Workflow Dynamics and the Imaging Value Chain: Quantifying the Effect of Designating a Nonimage-Interpretive Task Workflow

Matthew H. Lee, MD, Andrew J. Schemmel, MD, B. Dustin Pooler, MD, Taylor Hanley, BS, Tabassum A. Kennedy, MD, Aaron S. Field, MD, PhD, Douglas Wiegmann, PhD, John-Paul J. Yu, MD, PhD, Matthew H. Lee, MD, Andrew J. Schemmel, MD, B. Dustin Pooler, MD, Taylor Hanley, BS, Tabassum A. Kennedy, MD, Aaron S. Field, MD, PhD, Douglas Wiegmann, PhD, John-Paul J. Yu, MD, PhD, Department of Radiology, University of Wisconsin School of Medicine and Public Health, Madison, WI. Department of Psychiatry, University of Wisconsin School of Medicine and Public Health, Madison, WI. Department of Industrial and Systems Engineering, University of Wisconsin School of Medicine and Public Health, Madison, WI. Department of Biomedical Engineering, College of Engineering, University of Wisconsin, Madison, WI. Neuroscience Training Program, University of Wisconsin-Madison, Madison, WI.

A B S T R A C T

Purpose: To assess the impact of separate non-image interpretive task and image-interpretive task workflows in an academic neuroradiology practice. Materials and Methods: A prospective, randomized, observational investigation of a centralized academic neuroradiology reading room was performed. The primary reading room fellow was observed over a one-month period using a time-and-motion methodology, recording frequency and duration of tasks performed. Tasks were categorized into separate image interpretive and non-image interpretive workflows. Post-intervention observation of the primary fellow was repeated following the implementation of a consult assistant responsible for non-image interpretive tasks. Pre- and post-intervention data were compared. Results: Following separation of image-interpretive and non-image interpretive workflows, time spent on image-interpretive tasks by the primary fellow increased from 53.8% to 73.2% while non-image interpretive tasks decreased from 20.4% to 4.4%. Mean time duration of image interpretation nearly doubled, from 05:44 to 11:01 (p = 0.002). Decreases in specific non-image interpretive tasks, including phone calls/paging (2.86/hr versus 0.80/hr), in-room consultations (1.36/hr versus 0.80/hr), and protocolling (0.99/hr versus 0.10/hr), were observed. The consult assistant experienced 29.4 task switching events per hour. Rates of specific non-image interpretive tasks for the CA were 6.41/hr for phone calls/paging, 3.60/hr for in-room consultations, and 3.83/hr for protocolling. Conclusion: Separating responsibilities into NIT and IIT workflows substantially increased image interpretation time and decreased TSEs for the primary fellow. Consolidation of NITs into a separate workflow may allow for more efficient task completion.

© 2017 Elsevier Inc. All rights reserved.
radiologists workday, accounting for approximately one-third (37.1%) of total time, which parallels results from similar peer institutions. More importantly, we demonstrated that the reading room work environment is highly fragmented with an average of 14.9 task-switching events (TSEs) per hour, yielding a rate of approximately 1 interruption every 4 minutes. These observations demonstrated that reading room activities can be broadly dichotomized into 2 distinct workflows constituting either IIT or nonimage interpretative tasks (NIT). In an effort to mitigate the effects of a highly disrupted work environment, and to better accomplish our discrete IIT and NIT workflows, we created a dedicated “consult assistant” (CA) position in the reading room, who was tasked with managing the reading room NIT workflow. The purpose of this study was to assess the effects of separating IIT and NIT workflows in reducing TSEs encountered by personnel in the reading room and its effect on total time spent on IITs. We secondarily sought to quantify the specific nature and frequency of NITs undertaken by the CA. We hypothesize that implementation of a CA reduces the number of workplace disruptors and TSEs in the reading room and thereby increase time for IITs.

Materials and Methods

This HIPAA compliant study was granted an Institutional Review Board exemption as a quality improvement initiative.

Study Background

Our institution is an integrated health care system comprising 6 hospitals and over 80 outpatient sites. Study observations were conducted in our main campus subspecialty adult neuroradiology reading room. Coverage of the main neuroradiology reading room during daytime hours typically comprises 2-3 board-certified neuroradiologists, 1-2 neuroradiology fellows, and 1-2 radiology residents. Traditionally, responsibility for image interpretation, procedures, and ancillary tasks (answering phones and pages, in-room consultations with providers, etc.) has been shared among attendings and trainees present in the reading room.

When more than 1 neuroradiology reading room fellow is present, 1 fellow is typically designated the “primary fellow” for that day, as the second fellow may have other responsibilities (eg, medical student education, diagnostic neuroradiography standby, or functional magnetic resonance imaging [MRI] duties). In addition to image interpretation and ancillary tasks, the primary fellow is responsible for performing image-guided procedures as they occur during the day. The primary fellow was selected for observation as this position was felt to represent the most consistent coverage (attending presence within the room more often varies given academic and other responsibilities) as well as consistency in training level (as compared with rotating residents).

Study Design, Task Categorization, and Definitions

A prospective, randomized, observational investigation of the neuroradiology reading room was performed from October 2015-February 2016. During the observation period, each of our institutions’ 6 neuroradiology fellows rotated through the role of primary fellow, with randomized observation dates and times. One-on-one observation of the primary fellow was conducted by 1 of 2 trained observers (A.S. and T.H.) during the week (Monday–Friday, Saturday and Sunday excluded) in half-day shifts (8:00AM-12:00PM or 1:00PM-5:00PM). The type and duration of all tasks were recorded using a time and motion methodology. Task categories included as follows:

1. Image interpretation, including dictation and report editing.
2. Consensus image review with neuroradiology faculty.
3. Procedures.
4. Answering phone calls or pages from providers, techs, and other radiologists.
5. In-room consultation with providers, techs, and other radiologists.
6. Protoceling studies.
7. Teaching (dedicated teaching by attendings).
8. Meetings outside the reading room, related to academic or other work responsibilities.
9. Personal time within the reading room, including checking work-related email, etc.
10. Personal time out of the reading room.

Phone calls or paging and in-room consultations were further subcategorized (Tables 1-3). For the purposes of this study, each transition from a task in progress to a new task is defined as a TSE.

The preintervention observation period of the primary reading room fellow was conducted over a 30-day period (October-November 2015). Following this period, the data were collated and analyzed; this preintervention data has been previously reported.

Following completion of the preintervention period, the task categories were divided into 3 distinct workflows: IITs (ie, image interpretation and consensus image review), NITs (ie, phone calls or paging, in-room consultations, protoceling, and teaching), and procedures, which were considered a separate workflow as they occur entirely outside the reading room. Personal time and meetings were grouped into “other” tasks not associated with any reading room workflow. For the purposes of this study, the NITs of phone calls or paging, in-room consultations, and protoceling were defined as “disruptive tasks,” as they were the tasks most likely to represent an unanticipated interruption from the primary IIT workflow responsibility of image interpretation.

After reading room tasks were separated into distinct workflows, the CA position was established and assigned primary responsibility for the NIT workflow in the main neuroradiology reading room during daytime hours (8:00AM-5:00PM). Neuroradiology fellows fulfilled the CA role for the duration of the study; specifically, 1 fellow, instead of normal reading room tasks was assigned to be the CA. Thus the presence of the CA does not represent the presence of additional trainees or staffing in the reading room. In addition to the NIT workflow, the CA interpreted any functional MRIs performed while on service. The primary fellow retained primary responsibility for the IIT and procedure workflows.

Observation of the primary reading room fellow was then repeated over a 30-day period (January-February 2016). At the conclusion of the postintervention observation of the primary fellow, dedicated observation of the CA was performed over a 1-week period. Out of 6, 3 neuroradiology fellows served in the CA role over the course of the study period. At the conclusion of the postintervention primary fellow and consult fellow observation periods, the data was collated, analyzed, and compared to the preintervention data.

Statistical Analysis

Data were collected and analyzed using Microsoft Excel 2010 (Microsoft, Redmond, WA). Categorical variables were compared using Fisher exact test or chi-squared analysis, where appropriate, and continuous variables were compared using the two-tailed t-test, with a criterion of statistical significance of 0.05. Reported confidence intervals are calculated for the 95% confidence level.
دریافت فوری

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات