

A Curriculum for Diagnostic Reasoning: *JGIM*'s Exercises in Clinical Reasoning

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INTRODUCTION

In 2013, an estimated 251,000 deaths occurred due to medical error in the USA.¹ Diagnostic errors make up a subset of these errors. *Improving Diagnosis in Health Care* advocates for training in clinical reasoning (CR) as a preventative strategy.² However, there are few available resources to aid clinician-educators in teaching CR.

To advance professional development in teaching foundational CR concepts, the *Journal of General Internal Medicine* (*JGIM*) initiated the Exercises in Clinical Reasoning (ECR) series.³ This series utilizes expert clinicians' discussions of challenging cases to demystify the CR process. We created a novel open-access online CR toolbox with downloadable teaching modules based on the print ECR series.⁴ By using this toolbox, teachers can engage learners in the case-based application of core CR concepts. In this report, we describe the process of developing this resource, its current usage statistics, and goals for future assessment and development.

METHODS

In 2015, five clinician-educators with CR expertise designed online educational tools to supplement the print version of the ECR series. The team reviewed the existing CR literature and identified four core CR concepts to highlight the following: Problem Representation, Illness Scripts, Dual Process Theory, and Diagnostic Schema. The panel then reviewed all 23 ECR publications, coded them by CR concept, and voted on the cases that best exemplified these four concepts. These manuscripts became the core content for the online curriculum. The panel drew on concepts of curriculum integration, which aim to teach learners in a comprehensive manner.⁵ Each teaching module was designed to include an introduction to the CR concept with a clinical example, access to the related ECR case, a PowerPoint

teaching slide set, and a supplemental teacher's guide with suggested prompts and key discussion points. These modules were produced in teams, shared across groups for informal peer review, then posted to *JGIM*'s website along with an introduction to the online toolbox. Module posts were accompanied by announcements from the Society of General Internal Medicine's (SGIM) Twitter account. We used Google Analytics software to collect information on site usage—including webpage views over time and source of entry to the ECR website.

RESULTS

The first online ECR modules on Illness Scripts, Problem Representation, and Dual Process Theory were posted in April 2016. Since then, there has been a steady rise in visitors to the ECR website, including several periods of significant traffic increase (Fig. 1). Seventy-nine percent of site visitors accessed the ECR website from organic web searches (i.e., without suggested results from sponsors such as SGIM), compared to 12% from direct links (e.g., via email), 8% from referrals from other webpages (such as *JGIM* web), and 1% from social media (Fig. 2).

DISCUSSION

We found continued growth in website visits 2 years after launching an online CR teaching toolbox. The majority of users accessed the site via organic web searches rather than through SGIM-specific links or social media posts. This data suggests high interest in and need for this open-access online curriculum.

Several next steps will help elucidate the practical impact of this resource. A better understanding of user demographics (e.g., experience level of teachers and learners), frequency and methods of use, barriers to use, and learners' impressions will guide further development of this online toolbox. We plan to include a brief online survey when users download materials to collect these data. We also plan to include space for qualitative comments, which will offer feedback on the successes, barriers, and challenges with using our modules. Ultimately, we hope to evaluate the impact of these materials on learners. As we study the needs of toolbox users, we plan to refine the

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Figure 1 Exercises in Clinical Reasoning (ECR) webpage views per month (April 2016-May 2018).

existing modules. Future additions of ECR cases will highlight the existing core CR concepts and expand the breadth of the toolbox to cover additional CR concepts.

In this report, we describe the process of developing and implementing a novel open-access online toolbox to facilitate case-based training in CR. With further study, we hope to strengthen our online curriculum, with the goal of enhancing future clinicians' approaches to patient care through a better understanding of core CR concepts.

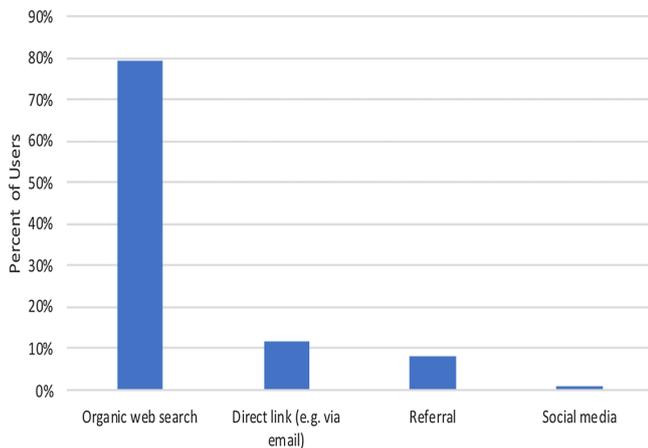


Figure 2 Route of Access to ECR Website. This figure summarizes how ECR users accessed the website. "Organic web search" represents access via search engine (e.g., Google Web Search). "Direct link" represents access via a link to the ECR website (e.g., link shared by email). "Referral" links come from other ECR-associated webpages (e.g., JGIM web). "Social media" links to the website were predominantly shared on Twitter or Facebook.

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Compliance with Ethical Standards:

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