Biased Language in Patient Medical Records: Detection through Natural Language Processing (NLP) and Impact on Quality

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Outline

Preliminary Studies
- Linguistic analysis, Part 1 (sickle cell disease)
- Linguistic analysis, Part 2 (HIV)
- Experimental vignette

Research Agenda (RWJ Grant Aims)
- Linguistic and philosophical considerations
- NLP
Words used to describe patients: few studies

- Finucane et al. found that patient race was more often mentioned in morning report
  - for black vs. white pts
  - for black pts who had ‘negative’ characteristics

- Glassberg et al. found that emergency providers who used the term ‘sickler’ to refer to patients with sickle cell disease
  - had more negative attitudes towards those patients and
  - were less likely to give adequate pain medication

- Little data on medical records
Language used in Medical Records May **Reflect Bias**
Study Aim

To characterize how perceptions about patients might manifest within the language of medical records

Part 1 – Acute care of painful crisis in sickle cell disease
Methods

Medical Condition
- Sickle cell disease (SCD) causes acute unpredictable episodes of severe pain
- Primarily affects persons of African descent
- Patients frequently report stigma and discrimination

Study Subjects and Setting
- 25 patients with SCD in ED with pain
- 57 patients with SCD admitted to the hospital with pain
- Academic medical center

Analysis
- We reviewed all narrative portions of medical records and identified themes
Overall Results

Three overlapping themes may convey negative attitudes towards patients:

- Perpetuating **negative stereotypes**
- **Blaming** a patient for their symptoms
- Casting **doubt** on patient reports and experience
Negative stereotypes

Direct. Describing patient in potentially unpleasant manner with irrelevant information

◦ patient snoring loudly

◦ Pain started when he was hanging outside McDonalds
Negative stereotypes

**Indirect.** Stereotypes perpetuated by quoting patient comments that convey low education or socioeconomic status → also mocking patient

- *not able to keep food down because “it goes straight through me in the diarrhea”*
- *patient stated “I should take my ass home”*
- *wound was supposed to be “all closed up”*
Providers highlight nonadherence

- *Not wearing* **mandatory** oxygen
- uncooperative
- **refuses** O2 for a ‘short walk’
- patient off unit **without notifying RN**
Doubt about patient reports and experience

Direct statement: *Patient has narcotic-seeking behavior*

Indirect: conveyed by juxtaposing patient reports (considered subjective) with discrediting clinician reports (considered objective)

- patient reports 10/10 pain but labs are stable
- patient *chatting* on phone, requesting pain medication
- sleeping all night without complaints but rates pain 8/10
- Pt c/o pain 8/10 although no physical signs as pt conversing *lightheartedly* with visitor
Doubt about patient reports and experience

Indirect: use of quotes
- states "I am in as much pain as before"
- Reports that pain medication is "not enough"

Indirect: use of discrediting verbs and adverbs
- claims he still has pain
- insists her pain is not improved
- reportedly had two seizures

All language has a way of encoding the source of knowledge and the believability
Study Aim

1. To describe ways in which clinicians may convey attitudes towards HIV patients in notes written after ambulatory encounters

2. To determine whether the language used by clinicians in medical records actually reflects clinicians’ self-reported attitudes

Part 2 – Ambulatory HIV care
Methods – Data Collection

Study Subjects: 14 primary care clinicians and 131 patients

Setting: Ambulatory encounters at HIV specialty clinic

Data Sources:

1. Clinician-rated level of respect for each patient after interacting in routine encounter on a scale of 1 (much less than average) to 5 (much more than average)

2. Narrative portion of clinical note
Methods – Data Analysis

**Qualitative:** Two authors reviewed all notes and identified themes with potential valence (positive or negative)

**Quantitative:** Correlation of clinician rating with a blinded reviewer who simply read the note and rated their perception of clinician respect
Relevant Domains of Language

- Psychosocial Details
- Treatment Plans
- Adherence
## Psychosocial Details

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Psychosocial Details</strong></td>
<td></td>
</tr>
<tr>
<td>Today, he reports that his mood is much better. His thinking is clear. He does not feel confused. He is more social. Previously, he stayed in his room for several days at a time, now he is socializing with neighbors. He is looking forward to having his sons home over Thanksgiving.</td>
<td>last seen on 7/19/06 while in [name of] Detention Center.... which were prescribed him while incarcerated previously.... multiple periods of incarceration, most recently released on DATE.... has not used any drugs or alcohol during the interval period since his release on....recently incarcerated</td>
</tr>
<tr>
<td>Her only other concern at the moment is her son who is in the service. She states that she has not heard from him in &gt; one month but believes he is well.</td>
<td>She continues to work part-time as a substitute teacher and reports that she could not find it within herself to realize the benefits to be derived from disclosing her HIV status to her partner.</td>
</tr>
</tbody>
</table>
## Nonadherence to Treatment

<table>
<thead>
<tr>
<th>Adherence</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The patient still struggles with adherence issues regarding his medications and follow-up appointments... at times I feel that he is just overwhelmed with all the medications and the follow-up appointments as well as this recent memory problem, which has compounded the problem.</td>
<td>Unfortunately she had neglected to refill her blood pressure medication over the last week, which she reports was due to financial issues. She continues to use cocaine on a regular basis.</td>
</tr>
<tr>
<td></td>
<td>[name] has done essentially nothing else regarding our plans at our last visit.</td>
<td>He reports he continued in spite of advice not to</td>
</tr>
</tbody>
</table>


## Treatment Plans

<table>
<thead>
<tr>
<th>Positive (Collaborative)</th>
<th>Negative (Unilateral)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Plans</td>
<td></td>
</tr>
<tr>
<td>We discussed..</td>
<td>I instructed her to...</td>
</tr>
<tr>
<td>We agreed...</td>
<td>I told him that...</td>
</tr>
<tr>
<td>The patient has decreased her cigarette use down to 1 cigarette a week from 1 cigarette every other day. I have encouraged her to completely stop, and she is considering doing this.</td>
<td>The patient today forgot to bring his pharmacy card including the phone number of the coverage or customer service line. <strong>He is to call</strong> my voice mail over the weekend and leave me a message with that phone number</td>
</tr>
<tr>
<td>In terms of her substance abuse, we talked at length about potential ways to get in a recovery program. ...I have encouraged her to think about...</td>
<td>The patient has been instructed to stop metformin....</td>
</tr>
</tbody>
</table>
Does language reflect actual attitudes?

<table>
<thead>
<tr>
<th>Provider-Rated Level of Respect (Tertiles)</th>
<th>Independent Rater Level of Respect Assessment</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>9</td>
<td>20</td>
<td>11</td>
<td>40</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>1</td>
<td>24</td>
<td>13</td>
<td>38</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>0</td>
<td>19</td>
<td>15</td>
<td>34</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>10</td>
<td>63</td>
<td>39</td>
<td>112</td>
</tr>
</tbody>
</table>

\[X^2 = 15.04, \ p = 0.005\]

Correlation of independent rating (low, medium, high) with provider-rated respect (scale 0-5) =

\[R^2 = 0.290, \ p = 0.0019\]
Language used in Medical Records May **Perpetuate** Bias
Research Question

- Is one clinician’s use of stigmatizing language in the medical record associated with a subsequent clinician’s:
  - attitudes towards a patient
  - management of the patient’s pain
A randomized vignette study

Medical students and residents completed an online survey

Randomized to view one of 2 chart notes
  ◦ medically-identical information, same hypothetical patient
  ◦ Mr. R, a 28 year-old male with SCD presents to urban academic center ED with a pain crisis, and is described in two chart notes by admitting physician and nurse

Notes in stigmatizing language vs. neutral language
A randomized vignette study

Positive Attitudes towards Sickle Cell Patients Scale (PASS)
- 7 items, 5-pt Likert, score 5-35, with higher being more positive
- E.g. “In your opinion, how likely is this patient to exaggerate discomfort?”

Pain Management (residents only)
- Two multiple choice questions, plus self-rated comfort dosing
- E.g. “Based on this information, how would you manage this patient: ketorolac 60 mg IM; morphine 4 mg IV; hydromorphone 1 mg IV; hydromorphone 4 mg”
## Vignette Examples

<table>
<thead>
<tr>
<th>Neutral</th>
<th>Stigmatizing*</th>
</tr>
</thead>
<tbody>
<tr>
<td>At home, <strong>he takes</strong> 100 mg OxyContin BID and oxycodone 5 mg for breakthrough pain.</td>
<td>At home <strong>he reportedly takes</strong> 100 mg OxyContin BID and oxycodone 5 mg for breakthrough pain.</td>
</tr>
</tbody>
</table>

*All stigmatizing language from real medical records*
## Vignette Examples

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<tr>
<td>He spent yesterday afternoon with friends ... which caused dehydration due to the heat. He believes that this, along with recent stress, precipitated his current crisis.</td>
<td>Yesterday afternoon, he was hanging out with friends outside McDonald’s ... got dehydrated due to the heat. He believes that this, along with some “stressful situations,” has precipitated his current crisis.</td>
</tr>
</tbody>
</table>

*All stigmatizing language from real medical records*
Vignette Examples

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</thead>
<tbody>
<tr>
<td>His girlfriend is by his side but will need to go home soon.</td>
<td>He is insisting that his pain is “still a 10.” His girlfriend is lying on the bed with her shoes on and requests a bus token to go home.</td>
</tr>
</tbody>
</table>

*All stigmatizing language from real medical records*
Most respondents were:
- white (54%), 10% were black
- male (55%)
- between the age of 25-29 (56%)

No differences in respondent characteristics by study arm (neutral vs. stigmatizing)
Exposure to the stigmatizing language chart note is associated with more negative attitudes.
Exposure to the stigmatizing language chart note is associated with less aggressive pain management.

Pain Management Score:

- 5.3 neutral language
- 4.7 stigmatizing language

- 7 more aggressive pain management
- 5 less aggressive pain management

p < 0.001
Language in medical records can transmit bias and adversely affect care

Attention to the language used to describe patients in medical records may decrease physician bias, promote patient-centered care and reduce healthcare disparities

Which dimensions of stigmatizing language are the most damaging?
Discussion

Natural for clinicians to have both positive and negative feelings about patients

Some information (e.g. nonadherence or drug abuse) may need to be conveyed to provide the best care

Attention to the language used to describe patients in medical records may decrease physician bias, promote patient-centered care and reduce healthcare disparities

Which dimensions of stigmatizing language are the most damaging?

However

Bias in the medical record may be unrecognized

This language should be more carefully considered

Biases should be acknowledged and addressed
1. To examine language used by doctors and nurses in medical records that may convey negative attitudes towards the patient, and develop an algorithm using natural language processing (NLP) that can efficiently detect such language in electronic patient records.
RWJ Grant Specific Aims

1. To examine language used by doctors and nurses in medical records that may convey negative attitudes towards the patient, and develop an algorithm using natural language processing (NLP) that can efficiently detect such language in electronic patient records.

2. To evaluate the impact that stigmatizing language has on the quality of care (clinician attitudes and clinical decision making) using an experimental vignette study design.
1. To examine language used by doctors and nurses in medical records that may convey negative attitudes towards the patient, and develop an algorithm using natural language processing (NLP) that can efficiently detect such language in electronic patient records.

2. To evaluate the impact that stigmatizing language has on the quality of care (clinician attitudes and clinical decision making) using an experimental vignette study design.

3. To develop a set of recommendations regarding what should and should not be documented in medical records and potential health system strategies to reduce stigmatizing language.
Linguistic and Philosophical Considerations

- Epistemic Modality
- Quotation Marks
- Testimonial Injustice
Epistemic Modality

EVIDENTIALS = indicate the source of one’s knowledge or the evidence one has

Declarative form (e.g. ‘It will rain later’ or ‘patient has headache’) indicates certainty, so that however the speaker came by the information, they are endorsing it as true, factual, accurate, etc.

As soon as a speaker adds an evidential (‘I heard that it will rain later’) they attribute the information to some unknown/unspecified source. In doing so the speaker is declining to endorse the information, beyond indicating that’s what they hear.

In common language - ‘I heard that’, ‘it says here’, ‘she told me’

In medical records - ‘seems to’ and ‘appears to’ ‘patient states that’

A speaker might go further by saying that ‘She claims that she’ll pass the exam’, the verb ‘claim’ further distancing the speaker from the information, thereby indicating a degree of doubt or possible scepticism.
Quotation Marks

Original intent is to promote accuracy. By quoting a source directly, there should be nothing lost in its interpretation – it ought to be as neutral as possible.

Quotation marks, however, have evolved not simply to convey that these words have been spoken, but as an indication that these words are to be doubted (Garber)

Just as the use of quotation marks is shifting towards a nearly polar opposite effect in society at large, so is their use in medical records.

“The scare quote is the perfect device for making an insinuation without proving it, or even necessarily making clear what you’re insinuating.” Jonathan Chait in The New Republic (2008)
Testimonial Injustice

A speaker receives an unfair deficit of credibility from a hearer owing to prejudice on the hearer's part

Many examples in law enforcement
- detailed example of testimonial injustice taken from the trial in To Kill a Mocking Bird
  - Henry Louis ‘Skip’ Gates

“We know, like I said, we know what’s wrong with us, we know what’s hurting, whether they want to believe it or not.”

– focus group participant, on respect
Natural Language Processing: Existing Sentiment and Bias Tools Won’t Work

- Negative connotations but not implicitly negative:
  - abnormal, swelling, pain, trouble, confusion
  - Frequent use of negatives and negation within the medical domain
    - “no history of”, “no difficulty”, “no presence”

- E.g. most negative polarity sentences
  - “However Pt says this is the worst it has ever been.”
  - “The pain is worst at the plantar surface of the toes and feet.”
  - “He reports feeling awful for days after the vaccine.”

- E.g. most biased sentences:
  - “Skin: No rashes, No recent infections, no jaundice  Head: No abnormal/worsening headaches, No loss of consciousness  Eyes: No visual complaints, no pain, no abnormal lacrimation  Ears: No difficulty hearing, no pain  Nose/Sinuses: No congestion, No runny nose, no bloody nose...”
Thank you
What should be documented, and how?

"The ways people use words convey a great deal of information about themselves, their audience, and the situations they are in. Individuals’ choice of words can hint at their social status, age, sex, and motives“

What about ‘positive’ language?

pleasant
patient is a well-nourished man whose weight of 175 pounds is *actually* increased from his prior visit

MEANING IN INTERACTION: THE CASE OF *actually*

REBECCA CLIFT

University of Essex

One aspect of the relationship between meaning and interaction is explored here by taking the English particle *actually*, which is characterized by flexibility of syntactic position, and investigating its use in a range of interactional contexts. Syntactic alternatives in the form of clause-initial or clause-final placement are found to be selected by reference to interactional exigencies. The temporally situated, contingent accomplishment of utterances in turns and their component turn-constructional units shows the emergence of meaning across a conversational sequence; it reveals syntactic flexibility as both a resource to be exploited for interactional ends and a constraint on that interaction.*


The meaning of any single grammatical construction is interactionally contingent, built over interactional time in accordance with interactional actualities. Meaning lies not with the speaker nor the addressee nor the utterance alone . . . but rather with the interactional past, current and projected next moment.

(Schegloff et al. 1996:40)