

The Influence of a diagnostic reminder system on clinical reasoning during simulated encounters

James Carlson, Barbara Eulenberg, Thad Anzur, Marc Abel, Diane Bridges, John Tomkowiak, Rosalind Franklin University of Medicine and Science, North Chicago, IL



Overview

One suggested strategy to minimize diagnostic error is to integrate a diagnostic reminder system (DRS) at the point of care.¹ Specifically, a DRS is an informatics tool that allows a clinician to efficiently search a medical database and use the data gathered to reflect on and improve diagnostic decisions.²

Incorporating a DRS into simulated training encounters offers the potential to help students improve their diagnostic accuracy and learn how to effectively use informatics tools that will be available to them in practice. However, it is unclear if students possess the judgment and skill to use sophisticated informatics tools due to their clinical inexperience.^{3,4} **This study explored the following questions:**

1. Is student diagnostic accuracy improved with the use of Isabel PRO?
2. What are student attitudes toward the use of a diagnostic reminder system as an educational tool and resource for future practice.

Methods: Setting and Subjects

Twenty fourth-year medical students (M4) participated in a four-station simulation-based exercise designed to measure the impact of Isabel PRO on diagnostic accuracy. Stations included 3 standardized patient (SP) cases and one mannequin-based simulation. Case topics included frequently missed/challenging diagnoses noted in the medical literature (Fig. 1).⁵

Case #1: 55 year old male presents to an urgent care center with complaint of c/o acute back pain (SP encounter). Elicited History and Physician (H+P) is suggestive of Abdominal Aortic Aneurysm (AAA).

Case #2: 30 year old male presents to the Emergency Room (ER) c/o feeling anxious and heart palpitations (mannequin based simulation). Elicited H+P is suggestive of Thyrotoxicosis.

Case #3: 45 year old female presents to a primary care office with urinary incontinence and subtle neurologic signs and symptoms (SP encounter). Elicited H+P is suggestive of Multiple Sclerosis (MS).

Case #4: 45 year old female presents to primary care office c/o polyarthralgia (SP encounter). Elicited H+P is suggestive of Systemic Lupus Erythematosus (SLE).

Fig 1: Simulated case scenarios and topics presented.

Methods: Study Protocol



Fig. 2 Standardized Patient scenario

Step 1: Students received a two-hour training session in use of the Isabel PRO diagnostic reminder system.

Step 2: Students rotated through the four case simulated exercise. During each station, students spent 15 min performing a focused H+P to identify pertinent findings in the case presentation (Fig 2).

Step 3: After each station, students completed a 10 min post-encounter exercise that evaluated diagnostic accuracy. During the post-encounter, students submitted diagnostic hypotheses prior to (Pre) and again after (Post) using Isabel PRO as a diagnostic reminder system (Fig #3). Blinded pre- and post-diagnostic hypotheses were graded by faculty and compared to determine the impact of Isabel PRO on diagnostic accuracy for each case. Each student received 2 scores for each station and for the combined four case exercise: a Pre-Isabel Diagnostic Accuracy Score (Pre-DAS) and Post-Isabel Diagnostic Accuracy Score (Post-DAS).

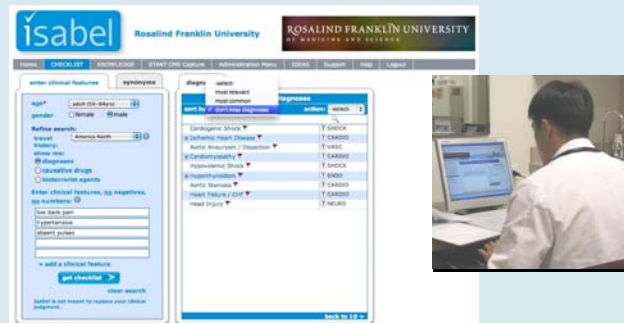


Fig 3. Isabel PRO query interface. Students enter a query based on clinical findings, reflect on their initial diagnostic hypotheses, and refine a list of final diagnostic hypotheses.

Statistical Analysis: Paired T-tests were used to compare Pre-DAS and Post-DAS scores. Pearson's correlation coefficient (r) was used to explore the relationship between Pre-DAS score and magnitude of diagnostic change after using Isabel PRO. A post-experience survey and a focus group discussion was used to elicit student perception regarding the use of a DRS as a clinical and educational tool.

Results

Diagnostic accuracy significantly improved in three of the four individual cases and for the combined four-case exercise after using Isabel PRO (Table 1). There was a significant negative relationship between students with the lowest Pre-DAS scores and the greatest Pre-Post improvement in diagnostic accuracy (Table 2).

Table 1: Pre and Post Isabel Diagnostic Accuracy Scores (DAS) for each case and combined four case exercise.

Case	Pre- Isabel DAS		Post- Isabel DAS	
	Mean	SD	Mean	SD
#1: Back Pain (AAA)	33	+/- 17	48*	+/- 14
#2: Anxiety (Thyrotoxicosis)	41	+/- 19	54*	+/- 17
#3: Incontinence (MS)	47	+/- 11	53*	+/- 18
#4: Joint pain (SLE)	33	+/- 13	36	+/- 13
Overall	36	+/- 11	44*	+/- 18

n=20
*Paired Samples T-Test (2 tailed) demonstrating significant improvement (p<0.05)

Table 2: Pearson product moment correlations (r) between Pre-DAS magnitude of diagnostic improvement Pre-Post Isabel use.

Case	Correlation between Pre-DAS and magnitude of diagnostic improvement	Average magnitude of change between Pre-Post DAS scores
#1: Back Pain (AAA)	-0.57*	+0.88 (+/- 0.12)
#2: Anxiety (Thyrotoxicosis)	-0.57*	+0.13 (+/- 0.18)
#3: Incontinence (MS)	-0.58*	+0.86 (+/- 0.08)
#4: Joint pain (SLE)	-0.44*	+0.68 (+/- 0.11)
Overall	-0.46*	+0.67 (+/- 0.06)

n=20
*Pearson product moment correlations demonstrating significant relationship (p<0.05)

A majority (>50%) of students found the software relatively simple to learn, felt that it helped them reflect on diagnostic options that they had not originally considered, and valued the opportunity to use the software in conjunction with simulated cases.

Conclusions

Despite limited experience, students were able to effectively use a DRS to improve their diagnostic accuracy during a series of simulated case studies. The significant negative relationship between Pre-DAS and magnitude of Pre-Post accuracy improvement suggests that the period of reflection with Isabel PRO was of most help to students with the lowest initial diagnostic accuracy.

Survey results indicate that use of a DRS within the context of a patient case represents a distinct clinical skill set requiring appropriate training. Providing learners with gold standard examples of how to best use a specific informatics tool within specific clinical situations is an essential learning component. Students felt learning how to use a sample DRS within the medical curriculum was important due to their increasing prevalence and perceived value to future practice.

References:

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