee MK, Tomolo A, Olson D, Phillips LS. Nurse Practitioners, Physician Assistants, and Physicians Are Comparable in Managing the First Five Years of Diabetes. Am J Med. 2018 Mar;131(3):276-283.e2.

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