Reconsidering sore throats

Part 2: Alternative approach and practical office tool

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ABSTRACT

OBJECTIVE To identify a management approach for Group A streptococcal (GAS) pharyngitis that would address overuse of antibiotics and could be implemented immediately.

QUALITY OF EVIDENCE No randomized, controlled trials were found; four observational studies met our criteria: simplicity, discrimination ability for GAS pharyngitis compared with throat culture, and validation in a different patient population. Only one scoring system fulfilled all three criteria.

MAIN FINDINGS Formal clinical scoring systems have the potential to improve family physicians' ability to identify and manage GAS pharyngitis. One system had been sufficiently validated to support its use in clinical practice. Four clinical characteristics (no cough, fever higher than 38°C, exudate, and tender cervical nodes) linked to explicit management decisions form the basis for a sore throat score.

CONCLUSIONS Use of a clinical score for management of GAS pharyngitis can be recommended on the basis of the rarity of rheumatic fever in modern society, the resources devoted to management of upper respiratory tract illnesses, the volume of antibiotics prescribed, and the emergence of antibiotic resistance as a growing health issue.

RÉSUMÉ

OBJECTIF Identifier une approche thérapeutique pour la pharyngite à streptocoques du groupe A (SGA) que l'on pourrait appliquer immédiatement et qui tiendrait compte de l'utilisation abusive des antibiotiques.

QUALITÉ DES PREUVES Nous n'avons recensé aucun essai randomisé et contrôlé. Quatre études d'observations répondaient aux critères suivants : simplicité, capacité de discriminer la pharyngite à SGA comparativement à la culture de gorge et validation dans une population différente de patients. Un seul système de cotation a satisfait à ces trois critères.

PRINCIPAUX RÉSULTATS Les systèmes formels de cotation clinique ont le potentiel d'améliorer la capacité des médecins de famille à identifier et à traiter la pharyngite à SGA. Un système a franchi suffisamment d'étapes de validation pour en recommander l'utilisation en pratique clinique. Quatre caractéristiques cliniques (absence de toux, fièvre de plus de 38°C, exsudat et adénopathies cervicales douloureuses) liées aux décisions thérapeutiques forment la base d'un système de cotation du mal de gorge.

CONCLUSIONS On peut recommander l'utilisation d'un système clinique de cotation pour traiter la pharyngite à SGA en se basant sur la rareté du rhumatisme articulaire aigu dans notre société moderne, les ressources consacrées au traitement des affections des voies respiratoires supérieures, le volume des antibiotiques prescrits et l'émergence de l'antibiorésistance comme problème de santé croissant.

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In part 1 of this review of sore throat management,[1] evidence addressing several common clinical questions posed by community family physicians was presented. In addition, approaches advocated by expert groups and approaches followed by practising physicians were described and problems highlighted. In this paper, we present a rationale for an alternative approach and a practical strategy for incorporating this approach into busy office practices.

Method

Our literature search strategy[1] identified several treatment algorithms and decision rules relating to management of GAS pharyngitis.[2-11] The research partners evaluated each rule according to the following criteria: simplicity, discrimination ability for GAS pharyngitis compared with throat culture, and validation in a different patient population. Only one score fulfilled all three criteria.[2] This was then modified and presented to family physicians participating in the project for critical comment and clinical feedback.

Formal vs informal clinical scoring systems

Clinical judgment. Although clinical judgment as it is usually exercised lacks specificity,[1] clinicians prefer to use it for identifying cases of GAS. For any one symptom or sign, there is considerable overlap between those with and without GAS, but groups of signs and symptoms exhibit more systematic differences (**Table 1**[12-14]). Physicians base clinical judgment on such groups of signs and symptoms as opposed to individual characteristics. Clinical experience reinforces the view that some presentations of GAS pharyngitis are quite distinct from viral infections of the upper respiratory system.

This observation led investigators to develop scoring systems and clinical rules[2-11] based on combinations of findings to maximize diagnostic accuracy. The score developed by Centor et al[2] was derived from a study of 286 consecutive adults older than 15 who presented to an emergency department in Virginia complaining of sore throat. Information was collected on duration of symptoms, age, exposure to streptococcal organisms, fever, difficulty swallowing, coryza, cough, temperature higher than 38°C, tonsillar exudate, pharyngeal exudate, injection of the pharynx, tonsil swelling, swollen tender anterior and posterior cervical nodes, and the physician's guess. All patients had a throat culture.

When included in a logistic regression model, only four findings independently predicted throat cultures positive for GAS: tonsillar exudate, swollen tender anterior cervical nodes, lack of cough, and a history of fever higher than 38°C. The proportions of people with positive throat cultures according to the number of findings present are shown in **Table 2**.

Table 3[2,15,16] shows the probability of GAS using this clinical score in different settings.[15,16] The predicted occurrence of GAS using the score was similar to throat culture results, after adjusting for the differing prevalences of GAS in these communities. Use of this approach would have led to fewer throat cultures, a higher proportion of patients being appropriately treated, and a lower proportion being overtreated.[17]

A cutoff of two or more characteristics as a "positive" test for GAS had a sensitivity of 86% and a specificity of 42%.[15] A single throat culture is estimated to have a sensitivity of 90% for identifying GAS.[18] Even though the score sensitivity is somewhat lower, the difference in the absolute proportion of GAS cases detected in a given community is likely minimal, given that only 8% to 19% of people with sore throats seek medical care.[1]

Sore throat score. The clinical sore throat score has a higher sensitivity than clinical judgment, but its specificity is unsatisfactory for making treatment decisions. This can be corrected by linking the sore throat score with explicit decisions about throat culture use (**Figure 1**). This is also congruent with the selective approach most physicians report they currently follow.

A recent study showed that, while use of the score improved physicians' estimates of the likelihood of GAS, it did not alter use of antibiotics.[19] However, the approach advocated here links the probability of GAS to a specific clinical course of action. This is necessary to overcome the low specificity of usual clinical judgment, which leads to overuse of antibiotics.

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Figure 1. Determining the sore throat score: *This score should not be applied to those younger than 15 years of age or in a community where an outbreak of GAS is occurring.*

Does the patient meet the following criteria?
- Absence of cough?
- History of fever over 38°C (101°F)?
- Tonsillar exudate?
- Swollen, tender anterior cervical nodes?

NUMBER OF CRITERIA MET	CHANCE OF STREPTOCOCCAL INFECTION IN COMMUNITY WITH USUAL LEVELS OF INFECTION (%)	SUGGESTED ACTION
0	2-3	No culture or antibiotic is required
1	3-7	
2	8-16	Culture all; treat only if culture is positive
3	19-34	
4	41-61	Culture all; treat with penicillin on clinical grounds*

**If patient has high fever or is clinically unwell, and presents early in disease course. Use erythromycin if patient is allergic to penicillin.*

Using the streptococcal score sheet: The score lists four clinical characteristics to be assessed by a physician (**Figure 1**). For patients with none or only one of the clinical findings, the probability of GAS is less than 10%, based on studies of GAS prevalence among patients in family physicians' offices.[1] Even using throat culture for all cases would miss 10% of GAS cases,[18] so we suggest that no throat culture be taken in this group and no antibiotics be prescribed. These people accounted for 45% of all sore throats in the original study[2] and represent a substantial reduction in the need for throat cultures compared with expert recommendations.

In those with two or three findings, we suggest that a throat culture be taken and a treatment decision wait until culture results are available, because more than 70% of this group will not have positive results. Reasons for advocating this procedure include: no increased risk of rheumatic fever if penicillin is delayed for 48 to 72 hours pending culture results[20]; these people might well achieve reasonable relief of symptoms with the use of antipyretic agents only[1]; and risk of recurrent disease in the next few months possibly increases with early antibiotic treatment.[1] Substantial reductions in antibiotic use should result from following this approach for patients with three or fewer findings, as they represent up to 90% of all sore throat presentations in general practice.

Only 10% to 15% of all presentations have all four characteristics present.[2] These patients have the highest probability of GAS pharyngitis, are likely to be sicker, and sometimes gain the greatest relief of symptoms.[1] We recommend that a throat culture be taken and a decision to initiate antibiotics be made on clinical grounds.

This decision should take into account how early the pharyngitis has been caught and how severe it is. A person who has been ill for 3 days before presenting to a physician is most likely past the point where antibiotics can relieve symptoms.[21] Reasons for taking a throat culture if antibiotics are prescribed are that as many as 50% will have cultures negative for GAS, while positive culture results could influence the care of other family members who subsequently develop sore throats.

Collapsing the clinical score: Busy clinicians who find these categories cumbersome can use a rule

Table 1. Results of throat culture and specific clinical characteristics

SYMPTOM OR SIGN	POSITIVE CULTURE RESULTS (%)	NEGATIVE CULTURE RESULTS (%)
ADULTS[12]		
Rhinorrhea	26	41
Cough	17	47
Red throat	98	84
Exudate	47	21
Temperature >38.2°C	17	6
Cough, no streptococcus exposure, temperature <37.8°C	11	38
CHILDREN[13]		
Rhinorrhea	45	55
Cough	36	64
Adenopathy	36	64
Exudate	45	55
Rhinitis or cough[14]	49	79

of thumb to shorten the score with only minor modifications. If a person has only one of the four items (fever above 38°C, tonsillar exudate, swollen tender anterior cervical nodes, or lack of cough), then neither a throat swab nor antibiotics should be recommended. All others should undergo a throat swab and await culture results before a decision about antibiotics is made. We recommend *against* using clinical judgment to decide whether antibiotics should be initiated if this shortened rule is used. Most will not have GAS, and clinical judgment will be right about as many times as it is wrong, resulting in the same problem of antibiotic overuse.

Limitations: Accuracy of this clinical rule depends on the prevalence of GAS in the particular patient population.[16] However, accuracy of usual clinical judgment also depends on prevalence, and therefore does not detract from the validity of this approach. As noted earlier, the prevalence of GAS in most family physicians' offices is between 10% and 20%. The score has been adjusted to reflect this level of endemic disease. In an outbreak of GAS disease where the prevalence would be higher, this score would not apply. Also, this rule should be applied only to those 15 years of age or older, until further studies are done in pediatric populations.

Table 2. Proportion of people with throat cultures positive for Group A streptococcus according to the number of criteria

NUMBER OF CHARACTERISTICS	PEOPLE WITH CULTURE SHOWING GAS (%)	PROPORTION OF PEOPLE (%)
None	2.5	15
One	6-7	30
Two	14-17	25
Three	30-34	20
All four	56	10

Discussion

The dominant premise behind expert recommendations over the last 40 years for managing people with sore throats has been the need to prevent complications from GAS pharyngitis, primarily rheumatic fever. A secondary goal has been appropriate antibiotic prescribing through a policy of routine throat swabbing, as "a negative culture allows the physician to safely withhold antibiotics."[20] Utilization of throat swabs has not been a serious consideration to date.

Implementing expert recommendations would necessitate an increase in the use of throat swabs over current levels. This is difficult to justify given that rheumatic fever rates have continued to decline, and a significant proportion of people at risk for rheumatic fever likely never seek medical attention. In addition, identification of a "carrier" state rather than active GAS infection,[13] the number of people failing to complete 10 days of antibiotic treatment considered optimal to eradicate GAS from the pharynx,[22,23] and the failure of even adequate courses of penicillin therapy to eliminate pharyngeal GAS in some cases[24] raise further questions about the effectiveness of office-based sore throat treatment to prevent rheumatic fever.

However, recent changes in the epidemiology of GAS argue against abandoning such a system altogether for the present.[25] Specifically, the reasons for the appearance of virulent forms of GAS illness are unknown, although pharyngitis does not seem to occur more often in these cases than in the general population.[26,27] As a result, family physicians will continue to see people with sore throats and need to define a management strategy to limit antibiotic overuse.

This discussion has focused on the role of GAS and has not addressed the possible role of other

Table 3. Performance of clinical score in predicting positive throat culture results in different study settings

	CENTOR ET AL[2]	WIGTON ET AL[15]		POSES ET AL[16]	
NO. OF CHARACTERISTICS	ORIGINAL STUDY (%)	PREDICTED (%)	ACTUAL (%)	PREDICTED (%)	ACTUAL (%)
0	2.5	4	2.6	1	0
1	6-7	10-11	14	1	2
2	14-17	22-25	23	4	1
3	30-34	44-47	45	9	9
4	56	68	54	24	14

organisms in producing clinical pharyngitis.[28-31] However, the main reason for treating GAS pharyngitis has been to prevent secondary complications that have not been shown to occur with other organisms. Pharyngitis itself is a self-limited illness. Although local complications occur, albeit infrequently, it is unknown how many people with uncomplicated pharyngitis need to be treated to prevent one local complication.

We also recognize that factors in the physician-patient encounter, other than clinical findings, influence the decision to prescribe antibiotics.[32-35] Physicians report that they feel pressured at times to prescribe antibiotics. However, patients also consult their physicians for information and reassurance rather than with an expectation of treatment.[36] Using the sore throat score to discuss treatment recommendations could serve as an educational tool for physicians to assist patients in changing expectations for antibiotics.

A selective strategy is not new and has been proposed by others.[37,38] The approach proposed here has been developed in conjunction with community-based family physicians to ensure its clinical applicability. While is unclear how acceptable such clinical scores are to physicians in practice,[39] the use of a prediction rule in Ontario has been demonstrated to affect waiting times, use of technology, and costs.[40] These outcomes are increasingly important to provincial governments, and expectations that physicians demonstrate cost-effective care will grow. This expectation could be especially relevant for family physicians as other providers vie to demonstrate they can deliver low-cost primary care in Canada.

Conclusion

We advocate implementing a sore throat score on the basis of the rarity of rheumatic fever in modern society, the resources devoted to managing upper respiratory tract illnesses, the volume of antibiotics prescribed, and the emergence of antibiotic resistance as a growing health issue. A study of the score's validity in an office setting compared with a throat culture criterion standard is under way, as is a trial of the most useful format to use in applying the score during the clinical encounter. Based on the analysis presented here, however, it seems unlikely that use of the score at present will adversely affect quality of care for GAS pharyngitis compared with current patterns of practice.

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References

1. McIsaac WJ, Goel V, Slaughter PM, Parsons GW, Woolnough KV, Weir PT, et al. Reconsidering sore throats. Part 1: Problems with current clinical practice. *Can Fam Physician* 1997;43:485-493.
2. Centor RM, Witherspoon JM, Dalton HP, Brody CE, Link K. The diagnosis of strep throat in adults in the emergency room. *Med Decis Making* 1981;1:239-46.
3. Hoffman S. An algorithm for a selective use of throat swabs in the diagnosis of group A streptococcal pharyngo-tonsillitis in general practice. *Scand J Prim Health Care* 1992;10:295-300.
4. Forsyth RA. Selective utilization of clinical diagnosis in treatment of pharyngitis. *J Fam Pract* 1975;23:173-7.
5. Breese BB. A simple scorecard for the tentative diagnosis of streptococcal pharyngitis. *Am J Dis Child* 1977;131:514-7.

6. Funamura BL, Berkowitz CD. Applicability of a scoring system in the diagnosis of streptococcal pharyngitis. *Clin Pediatrics* 1983; 22:622-6.
7. Komaroff AL, Pass TM, Aronson MD, Ervin CT, Cretin S, Winickoff RN, et al. The prediction of streptococcal pharyngitis in adults. *J Gen Intern Med* 1986;1:1-7.
8. DeNeef P. Selective testing for streptococcal pharyngitis in adults. *J Fam Pract* 1987;25(4):347-53.
9. Clancy CM, Centor RM, Campbell MS, Dalton HP. Rational decision making based on history: adult sore throats. *J Gen Intern Med* 1988;3:213-7.
10. Meland E, Digranes A, Skjaerven R. Assessment of clinical features predicting streptococcal pharyngitis. *Scand J Infect Dis* 1993;25:177-83.
11. Seppala H, Lahtonen R, Ziegler T, Meurman O, Hakkarainen K, Miettinen A, et al. Clinical scoring system in the evaluation of adult pharyngitis. *Arch Otolaryngol Head Neck Surg* 1993;119:288-91.
12. Walsh BT, Bookheim WW, Tompkins RK. Recognition of streptococcal pharyngitis in adults. *Arch Intern Med* 1975;135:1493-7.
13. Kaplan EL, Tup FH, Dudding BA, Wannamaker LW. Diagnosis of streptococcal pharyngitis: differentiation of active infection from the carrier state in the symptomatic child. *J Infect Dis* 1971; 123:490-501.
14. Honikman LH, Massell BF. Guidelines for the selective use of throat cultures in the diagnosis of streptococcal respiratory infection. *Pediatrics* 1971;48:573-81.
15. Wigton RS, Connor JL, Centor RM. Transportability of a decision rule for the diagnosis of streptococcal pharyngitis. *Arch Intern Med* 1986;146:81-3.
16. Poses RM, Cebul RD, Collins M, Fager SS. The importance of disease prevalence in transporting clinical prediction rules. The case of streptococcal pharyngitis. *Ann Intern Med* 1986;105:586-91.
17. Cebul RD, Poses RM. The comparative cost-effectiveness of statistical decision rules and experienced physicians in pharyngitis management. *JAMA* 1986;256:3353-7.
18. Shulman ST. Streptococcal pharyngitis: diagnostic considerations. *Pediatr Infect Dis J* 1994;13:567-71.
19. Poses RM, Cebul RD, Wigton RS. You can lead a horse to water – improving physicians' knowledge of probabilities may not affect their decisions. *Med Decis Making* 1995;15(1):65-75.
20. Dajani AS, Bisno AL, Chung KJ, Durack DT, Gerber MA, Kaplan EL, et al. Prevention of rheumatic fever. A statement for health professionals by the Committee on Rheumatic Fever, Endocarditis, and Kawasaki Disease of the Council on Cardiovascular Disease in the Young, the American Heart Association. *Circulation* 1988;78:1082-6.
21. Touw-Otten FW, Johansen KS. Diagnosis, antibiotic treatment and outcome of acute tonsillitis: report of a WHO regional office for Europe study in 17 European countries. *Fam Pract* 1992;9(3):255-62.
22. Cockburn J, Gibbard RW, Reid AL, Fisher RW. Determinants of non-compliance with short-term antibiotic regimens. *BMJ* 1987; 295:814-8.
23. Lima J, Nazarian L, Cherney E, Laht C. Compliance with short-term antimicrobial therapy: some techniques that help. *Pediatrics* 1976;57:383-6.
24. Brook I. Penicillin failure and copathogenicity in streptococcal pharyngotonsillitis. *J Fam Pract* 1994;38(2):175-9.
25. Schwartz B, Facklam RR, Breiman RF. Changing epidemiology of group A streptococcal infection in the USA. *Lancet* 1990; 336:1167-71.
26. Stevens DL, Tanner MH, Winship J, Swartz R, Ries KM, Schlievert PM, et al. Severe group A streptococcal infections associated with a toxic shock–like syndrome and scarlet fever toxin A. *N Engl J Med* 1989;321:1-7.
27. Conly JM, Shafran SD. Resurgence of virulent group A streptococcal infections – the streptococcal toxic shock syndrome. *Can J Infect Dis* 1992;3:222-3.
28. Glezen WP, Clyde WA Jr, Senior RJ, Sheaffer CI, Denny FW. Group A streptoccoci, mycoplasmas, and viruses associated with acute pharyngitis. *JAMA* 1967;202:119-24.
29. Meier FA, Centor RM, Graham L Jr, Dalton HP. Clinical and microbiological evidence for endemic pharyngitis among adults due to group C streptococci. *Arch Intern Med* 1990;150:825-9.
30. Williams WC, Williamson HA Jr, LeFevre ML. The prevalence of *Mycoplasma pneumoniae* in ambulatory patients with nonstreptococcal sore throat. *Fam Med* 1991;23(2):117-21.
31. Cimolai N. Bacteriology of the upper respiratory tract: what is important? *Can Fam Physician* 1988;34:2155-9.
32. Gillam SJ. Sociocultural differences in patients' expectations at consultations for upper respiratory tract infection. *J R Coll Gen Pract* 1987;37:205-6.
33. Vinson DC, Lutz LJ. The effect of parental expectations on treatment of children with a cough: a report from ASPN. *J Fam Pract* 1993;37(1):23-7.
34. Howie JGR. Clinical judgement and antibiotics use in general practice. *BMJ* 1976;2:1061-4.
35. Stephenson MJ, Henry N, Norman GR. Factors influencing antibiotic use in acute respiratory tract infections in family practice. *Can Fam Physician* 1988;34:2149-52.
36. Van de Kar A, Knottnerus A, Meertens R, Dubois V, Kok G. Why do patients consult the general practitioner? Determinants of their decision. *Br J Gen Pract* 1992;42:313-6.
37. Hutchison B, Yassi AL. Resolving the sore throat dilemma. *Can Fam Physician* 1981;27:471-7.
38. Tompkins RK, Burnes DC, Cable WE. An analysis of the cost-effectiveness of pharyngitis management and acute rheumatic fever prevention. *Ann Intern Med* 1977;86:481-92.
39. Pearson SD, Goldman L, Garcia TB, Cook EF, Lee TH. Physician response to a prediction rule for the triage of emergency department patients with chest pain. *J Gen Intern Med* 1994;9:241-7.
40. Stiell IG, McKnight RD, Greenberg GH, McDowell I, Nair RC, Wells GA, et al. Implementation of the Ottawa Ankle Rules. *JAMA* 1994;271:827-32.

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