ORIGINAL ARTICLE

Technology-Assisted Virtual Consultation for Medical Imaging

Andrew B. Rosenkrantz, MD, MPA[a], Jason Sherwin, BS[a], Chandan P. Prithiani, MS[a], Dana Ostrow, BA[a], Michael P. Recht, MD[a]

Abstract

Purpose: The aim of this study was to report the investigators' preliminary experience in the implementation of a "virtual consult" (VC) system enabling consultations between radiologists and referring physicians in physically remote locations throughout their enterprise.

Methods: Referrers and radiologists directly access the VC through the electronic medical record and PACS, respectively. Referrers may click a VC link associated with any examination report to instant message the appropriate subspecialist radiologist, who receives an alert allowing automatic loading of the examination. The radiologist and referrer may then discuss the examination via instant messaging as well as launch a real-time screen-share of the radiologist's PACS display, with the option for either participant to control the display. Radiologists' and referrers' feedback was evaluated after the institution's first 110 VC sessions.

Results: Referrers' most common specialties were emergency medicine (27.3%) and internal medicine (13.6%); radiologists' most common subspecialties were abdominal (33.6%) and thoracic (16.4%) imaging. Screen-shares lasted on average 12 ± 16 minutes. From 80% to 90% of referrers agreed that the VC was easy to use, improved their understanding of the radiology report, affected patient management, and enhanced radiologists' role. Referrers found the VC to be particularly useful when traditional consultation was difficult because of location or time constraints or when seeking a quick response to a targeted question. Radiologists recognized referrers' positive response to the VC, although they tended to view the VC as disruptive to normal workflow.

Conclusions: The VC addresses a key challenge in the current era of digital radiology practice and provides added value to referrers, though continued radiologists' workflow optimization is warranted.

Key Words: Radiologist, radiology practice, referring physician, consultation, digital radiology

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INTRODUCTION

Direct dialogue between radiologists and referring physicians may greatly benefit patient care. Regardless of the quality of a report, referring physicians may have follow-up questions or areas of uncertainty relating to its content [1]. In addition, referring physicians may have challenges in independently reviewing images and identifying key abnormalities, particularly as the complexity of medical imaging examinations increases [2-4]. Incomplete or inefficient communication between referring physicians and radiologists to address such matters risks a misunderstanding of images or of their interpretation [5,6], which in turn may negatively affect patient care. Nonetheless, hindered communication between radiologists and referring physicians is ubiquitous in the modern digital radiology environment, in which radiologists commonly review images and generate reports in a location physically remote from where referring physicians are engaged in patient care [7,8]. This separation creates natural barriers to direct interactions that risk detaching radiologists from patient clinical teams, thereby weakening their integration with other providers and potentially negatively affecting patient care [7,8].

One solution to this challenge is to use digital communications technologies to facilitate dialogue between radiologists and referring physicians. Modern technologies provide mechanisms to greatly improve

[a]Department of Radiology, New York University Langone Medical Center, New York, New York.

Corresponding author and reprints: Andrew B. Rosenkrantz, MD, MPA, New York University Langone Medical Center, Center for Biomedical Imaging, Department of Radiology, 660 First Avenue, 3rd Floor, New York, NY 10016; e-mail: andrew.rosenkrantz@nyumc.org.

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referring physicians' ease and efficiency in reaching the appropriate radiologist for review of a given study, minimize disruption of workflow to both referring physicians and radiologists, and even enabling shared real-time viewing of the same image set on different monitors, despite separate physical locations. Such functionalities, in combination, may motivate referring physicians and radiologists alike to engage in more frequent technology-assisted dialogue to review radiologic images and their associated reports, in turn having the potential to benefit patient management.

Recognizing this opportunity, our radiology department has developed a "virtual consult" (VC) system for radiologists and referring physicians to easily consult on imaging examinations from physically remote locations throughout our enterprise. Briefly, the system allows referring physicians to initiate "instant messaging"—like chat sessions with subspecialty radiologists when viewing radiology reports directly within the electronic medical record (EMR), as well as share the consulting radiologists' screen during the session. In this article, we report our preliminary experience in the implementation of such a system, with a focus on the perceived quality of communication and potential value in patient management.

METHODS

Implementation of the VC System

Our radiology department's IT division developed the VC tool in collaboration with the vendor for radiology workflow engine software that was already in use within our department (Primordial Inc, St Paul, Minnesota) as well as with the medical center IT department's unified communications team, which facilitated the use of a previously implemented institutional screen-sharing software solution (Cisco WebEx, Milpitas, California). In brief, the VC tool integrates workflow between the EMR (Epic, Verona, Wisconsin), as accessed by the referring physicians during the VC, the radiologists' PACS environment (iSite; Philips Medical Systems, Andover, Massachusetts), and the screen-sharing system. Figure 1 demonstrates a schematic of the IT infrastructure of the VC.

The VC is available during normal weekday hours and can be accessed by referring physicians throughout the enterprise (outpatient, inpatient, and emergency department [ED] settings). During the time the tool is available, assigned radiologists for each subspecialty designate themselves as their respective sections' VC consultants. The referring physician may launch a VC

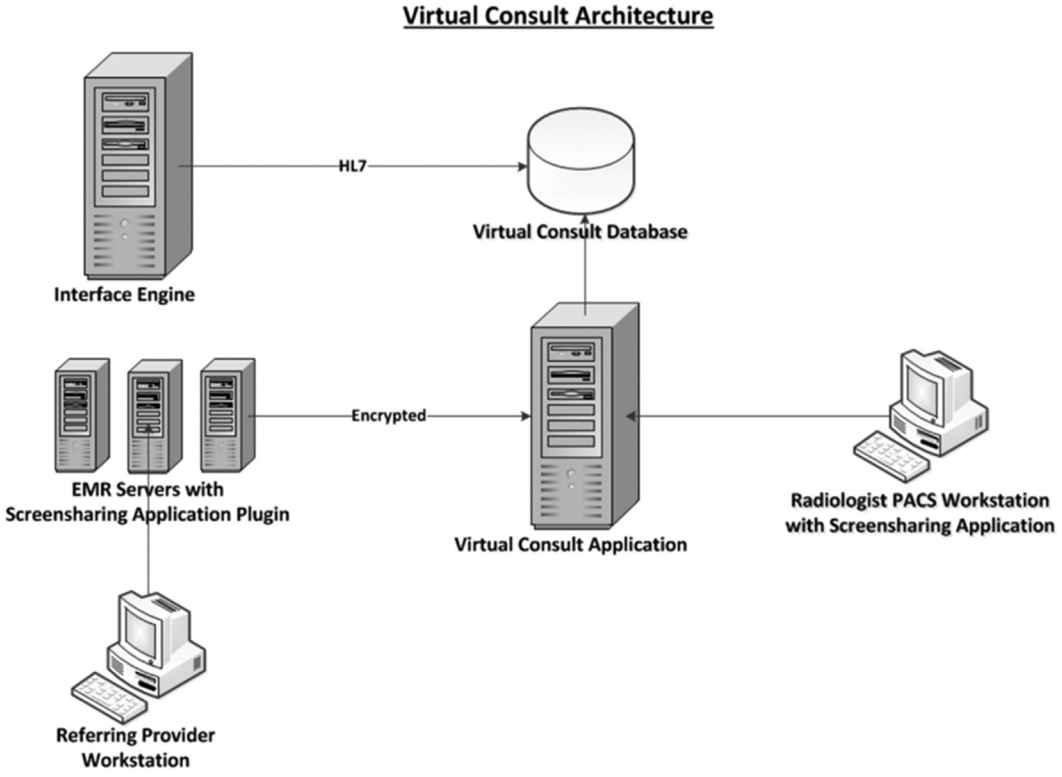

Fig 1. Schematic of the IT infrastructure of the virtual consult. EMR = electronic medical record; HL7 = Health Level Seven.