



# Precision implementation: Developing and validating predictive models of information technology tool adoption

Huguet N,<sup>1</sup> Marino M,<sup>1</sup> Holderness H,<sup>1</sup> Angier H,<sup>1</sup> Jamieson E,<sup>1</sup> O'Malley J,<sup>2</sup> DeVoe JE.<sup>1</sup>

<sup>1</sup>Oregon Health & Science University; <sup>2</sup>OCHIN, Inc.

OCHIN

## BACKGROUND

- Implementation support strategies can help clinical practices with adoption and maintenance of evidence-based guidelines.
- Which clinics will benefit most from a particular implementation strategy and with how much assistance is unknown.
- New methods are needed to predict which practices will implement targeted changes with less vs. more / different kinds of support.

## STUDY OBJECTIVES

- To develop and validate predictive models that estimate the likelihood of adoption and sustained use of electronic health record (EHR)-related tool.

## SETTING

- EHR data from 351 community health centers in the OCHIN research network from 5/1/17 to 6/30/19 (1 year pre-and post-EHR tool implementation).

## MEASURES

- Tool adoption: any instance of tool use within 12 months of rollout.
- Tool sustainability:  $\geq 1$  tool use in the last 4 months of the 12-month follow-up period.
- Insurance support EHR tool tested:
  - Designed for clinic eligibility specialists
  - Documents health insurance assistance provided to CHC patient insurance
  - Assists with HRSA reporting
  - Clinics received basic training document

Figure 1: Percent of clinics that adopted and showed sustained use of the tool

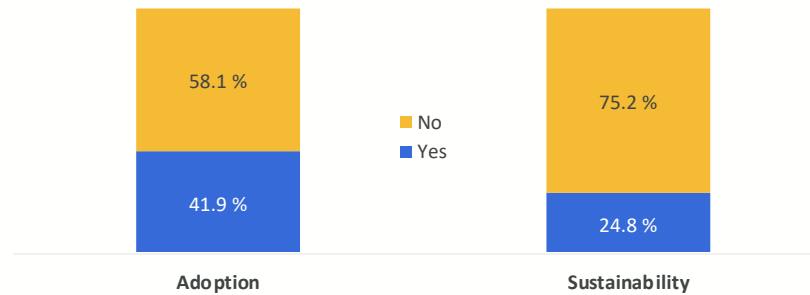


Table 1: Selected clinic characteristics by adoption or sustainability of the tool

	ADOPTION		SUSTAINABILITY	
	No Mean (SD) / %	Yes Mean (SD)/ %	No Mean (SD)/ %	Yes Mean (SD)/ %
Total # of clinics	180	130	310	77
Years in EHR	4.1 (2.5)	5.1 (2.8)	4.3 (2.6)	5.3 (2.6)
School-based health center	35.6	17.7	32.6	14.3
Clinic in state that expanded Medicaid	88.9	91.5	90.1	89.6
Urban Clinic	91.7	93.1	91.8	93.5
Median patient age	29.4 (15.2)	35.1 (11.5)	30.3 (14.7)	36.3 (10.8)
% Hispanic patients	24.4 (25.1)	29.7 (25.2)	25.8 (25.5)	29.1 (24.4)
% Non-white patients	31.2 (27.0)	25.2 (24.0)	29.5 (26.5)	26.3 (24.3)
% of patients with 2+ chronic conditions	30.3 (22.5)	38.1 (17.7)	31.5 (22.1)	39.9 (15.6)
Total # of visits	11,979 (22562)	41,909 (45203)	15,943 (27564)	50,515 (48245)
% of visits that were ambulatory	62.8 (22.2)	52.6 (17.5)	61.1 (21.7)	50.6 (16.1)

These characteristics are a subset of characteristics that were included in predictive modeling. These were selected because they had the largest difference in distribution between adopters/sustainers and non adopters/sustainers

Table 2: Model performance and predictive variables

	ADOPTION	SUSTAINABILITY
	Model fit AUC, (95% CI)	Model fit AUC, (95% CI)
	0.784 (0.710 - 0.858)	0.829 (0.746 - 0.912)
<b>Predictive variables</b>	<b>Interpretation</b>	<b>Interpretation</b>
Years in EHR	Higher odds of adoption	
Total # of visits	Higher odds of adoption	Higher odds of sustainability
% of visits that were ambulatory	Lower odds of adoption	

## METHODOLOGY

- LASSO penalized logistic regression.
- Sample divided into a training sample (70%) and a testing sample (30%).
- Variables/domains in models: type of clinics, geographic variable, # and type of departments/clinic, patient panel, patient panel demographic characteristics, type and # of encounters, payer distribution, provider type, # of encounters with eligibility specialist.
- Predictive performance assessed using area under the ROC curve (AUC): ability to distinguish who used the tool from those who did not.

## RESULTS

- Models for adoption and sustainability show high classification accuracy.
- Out of the 25 variables entered in the model, three predicted adoption and one predicted sustainability.
- Number of visits was the strongest predictor of both adoption and sustainability.

## LIMITATIONS

- Not tested on other types of HIT tools.
- Limited to one EHR type.
- Limited to CHC settings.

## CONCLUSIONS

- EHR data can be used to predict EHR tool use.
- Next step: validate the model with a clinical tool.

## FUNDING/ CONTACT

- P50CA244289 National Cancer Institute, (PI: JE DeVoe)
- Contact: Huguet, N, PhD, [huguetn@ohsu.edu](mailto:huguetn@ohsu.edu)