



EVALUATION OF FIRST-YEAR MEDICAL STUDENT USE OF A DIAGNOSTIC DECISION-MAKING RESOURCE

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BACKGROUND

The ability to access, appraise, and use information is critical in contemporary medicine. At Rocky Vista University College of Osteopathic Medicine, first-year medical students develop these skills in a medical informatics course that is team-taught by clinicians, scientists, and librarians. In the course, small-groups of students explore representative clinical cases that require literature searching and clinical reasoning. The development of a quality differential remains one of the most challenging aspects of the course for first-year students. This study evaluates the effect of a diagnostic reminder system (DRS) on the development of the differential. It is hypothesized that use of a DRS improves quality.

METHOD

The DRS used in the study is ISABEL, an interactive online database that generates a differential based on symptoms entered (see description in Verdell and Moore 2011). To evaluate the effect of the DRS, student volunteers from the medical informatics course were divided into control and experimental groups and were asked to complete two exercises requiring the development of a differential listing five diagnoses, placing the most likely first in the list. Both groups received training on the use of relevant medical literature and the DRS, but only members of the experimental group had access to the DRS during the study. Members

of control and experimental groups were reversed for first and second exercises, providing parallel data sets and ensuring equal educational experiences. Forty students participated. None had prior experience with ISABEL. The clinical cases assigned in the exercises were comparable in length and complexity.

CASES

Case One: A 22-year-old female presents with fever, nausea, vomiting, diarrhea, and progressively worsening pain in joints, abdomen, and flank. For two days she has had dysuria and has not tolerated food or drink. Temperature 103.1° F, BP 123/85, HR 90, respiration 20 per minute, and O2 sat. 95% on room air. She appears diaphoretic and in severe pain. Tenderness is noted during pelvic exam. Laboratory evaluation shows elevated white blood cell count. Urinalysis shows weakly positive leukocyte esterase and nitrates.

Case Two: A 75-year-old male presents with pleuritic chest pain with dyspnea. The patient is a nonsmoker with history of coronary artery disease and hypertension. He is febrile and tachypneic with BP 145/65, HR 115, and O2 sat. 87% on room air. Physical examination shows right lower extremity edema with tenderness. Labs show elevated white blood cell count, no evidence of acute renal failure, and a positive D-dimer. Pneumonia is evident on chest x-ray.

The quality of student differentials was determined by the inclusion and rank of items (cf. approach of Ramnarayan *et al.* 2003). One point was awarded for every item that matched an item on a master differential list developed by clinicians and librarians; two more points were awarded if the working diagnosis identified by the clinicians and librarians appeared first or second on a participant list. Clinicians and librarians did not consult ISABEL when preparing the master differential. The significance of differences between group mean scores was determined by applying independent-samples

t-tests. Participants also completed short, group-specific questionnaires.

QUESTIONNAIRES

Control Group

1. How many minutes did it take to develop the list?
2. Which online resources did you consult?

Experimental Group

1. How many minutes did it take to develop the list?
2. Have you used ISABEL before?
3. How easy is ISABEL to use?
Circle 1 2 3 4 5 where 1=very easy and 5=very difficult
4. How useful is ISABEL in developing a differential?
Circle 1 2 3 4 5 where 1=very useful and 5=not at all useful
5. Should first-year medical students have access to ISABEL? Circle 1 2 3 4 5 where 1=yes without restrictions and 5=no without exceptions
6. Additional comments?

RESULTS

The DRS improved the quality of the differential. The mean score in the first group (n = 20) increased from 2.7 to 4.3 ($p = 0.0003$), and from 4.3 to 5.0 in the second ($p = 0.0596$). When first and second exercise scores were evaluated together (n = 40), the mean showed an increase from 3.5 to 4.6 ($p = 0.0004$).

SCORES

		MEAN	STDEV	P
EXERCISE 1	Control	2.7	1.7	
	Experimental	4.3	0.9	0.0003
EXERCISE 2	Control	4.3	1.6	
	Experimental	5.0	0.9	0.0596
COMBINED	Control	3.5	1.8	
	Experimental	4.6	1.0	0.0004

Although the DRS improved the quality of differentials developed by first-year medical students, use of a DRS in the first-year curriculum has both benefits and risks. To

complete the exercise, members of the control group typically had to consult two or more resources (most often Dynamed and UpToDate; cf. Graber *et al.* 2009), on average needed 76% more time (14 minutes instead of 8), and 47% did not identify the correct working diagnosis. Use of the DRS did simplify and speed the development of a differential, as well as improving quality. Students listing the correct working diagnosis increased from 53% to 93% with use of the DRS. Nonetheless, 20% believed that access for first-year medical students should be limited in some manner, and 5% believed that access should be restricted without exception. Comments from the 5% revealed belief that the use of the DRS did not require enough clinical reasoning and could slow the development of basic individual diagnostic skills, a pedagogical concern that merits further discussion (cf. Carlson *et al.* 2011).

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