Delayed Initiation of Insulin Therapy and Glycemic Control in Patients Who Decline Insulin

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Disclosed no conflict of interest

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Background

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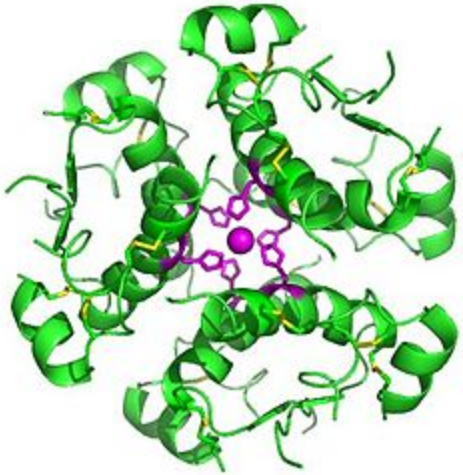
Background

- Provider experience shows that many patients decline insulin therapy.
- Systematic data on the outcomes of the patients who decline insulin therapy are lacking.
- Medication decline is not reflected in administrative or structured electronic clinical data, but is primarily recorded in narrative notes.

Objectives

- To determine whether patients who decline insulin and delay insulin therapy initiation have worse glycemic control than individuals who accept insulin therapy without delay.



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Materials & Methods

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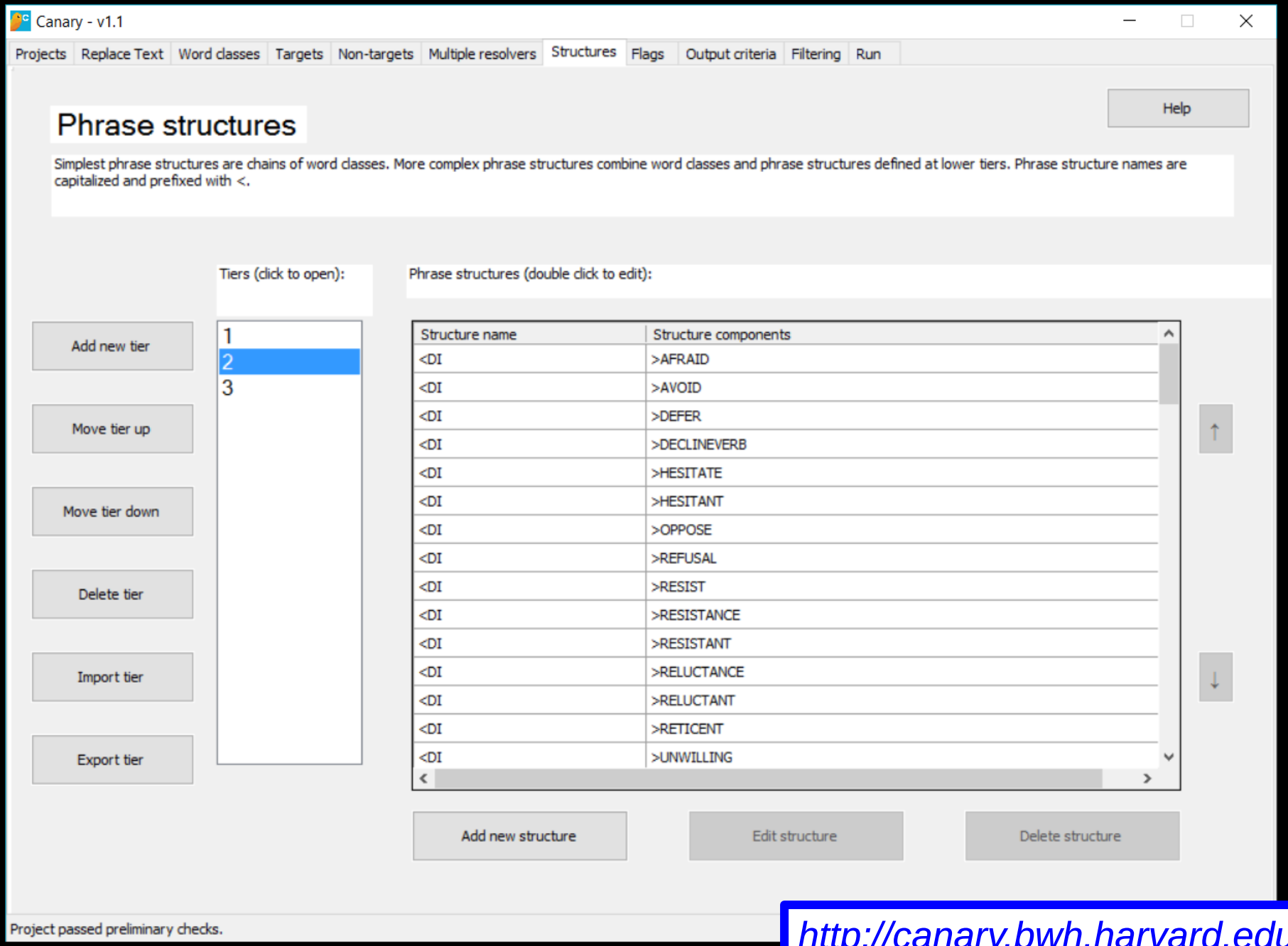
Approach

- We developed a natural language processing (NLP) algorithm to identify insulin therapy decline by patients from the text of physician notes.
- We used Canary, an open-source NLP platform designed for clinicians and researchers.
- The NLP tool achieved 100% sensitivity and 95% PPV.

Canary
A user-friendly Information Extraction Tool

http://canary.bwh.harvard.edu


Canary - v1.1
Projects
Replace Text
Word classes
Targets
Non-targets
Multiple resolvers
Structures
Flags
Output criteria
Filtering
Run
Help
Phrase structures
Simplest phrase structures are chains of word classes. More complex phrase structures combine word classes and phrase structures defined at lower tiers. Phrase structure names are capitalized and prefixed with <.
Tiers (click to open):
Phrase structures (double click to edit):
Add new tier
Move tier up
Move tier down
Delete tier
Import tier
Export tier
1
2
3
Structure name
Structure components
<DI >AFRAID
<DI >AVOID
<DI >DEFER
<DI >DECLINEVERB
<DI >HESITATE
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<DI >OPPOSE
<DI >REFUSAL
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<DI >RELUCTANT
<DI >RETICENT
<DI >UNWILLING
Add new structure
Edit structure
Delete structure
Project passed preliminary checks.
http://canary.bwh.harvard.edu

Materials and Methods

Study Design

- Retrospective cohort study

Study Cohort

- Adults with diabetes treated in primary care practices affiliated with BWH or MGH between 2000-2014 who:
  a. had no prior history of insulin prescription or documented insulin therapy decline
  b. had HbA1c $\geq$ 7.0%
  c. received a prescription for insulin during the study period

Materials and Methods

Exclusion Criteria

- Diagnosis of type 1 diabetes
- eGFR < 30 at baseline

Materials and Methods

Predictor Variable

- Binary variable: whether or not the patient declined insulin therapy recommendation

Outcome Variable

- Time to A1c < 7.0%
  - Starts from the study entry date and ends at the study exit (HbA1c below 7.0%, 1 year after the last note, death, study end date)

Statistical Analyses

- Log-rank test to compare Kaplan-Meier curves for time to HbA1c control
- Marginal Cox proportional hazards models to estimate the association between time to HbA1c control and insulin therapy decline, adjusted for covariates and clustering within individual providers

Results

Study Population

3,032 adults with diabetes included in the study

2,487 (82%) started insulin therapy without delay

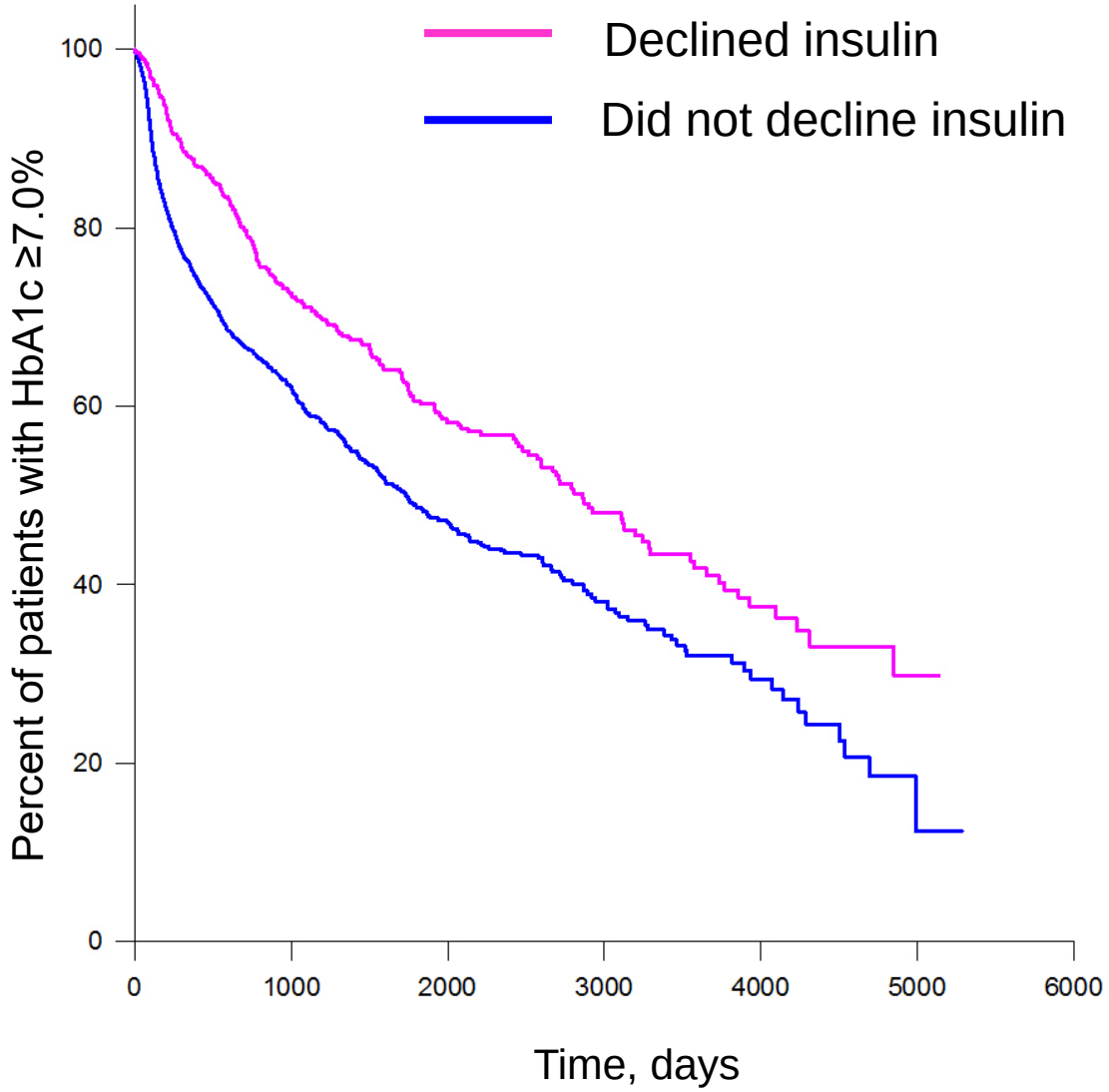
- Median time to HbA1c < 7.0%: **13 months**
- **930** (37%) reached HbA1c < 7.0%

545 (18%) initially declined insulin

- Median time to insulin acceptance: **18 months**

- Median time to HbA1c < 7.0%: **43 months**
- **232** (43%) reached HbA1c < 7.0%

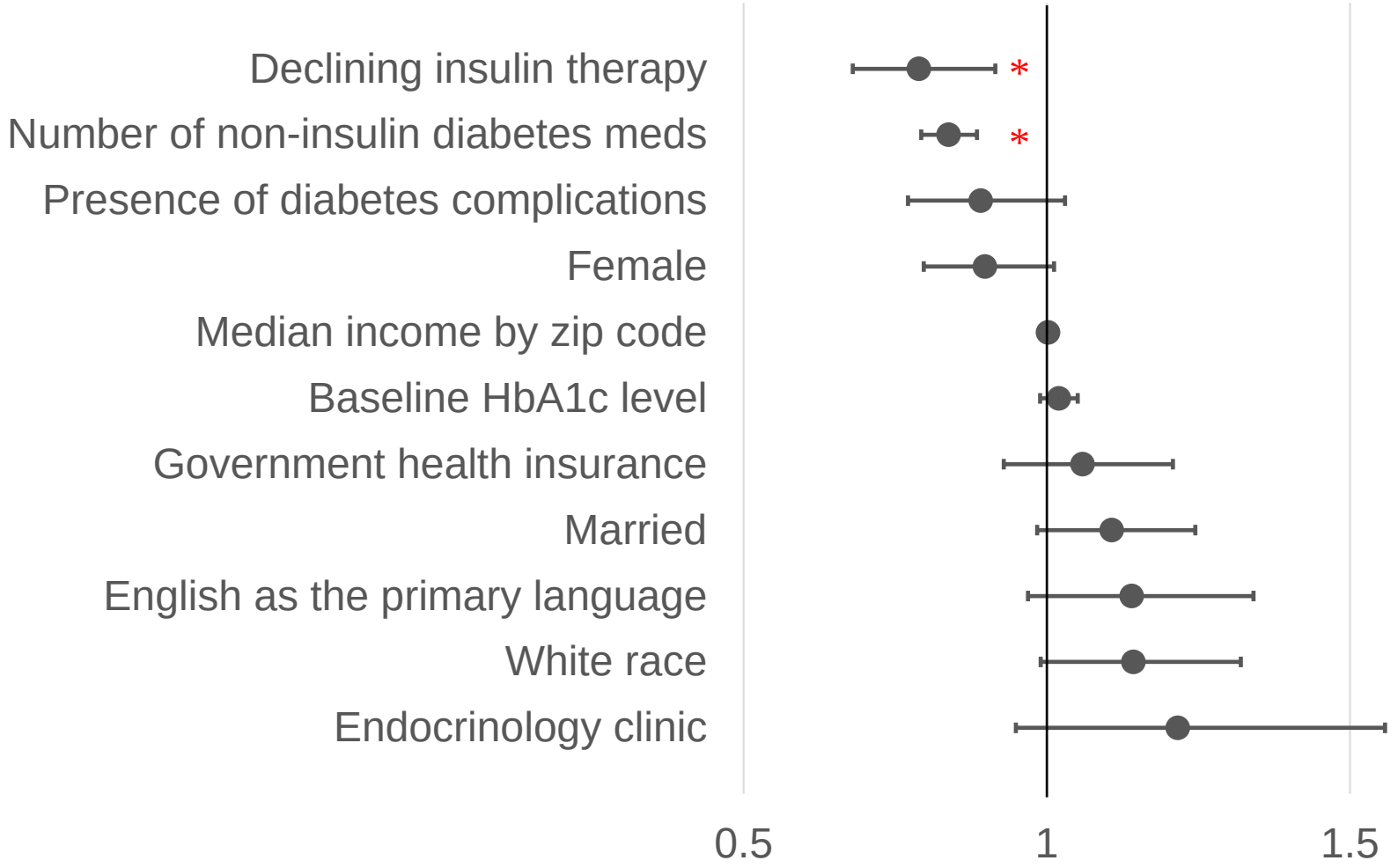
Insulin decline and time to HbA1c control



	Median time to HbA1c control
Declined insulin	43 months
Did not decline insulin	13 months

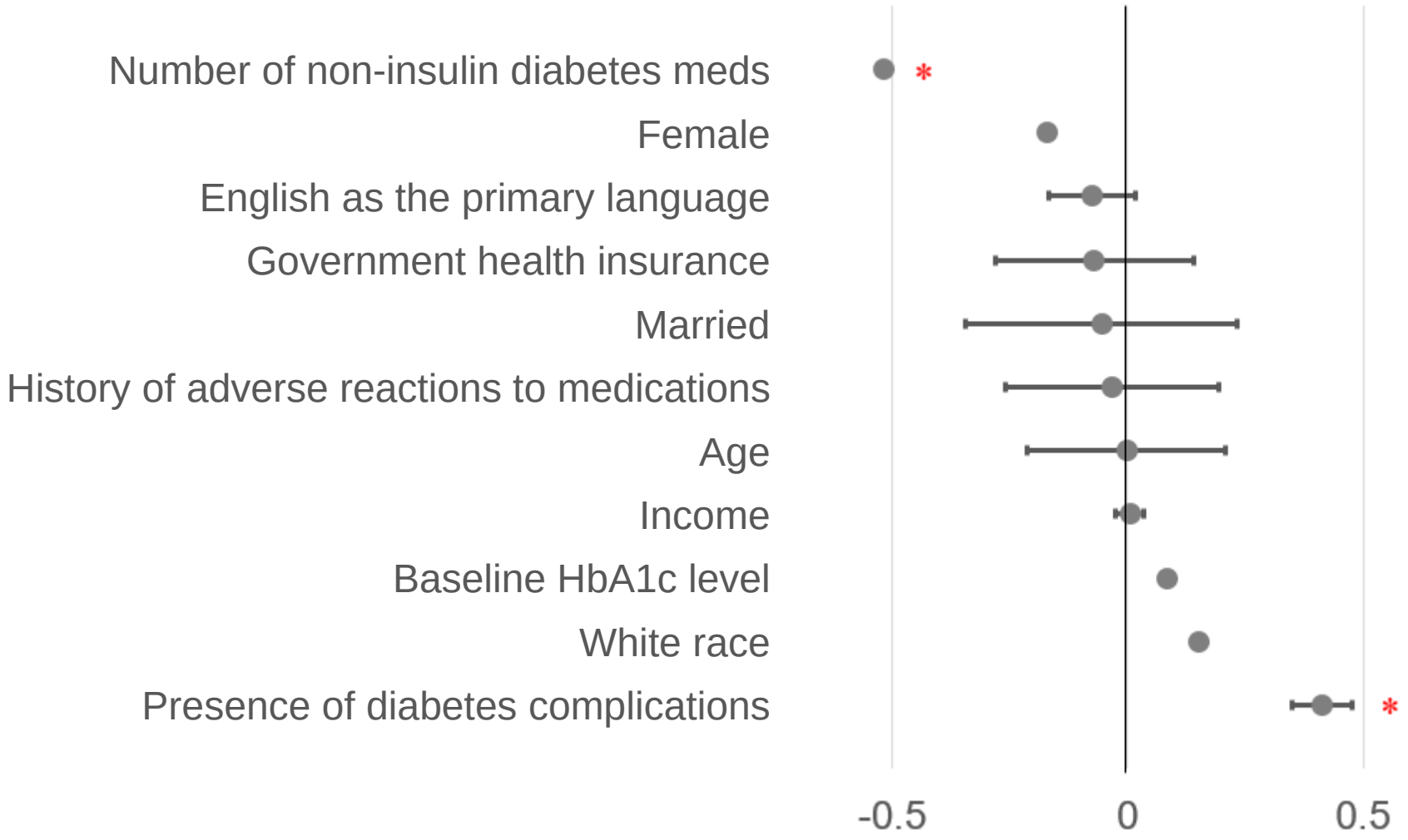
$p < 0.0001$ by log-rank test

Effect of patient and treatment characteristics on time to HbA1c control



* *P* values < 0.005 were significant after Simes-Hochberg correction.

Effect of patient characteristics on acceptance of insulin therapy



* *P* values < 0.005 were significant after Simes-Hochberg correction.

Discussion & Conclusions

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Discussion

- Natural Language Processing is a powerful technology that allows analysis of previously unexplored phenomenon of insulin therapy decline by patients with diabetes.
- This is the first study to describe the sequelae of insulin therapy decline by patients.
- Insulin therapy decline is common among patients with uncontrolled diabetes.

Discussion

- Patients who decline insulin and delay the initiation of insulin therapy take more than 3 times as long to achieve glycemic control compared to individuals who start insulin therapy without delay.

- Insulin therapy decline by patients was the strongest predictor of time to achievement of glycemic control in patients with uncontrolled diabetes.

Discussion

- Patients with existing diabetes complications were less likely to decline insulin therapy.

- Further research is needed to study reasons for insulin therapy decline by patients and its long-term outcomes.

Limitations

- Conducted at two large academic hospitals
- Retrospective study

Conclusions

- Delayed initiation of insulin therapy in patients who decline insulin was associated with longer time to achievement of glycemic control.

- This important clinical phenomenon of insulin therapy decline by patients must be addressed to improve the care and outcomes of patients with diabetes.

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Questions?

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