



INFORMATICS PROFESSIONALS. LEADING THE WAY.

Generating a Test of EHR Narrative Comprehension

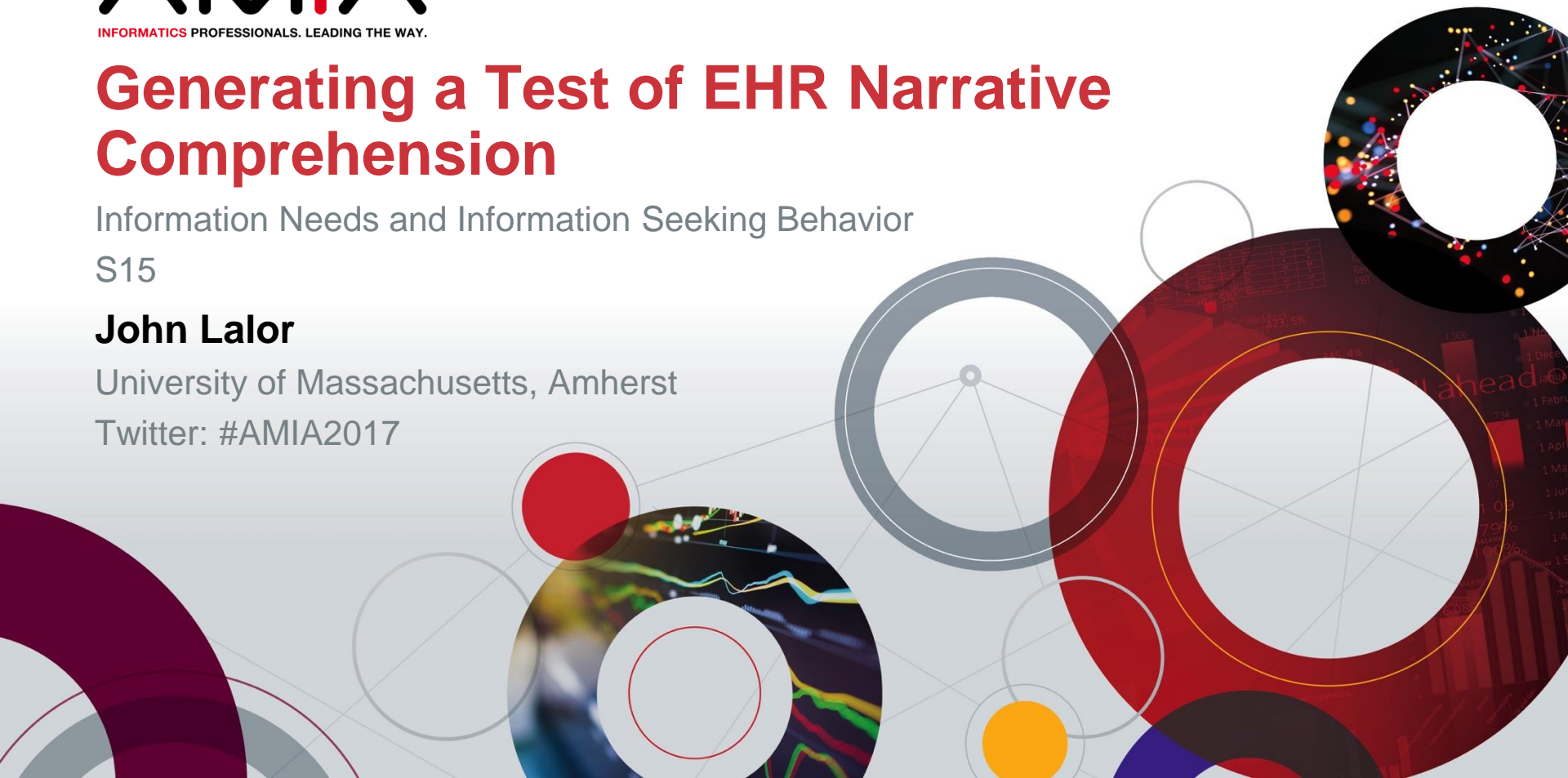
Information Needs and Information Seeking Behavior

S15

John Lalor

University of Massachusetts, Amherst

Twitter: #AMIA2017



Disclosure

I and my spouse have no relevant relationships with commercial interests to disclose.

Learning Objectives

After participating in this session the learner should be better able to:

- Generate comprehension questions from Electronic Health Records.
- Evaluate the quality of questions using Item Response Theory and crowdsourced responses.

Acknowledgements

- Hao Wu and Li Chen, Boston College
- Kathy Mazor and Hong Yu, UMMS

Motivation

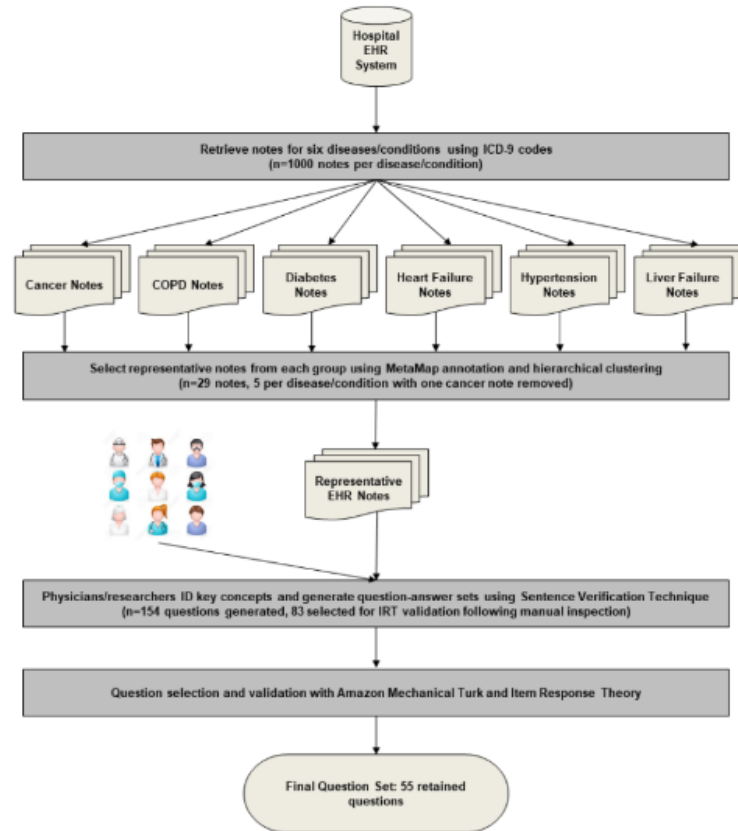
Patients are being given access to their Electronic Health Records (EHRs)

EHR notes include medical terms and are difficult to understand, particularly for individuals with low health literacy

Tests of health literacy exist, but none are specific to testing a patient's ability to read and comprehend EHR notes

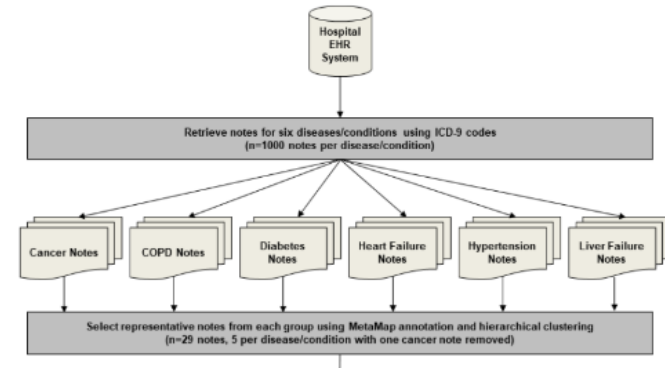
The *monitor* has not shown any **dysrhythmias** or a **rrhythmia** either *prior to or during any of his spells*

Process Overview



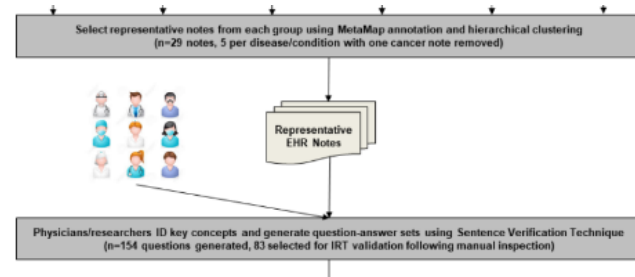
EHR Note Identification

- Pull notes from hospital database according to ICD-9 code
- Identify key medical terms in the notes and cluster according to terms
- Select note with most medical concepts from each cluster



Question-Answer Generation

- Groups of physicians and medical researchers identified important concepts in notes
- Groups wrote multiple choice questions using Sentence Verification Technique
 - Answer options: paraphrase, meaning change, and distractor



Sentence Verification Technique

Forming Test Questions using SVT:

Please read the following question and then examine the answer choices and choose the answer that best represents the question text.

What does the following sentence mean? “The monitor has not shown any dysrhythmias or arrhythmia either prior to or during any of his spells.”

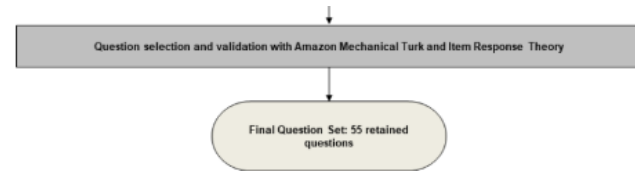
1. He has had abnormal rhythm prior to or during his spells of chest pain
2. The monitor has shown abnormal heart rhythms before and during his spells
3. His heart rhythm is normal before and during his fainting spells

What does the following sentence mean? “Patient recently presented to the hospital with shortness of breath.”

1. Shortness of breath has many causes
2. She went to the hospital for trouble breathing
3. She visited the clinic due to shortness of iron

Question Validation

- Gather response patterns from Amazon Mechanical Turk to identify good items
 - 83 items → 55 items
- 2nd round on AMT for validation
 - All items retained

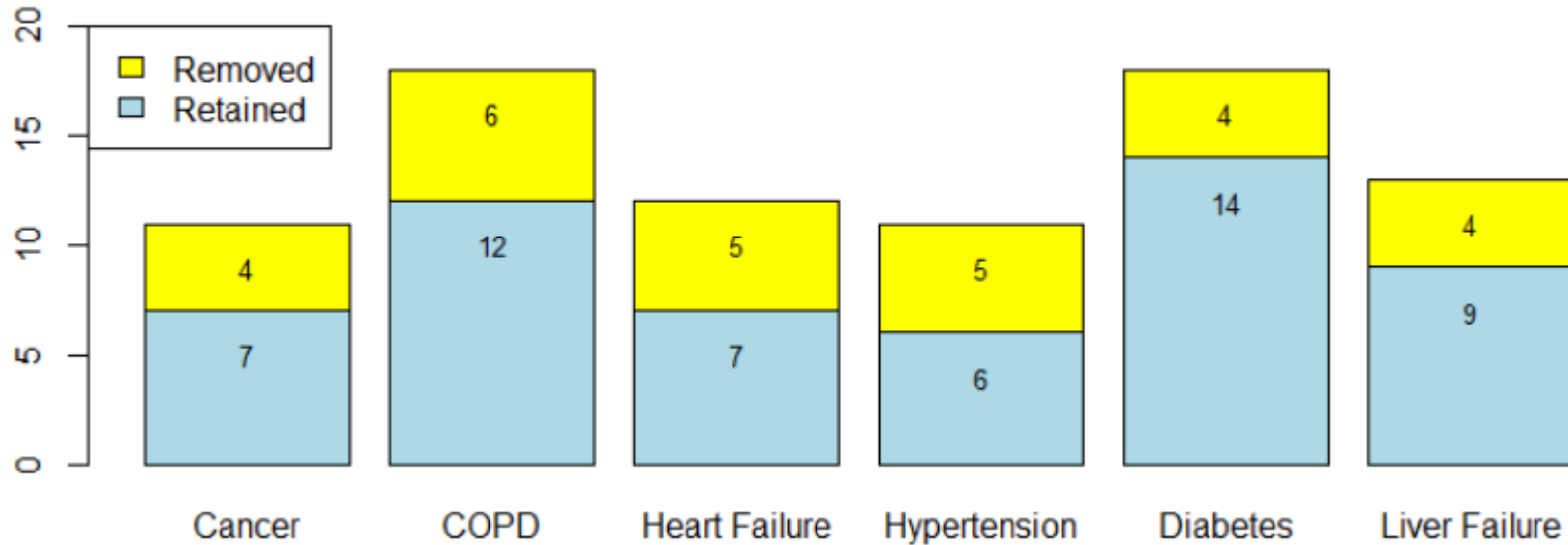


Results



IRT Item Removal

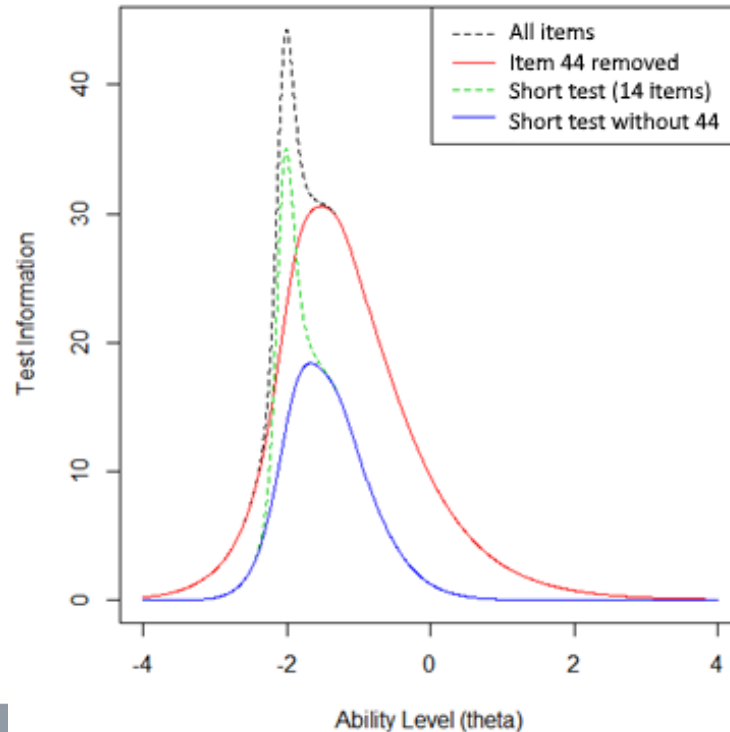
Counts of Retained and Removed Items



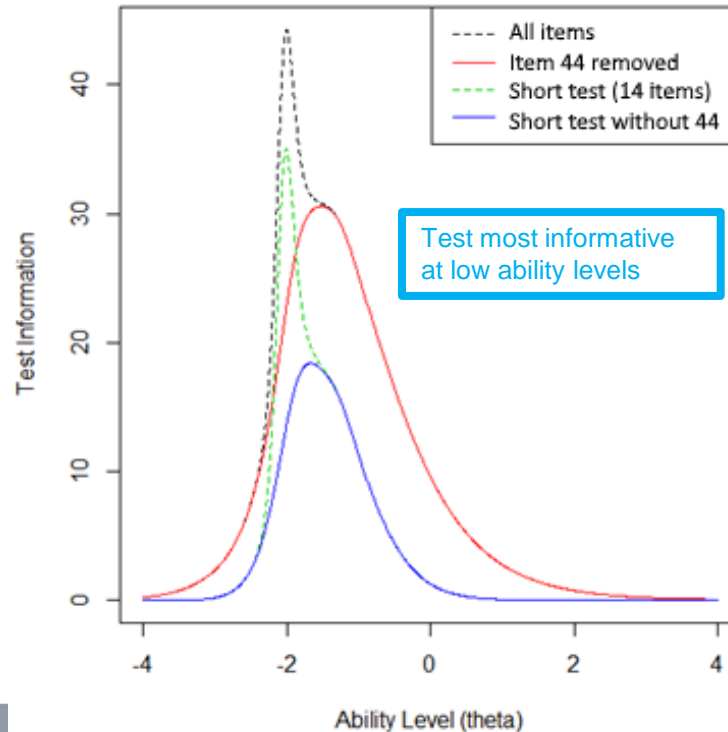
Retained/Removed Examples

	Question	Paraphrase	Meaning Change	Distractor
Retained	Pegfilgrastim 6 mg subcutaneous one dose	Do an under skin injection of one dose of 6 mg pegfilgrastim	Pegfilgrastim 6 mg epidermal one dose	Pegfilgrastim may prevent neutropenia
Removed	Osteoporosis	Weakness in bones	Hardening of bones as we get older	Some bones get hard and some weak

Test Information Curve



Test Information Curve

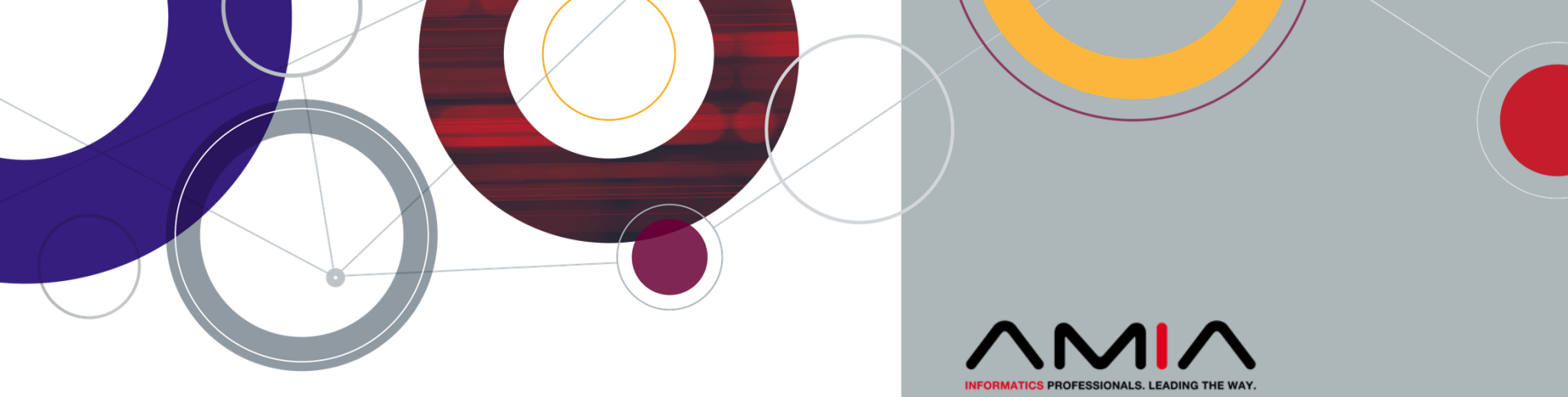


Ability by Demographic

Education Level	Less than High School	-0.899
	High School Diploma	-0.038
	Associates Degree	-0.013
	Bachelors Degree	-0.034
	Masters Degree or Higher	0.199
Age	18-21	-0.493
	22-34	-0.042
	35-44	-0.066
	45-54	0.222
	55-64	0.212
	65 and older	-0.122


Conclusion

- New instrument to assess patient EHR note comprehension
 - Generated from de-identified notes
 - Test is most informative for low ability
 - Next steps: validate test with populations where low health literacy is prevalent
- Future work: Automatic question generation for personal EHR note comprehension
 - Use patients' own notes to test comprehension




AMIA is the professional home for more than 5,400 informatics professionals, representing frontline clinicians, researchers, public health experts and educators who bring meaning to data, manage information and generate new knowledge across the research and healthcare enterprise.



 @AMIAInformatics

 @AMIAinformatics

 Official Group of AMIA

 @AMIAInformatics

#WhyInformatics

Thank you!

Email: lalor@cs.umass.edu

Data: jplalor.github.io/ehr

