

RESEARCH LETTER

Bias in the Evaluation of Pharyngitis and Antibiotic Overuse

Clinical context may lead to bias in findings on physical examination.^{1,2} To assess whether the patient's history might distort the perception of physical findings and subsequent management decisions in pharyngitis, simulated patients visited general clinics attended by 32 practitioners.

Methods. The clinicians received advanced notice from the district management about a quality-control survey that was to take place, without details about its exact nature. Each physician was visited twice (at a 1-month interval) by a simulated patient presenting with the following scripts:

- Script 1 ("viral"), for which the complaint was "Since yesterday I have had a headache, fever (around 40°C), sweating, and chills. For several days, I have had a cough and a runny nose. This morning, I felt discomfort in my throat, hoarseness, generalized weakness, and muscle pains, and I took paracetamol."
- Script 2 ("bacterial"), for which the complaint was "Since yesterday, my throat has been painful. I have a headache, fever (temperature up to 39°C), and took paracetamol before coming. My girlfriend said my breath smells bad. She had the same illness several days ago and was told she had a throat infection." The simulated patient denied cough, nasal discharge, and eye symptoms, if asked.

Simulated patients were healthy, had no cervical lymphadenopathy, and their throats were normal, as assessed by photography before each visit. One and 2 Centor criteria were fulfilled in script 1 and 2, respectively, predicting a low probability for strep throat.³ The simulated patients recorded the physician's assessment for the presence of throat redness and exudates, as reported to them on questioning. Physicians' computerized records were available for review for 38 visits with 19 physicians and were used to extract data about findings of enlarged lymph nodes, laboratory testing for throat culture, and antibiotic prescriptions.

The physical findings observed by physicians were recorded and added up to a severity score as follows: 0 for no throat redness; 1, 2, or 3 for "slightly red," "red," or "very red" pharynx, respectively; and either 0 or 1 for the absence or presence of throat exudates and cervical lymphadenopathy, respectively. Fisher and Wilcoxon tests were used to compare findings between scripts. Statistical significance was set at $P \leq .05$.

Table. Physical Findings and Actions Taken by Physicians^a

| Findings | SP Script 1 "Viral" | SP Script 2 "Bacterial" |
|---|------------------------|----------------------------|
| Redness | | |
| None | 6/32 (19) | 8/32 (25) |
| Slight | 13/32 (41) | 7/32 (22) |
| Moderate | 11/32 (34) | 10/32 (31) |
| Severe | 2/32 (6) | 7/32 (22) |
| Exudates | 2/32 (6) | 8/32 (25) |
| Lymph nodes | 3/19 (16) | 5/19 (26) |
| Median severity score of findings (range) | 2.0 (0-3) | 2.5 (0-4) ^b |
| Throat culture | 9/19 (47) | 14/19 (73) |
| Antibiotics prescribed | 4/19 (21) | 15/19 (79) ^c |

Abbreviation: SP, simulated patient.
^aData are given as numbers indicating frequency of findings per number of practitioners for each script (percentage) unless indicated otherwise. Data on lymph nodes, throat cultures and prescriptions, extracted from the charts, were available for only 19 of the 32 practitioners.
^b $P < .005$ vs viral script.
^c $P < .001$ vs viral script.

The physicians' mean age was 52 years (range, 33-66 years); 23 physicians trained in Europe, 7 in Israel, and 2 in America, with a range of 5 to 32 years of professional experience (mean, 19 years); and 13 physicians were board certified in family medicine.

Results. The **Table** summarizes the physical findings and actions taken by the physicians in response to the different scripts. Physicians generally perceived some abnormal finding, and more often so with the "bacterial" script. The median severity score was greater than 1; at least 1 abnormal finding was observed in more than half of the encounters ($P < .001$ vs the expected normal finding). The perception of abnormal findings was often associated with throat cultures and empirical administration of antibiotics, especially with the bacterial script. It is worth noting that 75% of the physicians were consistent across scripts in their perception of redness in the throat and exudates, irrespective of the script and without relation to country of training or years of experience.

Comment. This study suggests that, while critical for diagnosis, the patient's history may bias the physician's perception of physical findings; after listening to complaints suggestive of a throat infection, most physicians detected abnormal physical findings in healthy actors—upgrading the Centor criteria by 1 or 2 points, making strep throat likely and warranting antibiotic use. A history that was suggestive of bacterial disease led to the perception of more pathological findings, cultures, and antibiotic prescription.

Psychological research on the influence of context on perception has been extended into the clinical arena.^{1,2}

Studies suggest that the recognition of clinical signs is strongly influenced by the diagnosis considered: a correct hypothesis increases the identification of real features, whereas with an incorrect diagnosis, clinicians fail to recognize true findings and report signs that are not present.^{1,2} This cognitive bias does not appear to result from the lack of clinical experience; residents were as susceptible as second-year medical students to the biasing effects of a tentative diagnosis, although more experienced clinicians have not been tested.¹

Our results confirm that a suggested diagnosis introduces bias into the interpretation of physical findings and extend these observations into the actual practice by experienced family physicians. The scripts in our study, strongly suggestive of either viral or bacterial pharyngitis, had an impact on the practitioner's evaluation, as if believing is seeing.¹ Since case management derives from diagnostic assessment, it is not surprising that, in many instances, the clinicians ordered throat cultures and prescribed antibiotic agents. Our study, therefore, suggests that this cognitive bias may contribute to the overuse of tests and antibiotic agents in the management of pharyngitis.

These observations suggest that the diagnostic process is an interaction between hypothesis and incoming information.¹ Bias in the interpretation of physical signs by early diagnostic hypotheses poses a considerable challenge to reducing clinical errors.¹ For the diagnosis of pharyngitis, correct clinical assessment would improve the utility of prediction rules³ and reduce the overuse of tests and antibiotic agents.^{4,5}

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