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Humanitas Cognitive Tutor: A Tool for Assessing and Promoting Diagnostic Reasoning Skills

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Background: Diagnostic reasoning skills require efficient data collection and analytical abilities. The Humanitas Cognitive Tutor (HCT) program promotes such skills through exposure to life like clinical cases. Furthermore, its ability to track students' performance might identify specific knowledge gaps.

Methods: Twenty-five 5th-year Humanitas University medical students completed a HCT case on a patient presenting to the ED with dyspnea. Students' actions were recorded via log system for further analysis. Performance was analyzed against 7 metrics: identifying information in the presenting scenario; history taking; conducting physical examination; ordering medical tests; formulating diagnostic hypotheses; matching acquired data with the differential diagnosis; final diagnosis. A performance metric was built for each section, combining sensitivity (how many information in each section were found) and precision (how many correct actions were performed) metrics. The F1 score (0-1 range) provided a harmonic mean of sensitivity and precision metrics. The combined score reflected the student's overall score. Dividing those 7 metrics into two groups represented information collection ability and analytical ability.

Results: Overall mean F1 performance was 0.600±0.056. 14 students scored between 0.6-0.7, 11 below 0.6. Grouping the 7 metrics into two domains provided specific insight on the student's preparation, highlighting different educational needs. For example, although 2 students had identical overall scores, one performed worse at data collection while the other did poorly on data analysis.

Conclusions: The HCT may be used to assess students' ability to apply medical knowledge in a clinical context and detect specific areas which should be strengthened to solidify diagnostic reasoning skills.

Biography:

Dana Shiffer earned her Bachelor of Science (B.S.) degree in Physiological science from the University of California- Los Angeles in 2007. In 2017, she received her M.D. degree from the University of Milan, Italy. She is currently in her first year of residency in Emergency Medicine at the Humanitas University of Milan, Italy. Currently, her research interest in on autonomic nervous system disorders and the development of artificial intelligence algorithms to be used on big data.