

THE ROLE OF CLINICAL EXAMINATION IN THE MANAGEMENT OF PATIENTS WITH RESPIRATORY DISEASE IN THE BACKGROUND OF EVIDENCE BASED MEDICINE AND CLINICAL CARE- REVIEW ARTICLE

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ABSTRACT

BACKGROUND

The clinical history taking and physical examination are the hallmarks of medical teachings and in clinical practice. However in present days these traditional methods are losing their importance due to availability of advanced technologies. The clinicians are more dependent on the investigations. History and clinical examination, till recent times were thought to be less objective and individualized. But there are statistical parameters based on evidence based medicine and clinical care that can be used to make the clinical examination more objective and precise. Utilizing these parameters the clinical examination will be more beneficial to the clinicians. In resource limited settings, clinical examination combined with the following statistical parameters will help to narrow down the diagnosis and provide timely diagnosis. The article tries to give a template for predicting the probability, establishing treatment and testing thresholds for common respiratory symptoms based on the evidence based medicine methods.

KEYWORDS

Evidence Based Medicine, Respiratory System, Probability, Kappa Ratio.

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BACKGROUND

The physical examination and history taking are the backbone of diagnosis in traditional teaching of medicine. In the commerce driven modern era of medicine they are losing their importance due to rapid advances in technology and clinicians are depending more and more on investigations for making a diagnosis. However with the rapid escalation in the cost of medical care and a large number of patients still being treated in resource deprived settings, the clinical examination is the most effective tool in the management of patients. However clinical examination till recent times was less objective and individualized. From the past 10 years there has been an attempt to make history taking and clinical examination more precise and increase their utility. The statistical parameters of objectivity employed in lab parameters and therapeutics if applied to history taking and clinical examination will yield more value cost effectively. In addition the use of epidemiological information by the bed side will prioritize the data from history and examination,

narrow down the differential diagnosis and help in efficient and timely patient management.

REVIEW OF LITERATURE

Evidence based medicine (EBM) is use of latest evidence in making decisions pertaining to clinical care. Evidence based medicine uses combination of the evidences in literature along with the presenting symptoms, signs and scenarios in clinical decision making. EBM can be of potential use in setting in the areas of limited resources. EBM requires efficient literature-searching, and the application of evidence in evaluating the clinical literature. It is cost-effective and gives best evidences and better health care. In EBM the researchers study numerous available literatures over a particular topic and bring out the best evidence regarding the disease or treatment. The review of literature for studies which are valid, accurate and precise is a exhaustive process which requires diligence and the ability to understand errors and knowledge of statistics. The JAMA has a continuing series of articles which have looked into the precision, accuracy and validity of studies dealing with clinical diagnosis and is a valuable source of LR for the physical signs. The kappa statistics from evidence based resources will give the reliability of the physical signs. Articles where the errors are minimum and pass the scrutiny of validity are used for deriving the LR and kappa statistics.

MATERIALS AND METHODS

The article tries to give a template for predicting the probability, establishing treatment and testing thresholds for

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common respiratory symptoms based on the evidence based medicine methods. The technique of integrating LR of symptoms and physical signs with probability based on prevalence and narrowing the differential diagnosis in common respiratory diseases is advocated.

How is Evidence Based Clinical Decision Different?

1) The traditional teaching in clinical medicine was focused on the history and clinical examination for a list of differential diagnosis. In the evidence based approach, the diagnostic process starts much earlier by estimating the pre probability (prior).

The parameters to consider in fixing the prior probability are

i) prevalence in the area from available literature, experience
ii) Clinical setting which may be outpatient, emergency ward and underlying diseases
iii) individual patient profile which includes age, sex, habits and occupation. The emphasis is on reducing the differential by pausing at this time and looking at the overall scenario based on a broader perspective. The history, clinical exam which are more objective will help in arriving at the posterior probability and establishing the testing and treatment thresholds.

2) The differential diagnosis will have a leading hypothesis, not to miss diagnosis (diseases which can cause loss of life or limb) and active alternates.

3) There is a focus on establishing a treatment threshold and test threshold for the effective and early management of the patient rather than arriving at an absolute diagnosis based on gold standard. The testing is done in a more logical manner based on evidence and at times treatment initiated without tests depending upon the clinical situation. The existing literature on evidence based medicine is utilized to select the tests objectively and cost effectively to arrive at a reasonable diagnosis. The focus is on early treatment with minimum delay and optimal investigations supported by the available evidence in literature.

4) To make use of evidence based validated scales and algorithms (when available) in choosing tests and deciding treatment.

5) Management decisions are based on post-test probability of disease which is arrived at by either the Bayer's theorem or easily available nomograms.

6) There is an increased confidence level in the mental status of treating physician in diagnosis and management of patients as it is supported by solid evidence.

The statistical parameters employed are.¹

Patient Related

Prevalence-proportion of all individuals who have the disease.

Symptom or a group of symptoms and physical sign related

1. Sensitivity-the proportion of true positives who are test positive.
2. Specificity-the proportion of true negatives who are test negative.
3. Positive predictive value-proportion of test positives who are true positive.

4. Negative predictive value-proportion of true negatives who are true negative.
5. Kappa-it is a statistical parameter that measures the agreement between 2 raters where response can fall into any of a number of categories.

Interpreting Kappa

- <.00-poor
- .00-.20-slight
- .21-.40-fair
- .41-.60-moderate
- .61-.80-good
- .81-1.00-very good.

Disease Related

1. Likelihood ratio-+LR tells us how likely is that a result is a true positive rather than a false positive.

A +LR >10 causes a large shift in disease probability and are very useful for ruling in disease.+LR 5-10 cause a moderate shift in probability.

A -LR tells us how likely a result is false negative rather than a true negative. A-LR less than 0.1 causes a large shift in disease probability and are very useful in ruling out a disease. An -LR between 0.1 and 0.5 cause a moderate shift in probability.

The LR's are not dependent on the prevalence of the disease. They give a strong idea regarding the probability of the disease and are available in evidence based clinical diagnosis manuals.

2. Odds-the odds of having the disease is defined as follows-

Pre-test odds=prevalence/1-prevalence

Post-test odds=pre-test odds xLR

3. Pre-test and Post-test probability

The pre-test probability is arrived at by taking the prevalence, history and physical examination. The post-test probability is calculated from the post-test odds or nomograms.

The difference between odds and probability is that the odds give the ratio between the diseased and non- diseased group. The probability gives the proportion of diseased to the combined group of those with disease and those without disease.

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The basic premise for the diagnosis starts with the analysis of symptoms or history which contributes to the diagnosis 80% of the times. The other parameters collectively contribute for the remaining 20% of the diagnosis formulation.

The individual profile and systemic findings provide vital clues regarding the etiological diagnosis of the patient.

COPD is almost always seen in an older patient with >70 years of pack history of smoking.

Chronic cough with haemoptysis, nicotine staining, cachexia, lymphadenopathy and clubbing is indicative of underlying malignancy.

Night sweats, cough and low grade fever are suggestive of tuberculous aetiology.

The following general physical examination findings are suggestive of underlying aetiology in ILD

Rheumatoid arthritis-symmetrical deforming arthritis of hands and rheumatoid nodules.

Systemic sclerosis-tight and shiny skin, telangiectasia, sclerodactyly, calcinosis, atrophic nails and Raynauds phenomenon.

SLE-butterfly rash, petechial rash, livedo reticularis, purpura and arthropathy.

Dermatomyositis-Gottron's papules, heliotrope rash of eyelids and periorbital areas and proximal myopathy.

Ankylosing spondylitis-loss of lumbar lordosis, fixed kyphosis, stooped posture.

Neurofibromatosis-neurofibromata, cafe au lait spots

Sarcoidosis-erythema nodosum, maculopapular skin lesions, lupus pernio, lymphadenopathy.

Drugs-amiodarone-grey slate pigmentation.

Radiation therapy-erythema or field markings on chest wall.

The occupational history gives important clues in the etiological diagnosis of ILD.

Seasonal and epidemic outbreaks of acute respiratory illness is characteristic of Influenza.

The analysis and interpretation of symptoms remain the cornerstone in the management of diseases. It is the knowledge of prevalence which gives additional weight to the diagnostic process.

Chronic Cough

This prevalence data is from the outpatient setting in America.

Chronic allergic rhinitis or postnasal drip syndrome	41%
Asthma	24%
GERD	21%
COPD including chronic bronchitis	5%
Bronchiectasis	4%
Lung cancer	<2%
Related to medications (beta blockers and ace)	5%-25%
Idiopathic and psychological cough	<5%

In addition, it is important to identify the alarm symptoms like haemoptysis, fever and purulent sputum, wheezing and shortness of breath, cough with chest pain, cough with chronic excessive sputum production, cough and unintentional weight loss and cough with dyspnoea and lower extremity oedema.

Chronic Cough and Breathlessness

COPD is almost always seen in an older patient with >70 years of pack history of smoking. The patient can present to either the OPD or emergency with an acute exacerbation.

The diagnosis of obstructive airway disease is clinically possible in only 50% of the cases and only when it is severe. 50% of cases usually mild to moderate is hidden from bedside clinical examination.

The gold standard for the diagnosis of obstructive airways disease is spirometry.

The spirometry criteria for diagnosis of chronic bronchitis is

- FEV1/FEC lower than 5 percentile for the age height and weight of the person or less than 70%.
- Increased volumes of the lung due to air trapping.

The clinical parameters which have the highest predictive values in the order of importance are

- History of smoking more than 70 pack years
- Past history of COPD
- Are breath sounds diminished in intensity?

Yes for 2 out of 3 has a +LR of 27.5

The physical examination findings with the likelihood ratios are

Positive LR

More than 10	Early inspiratory crackles Breath sound score 9 or less Absent cardiac dullness left sternal border
5-10	Subxiphoid cardiac impulse Hyper-resonance right upper chest Hoover sign
2-5	Forced expiratory time of 9 secs or less Maximum laryngeal height of 4 cm or more

Negative LR

0.1-0.2	Breath sounds 16 or more Forced expiratory time (2,3)
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Bronchial Asthma

Scenario: Asthma usually presents in the childhood and is characterized by intermittent breathlessness. It is characterized by stereotypical triggers (allergens, cold weather and exercise) and rapid response to beta-agonist inhalers. The patient usually has other allergic diseases like

allergic rhinitis and atopic dermatitis. The patient can present to the outpatient or the emergency with acute exacerbation.

The diagnosis of asthma is usually clinical and made by the patient but PFT are required for management of the patient.

The atypical varieties and mild cases require PFT for diagnosis.

1. PEF variability of 20% between the best and worst.
2. Decreased FEV1/FVC ratio.
3. Reversibility defined as atleast 200 ml increase in FEV1 and 12% increase with bronchodilators.
4. Methacholine challenge-A decrease in FEV1 of 20% has a 95% negative predictive value.

The clinical parameters with the likelihood ratios are as follows

Positive LR

More than 25	Wheezing and dyspnoea at rest Wheezing and nocturnal dyspnoea Pulsus paradoxus >25
15-20	Wheezing and nocturnal tightness
10-15	Wheezing and dyspnoea Wheezing and exertional dyspnoea Nocturnal dyspnoea
5-10	Wheezing without URI symptoms Dyspnoea at rest Pulsus paradoxus >20 Wheezing detected during methacholine challenge

Negative LR

.2 to .5	Wheezing Wheezing without URI symptoms Wheezing and exertional dyspnoea Diminished breath sounds during methacholine challenge ^(2,3)
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The most reliable Physical signs with kappa statistics above 0.60 are

- 1) Hoovers sign (0.74), 2) Barrel chest (0.62)

The physical signs with variable kappa are

- 1) Wheeze 2) Reduced breath sound intensity 3) Rhonchi and 4) Forced expiratory time.

Pleural Effusion

The common scenarios where pleural effusion is seen are medical ICU patients (8.4%), as a parapneumonic effusions (20%-57%) and in heart failure (87%).

The gold standard for the diagnosis of pleural effusion is chest x-ray.

The clinical parameters for predicting pleural effusion have the following LR.

Positive LR

15-20	Dullness on percussion
5-10	Asymmetric chest expansion Reduced tactile fremitus and vocal resonance in hospitalised patients Bronchial breath sounds in hospitalised pati

Negative LR

0.01-0.1	Dullness on percussion
0.1-0.3	Reduced tactile fremitus and vocal resonance in hospitalized patients

The physical signs with their kappa statistics are as follows

- Reduced breath sound intensity-0.16-0.89
- Reduced VR-0.78
- Reduced tactile fremitus-0.24-0.86
- Pleural rub-.02-0.51
- Reduced chest movement-0.14-0.38.^{3,4}

Interstitial Lung Disease

The gold standard for diagnosis is High resolution chest CT with biopsy required for etiological diagnosis.

There are no articles indicating LR for Interstitial lung disease.

Scenario- The following general physical examination findings are suggestive of underlying aetiology in ILD

1. Rheumatoid arthritis-symmetrical deforming arthritis of hands and rheumatoid nodules
2. Systemic sclerosis-tight and shiny skin, telangiectasia, sclerodactyly, calcinosis, atrophic nails and Raynaud's phenomenon
3. SLE-butterfly rash, petechial rash, livedo reticularis, purpura and arthropathy.
4. Dermatomyositis-Gottron's papules, heliotrope rash of eyelids and periorbital areas and proximal myopathy.
5. Ankylosing spondylitis-loss of lumbar lordosis, fixed kyphosis, stooped posture.
6. Neurofibromatosis-neurofibromata, cafe au lait spots
7. Sarcoidosis-erythema nodosum, maculopapular skin lesions, lupus pernio, lymphadenopathy.
8. Drugs-amiodarone-grey slate pigmentation.
9. Radiation therapy-erythema or field markings on chest wall.

Common Clinical Features are

- Symmetrically reduced chest expansion
- Dull percussion note with reduced VF and VR
- Fine end inspiratory crackles at lung bases.
- Inspiratory squeaks with the small airway involvement in hypersensitivity pneumonitis.

Haemoptysis

The quantification is very important in haemoptysis. Mild is less than 20 ml in 24 hours, whereas massive is more than 250 ml in 24 hours. The prevalence of various diseases are as follows.

Bronchitis	20%-40%
Lung cancer	15%-30%
Bronchiectasis	10%-20%
Cryptogenic	10%-20%
Pneumonia	5%-10%
Tuberculosis	5%-15%

Massive haemoptysis is an alarming symptom. The prevalence of serious diseases are as follows-

Cancer	40%
Infections such as tuberculosis, lung abscess, pneumonia and fungal infections	20%
Alveolar haemorrhage syndrome	<5%

Acute Onset Breathlessness

There are no data regarding the prevalence of various diseases for dyspnoea. Acute onset dyspnoea is usually seen in the emergency setting. The alarm symptoms of dyspnoea are

1. Pleuritic chest pain unilateral that increases with respiration.
2. Lip swelling, hives and wheezing.
3. Substernal chest pressure.
4. Pink frothy sputum.
5. Fever and sputum production.
6. Fever and signs of serious infection and shock.
7. Fever, progressive sore throat, dysphagia and hoarseness.
8. Ascending paralysis.
9. Generalized weakness.
10. Diabetes and renal failure.

Pneumothorax

Scenario: It is usually an young patient and smoker presenting with acute onset breathlessness after strenuous activity for a spontaneous or primary pneumothorax. Tension pneumothorax presents usually in the background of trauma or ICU with acute respiratory distress.

History and physical examination remain the cornerstone for the diagnosis of pneumothorax. The gold standard for diagnosis of pneumothorax is chest x-ray.

There are no documented LR's for pneumothorax

Commonly Seen Signs are

- Respiratory distress
- Tachypnoea
- Asymmetric lung expansion
- Distant or absent breath sounds
- Hyper resonance

They also have cardiovascular findings like tachycardia, pulsus paradoxus and hypotension.

- Shift of mediastinum
- Reduced chest expansion
- Hyper resonant percussion note
- Reduced VF and VR
- Breath sounds are reduced.

Acute Pulmonary Embolism

Scenario: The disease is common in patients with 1) active cancer or treatment within the past 6 months 2) paralysis, paresis or plaster immobilization of lower limbs 3) recently bed ridden (>3 days) or major surgery (<4 weeks).

The clinical probability is determined by a scoring system-

Feature	Score
Active cancer or treatment within past 6 months	1
Paralysis, paresis or plaster immobilization of lower limbs	1
Recently bedridden (>3 days) or major surgery (<4 weeks)	1
Localized tenderness along the venous system	1
Entire leg swollen	1
Calf circumference >3 cm more than the other side, 10 cm below tibial tuberosity	1
Pitting oedema >asymptomatic leg	1
Collateral superficial veins	1
Alternative diagnosis is likely, or more likely than DVT	-2

Total score- 0=low probability, 1-2 =moderate probability, more than or equivalent to 3=high probability
A negative D-Dimer effectively rules out a PE in those with low or moderate probability of PE and imaging is not required. However a positive test does not establish a diagnosis of PE and imaging is required. A patient with high probability will go directly for imaging.

Acute Respiratory Infections

Sinusitis

Sinus puncture with culture serves as reference standard for research. Clinicians prefer to use sinus x-ray for diagnosis.

The evidence for clinical predictors for the diagnosis of sinusitis are as follows

- 1) +LR>5.
- 2) 4 or more of the following findings.

Maxillary toothache, purulent nasal secretion, poor response to nasal decongestant, abnormal transillumination result, patient report of coloured nasal discharge.

Maxillary tenderness is checked by tapping with a tongue blade.

The best method for trans illumination is performed using the Welch-Allyn transilluminator over the infra-orbital rim, shielding the light source from the observers eyes and

judging the light transmission through the hard palate in a completely darkened room. It is reported as opaque (no transmission), dull (reduced transmission) or normal.⁵

Sore throat is the next important symptom. There are no data regarding the prevalence of various diseases causing sore throat. The alarm symptoms for sore throat are odynophagia, dysphagia, drooling, respiratory distress, trismus, muffled voice, stiff neck and erythema of neck, recent foreign body impaction or oropharyngeal procedure, rash and adenopathy, recent cocaine smoking, weight loss, night sweats.

Streptococcal Pharyngitis

The reference standard tests are Streptococcal throat culture and streptococcal antigen tests.

There is a clinical prediction rule (Centor) for the diagnosis for Strep throat in adults.

One point is assigned to each of the following clinical features

1. History of fever
2. Anterior cervical lymphadenopathy
3. Tonsillar exudate
4. Absence of cough

The McIsaac Modification of Centor Strep Score

- a) +1 Point for
- History of fever or measured temp >38°C
 - Absence of cough
 - Tender anterior cervical lymphadenopathy
 - Tonsillar swelling or exudates
 - Age <15 years
- b) -1
- Age >45 years

The Centor score and modified Centor score perform differently for younger and older patients. The modified Centor score has a +LR of 4 with 4-5 points in children aged 3-17 years.

The Centor score improves greatly when combined with rapid strep test results. A positive point of care rapid Strep result with 2-4 points in Centor score has a very high +LR.

A negative point of care rapid Strep result with 0-4 points on Centor score has a negative LR of 0.09.⁶

Consolidation

Scenario: It can present in age and can present to either the outpatient or emergency depending upon the severity. The gold standard for diagnosis is chest x-ray. The etiological diagnosis is by microbiological support.

Clinical predictors of pneumonia with their LR

Positive LR

5-10	Egophony
1-5	Fever >37.8°C Crackles Any chest finding

Negative LR

0.01-1	Normal vital signs and lung examination Normal vital signs
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The normal vital signs are defined as

- HR <100 bpm
- Temperature <37.8 °C
- RR <20 breaths /min.

The reliability of physical signs as determined by kappa statistics are as follows-

- Tachycardia-0.85
- Impaired consciousness-0.65-0.88
- Systolic hypotension-0.27-0.90
- Tachypnoea-0.25-0.60
- Dull percussion note-0.16-0.84
- Crackles-0.21-0.65⁽¹¹⁾

RESULTS

The use of evidence based template in symptoms of respiratory diseases is helpful in the diagnosis of all the common diseases. The cause of chronic cough (>8 weeks) is most of the times benign but a proper diagnosis is useful in alleviating the anxiety of the patient and treatment. The previously known post nasal drip syndrome is now called upper airway cough syndrome and is characterized abundant secretions from the upper respiratory tract that drip into the oropharyngeal and tracheobronchial tree causing cough. It is the most common cause of chronic cough and diagnosed by simple history of mucous drip in the back of the throat. The second most common cause is Gastro-oesophageal reflux disease and in 75% of the patients is the only symptom and is diagnosed by simple history of heart burn and very rarely tests such as oesophageal manometry are required. The causes of chronic cough with breathlessness is more elaborate. The main issue is the differentiation of chronic obstructive airway disease and bronchial asthma. The diagnosis of COPD requires spirometry in most of the cases though the history and patient profile help in predicting the disease. The diagnosis of bronchial asthma is clinical though spirometry may be required for assessing the severity and treatment. An occasional patient may require laryngoscopy for the periodic vocal cord movement disorder diagnosis. The diagnosis of rarer diseases like interstitial lung disease, bronchiectasis and fibrosis usually require imaging and other investigations and they are no evidence backed parameters for a confident diagnosis. The presence of general physical examination findings help in predicting the aetiology for ILD. The occupational history is important in ILD. The diagnosis of

pleural effusion also requires lab testing in view of the diversity of causes though the predicting the patient who requires imaging has evidence backed criteria.

The diagnosis of cause in acute onset breathlessness is complex. The diagnosis of pulmonary embolism is standardized as there is an evidence backed scale which helps in predicting the diagnosis and the treatment threshold is achieved in view of the emergency rather than achieving a gold standard diagnosis. The same is true with tension pneumothorax where a clinical diagnosis in appropriate patient helps in crossing the treatment threshold. In the diagnosis of acute respiratory infections, there are validated scales for the diagnosis of acute streptococcal pharyngitis and sinusitis which makes it quite easy to cross the treatment threshold. The diagnosis of pneumonia requires chest x-ray, though the clinical findings help in predicting who requires the x-ray. The diagnosis of influenza is by seasonal occurrence and clustering. The diagnosis of acute bronchitis is by exclusion of pneumonia by chest x-ray.

DISCUSSION

The differentiation of COPD from bronchial asthma is important and the use of template based on evidence support will help in differentiation of the two most common causes of cough and breathlessness. The differentiation is important because of the marked differences in treatment, disease progression and outcome. The diagnosis of COPD almost always requires spirometry interpreted in the background of patient symptoms, smoking status, age and comorbidities.⁵

The crossing of treatment threshold with clinical parameters in tension pneumothorax helps in early and life saving measures.⁶ The use of validated scale in management of patient with pulmonary embolism will aid in crossing the testing threshold based on evidence.⁷

The lookout for alarm symptoms will help in early diagnosis of bronchogenic carcinoma. The use of evidence based guidelines will help in follow up of patient with suspicious x-ray findings in suspected lung cancer.⁸

The use of evidence based predictors may help in narrowing down the subjects who will require chest x-ray in patients with pneumonia.⁹ and pleural effusion.¹⁰

The use of evidence based template for diagnosis for streptococcal pharyngitis and sinusitis may help in the reduction of antibiotic usage in patients with sore throat and sinusitis.

CONCLUSION

The above presented evidenced based template provides us the evidences which are objective and are derived from modern and latest literature. They add to the traditional clinical methodology. Using these template we can add more objectivity to the clinical methods pertaining to respiratory medicine.

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