Creation of a Comprehensive, Case-Based Video Curriculum on Diagnostic Clinical Reasoning for Medical Students

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I. Specific Educational Aims:

A. Create a series of case-based videos to teach the core concepts of diagnostic clinical reasoning
B. Create a facilitator guide for small group discussion to support the core concepts
C. Create a series of case scenarios ("paper cases" and simulated video encounters), meant for evaluation
D. Create a rubric for the assessment of skills in diagnostic clinical reasoning, meant for evaluation
E. Once finalized, this curriculum will be disseminated online and made available on MedEdPortal.

How does the project contribute to medical teaching? This online curriculum will formally consolidate the necessary tools to effectively teach the art of diagnostic clinical reasoning to the Stanford medical students. We believe that providing a formal framework will allow trainees to set an initial foundation for refinement during their years in graduate medical education and into future practice. Through dissemination via an online platform, we hope to share this knowledge with medical students across the country.

II. Project Rationale: Diagnostic clinical reasoning is the ability to sort through a cluster of features presented by a patient and accurately assign a diagnostic label[1]. This foundational skill is taught at all levels of medical training and requires years to development and refine. Furthermore, correct diagnosis is critical to avoid diagnostic error, a chief concern by both patients and physicians accounting for nearly 20% of preventable errors in hospitalized patients[2]. Medial students typically acquire knowledge organized by organ system or pathophysiology which creates challenges when appropriate diagnostic reasoning requires the synthesis of information both across organ systems and across disciplines[3]. To provide a sound foundation for the lifelong pursuit of mastery, these skills should be introduced in a deliberate, organized fashion.

Much thought and effort has been successfully put into Stanford's existing diagnostic clinical reasoning curriculum within the Practice of Medicine (POM). Through feedback from students, POM faculty are moving away from teaching clinical reasoning in large group sessions in favor of small group learning to maximize learning environments with lower student to faculty ratios. This change is an opportunity to present the core concepts of diagnostic reasoning in an online video format. Video teaching modules have been used in medical education with several strengths over more traditional instruction including more convenient access to content[4], optimized instructor contact time, improved examination scores[5], and decreased surgical errors[6]. In addition, with the entrance of Physician Assist (PA) students into POM and the upcoming split curriculum, there will be benefit from a clinical reasoning curriculum that is more modular and flexible.

This curriculum will include online, case-based videos covering instruction on the core concepts of diagnostic clinical reasoning. These videos will be multimedia, noninteractive, averaging 5-10 minutes in length. The core concepts will be reinforced through small group discussion led by a facilitator. To ensure the learning objectives for core concepts are uniformly taught, we will create a comprehensive facilitator guide as part of this curriculum. For evaluation, we will create a mix of "paper cases" and video-based cases using SPs. The cases used for evaluation will require an accompanying standardized grading rubric, which will be developed by the investigators in conjunction with POM faculty. The final product will be disseminated to medical trainees and academic institutions across the country.

Pilot Data: In 2016-2017, several videos were created as part of this curriculum including (1) An introduction to diagnostic clinical reasoning, (2) Discussion of semantic qualifiers, and (3) Two cases with SP encounters to evaluate a student's clinical reasoning skills. One of these SP videos replaced a written case in a Q3 POM clinical reasoning small group session. The other SP video was incorporated along with a grading rubric into

a new oral component of the Q3 POM final exam. Informal feedback from students and POM faculty were uniformly positive as was official student commentary from their end-of-quarter evaluations regarding the use of video to teach advanced clinical skills.

 III. Approach: For the creation of the comprehensive curriculum, we will utilize an iterative approach. Core concepts for clinical diagnostic reasoning were proposed and finalized through literature review and expert opinion. These concepts include: Introduction & Definitions, Cognitive Theory, Bayesian Analysis & Biostatistics, General Approach to Diagnosis, Key features & Data acquisition, Semantic Qualifiers, Summary Statements, Diagnostic Framework, Illness scripts, Creating a Differential Diagnosis, Cognitive Bias & Heuristics, Hypothesis Refinement, Threshold Model, and Clinical Prediction Rules. We will draw from these concepts when creating the instructional videos and facilitator guide for small group description. For evaluation, simulated case scenarios of varying complexity will be created from common presentations (e.g. shortness of breath). Rubrics will be developed and refined for a variety of potential assessment objectives (e.g. development of a summary statement). Throughout the creation and initial pilot phase of the project, we will conduct informal interviews with medical students and faculty to optimize our educational delivery.

IV. Timeline and plan for implementation

Phase	Timeline	Plan
Preparation	Through 02/2018	o Finalized of key components to include in curriculum o Ongoing creation of case-based instructional videos o Creation of an accompanying facilitator guide o Ongoing creating of simulated case scenarios for evaluation o Creation of a grading rubric for evaluation o Determination of Human Subject Research letter submission
Pilot	03/2018 - 06/2018	o Pilot rollout of curriculum o Iterative improvements to curriculum based on focus groups, interviews, and surveys to a select group of medical students and faculty
Evaluation	07/2018 - 09/2018	o Continuous evaluation of this curriculum by medical students and faculty
Post Experiment	Through 09/2018	o Data interpretation and analysis o Manuscript preparation o Curriculum distribution

V. Anticipated work product

A. Creation of a comprehensive online, case-based curriculum covering core concepts of diagnostic clinical reasoning including case-based instructional videos and a comprehensive facilitator guide
B. A series of simulated patient case scenarios using a mix of "paper cases" and SP encounters used to evaluate student diagnostic clinical reasoning skills. A grading rubric will be developed for evaluation.
C. Distribution of the comprehensive online curriculum via MedEdPortal
D. Submission of a manuscript outlining the creation of this curriculum to a major medical education journal

VI. Evaluation plan: Evaluation of all aims will be ongoing and iterative through informal feedback from faculty and medical students. This information will be used during design of curriculum products for ongoing, continuous modification and optimization. For AIM A and B, we will use our patient case scenarios and grading rubric to provide a more explicit means of evaluation in the skills of diagnostic clinical reasoning. As portions of the curriculum become integrated into POM, we will also assess efficacy through review of official end-of-quarter student evaluations

VII. Dissemination of results: We plan to detail the creation and evaluation of this online curriculum in a manuscript for submission to a major medical education journal. In addition, we plan to have this curriculum presented in either poster or oral formal at a general internal medicine organizational conference such as the Society of Hospital Medicine (SHM) or American College of Physician (ACP).

VIII. Budget and justification:

	Item	Justification	Amount
Compensation			
	10 clinical days	PI's time to develop curriculum	$5000
	10 clinical days	Co-investigator's time to develop curriculum	$5000
		Total compensation:	**$10000**
Non-compensation			
	10 gift cards x $30 ea.	Gift cards to incentivize medical student focus group participation	$300
	3 x Lunches x $67 ea.	Lunch to incentivize focus group participation	$200
	1 stipend x $2000	Stipend for student assistant to assist with video creation and coordination with the SP program	$2000
	150 Standardized patient hours x $50 / hr	SP hours from Stanford Standardized Patient Program	$7500
		Total non-compensation:	**$10000***

*Note that no video production costs are listed as we already have all necessary equipment and production expertise

References:

1. Eva KW. What every teacher needs to know about clinical reasoning. Med Educ. 2005 Jan;39(1):98-106.
2. Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR, Lawthers AG, Newhouse JP, Weiler PC, Hiatt HH. Incidence of adverse events and negligence in hospitalized patients. Results of the Harvard Medical Practice Study I. N Engl J Med. 1991 Feb 7;324(6):370-6.
3. Bowen JL. Educational strategies to promote clinical diagnostic reasoning. N Engl J Med. 2006 Nov 23;355(21):2217-25.
4. Jang HW, Kim KJ. Use of online clinical videos for clinical skills training for medical students: benefits and challenges. MC Med Educ. 2014 Mar 21;14:56.
5. Topping DB. Gross anatomy videos: student satisfaction, usage, and effect on student performance in a condensed curriculum. Anat Sci Educ. 2014 Jul-Aug;7(4):273-9.
6. Mendez A, Seikaly H, Ansari K, Murphy R, Cote D. High definition video teaching module for learning neck dissection. J Otolaryngol Head Neck Surg. 2014 Mar 25;43:7.