STUDYING INSULIN DECLINE IN PATIENTS WITH DIABETES

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ABSTRACT

Background
Anecdotally, patients with diabetes commonly decline insulin therapy. However, little data exists on the epidemiology of insulin decline. Information on patients declining insulin is not easily available. Medication decline occurs before any prescription is written and is not reflected in either administrative or structured electronic clinical data, but is primarily recorded in narrative notes.
Methods
We designed a natural language processing (NLP) tool for identification of documented insulin decline by patients based on the open-source Canary NLP platform. The NLP tool was validated against 1,501 manually reviewed provider notes. We used the validated NLP tool to analyze the incidence of insulin decline among patients with diabetes with HbA1c ≥ 7.0% treated in primary care practices affiliated with an academic medical center between 2000 and 2014 who were offered insulin therapy.
Results
The NLP tool achieved sensitivity of 100% and PPV of 95%. We used the NLP tool and identified 3,295 patients with diabetes who were offered insulin therapy. A total of 984 (29.9%) of these patients declined insulin therapy. 374 (11.4%) of them subsequently initiated insulin therapy after a mean of 790 days. Incidence of insulin decline was highest (34.2%) among patients with HbA1c ≥ 9.0%.
Conclusions
Insulin decline is common among patients with severe hyperglycemia and may lead to significant delays in treatment. NLP technology offers an unprecedented opportunity to shed light on this important clinical phenomenon.

REFERENCES

1. Canary, a user-friendly information extraction tool. Available from: http://canary.bwh.harvard.edu
2. Malmasi S, Sandor NL, Hosomura N, Goldberg M, Skentzos S, Turchin A. Canary: An NLP Platform for Clinicians and Researchers. Applied clinical informatics. 2017;8(2):447-53.

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BACKGROUND

- Anecdotally, patients with diabetes commonly decline insulin therapy. However, little data exists on epidemiology of insulin decline.
- Information on patients declining insulin is not easily available. Medication decline occurs before any prescription is given, and is not reflected in administrative or structured electronic clinical data, but is primarily recorded in narrative notes.

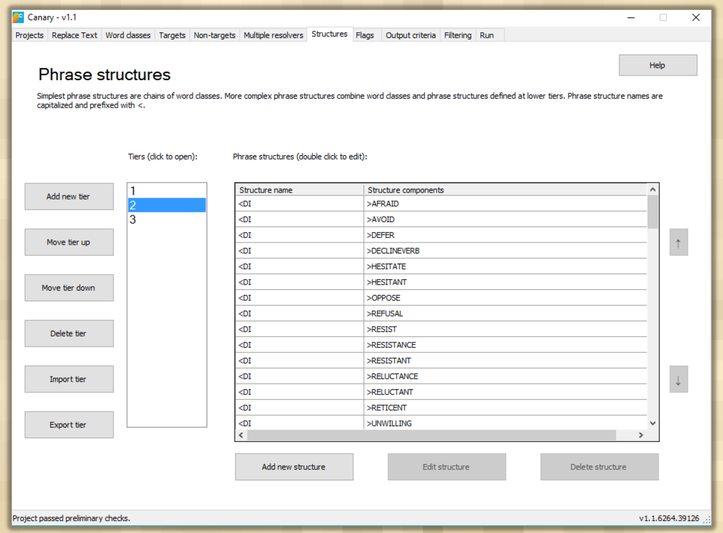
METHODS

OBJECTIVES:

- To design and validate a natural language processing (NLP) algorithm to identify patients' decline of insulin therapy from the text of physician notes
- To determine the incidence of insulin decline among patients with diabetes who were offered insulin therapy

- We designed an NLP tool for identification of documented insulin decline by patients using the open-source Canary NLP platform.[1, 2]
- The NLP tool was validated against 1,501 manually reviewed provider notes from the electronic medical record system of a large academic medical center.
- We used the validated NLP tool to analyze the incidence of insulin decline among patients with diabetes with HbA1c ≥ 7.0% treated in primary care practices affiliated with an academic medical center between 2000 and 2014 who were offered insulin therapy.

Canary
A user-friendly Information Extraction Tool



CONCLUSIONS

- Many patients with uncontrolled diabetes initially decline insulin therapy, possibly leading to significant delays in treatment.
- Natural language processing of electronic medical record data provides an unprecedented opportunity to study epidemiology, risk factors and outcomes of insulin decline by patients.

RESULTS

- The NLP tool achieved sensitivity of 100% and PPV of 95%.
- We used the NLP tool and identified 3,295 diabetes patients who were offered insulin therapy.
  - 984 (29.9%) declined insulin therapy.
  - 374 (11.4%) subsequently initiated insulin therapy after a mean of 790 days.
- Incidence of insulin decline was highest (34.2%) among patients with HbA1c ≥ 9.0%.

Language Model Accuracy (%, with 95% CI in parentheses)

	Sensitivity	Specificity	PPV
Note-Level	100.0 (76.8-100.0)	99.9 (99.6-100.0)	93.3 (68.0-99.8)
Sentence-Level	100.0 (82.4-100.0)	N/A	95.0 (74.4-99.9)

Number of Patients Who Declined Insulin by HbA1c