Use of Online Symptom Checkers to Delineate the Ever-Elusive GERD versus Non-GERD Cough

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To the editor,

Cough carries an annual prevalence in the population of 10–33% and remains the most common reason for primary care physician visits. Gastroesophageal reflux disease (GERD) is estimated to be present in 20–40 % of Western adult populations. Pulmonary manifestations, such as cough, have been recognized as a potential consequence of GERD, with the prevalence of GERD-associated cough ranging from 10%–40%. To best guide treatment, it remains imperative to differentiate cough from underlying GERD versus non-GERD causes. As patients are increasingly health literate, it is common for them to utilize publically available symptom checker applications prior to seeing a healthcare provider, as such, we aimed to prospectively analyze the diagnostic accuracy of symptom checkers versus doctors to accurately delineate GERD vs. non-GERD cough.

116-consecutive adult patients presented to a medicine clinic with chief complaint of "cough." A questionnaire was designed navigating cough symptom input for the three most visited online symptom checkers (WebMD, iTriage, FreeMD), which included specific questions pertaining to GERD symptoms as part of each cough algorithm. Forms were completed in the office prior to seeing the provider. The provider of 20 years clinical experience (B.B.) independently completed the patient assessment on the initial visit and

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asked whether GERD was considered the top diagnosis for the patient's cough symptoms. A panel of three active and equally experienced physicians used the aforementioned patient output data and ranked their top three diagnoses, and whether GERD was listed in the top three diagnoses. The three physician panel was then given the original symptom checker forms and the same patient's initial clinician visit note, without the assessment or plan listed, and asked whether GERD was part of this differential diagnosis. Statistical comparisons utilizing proportions were then made for the following: initial clinician diagnosis (CD) versus symptom checkers, initial CD versus physician panel with symptom checker output only, and initial CD versus physician panel with symptom checker output and initial clinician office visit note.

116 patients enrolled, 66 females and 50 males. 26 of 116 patients reported GERD symptoms on the questionnaires. There were no differences in gender or age of those reporting GERD symptoms. The office physician diagnosed five patients (5 of 26; 19%) with GERD as the top diagnosis for cough, of those patients listing initial GERD symptoms on symptom checker input. Subsequent symptom checker analysis alone failed to recognize GERD in the patients the office physician diagnosed with GERD as top diagnosis or inappropriately diagnosed GERD in patients not diagnosed by the initial office physician (Table 1). Physicians utilizing just the symptom checker data did not appear to enhance diagnostic performance. Physicians given the symptom checker data plus the blinded visit note did yield mild improvement in diagnostic performance. However, significant discordance remained between in-office clinician diagnosis and symptom checker diagnostic utilization.

Symptom checkers cannot reliably delineate GERD versus non-GERD cough in patients presenting with a chief complaint of cough in an ambulatory medicine clinic setting. Symptom checker and adjunct provider discrepancies also persisted, as some physician panels did not confirm a diagnosis of GERD from the initial clinical encounter, while others believed GERD (not in agreement with initial provider) to be the etiology of patient presenting with cough. The inability of the panel physicians, utilizing symptom checker input and clinic notes, to perform on par with the initial physician seeing the patient may stem from invaluable aspects of the in-person clinical encounter.

Key limitations included our use of a small physician panel in one medicine practice, precluding generalization of these findings across different settings. The primary analysis did not include a control group, assessing physician versus symptom checker diagnostic performance for other etiologies of cough. Real-life, complex, non-textbook patient cases in this analysis may account for poor symptom checker algorithmic diagnostic output, something prior studies have not accounted for⁻, and potentially affecting our use of symptom checkers to help delineate presenting symptoms.

The in-person clinical encounter carriers the potential to ascertain and interpret the patient's symptoms conveyed in vague and non-buzzword terms, something online symptom checkers still need improvement in. Clinical encounters also carry the ability to correlate patient's non-verbal physical examination cues, such as a grimace or body language. Physicians are also more likely to obtain more information than they end up documenting, as they may fail

to document pertinent negative findings. Both sensitivity and specificity are likely enhanced by clinical encounters versus symptom checkers or retrospectively utilizing clinic notes. Certain diagnoses may carry similar diagnostic potential as symptom checkers, but the overall trend appears to not be the case.

Innovative, open-source, global patient databases, such as The Human Diagnosis Project, may help refine symptom checker diagnostic algorithms by utilizing large-scale patient data to better incorporate the real-life, complex patient. Open-source systems with clinical testing and authentication may allow a more "real-life" scenario of online symptom checkers, closer mimicking a real-time clinical encounter. With such projects, we may better be able to delineate patient presenting symptoms—such as differentiating the ever-elusive GERD versus non-GERD cough—to better guide treatment strategies.

Acknowledgments

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Table 1:

Delineation of GERD vs. Non-GERD Cough Between Doctors and Symptom Checkers

Comparison	Non-GERD Diagnosis	GERD Diagnosis Ranking		
		Rank 1	Rank 2	Rank 3
Symptom Checker (SC)				
WebMD[a]	102 (98)	7 (0)	4 (0)	3 (1)
iTriage[a]	116 (111)	0 (0)	0 (0)	0 (0)
FreeMD[a]	116 (111)	0 (0)	0 (0)	0 (0)
Doctor + SC				
Doc 1[b]	113 (108)	0 (0)	1 (0)	2 (0)
Doc 2[b]	95 (94)	1 (0)	9 (3)	11 (1)
Doc 3[b]	107 (104)	0 (0)	2 (1)	7 (1)
Doctor + SC + Office Note				
Doc 1A[c]	100 (97)	2 (1)	10 (1)	4 (0)
Doc 2A[c]	85 (85)	4 (3)	10 (2)	17 (0)
Doc 3A[c]	110 (107)	1 (0)	1 (1)	4 (1)

N=116 unique patients. The numbers in the parentheses are the results consistent with the Clinical Diagnosis (CD) by the physician seeing the patient in the initial office visit (the gold standard for comparison). For example for DOC2A, there are 85 patients not diagnosed as GERD and all are consistent with CD results (=0). DOC2A ranked four patients as "1", three of them were also ranked as "1" by CD. DOC2A ranked 10 patients as "2" while 2 of them were diagnosed as "1" by CD. DOC2A ranked 17 patients as "3" and none of them were diagnosed as "1" by CD.

The clinic physician's top diagnosis for cough yielded the following diagnosis: asthma, bronchitis, heart failure, chronic obstructive pulmonary disease, influenza, pneumonia, sinusitis, upper respiratory infection, GERD

[a] Patient symptom checker diagnosis versus initial clinical provider diagnosis.

[b] Doctor panel review of patient symptom checker symptoms versus initial clinical provider diagnosis.

[c] Doctor panel review of patient symptom checker symptoms + initial clinical provider visit note (sans assessment and plan) versus initial clinical provider diagnosis.

CD: Clinical Diagnosis

GERD: Gastroesophageal Reflux Disease