Electronic Documentation of Lifestyle Counseling and Glycemic Control in Patients with Diabetes

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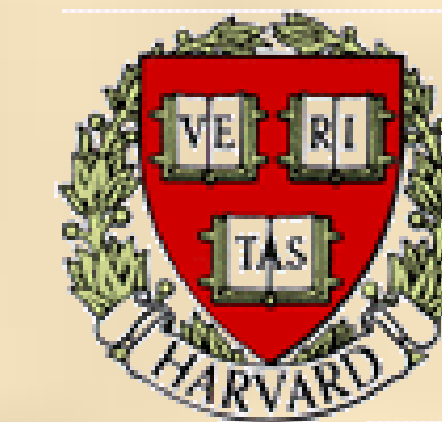[1]Brigham and Women's Hospital   [2]Massachusetts General Hospital,   [3]Harvard Clinical Research Institute,   [4]Harvard Medical School;   all in Boston, MA

ABSTRACT

Background
There are currently no methods that can assess the quality of lifestyle counseling delivered to the patient.

Methods
We retrospectively studied 10,870 hyperglycemic (HbA1c ≥ 7.0%) adults with diabetes followed at primary care practices affiliated with two academic hospitals between 2000 and 2010. *Documentation intensity* was represented by the mean number of characters per note documenting lifestyle counseling. *Heterogeneity* was calculated as the normalized Levenshtein distance between lifestyle counseling sentences between consecutive notes.

Results
Comparing patients in the highest versus lowest tertile by documentation heterogeneity and documentation intensity, median time to HbA1c < 7.0% was 26 versus 39 months, and 24 versus 39 months, respectively (P < 0.001 for all). In multivariable analysis, an increase of documentation heterogeneity by 0.15 units (1 SD) and an increase of documentation intensity by 51 characters/note (1 SD) was associated with hazard ratios of 1.08 (95% CI 1.04 to 1.12 ; P < .001) and 1.27 (95% CI 1.23 to 1.31 ; P < 0.001) for time to HbA1c target, respectively.

Conclusions
Higher heterogeneity and intensity of lifestyle counseling documentation in provider notes were associated with better glycemic control. These quantitative characteristics of electronic documentation of lifestyle counseling may be used as indicators of quality of diabetes care.

BACKGROUND

- Lifestyle (diet, exercise, weight loss) counseling is a critical component of diabetes care.
- There are currently no established methods to quantify quality of lifestyle counseling delivered to the patient based on EHR documentation.
- This is in part because lifestyle counseling is primarily documented in narrative documents (e.g. notes), making it difficult to analyze.
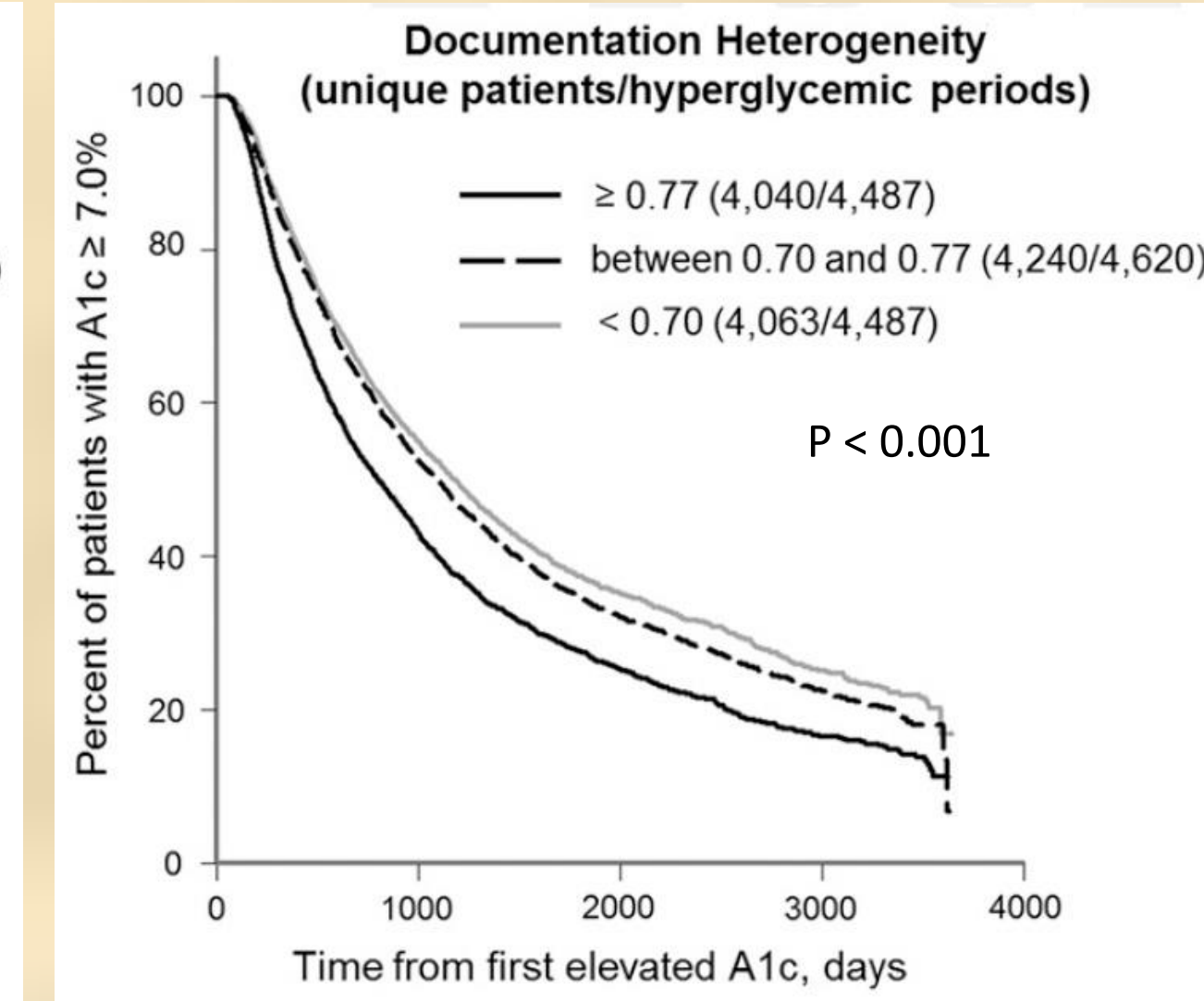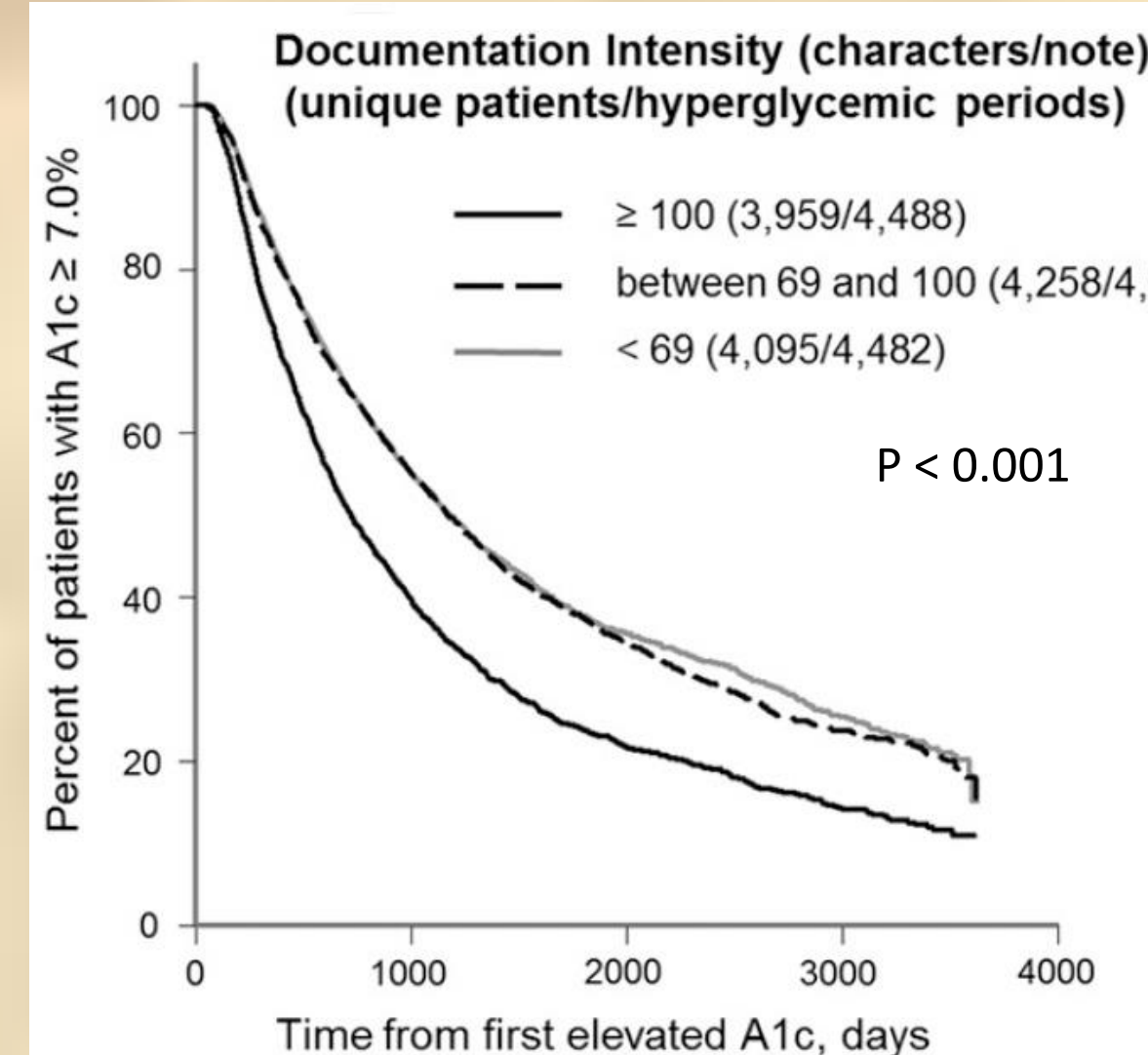
DESIGN

GOAL: To develop quantitative indicators of quality of lifestyle counseling delivered to patients with diabetes.

- Retrospective cohort study based at two academic medical centers
- Included patients with diabetes treated in primary care settings between 2000 and 2010
- Lifestyle counseling abstracted from electronic provider notes using validated (sensitivity 91-97% and specificity 88-94%) natural language processing software
- Documentation **INTENSITY**: mean number of characters per note documenting lifestyle counseling
- Documentation **HETEROGENEITY**: mean Levenshtein distance (number of character additions, deletions and transpositions needed to convert one sentence to another) between sentences documenting lifestyle counseling, divided (normalized) by the length of the longer sentence
- Unit of analysis: hyperglycemic period (from the first A1c ≥ 7.0% to the first A1c < 7.0% or end of study)

CONCLUSIONS

- Both higher documentation heterogeneity and higher documentation intensity of lifestyle counseling are associated with faster achievement of A1c control.
- Heterogeneity and intensity of documentation of lifestyle counseling in narrative provider notes may be used as indicators of quality of diabetes care.

RESULTS

Documentation Intensity (characters/note) (unique patients/hyperglycemic periods)
- ≥ 100 (3,959/4,488)
- between 69 and 100 (4,258/4,624)
- < 69 (4,095/4,482)
- P < 0.001

Documentation Heterogeneity (unique patients/hyperglycemic periods)
- ≥ 0.77 (4,040/4,487)
- between 0.70 and 0.77 (4,240/4,620)
- < 0.70 (4,063/4,487)
- P < 0.001

VARIABLE	HR (95% CI)	P-value
Intensity[1]	1.27 (1.23 – 1.31)	< 0.001
Heterogeneity[2]	1.06 (1.04 – 1.12)	< 0.001

[1]Per 1 SD increase (45 characters / note)
[2]Per 1 SD increase (0.15 units)
Multivariable analysis (Cox regression model) of time to A1c < 7.0% adjusted for patient demographics (age, sex, race, primary language, mean household income by zip code, health insurance), obesity, baseline A1c, rate of A1c testing, frequency of diabetes medication intensification, frequency of provider visits, frequency of lifestyle counseling, Charlson Comorbidity Index