Investigating the Clinical Relevance of Patient-Reported Symptoms for Influenza Triage

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Introduction

Motivation: During a public health crisis, telemedicine could be used as a tool to triage patients. If a patient can get the same diagnosis without an in-person visit, the burden on the healthcare system could be reduced.

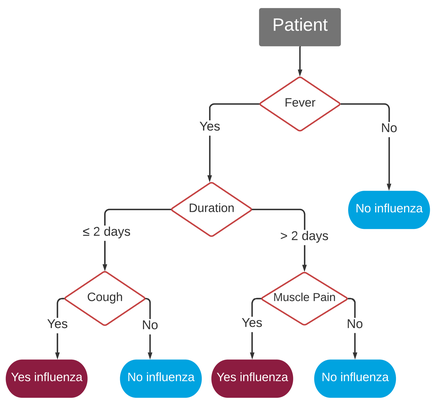
Question: Can a patient symptom questionnaire be used to predict influenza diagnosis by a physician?

- Data were collected in a previous study at UGA's University Health Center during the 2016-2017 flu season (1)
- A symptom questionnaire containing 19 symptoms was given to both patients and clinicians:
  - Patients filled out symptom questionnaire before the appointment
  - Clinicians filled out symptom questionnaire during the appointment

Clinical Decision Rules

We applied 5 clinical decision rules:

- CF (Cough-Fever Rule): Influenza diagnosed if cough and fever are both present
- CFA (Cough-Fever-Acute Onset Rule): Influenza diagnosed if cough and fever are both present for $\leq$ 2 days
- CFM (Cough-Fever-Myalgia Rule): Influenza diagnosed if cough, fever and muscle pain are all present
- Weighted Flu Score: 2 points given if cough and fever are both present, 2 points given for muscle pain, 1 point for chills/sweats and 1 point if symptoms are present for <= 2 days (3)
- Decision tree: See upper right figure (2)



Results

We found that the clinical decision rules predicted clinician diagnosis better using the symptoms reported by clinicians rather than by patients.

Table 1: The area under the ROC curve (AUC) is an overall measurement of accuracy. We saw a reduction in AUC using the patient questionnaire instead of the clinician questionnaire.

Decision Rule	Clinician AUC	Patient AUC	Difference	95% CI
CF	0.794	0.703	0.091	(0.07 - 0.11)
CFA	0.705	0.630	0.075	(0.056 - 0.094)
CFM	0.812	0.699	0.113	(0.091 - 0.135)
Score	0.890	0.794	0.096	(0.079 - 0.114)
Tree	0.856	0.760	0.096	(0.076 - 0.116)

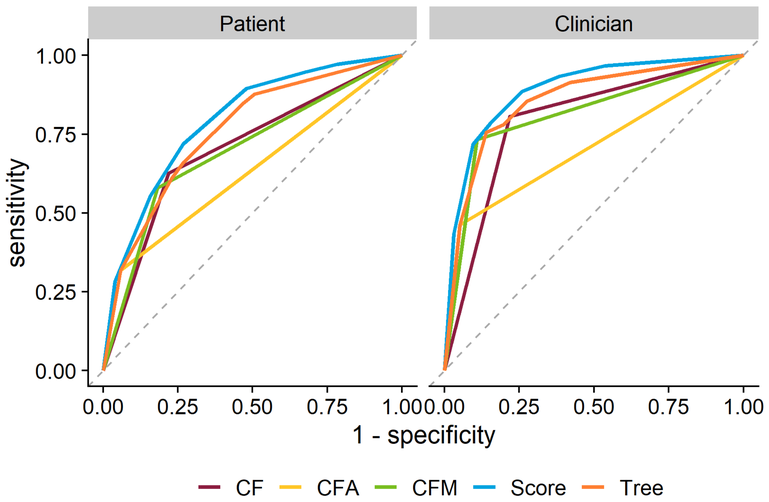


Figure 1: The ROC curves for each clinical decision rule.

The clinicians outperformed the patients across multiple performance measures.

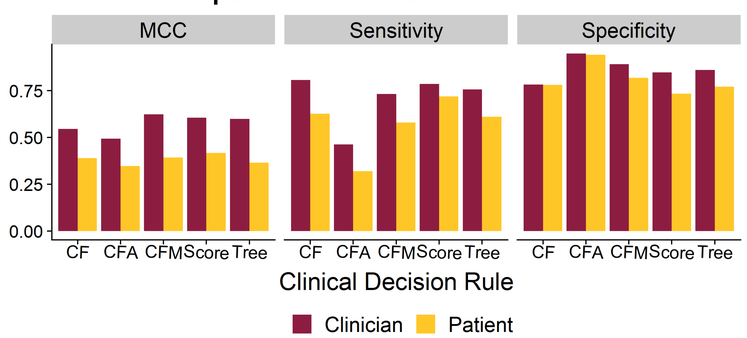


Figure 2: The closer F1, MCC, sensitivity and specificity are to 1, the better the prediction performance.

In a sensitivity analysis, we evaluated the clinical decision rules' ability to predict PCR confirmed flu status.

Table 2: Comparing AUCs, we found that the differences between patients and clinicians are smaller.

Decision Rule	Clinician AUC	Patient AUC	Difference	95% CI
CF	0.697	0.688	0.009	(-0.048 - 0.067)
CFA	0.634	0.607	0.027	(-0.027 - 0.08)
CFM	0.731	0.680	0.051	(-0.011 - 0.113)
Score	0.767	0.694	0.073	(0.013 - 0.133)
Tree	0.711	0.689	0.022	(-0.038 - 0.081)

The difference in performance may be explained by the lack of agreement between patients and clinicians.

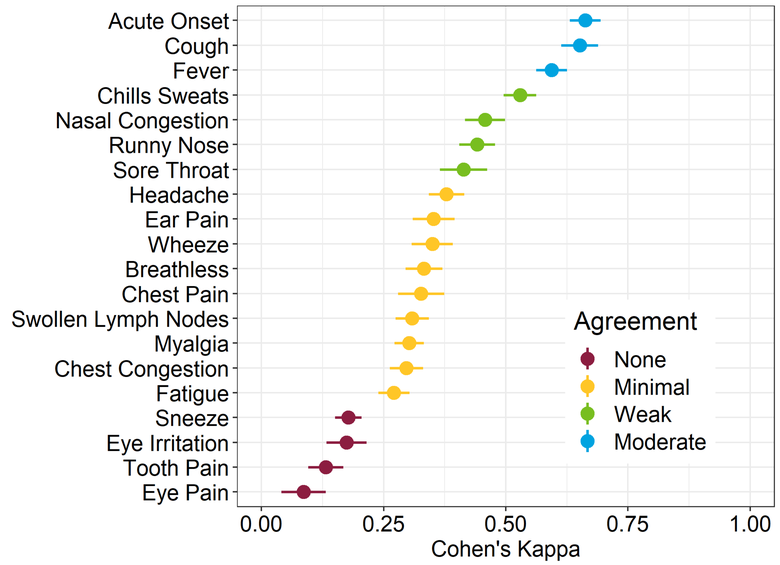


Figure 3: We used Cohen's Kappa to quantify agreement between the patient and clinician.

Conclusion

- Using a patient symptom questionnaire to predict physician diagnosis seems to lead to a reduction in accuracy
- Further studies need to be done to assess the clinical relevance for this reduction in accuracy

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1. Dale AP, et. al. 2019. *The Journal of the American Board of Family Medicine* 32(2):226–33.
2. Afonso, et. al. 2012. *Family Practice* 29(6):671–677.
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