UW TASP tele-antimicrobial stewardship program | echo

November 28, 2017

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Agenda

- Didactic: Throat Cultures
- Case Discussion
- Open Discussion

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Throat Cultures

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November 27, 2017

Biostatistics

- Sensitivity
- Specificity
- Prevalence
- Incidence
- Predictive values

Biostatistics

- **Sensitivity**- true positive rate or the proportion of pts with a positive test who have the disease (*Snout*)
- Specificity
- Prevalence
- Incidence
- Predictive value

Biostatistics

- Sensitivity- true positive rate or the proportion of pts with a positive test who have the disease (*SNout*)
- **Specificity**- true negative rate or the proportion of pts with a negative test who do not have the disease (*SPin*)
- Prevalence
- Incidence

Biostatistics

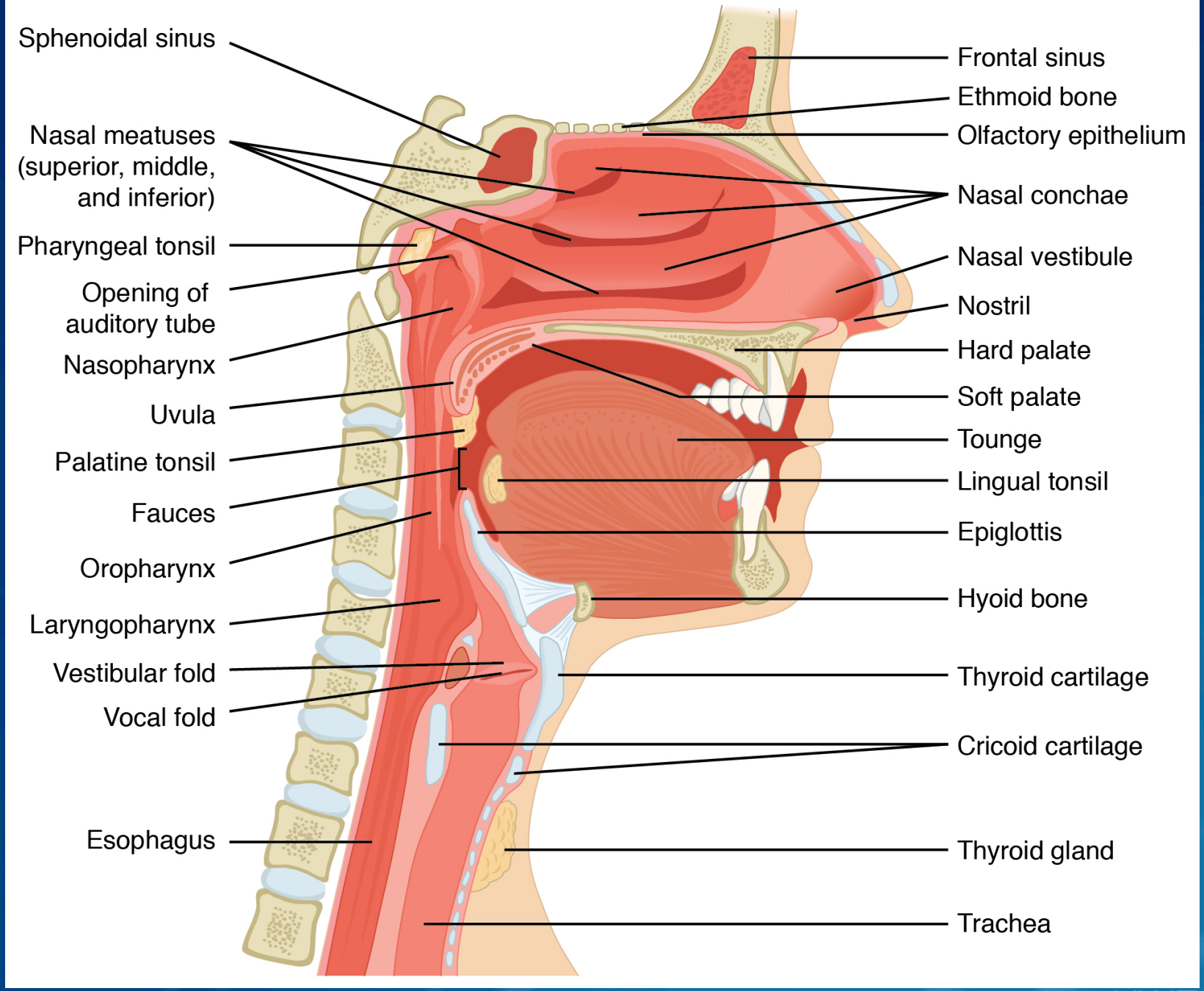
- Sensitivity- true positive rate or the proportion of pts with a positive test who have the disease (*SNout*)
- Specificity- true negative rate or the proportion of pts with a negative test who do not have the disease (*SPin*)
- **Prevalence**- the proportion of people with a disease in a population
- Incidence

Biostatistics

- Sensitivity- true positive rate or the proportion of pts with a positive test who have the disease (*SNout*)
- Specificity- true negative rate or the proportion of pts with a negative test who do not have the disease (*SPin*)
- Prevalence- the proportion of people with a disease in a population
- **Incidence**- the number of new cases of a disease in a population in a given time period

Positive and Negative Predictive Values

- Context matters!
- Positive predictive value- the probability that a patient with a positive test has the disease
- Negative predictive value- the probability that a patient with a negative test does not have the disease
- Depends on prevalence of the disease in the population
- More later (including likelihood ratios)



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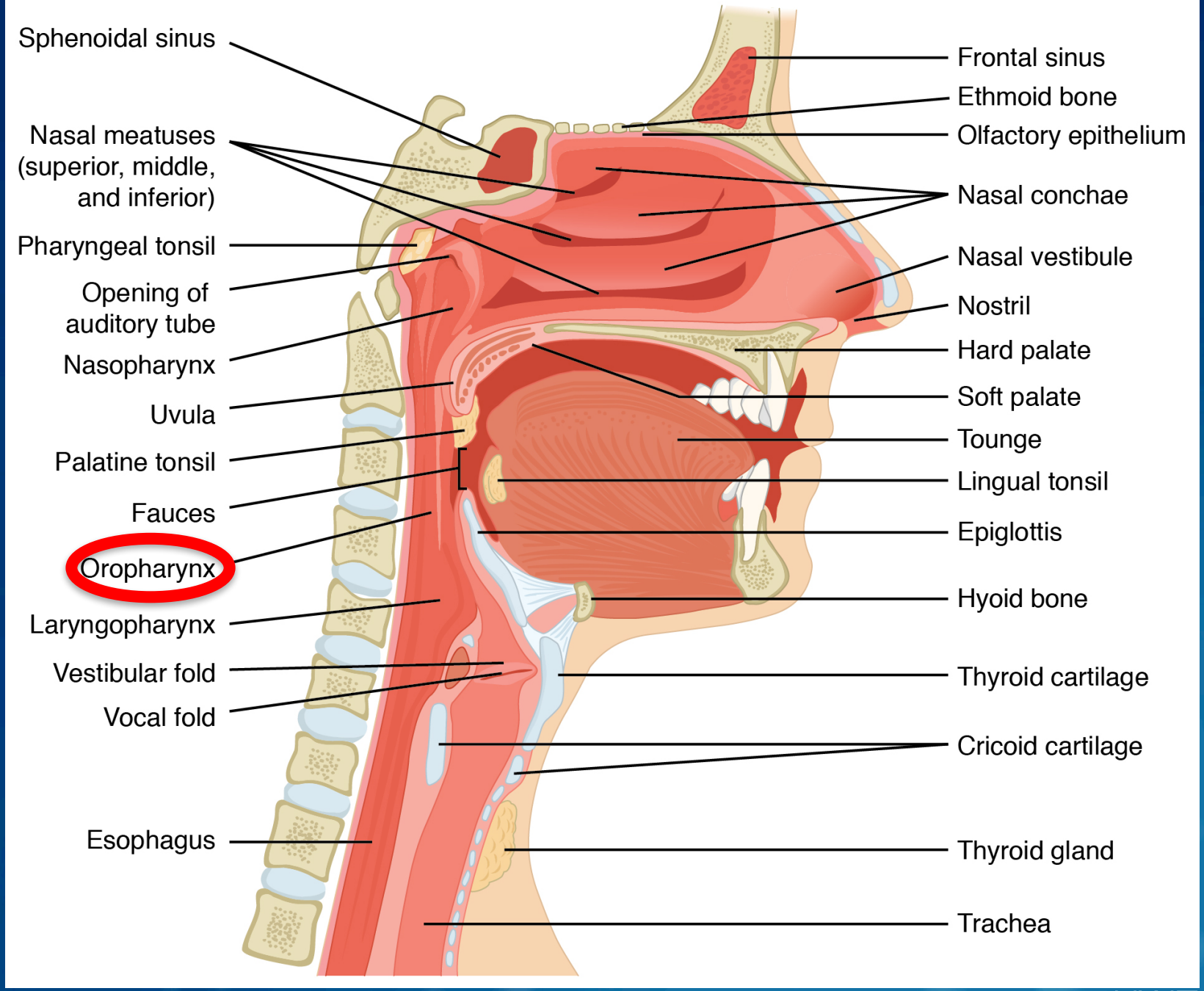

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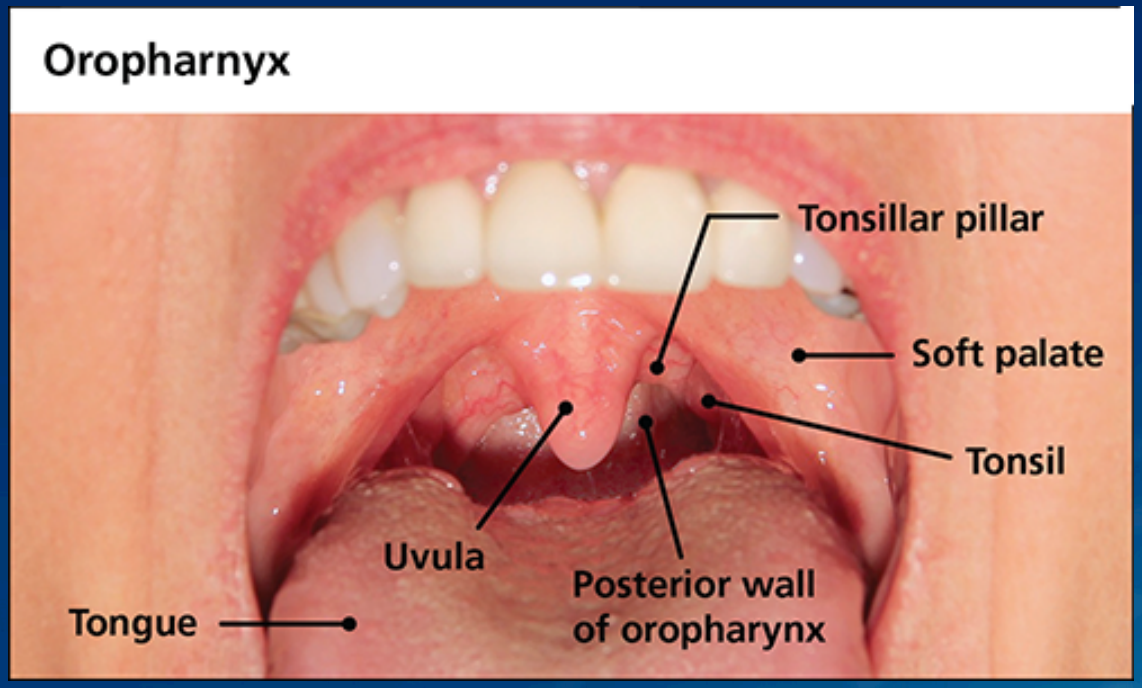
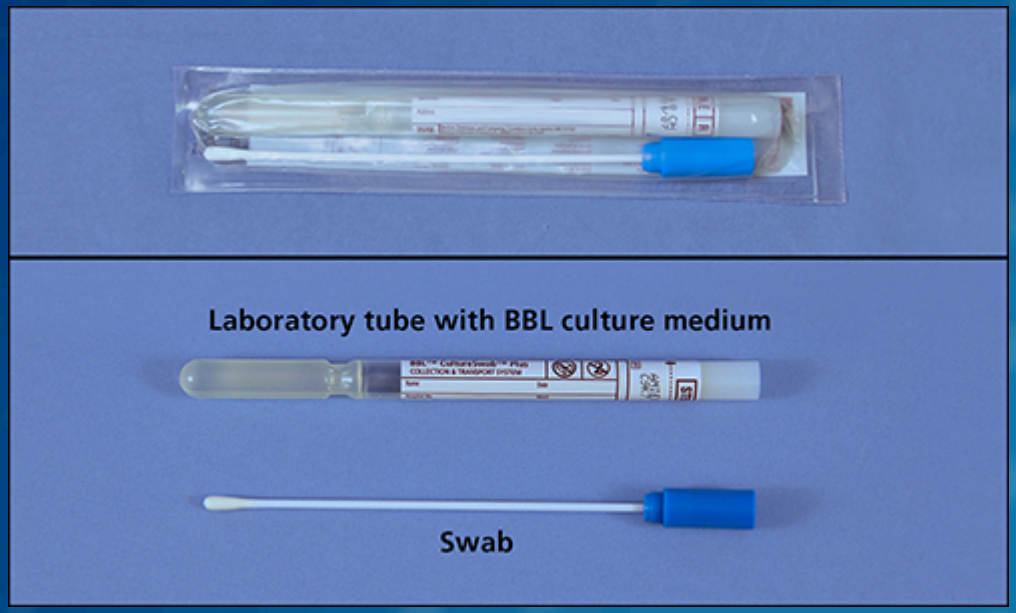




Pharyngitis

- Acute inflammation of the pharynx +/- tonsils
- Viruses are most common cause
- 2nd most common acute infection seen by FPs
- GAS (*S. pyogenes*) is the most common bacterial pathogen
  - 20%-40% of pharyngitis in children (age peak 5-10)
  - 5%-15% of pharyngitis in adults
- Pharyngitis (2010-2011) was 1 of 3 most common diagnoses leading to abx
  - 50%-70% of kids (GAS actual prevalence:37%)
  - 72% of adults (GAS actual prevalence:18%)

GAS Pharyngitis

- Most cases are benign and resolve w/in 1 week
- Some develop complications:
  - Suppurative: cervical lymphadenitis, retropharyngeal abscess, OM, mastoiditis
  - Non-suppurative: Rheumatic fever/heart disease (the latter kills ~223K/year globally), glomerulonephritis, TSS
- Experts recommend abx treatment of children with GAS-suspected or GAS-proven pharyngitis

Goals of Treatment

- Reduce the individual risk of complications
- Reduce the duration of symptoms
- Reduce the spread of the condition
- But there is lack of consensus for diagnostic pathway: Most guidelines recommend throat swabs, but are explicitly not recommended in some countries (UK, the Netherlands)

Diagnosis is Challenging

Table 1. Features Suggestive of Group A Streptococcal and Viral Pharyngitis

Group A streptococcal infection	Viral infection
Sudden onset of sore throat	Conjunctivitis
Age 5 to 15 years	Coryza
Fever	Cough
Headache	Diarrhea
Nausea, vomiting, abdominal pain	Hoarseness
Tonsillopharyngeal inflammation	Discrete ulcerative stomatitis
Patchy tonsillopharyngeal exudates	Viral exanthem
Palatal petechiae	
Anterior cervical adenitis (tender nodes)	
Presentation in winter or early spring	
History of exposure to streptococcal pharyngitis	
Scarlatiniform rash	

Adapted with permission from Shulman ST, Bisno AL, Clegg HW, et al. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. Clin Infect Dis. *2012;55(10):e91.*

Standard GAS Criterion for Diagnosis

- Throat culture on a 5% sheep's blood agar plate
- Able to detect very low number of bacteria
- Can take ~48 hours for results (18-24 hrs at 35-37 C)
- Cannot distinguish GAS as pathogen vs colonizer with viral pathogen as etiology of pharyngitis (latter case 10%-15% of healthy kids)
- Not cheap

Comparison of Hemolytic Activity for Group A, B, G, F Streptococci

Photo courtesy of Dr. Lesley McGee, CDC

Rapid Antigen Detection Tests (RADTs)

- Point-of-care (POC) assays
- Enzyme immunoassays (EIA), optical immunoassay (OIA), latex agglutination (LA)
- Both detect the Lancefield group A carbohydrate (cell wall antigen)

- Cochrane Review
  - Sensitivity 86%
  - Specificity 95%

Cohen, Cochrane Review, July 2016

RADTs

- North American guidelines recommend backing up a negative RADT with throat culture
- European guidelines do not

Clinical Scoring Systems: Centor Score

- Recommended by ACP/ASIM, CDC
  - Empirical tx of adults with >= 3, no treatment of others
  - RADT with 3 or 2 criteria with subsequent treatment of positive tests

Clinical Scoring Systems

Table 1 The Centor score

Symptoms	Points	Score	Post-test probability
Tonsillar exudates	1	0	2.5%
Tender anterior cervical adenopathy	1	1	6.5%
Absence of cough	1	2	15.4%
History of fever (> 38.0°C)	1	3	31.6%
		4	55.7%

Aalbers, BMC Medicine, 2011

Clinical Scoring Systems

Mistik Score

Table 1.

Distribution of viral and GABHS infections

Infection	Frequency	Percent
Virus	240	38.4
GABHS [a]	79	12.6
GABHS and virus	37	5.9
None	268	42.9
Total	624	100.0

[a] Group a beta haemolytic streptococci.

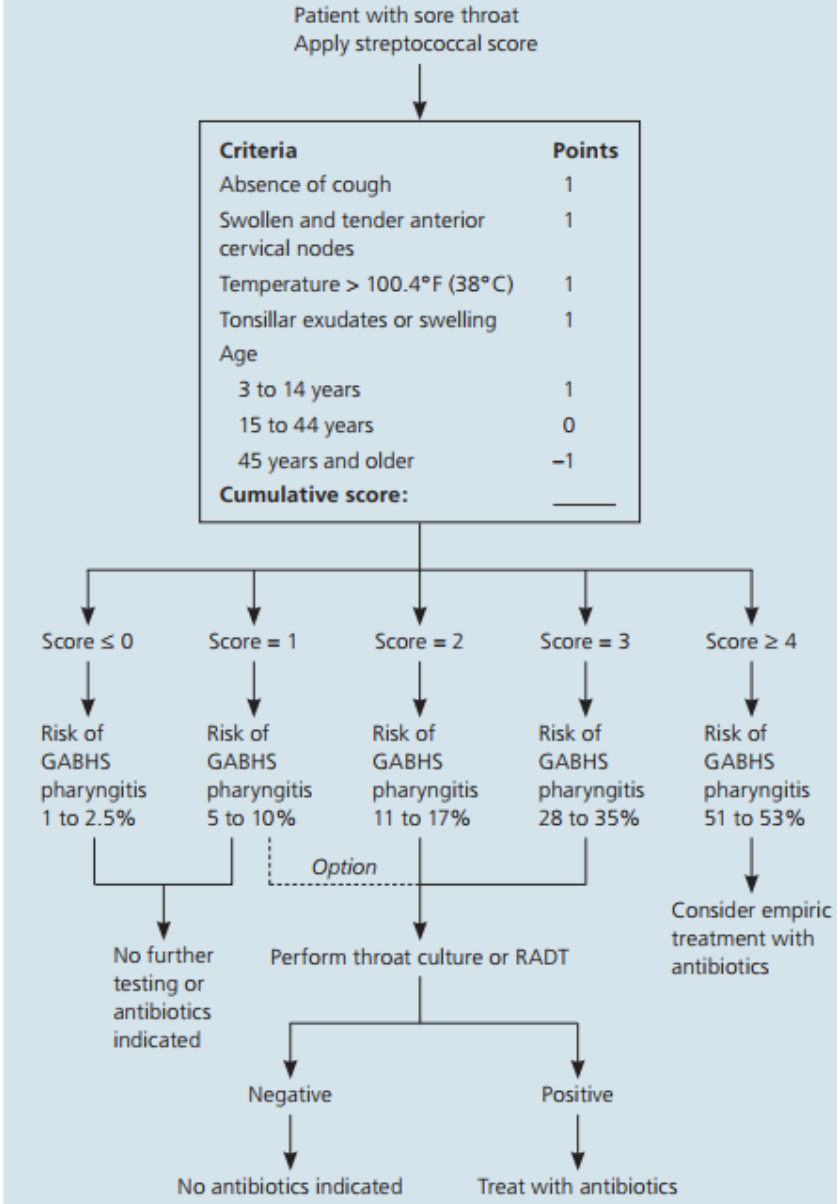
Mistik, Fam Pract, 2015

Clinical Scoring Systems: Centor Score

In terms of diagnostic accuracy, our analysis of the Centor score as a decision aid for antibiotic prescribing suggests that although the score is reasonably specific when ≥ 3 signs or symptoms are present (0.82) and very specific when 4 are present (0.95), the post-test probability of GABHS pharyngitis is relatively low (that is, for a prevalence of 15% and a score of ≥ 3, post-test probability is 32%, Table 4). Therefore, although the Centor score can enhance appropriate prescribing of antibiotics, it should be used with caution as treating all patients presenting with a sore throat and a score of ≥ 3 may lead to many patients being treated with antibiotics inappropriately (Table 4).

Aalbers, BMC Medicine, 2011

Clinical Decision Rule for Management of Sore Throat



Choby, AFP, 2009

Clinical Scoring Systems

Mistik Score

Table 4.

Score to diagnose viral sore throat

Variables	Points	OR [a]	95% CI [b]	
			Lower	Upper
Absence of headache	1	1.975	1.285	3.035
Stuffy nose	1	2.081	1.330	3.257
Sneezing	1	2.811	1.799	4.393
Temperature (≥37.5°C)	1	1.765	1.094	2.845
Absence of tonsillar exudate and/or swelling	1	1.823	1.181	2.815
Total score	5	–	–	–

[a] OR = odds ratio.

[b] CI = confidence interval.

Pr viral +
0 (8.3%
5 (82.1%)
No GABHS with a score of 5

Mistik, Fam Pract, 2015

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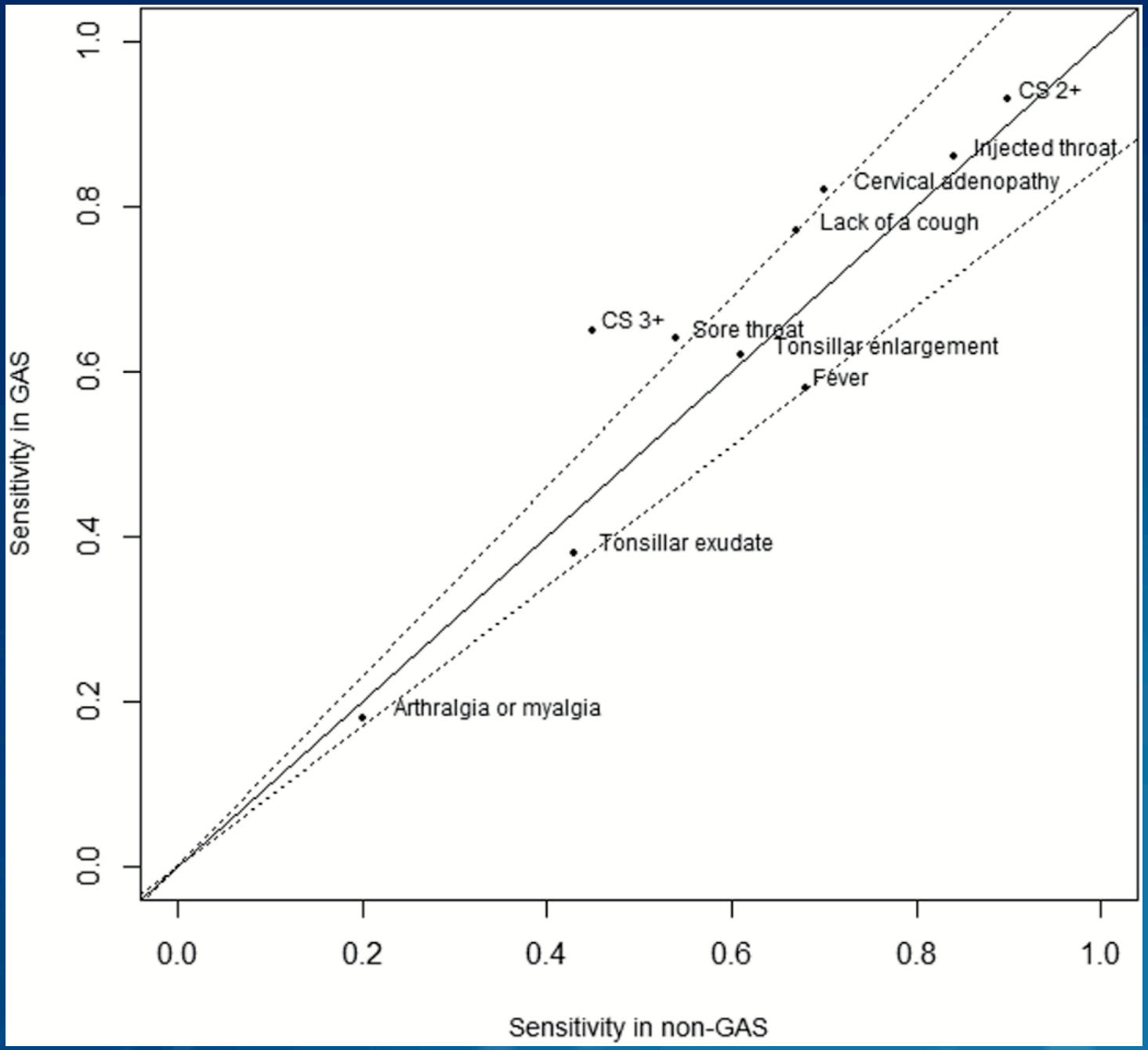
Other Assays

- Rapid molecular biology assays
  - DNA-RNA hybridization
  - Polymerase chain reaction
- Highly sensitive
- Higher cost, require specialized equipment and ~2 hour turn-around

Non-GAS Strep?

- Group C (~6% of throat cxs) and Group G
- + Culture = pharyngitis is controversial
- GCS and GGS have been associated with:
  - Severe/recurrent pharyngitis
  - Reactive arthritis, glomerulonephritis
  - Toxic-shock-like syndrome
- Antibiotics recommended by some, one RCT showed tx with penicillin resolved symptoms 1.3 days earlier
- No RADT



Thai, Family Practice, October 2017

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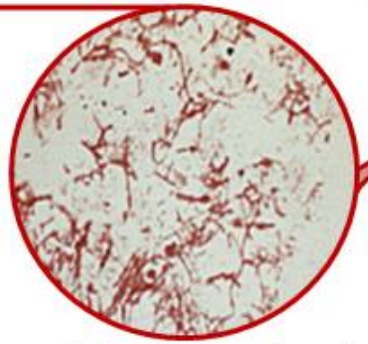
Other Pathogens

- *Mycoplasma pneumoniae*
- *Arcanobacterium haemolyticum*
- *Fusobacterium necrophorum* (a/w Lemierre syndrome)

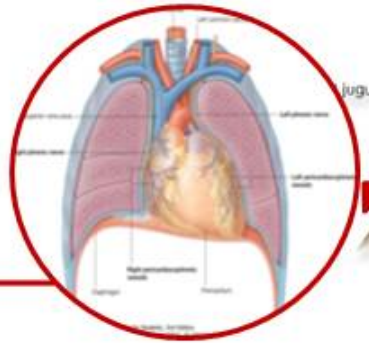
Hedin, Clinical Microbiology and Infection, 2015

Passage from tonsillar v into the IJV



Bacterial endotoxin induces platelet aggregation and septic thrombus formation

Septic emboli lodge in lungs, liver, endocardium, and/or joints



Other Pathogens

- *Mycoplasma pneumoniae*
- *Arcanobacterium haemolyticum*
- ***Fusobacterium necrophorum*** (a/w Lemierre syndrome)
- Adenovirus, bocavirus, coronaviruses, EBV, enterovirus, **influenza**, metapneumovirus, parainfluenzavirus, **rhinovirus**, RSV, **HSV**
- *Neisseria gonorrhea*
- *Candida albicans*
- *Corynebacterium diphtheria*

Hedin, Clinical Microbiology and Infection, 2015