Assessing clinical reasoning skills of final year medical students using the script concordance test

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Background: Clinical reasoning is the name given to the cognitive processes by which doctors evaluate and analyse information from patients. It is a skill developed by experiential learning and is difficult to assess objectively. The script concordance test, an assessment tool introduced into the health sciences about 15 years ago, is a way of assessing clinical reasoning ability in an objective manner and allows comparisons of the decisions made by medical students and experts in situations of uncertainty.

Methods: Twenty-six final year medical students from the International Medical University, Kuala Lumpur, were tested on their decision making skills regarding a young febrile patient. The students evaluated different pieces of information in five different scenarios and made decisions on a five-point Likert scale in the standard format of the script concordance test. Their decisions were compared to the decisions of a panel of experienced clinicians in Internal Medicine.

Results: The script concordance test scores for the different scenarios were calculated with higher scores being indicative of greater concordance between the reasoning of students and doctors. The students showed poor concordance with doctors in evaluating clinical information. Overall, only 20 percent of the choices made by students were the same as the choices made by the majority of doctors.

Conclusion: Medical students vary in their ability to interpret the significance of clinical information. Using the script concordance test, this preliminary study looked at the ability of final year medical students to interpret information about a patient with a febrile illness. The results showed poor concordance between students and doctors in the way they interpreted clinical information. The script concordance test has the potential to be a tool for teaching and assessing clinical reasoning.

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Introduction

Clinical reasoning is an acquired mental skill that distinguishes expert clinicians from novices in the medical profession. This skill requires adequate factual knowledge as well as the ability to analyse information and recognise patterns in information. It is a skill that can only be developed by experiential learning, that is, by interacting with, and learning from, patients in the wards and clinics. Most medical students acquire expertise in clinical reasoning through an unconscious process during their training by watching and hearing clinicians in the wards. It is therefore not surprising that young doctors vary widely in their diagnostic and problem-solving abilities. The seemingly effortless manner in which experienced clinicians make accurate medical diagnoses hides the complex nature of this cognitive process. It is important to realise that making a diagnosis is not the same as understanding the clinical problems in a patient. Diagnostic labelling may simply give an illusion of understanding. Teaching medical students how to think like expert clinicians is challenging. Script concordance testing is an evaluation that has been used to compare the thinking styles (or mental scripts) of novices with experts in situations of clinical uncertainty. It can also be used to highlight student errors in clinical reasoning by allowing them to compare their decisions with that of expert clinicians. It is a tool that encourages reflection, which has been defined by Saylor[1] as "the process of reviewing one's repertoire of clinical experience and knowledge". This preliminary study assessed the clinical reasoning skills of final year medical students using the script concordance test with a view to developing specific strategies for improving clinical reasoning.

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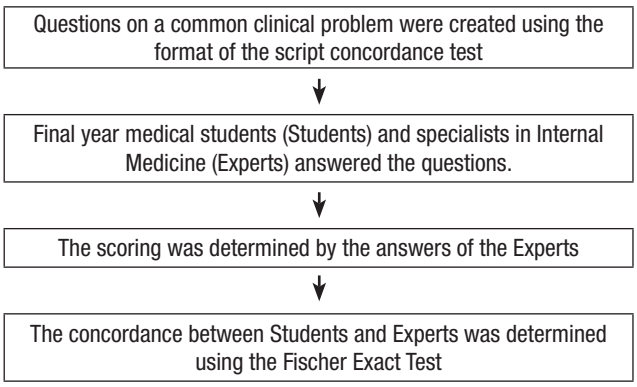
Methods

The methodology followed in this study is shown in the flow chart.



Twenty six final year medical students who had completed their Internal Medicine posting in Semester 10 (their final semester) were given five case scenarios based on a common clinical problem that they were all familiar with – a patient with a short duration of fever. This exercise was part of a clinical discussion session and the students answered the questions independently without consulting their notes or books. In each of the scenarios, the students were asked to evaluate specific pieces of new information and their decisions were compared with the decisions made by a panel of 6 experienced clinicians. The members of the panel comprised of 4 doctors who were from the Department of Internal Medicine in the International Medical University and 2 doctors who were medical specialists in the Department of Medicine in Hospital Batu Pahat. The scenarios and the specific pieces of new information that were given to them are shown here.

Scenario 1: A 21-year old man presented to the hospital with fever for 3 days. His temperature was noted to be 40.1 degrees Centigrade. His doctor diagnosed hyperthermia from impending heat stroke because of the prevailing high environmental temperatures. Now, if you are given new information – **that he was sweating, his pulse rate was 106/min and regular, and that his blood pressure was 116/86mm Hg** – what will you think about the diagnosis of heat stroke?

Scenario 2: A 21-year old man with fever for 3 days and a temperature of 40.1 degrees Centigrade also had chills, rigors, generalized body ache and pain in both knee joints when he presented to the hospital. His doctor prescribed antibiotics and paracetamol for him. Now, if you are given new information – **he also had frontal headache, a little rhinorrhoea, a dry cough and nausea** – what will you say about the decision to prescribe antibiotics?

Scenario 3: A 21-year old man with fever, chills, rigors, myalgia and arthralgia, developed an erythematous rash on his arms, chest and back, 4 days after onset of fever. His platelet count was 59000/uL (normal 150,000 to 400,000) at that time and dengue fever was diagnosed. Now, if you are given new information – **a systolic murmur of mitral regurgitation was detected on auscultation of the heart** – what will you say about the diagnosis of dengue fever?

Scenario 4: A 21-year old man with fever, an erythematous rash on his trunk and limbs, myalgia, arthralgia and thrombocytopenia was initially suspected to have dengue fever. But because of a history of trekking in a jungle and swimming in a river a week before he fell ill, his doctor revised his diagnosis to leptospirosis. Now, if you are given new information – **he had leukopenia in the peripheral blood and significantly elevated serum alanine transaminase levels (ALT)** – what will you say about the diagnosis of leptospirosis?

Scenario 5: A 21-year old man with fever, an erythematous rash on his trunk and limbs, myalgia, arthralgia, thrombocytopenia and leukopenia was confirmed to have dengue fever. After admission in the wards, his doctor diagnosed severe dengue and initiated intensive fluid therapy. Now, if you are given new information – **the haematocrit on admission was 44% (normal mean value 45%) and after fluid therapy for**

3 days, the lowest haematocrit value recorded was 34% – what will you say about the diagnosis of severe dengue?

For each of these scenarios, the students and members of the expert panel had five possible options as shown below:

1. They strongly agreed with the doctor's decision because of the new information.
2. They agreed with the doctor's decision because of the new information.
3. The information did not help to either agree or disagree with the doctor's decision.
4. They disagreed with the doctor's decision because of the new information.
5. They strongly disagreed with the doctor's decision because of the new information.

The choices made by the expert panel of clinicians formed the basis for assigning numerical scores[2] and determining the preferred choice for each of the scenarios. The method used for determining numerical scores is shown below (Table 1). A score of 1 generated by this method indicates the preferred choice by the majority of panel members and the scores by the students indicate the degree of concordance between their choices and the preferred choice.

Table 1: Generating scores for the script concordance test

	A	B	C	D	E
Number of panel members who chose each option					
Number of panel members who chose the option divided by the number of panel members who chose the most accepted option					
Score for each option					

Statistical Test: The Fisher Exact Test was chosen as the statistical test of significance due to the small sample size of experts.

Results

Table 2: Comparison between choices made by students and experts

	Preferred choice by expert panel	Number of experts (who chose the preferred option)	Number of students (who chose the preferred option)
Question 1. How does the new information affect the diagnosis of heat stroke?	**Option E.** Makes it very unlikely to be correct.	4 out of 6 (67%)	4 out of 26 (15%)
Question 2. How does the new information affect the decision to prescribe antibiotics?	**Option C.** Neither for nor against the diagnosis.	3 out of 6 (50%)	4 out of 26 (15%)
Question 3. How does the new information affect the diagnosis of dengue fever?	**Option C.** Neither for nor against the diagnosis.	6 out of 6 (100%)	9 out of 26 (35%)
Question 4. How does the new information affect the diagnosis of Leptospirosis?	**Option D.** Makes it unlikely to be correct.	3 out of 6 (50%)	8 out of 26 (21%)
Question 5. How does the new information affect the suspicion of severe dengue?	**Option B.** Makes it likely to be correct.	3 out of 6 (50%)	1 out of 26 (4%)

Table 3: Statistical analysis of results

	Concordance between expert panel and students for the preferred choice	Fisher Exact Test – Significance 2 sided	Comment
Question 1	67% vs 15%	0.023	Significant (p<0.05)
Question 2	50% vs 15%	0.101	Not significant (p>0.05)
Question 3	100% vs 35%	0.006	Significant (p<0.05)
Question 4	50% vs 21%	0.390	Not significant (p>0.05)
Question 5	50% vs 4%	0.015	Significant (p<0.05)

The results from Tables 2 and 3 demonstrate poor concordance between the choices of students and experts. There was statistically significant discordance between the choices of students and experts in 3 out of 5 questions. In absolute terms, only 26 out of 130 choices by students (20 percent) were the preferred choices of the experts in this entire exercise.

Discussion

This preliminary study involving twenty-six final year medical students showed evidence of a significant degree of discordance between how doctors and students interpret clinical information. It has identified an area of concern in undergraduate medical education. The medical students who participated in this study were just one examination away from graduating as doctors. Yet the majority of them were not evaluating clinical information as expected. While insufficient theoretical knowledge may be the reason for this in a few students, the majority of students probably are unable to adequately interpret the significance of information in different clinical contexts.

The clinical decisions made by doctors are the result of how they interpret and analyse data obtained from patients. This clinical reasoning process forms the basis of patient care[3]. Doctors differ in the ways they evaluate similar clinical problems and hence disagreement between doctors on diagnoses and management are not uncommon. While it is undeniably difficult to assess or demonstrate the entire process of clinical reasoning, the Script Concordance Testing helps to assess how students interpret clinical information in situations where the appropriate answer is uncertain[2]. If students can be privy to the different ways in which doctors think, they will be able to understand how doctors make clinical decisions and be able to refine and improve their own thinking strategies. Delaney and Golding published in 2014 the results of a study in which they sought to make thinking visible[5]. They found that attempts by clinical educators to show students how they think resulted in more reflective thinking by both the educators and students. It is necessary for students to reflect on their experience in the wards if they wish to develop good clinical reasoning skills. Portfolios were introduced into the medical curriculum for the purpose of encouraging reflection but these do not always show evidence of the required degree of reflection[4]. Strategies like the script concordance test described here enable students to see the degree of concordance in thinking between them and doctors and thereby can provoke them to reflect more on their experiences in the wards. This aspect of undergraduate medical training – clinical reasoning ability – needs to be emphasised and incorporated into the medical curriculum. The script concordance test can be a way for educators to address and improve clinical reasoning ability among their students.

This preliminary study, though based on the script concordance test, suffered from a few limitations. There were only five scenarios where the students had to interpret clinical information. The expert panel, against whom the students were judged, consisted of only six members. The results of the script concordance test are likely to have greater validity when students are tested against a greater number of scenarios and the reference panel is made up of ten to twenty members[6].

Conclusion

This study assessed clinical reasoning ability in final year medical students by using the Script Concordance Testing format. The study was confined to evaluating and interpreting clinical information in Internal Medicine. The results showed that final year medical students very often do not interpret clinical information in the same way as doctors. This can be attributed to insufficient exposure to how doctors think and make decisions in the wards and clinics. The script concordance test, when used judiciously, can be one way by which medical students are taught how doctors think and make decisions.

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