# Quantifying Language for Serious Illness Care Research with NLP

**Charlotta Lindvall, MD, PhD**

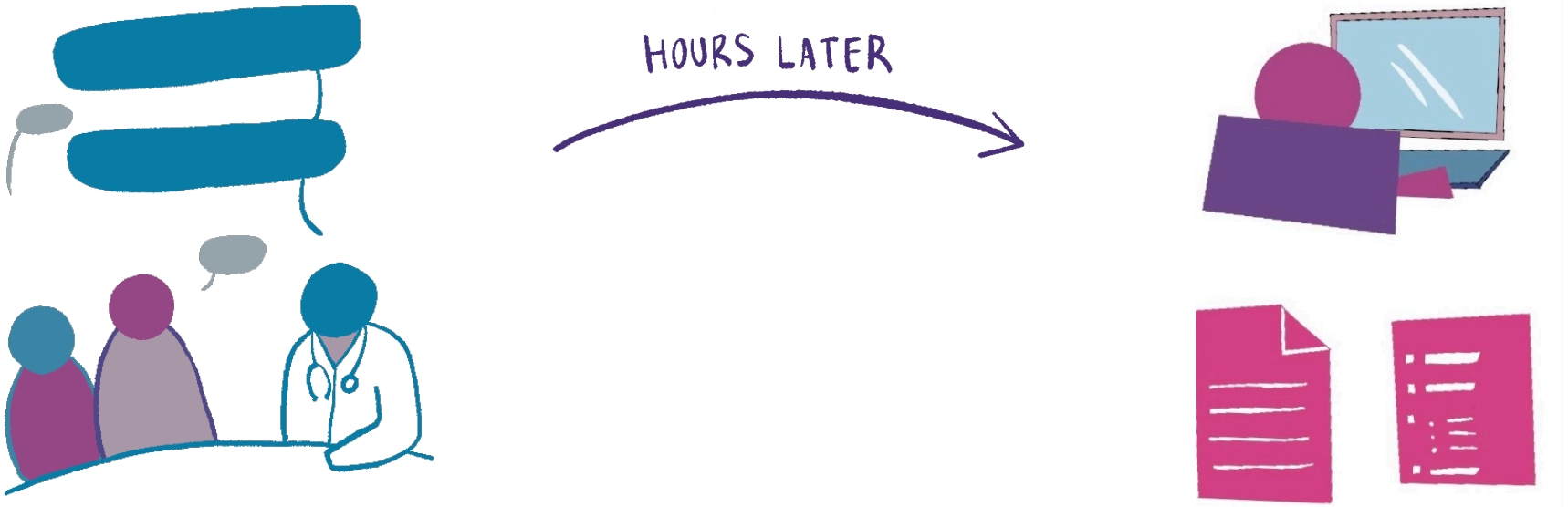
**Assistant Professor**

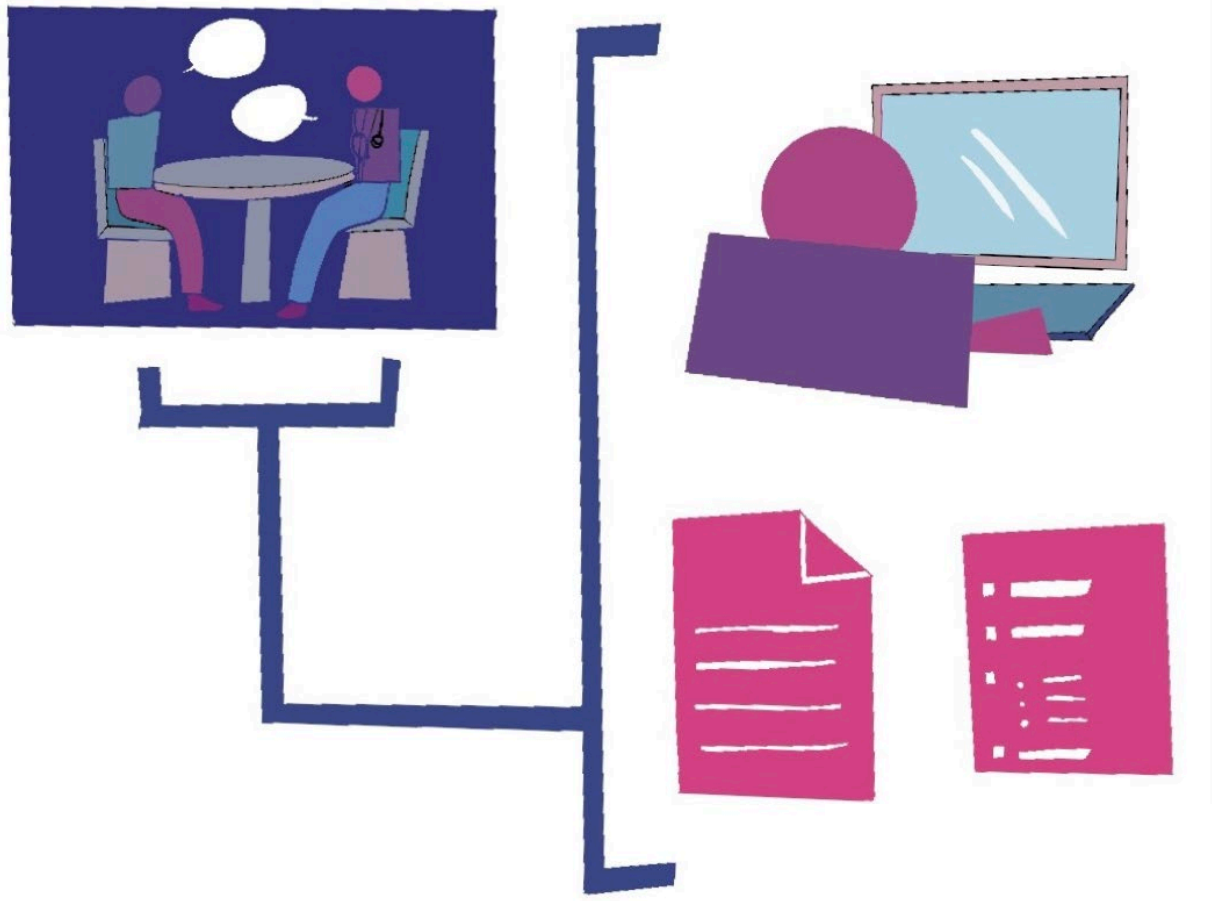
**Director of Clinical Informatics**

NASEM Nov 2, 2023

Dana-Farber
Cancer Institute

# Seriously ill patients face important decisions

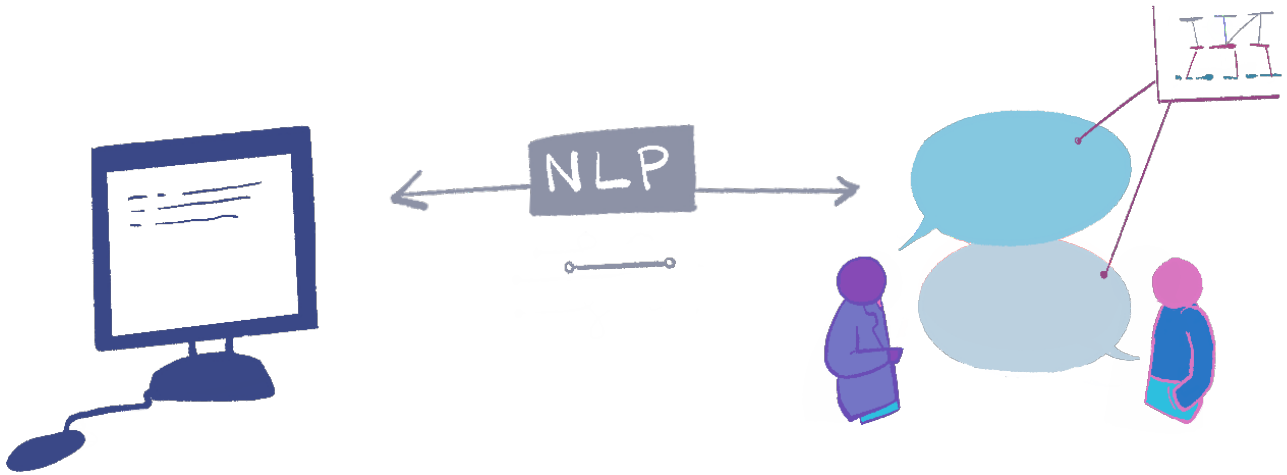




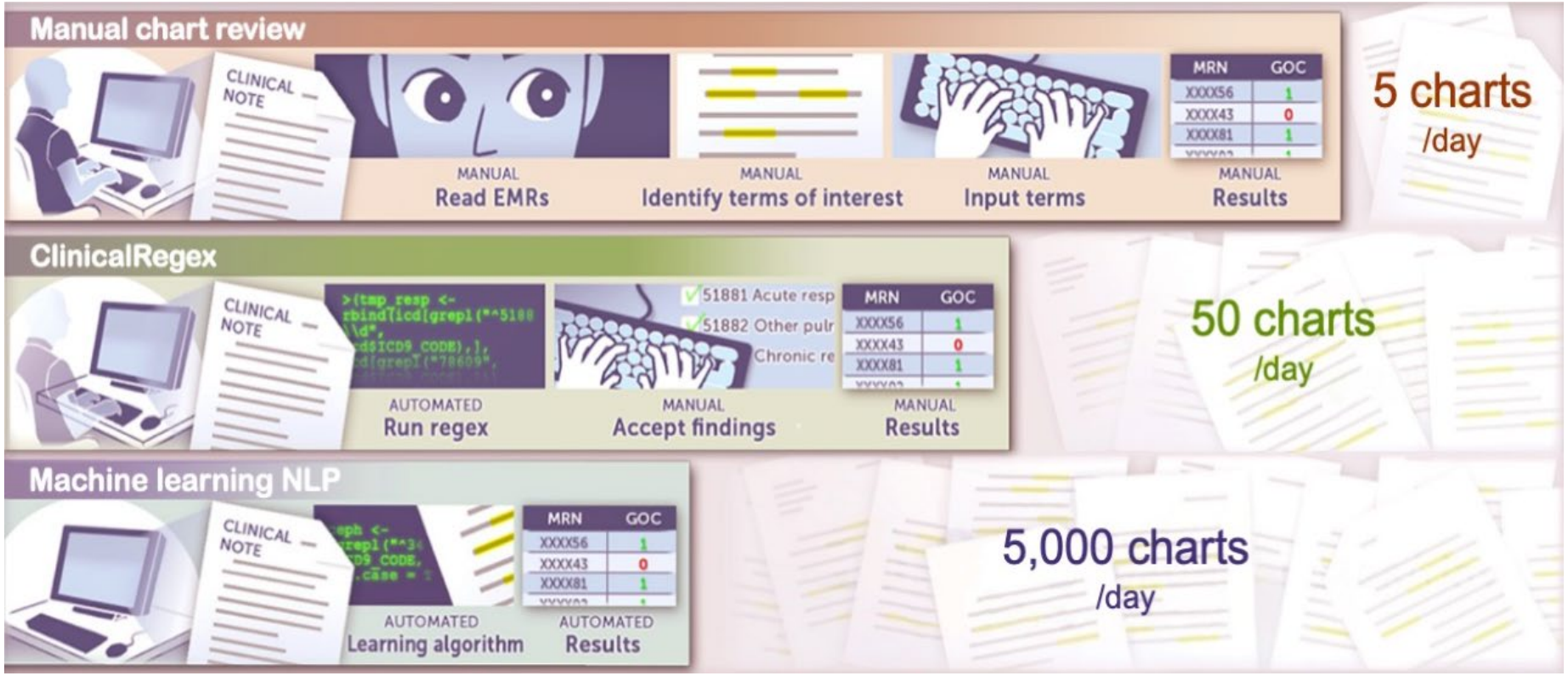
# *Measurement Challenges*

- Data: unstructured, structured
- Unstructured data is difficult to access
  - *Manually abstracting this information is prohibitively costly and time-intensive*
- Structured data may provide an incomplete proxy measure

# Natural Language Processing (NLP) enhances language comprehension in computers



# NLP enables the capture of text-based data






https://lindvalllab.github.io/clinical-regex/

Collapse All Expand All Hide

68 words not shown Less More

... confirmed is her healthcare proxy. Patient is eating OK, and able to get around home, though is requiring more ...

46 words not shown Less More

... Patient expressed gratitude towards our clinical team and towards family.

We discussed the patient's prognosis and her goals of care. During this discussion, the patient expressed understanding that her life expectancy was limited, and ...

5 words not shown Less More

... free and being at home.

The patient agreed with her daughter to enroll in hospice. The palliative care team consulted with the patient shortly after, with the goals of care focused on ensuring the ...

26 words not shown Less More

Time Limited Trial of Dialysis

0

Goals of Care

1

Palliative Care

1

Hospice

1

Code Status Limitations

0

Surrogate Decision Maker

1

Submit and continue

Submit

Original Investigation | Geriatrics

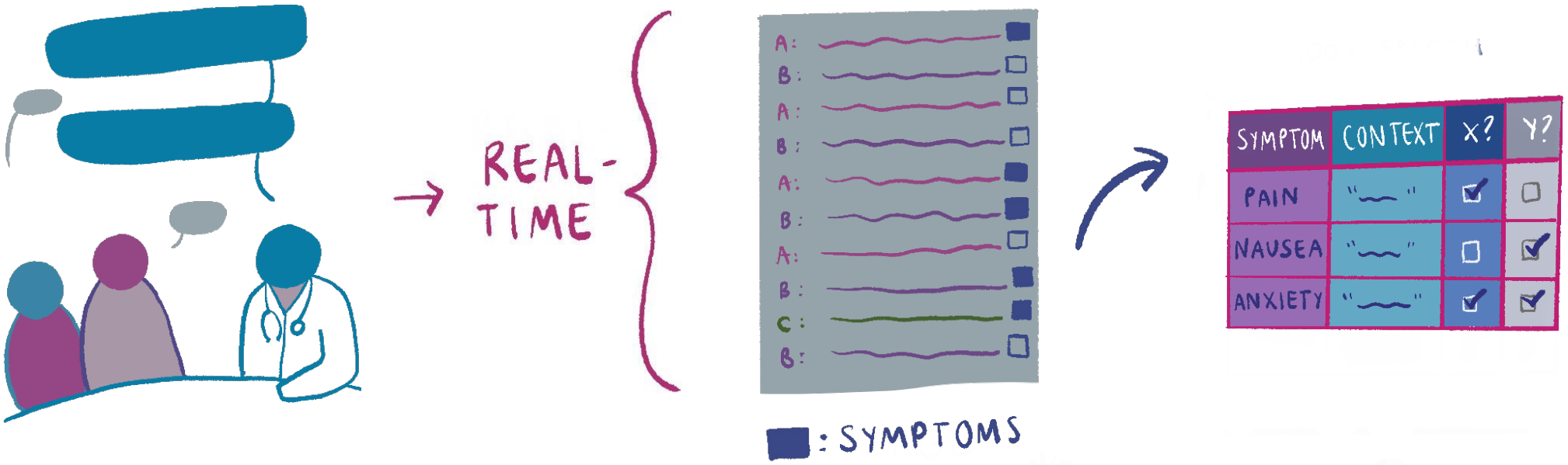
# Association of an Advance Care Planning Video and Communication Intervention With Documentation of Advance Care Planning Among Older Adults

## A Nonrandomized Controlled Trial

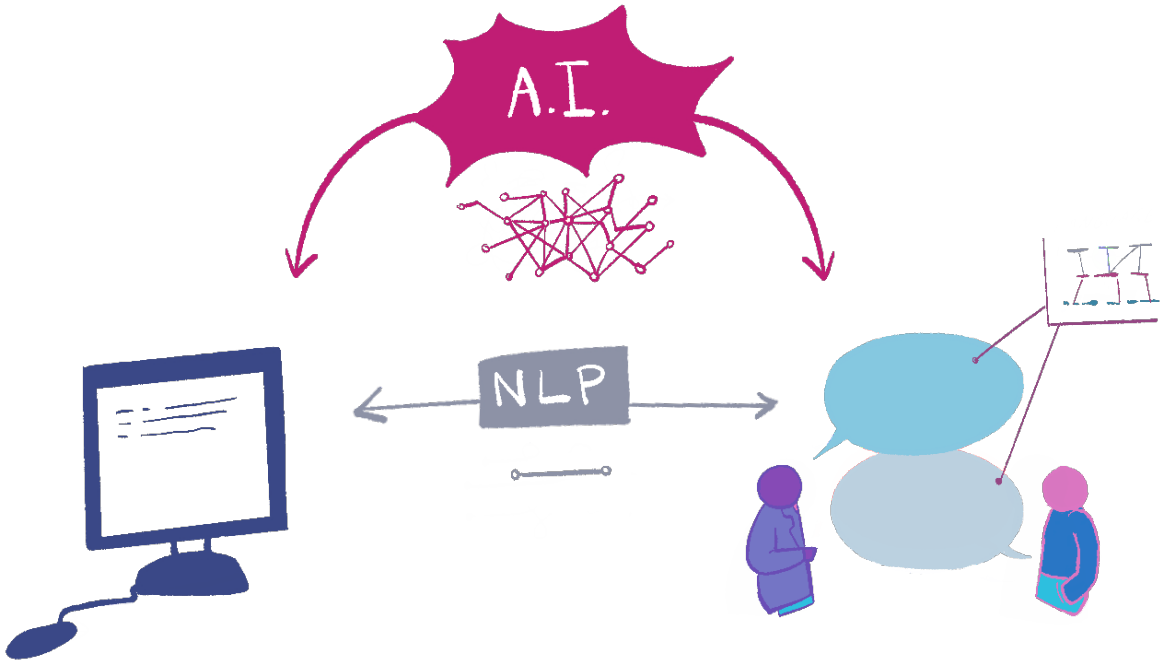
- Participants: 42,019 patients followed in 22 clinics
- Primary outcome: documentation of goals of care conversation in the electronic health record

*JAMA Network Open*. 2022;5(2):e220354. doi:10.1001/jamanetworkopen.2022.0354

# Envision the possibility…



# Rapid development in NLP methods including AI



# Our pilot study

- **Background:** Symptoms monitoring is needed for palliative care delivery and research
- **Study aim:** Test the performance of Large Language Models (LLM) to capture symptoms discussed in transcribed clinical conversations

# Study methods

- **Dataset:** 578 transcribed excerpts from 50 synthetic clinical conversations (Sci Data 2022 9;313)
- **Gold standard:** Clinician coded each excerpt for symptoms
- **Models:** GPT-3.5-turbo and GPT-4 (OpenAI)
- **Prompt:** Are any medical symptoms mentioned in this transcript?

# LLMs show promise in their ability to capture symptoms directly from conversations

- Gold standard identified symptoms in 400 of 578 conversations
- Using GPT-4, our prompt identified 442 symptoms with

  **0.98 sensitivity and 0.71 specificity**
- GPT-4 had improved performance over GPT-3.5 ($p<0.01$)

# Recommendations

Infrastructure to:

- Disseminate free or low-cost NLP tools
- Support secure computing platforms
- Share methodology and lessons learned

# Thank you!


Lindvall Lab

Josh Davis, BS

Brigitte Durieux, BS

Anne Kwok, BS

Kate Sciacca, NP

Chloe Van Dongen

Dana-Farber Leadership

James Tulsky, MD

Jason Johnson, PhD

Renato Umeton, PhD

Lab funding

National Institutes of Health

Poorvu-Jaffe Family Foundation

Dana-Farber Capital Fund



@lindvalllab

https://lindvalllab.dana-farber.org/

Email: charlotta_lindvall@dfci.harvard.edu