

Clinical Decision Support System (CDSS) in patient-centered care

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What is a clinical decision support system (CDSS)?

Why the need for CDSS?

Functions of CDSS

Methods for developing CDSS

Case study:

Predicting positive blood cultures in patients presenting with community-acquired pneumonia

A **clinical decision-support system (CDSS)** is any computer program designed to help health professionals make clinical decisions. In a sense, **any** computer system that deals with clinical data or medical knowledge is intended to provide decision support.

Why the need for CDSS?

Quality control: Variations in patients' characteristics, clinicians' experience and knowledge make quality of care difficult to control. CDSS promotes knowledge sharing and standardizes clinical management protocols to ensure the provision of patient-centered quality care.

Reduction of medical errors: Environmental and situational stressors make clinical decision-making a complex and tough mission. Automated CDSS helps to reduce medical errors caused by these unforeseen factors.

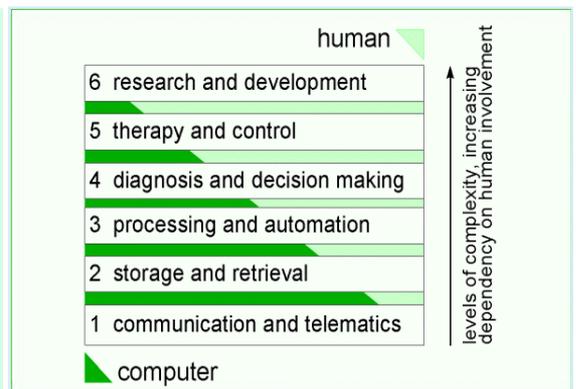
Reduction of medical cost: Total expenditure in the global healthcare market is increasing and is expected to reach over \$5 trillion in 2010. CDSS helps identify patients who are likely to require more costly medical care, thereby alerting physicians of the need to institute more cost-effective interventions. In addition, unnecessary treatments performed on low-risk patients can also be minimized.

Functions of CDSS

- Alerting
- Interpreting
- Critiquing
- Assisting
- Diagnosing
- Managing

Methods for developing CDSS

- Multiple Regressions
- Decision trees
- Rule-based system
- Artificial intelligence techniques (neural networks)
- Bayesian/probabilistic models



Levels of Automated Support in Healthcare - Van Bommel and Musen, 1997

Predicting positive blood cultures in patients presenting with community-acquired pneumonia at an Emergency Department using clinical decision support system

Motivation

In Singapore, pneumonia is consistently one of the most expensive diagnoses to treat among elderly persons with multiple comorbid conditions, a challenge to our healthcare system with its rapidly ageing population. Guidelines for the treatment of community acquired pneumonia (CAP) systematically recommend the ordering of blood cultures in hospitalized patients, preferably before commencement of antibiotic treatment. Blood cultures have good specificity for identifying pathogens. However, there is evidence of its low yield and a lack of its clinical utility, leading some to suggest abandoning it. Yet the practice of routine blood cultures continues. A more discriminatory approach to doing blood cultures has been recommended.

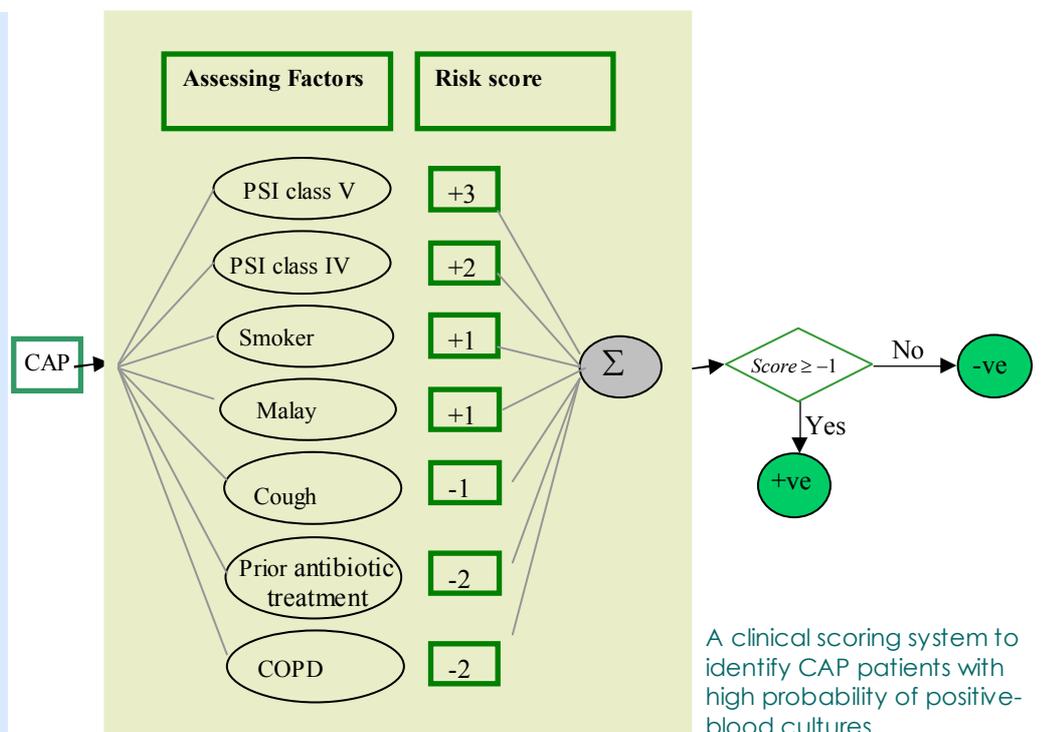
Objectives

To develop a decision support system to help doctors identify patients with CAP who have a high probability of positive blood cultures.

Model development

Historical data on patients' demographics, clinical symptoms, physical examinations, lab tests, comorbid conditions, as well as history of prior antibiotic therapy were collected.

Among 1,407 patients studied, routine blood cultures were negative in 94% of patients with CAP. A model was developed to identify risk factors associated with positive blood culture. A scoring system was then devised based on the above predictive model, and the sum of the scores gave an index that tells us if there is a likelihood of a positive culture.



PSI: pneumonia severity index. Patients were categorized into five risk classes; i.e. I, II, III, IV and V, with increasing 30-day mortality

A clinical scoring system to identify CAP patients with high probability of positive-blood cultures

Conclusion: In Singapore, pneumonia accounted for about 10,800 cases annually. Most of these patients would have had routine blood cultures, and found to be negative. The clinical scoring system is a step towards narrowing the number of patients for whom blood cultures is performed, thus ensuring more cost-effective care.



Sun Yan, PhD in Medical Informatics, and a Biostatistician; hailed from A*STAR's Bioinformatics Institute before joining HSOR. She has extensive experience in developing clinical decision support systems, predictive modeling and evaluation using large real world observational databases.