

to reduce unnecessary antibiotic use in patients with sore throat



Abstract

Objective: the identification of group A *Streptococcus* (GAS) infection in general practice patients with sore throat.

Design: A single throat swab was used as the gold standard for diagnosing GAS infection. Clinical information was recorded by experienced family physicians on standardized encounter forms. Score criteria were identified by means of

Setting: University-affiliated family medicine centre

Patients: A total of 521 patients aged 3 to 76 years presenting with a new upper respiratory tract infection from December 1995 to February 1997.

Outcome measures: Sensitivity, specificity and likelihood ratios for identification of GAS infection with the score approach compared with throat culture. Proportion of patients prescribed antibiotics, throat culture use, and sensitivity and specificity with usual physician care and with score-based recommendations were compared.

Results: A score was developed ranging in value from 0 to 4. The sensitivity of the score for identifying GAS infection was %, compared with % for usual physician care ($p = 0.06$); the specificity values of the 2 approaches were similar. Among patients aged 3 to 14 years, the sensitivity of the score approach was higher than that of usual physician care (% v. %) ($p < 0.05$). The proportion of patients receiving initial antibiotic prescriptions would have been reduced % by following score-based recommendations compared with observed physician prescribing ($p < 0.001$), without any increase in throat culture use.

Conclusions: An age-appropriate sore throat score identified GAS infection in children and adults with sore throat better than usual care by family physicians, with significant reductions in unnecessary prescribing of antibiotics. A randomized trial comparing the 2 approaches is recommended to determine the ability of the score approach to reduce unnecessary prescribing of antibiotics during routine clinical encounters.

Résumé

Objectif : Valider un résultat fondé sur des symptômes et des signes cliniques en ce qui concerne l'identification d'une infection à streptocoque du groupe A chez des patients qui consultent un omnipraticien pour un mal de gorge.

Conception : On a utilisé un seul écouvillonnage de la gorge comme étalon-or pour diagnostiquer une infection à streptocoque du groupe A. Des médecins de famille chevronnés ont consigné l'information clinique sur des formules de consultation normalisées. On a établi les critères relatifs au résultat au moyen

Contexte : Centre de médecine familiale affilié à une université à



Patients : Au total, 521 patients âgés de 3 à 76 ans qui se sont présentés avec une nouvelle infection des voies respiratoires supérieures de décembre 1995 à février 1997.

Mesures de résultats : Sensibilité, spécificité et ratios de vraisemblance de l'identification d'une infection à streptocoque du groupe A au moyen de la méthode du résultat comparativement à l'utilisation d'une culture prélevée dans la gorge. Proportion des patients auxquels on a prescrit des antibiotiques, utilisation de la culture prélevée dans la gorge et sensibilité et spécificité des soins habituels des médecins et des recommandations fondées sur le résultat.

Résultats : On a établi une échelle de résultats variant de 0 à 4. La sensibilité du résultat pour identifier une infection à streptocoque du groupe A s'est établie à 83,1 %, comparativement à 69,4 % dans le cas des soins habituels de médecins ($p = 0,06$). Les deux méthodes avaient une spécificité semblable. Chez les patients âgés de 3 à 14 ans, la méthode du résultat s'est révélée plus sensible que les soins habituels du médecin (96,9 % c. 70,6 %) ($p < 0,05$). La proportion des patients qui ont reçu une première ordonnance d'antibiotique aurait diminué de 48 % si l'on avait suivi les recommandations fondées sur le résultat plutôt que les observations du médecin ($p < 0,001$), sans augmenter l'utilisation des cultures prélevées dans la gorge.

Conclusions : Un résultat relatif au mal de gorge selon l'âge a permis d'identifier une infection à streptocoque du groupe A chez les enfants et les adultes qui avaient mal à la gorge mieux que les soins habituels de médecins de famille et a réduit considérablement la prescription inutile d'antibiotiques. On recommande de procéder à une étude randomisée pour comparer les deux méthodes afin de déterminer dans quelle mesure la méthode du résultat peut réduire la prescription inutile d'antibiotiques au cours de consultations cliniques de routine.

Antibiotic resistance is emerging as an important public health issue,¹⁻³ and overuse of antibiotics by physicians has been implicated as contributing to the problem.^{3,4} In Canada 40% of the population is estimated to receive at least one antibiotic prescription per year.⁵ One of the most common reasons for visiting a family physician and receiving an antibiotic is an upper respiratory tract infection (URTI). URTI accounted for 13% of visits to Ontario general practitioners in 1989, and a prescription was given in 50% of cases.⁶

Sore throat is a common complaint in URTI and may indicate infection with group A *Streptococcus* (GAS).⁷ Although GAS infection is considered an appropriate indication for antibiotic therapy,^{8,9} only 10% to 20% of sore throat presentations in general practice are culture positive for GAS.¹⁰⁻¹² The remainder are predominantly viral. Reports from various countries estimate that an antibiotic is prescribed in 30% to 75% of visits.¹³⁻¹⁶ This suggests that antibiotics are prescribed more often than necessary.

One reason for overuse of antibiotics may be current approaches to managing sore throat. Family physicians decide selectively whether to obtain a throat swab, prescribe an antibiotic or do neither in cases of URTI with sore throat.¹⁷⁻¹⁹ Studies comparing clinical diagnosis with

throat culture have shown a sensitivity of 50% to 70% and a specificity of 60% to 80%.^{10-12,20} Thus, clinical judgement may miss up to 50% of GAS infections while identifying 20% to 40% of the large number of non-GAS sore throat presentations as needing antibiotics.

Clinical prediction rules have been proposed as a way to increase the accuracy of clinical diagnosis.²¹ Some have been shown to improve patient outcomes in selected clinical problems.^{22,23} Although several scores have been proposed for assessing patients with sore throat,^{12,24-28} most were not developed in general practice settings,^{12,24,25,28} and those that were have had limited evaluation.^{21,26,27} Others are limited to adults^{12,24} or children.^{25,28} None has been shown to reduce antibiotic prescribing levels in actual clinical practice.²⁹

For an approach to the management of sore throat to be of practical use during routine office visits in general practice, it should be simple, be applicable to children and adults, assist in reducing unnecessary prescribing of antibiotics and improve identification of GAS infection. We describe the development and validation of a clinical score in a group of children and adults with sore throat attending a family medicine clinic and compare score-based recommendations for antibiotic prescribing with decisions by experienced family physicians.



Methods

The study was conducted in the Family Medicine Centre, from December 1995 to February 1997. The centre is a family medicine residency training site affiliated with the University of and handles approximately 30 000 outpatient primary care visits per year. The medical staff comprises 8 full-time family physicians, 5 part-time community-based physicians and 18 residents. All medical staff enrolled patients. The study was approved by an ethics review committee of the University of.

Patients aged 3 years or more were eligible for the study if, in the opinion of the physician, they had a new URTI. Patients were excluded if they had been taking antibiotics in the previous week or were immunocompromised. Patients or parents (in the case of children aged 16 years or less) were approached by the treating physician, and those giving written consent were enrolled. A standardized encounter form was completed by each physician at the time they assessed a patient, and a single throat swab was obtained in the physicians' usual manner.

Specimens were plated on 5% sheep blood agar and incubated anaerobically for 48 hours. GAS was identified by means of standard techniques.³⁰

The encounter form was used to document the patient's age, sex, number of days ill before the visit, presence of sore throat, runny or stuffy nose, cough, swollen neck glands, headache, general aches, rash, gastrointestinal discomfort or nausea, history of a temperature greater than 38°C and recent exposure to GAS. Physicians examined patients for the presence of a red throat, tonsillar swelling, tonsillar exudate, tender anterior cervical adenopathy, a rash typical of scarlet fever, fever (optional), abnormal tympanic membranes and lung findings. They then estimated the likelihood of GAS infection on a 10-cm scale from 0% to 100% and recorded whether an antibiotic had been prescribed. To reflect usual throat culture use, physicians were asked if they would normally have obtained a throat swab.

The score was calculated directly for the remaining patients, and the results were compared with those for the first group of patients. We assessed score accuracy and discrimination by determining sensitivity, specificity and likelihood ratios for identifying GAS infection compared with throat culture results. We determined score reproducibility by

This was also done for children and adults separately.

The sensitivity and specificity of score-based recommendations and of physician management for identifying GAS infection were compared with throat culture results. Physicians were considered to have identified a culture-positive case (sensitivity) if antibiotics were prescribed or a throat swab would have been taken. GAS-negative cases were considered to have been correctly managed (specificity) if antibiotics were not prescribed initially or if a throat swab would have been obtained in cases in which an antibiotic was prescribed. The physician could then advise that treatment be stopped when a negative culture result was reported. The proportion of patients prescribed antibiotics or in whom a throat swab would have been obtained under usual physician care was compared with score-based recommendations by means of a

Results

A total of 584 people were enrolled, 320 (54.8%) in the first half of the study and 264 (45.2%) in the second. Of the 584, 63 (10.8%) were excluded because of a diagnosis of bronchitis (in 25 cases), otitis media (in 13), sinusitis (in 8), pneumonia (in 5) or other lower respiratory tract syndrome where the score was not applicable (in 12). The remaining 521 patients (89.2%) (aged 3 to 76 years) represented 45% of the 1168 patients seen in the clinic during the study period with a recorded diagnosis of URTI/pharyngitis (ICD-10³³ code 460) or tonsillitis (code 463). The proportion of female patients in the study population was similar to the proportion in all clinic URTI encounters (70.6% and 67.3% respectively; $p = 0.17$), as was the proportion of adults (90.0% and 78.5% respectively; $p = 0.11$).

Table 1 shows the association between throat culture results and clinical findings. The overall prevalence of GAS infection was 13.8% (72/521). Age was inversely associated with GAS infection (mean age of culture-positive and culture-negative groups 21.1 and 32.1 years respectively) ($p < 0.001$), and female patients were less likely than male patients to have a positive culture result ($p = 0.01$). Symptoms associated with a positive throat culture result were absence of cough ($p < 0.001$), tender neck glands ($p = 0.02$), history of a temperature greater than



38°C ($p < 0.001$), gastrointestinal symptoms ($p = 0.01$) and recent exposure to GAS ($p = 0.01$). Signs associated with a positive culture result were red throat ($p = 0.01$), higher temperature (mean temperature of culture-positive and culture-negative groups 37.4°C and 36.9°C respectively for 304 patients) ($p < 0.001$), tender anterior cervical adenopathy ($p < 0.001$), tonsillar swelling ($p < 0.001$), tonsillar exudate ($p < 0.001$), pharyngeal exudate ($p < 0.02$) and a rash typical of scarlet fever ($p < 0.05$).

Physicians felt that throat culture was indicated in 40% of cases and prescribed antibiotics to 20.3% of patients before the culture results were available. A prescription was more likely in cases subsequently positive for GAS (48.6%) than negative (15.6%) ($p < 0.001$). The mean physician estimate of the likelihood of GAS infection was 44.9% among patients with a positive culture result and 21.0% among those with a negative result ($p < 0.001$).

Derivation of the score and management recommendations

Table 1: Relation between clinical characteristics and a positive result of throat culture for group A *Streptococcus* (GAS) among patients with a new upper respiratory tract infection

Characteristic	Overall; no. (and %) of patients* <i>n</i> = 521	Culture result; % of patients*	
		Positive <i>n</i> = 72	Negative <i>n</i> = 449
Female sex	368 (70.6)	58.3	72.8†
Ill for 1–3 d	215 (43.4)	51.4	42.1
Symptom			
Sore throat	493 (95.0)	97.2	94.6
Cough	343 (66.1)	46.5	69.2‡
Nasal symptoms	321 (61.8)	56.3	62.7
Tender neck glands	245 (47.7)	60.6	45.6†
Headache	243 (47.1)	47.9	47.0
Achiness	237 (45.9)	53.5	44.7
History of temperature > 38°C	164 (31.7)	52.8	28.3‡
Earache	171 (33.0)	34.7	32.7
Gastrointestinal symptoms	138 (26.7)	40.3	24.6†
Sinus pain	100 (19.4)	16.9	19.8
Recent exposure to GAS	61 (12.0)	21.4	10.5†
Rash	22 (4.3)	7.0	3.8
Sign			
Red throat	371 (72.6)	85.3	70.7†
Tender anterior cervical adenopathy	223 (43.8)	74.6	39.1‡
Tonsillar swelling	126 (24.6)	57.4	19.6‡
Tonsillar exudate	50 (9.8)	29.4	6.8‡
Palatal petechiae	31 (6.1)	8.8	5.7
Abnormal tympanic membrane	31 (6.1)	6.0	6.2
Pharynx exudate	15 (3.0)	7.4	2.3†
Lung findings	12 (2.4)	0.0	2.8
Scarlet fever rash	3 (0.6)	4.6	0.0†
Physician management			
Felt throat swab was indicated	204 (40.0)	60.0	36.8‡
Prescribed antibiotics	105 (20.3)	48.6	15.6‡
Estimate of GAS infection	518 (100.0)	44.9	21.0‡

*Excluding cases with missing data.

† $p < 0.05$.

‡ $p < 0.001$.

