Filmless in 60 Days: The Impact of Picture Archiving and Communications Systems Within a Large Urban Hospital

David B. Hayt, Steven Alexander, James Drakakis, and Nia Berdebes

Many large urban hospitals converting to filmless radiography use a phased approach for digital imaging implementation. In fact, this strategy often is recommended by picture archival communication systems (PACS) experts and vendors alike for large, busy hospitals installing PACS in existing physical facilities. The concern is that comprehensive conversion from film-based to digital imaging may be too overwhelming an adjustment in operations for a medical staff to effectively handle without serious disruption of workflow for patient treatment and care. Elmhurst Hospital Center is a 543-bed hospital located in the Borough of Queens in New York City. Owned by the New York City Health and Hospitals Corporation, this municipal teaching hospital provides services to a patient mix that is 38% indigent with no insurance, 50% covered by Medicaid or Medicare, and 12% affiliated with HMOs. Most inpatients are admitted through the emergency department. Forty-five percent of all radiology procedures conducted are for emergency patients. Historically, up to 25% of all diagnostic imaging examinations were never reported formally by radiologists. Report turnaround time for the remaining 75% was unacceptable, with only 3% of all imaging examinations reported within a 12-hour period in 1996. Both situations existed in great part because physicians and residents who felt they needed access to films simply took them. Many were never located or returned days after they were taken. In 1998, Elmhurst Hospital Center replaced its RIS and added voice recognition dictation capabilities in January 1999. A hospitalwide PACS was deployed 10 months later. With the exception of mammography, the hospital converted to filmless radiography within 60 days. The critical objectives to maintain control of films and radically improve the reporting process were achieved immediately. Over 99% of all examinations now are formally reviewed and reported. Only 7% of all reports take 1 or more days to generate. This report describes Elmhurst Hospital’s efforts to make improvements in the delivery of radiology services and the reasons attributed to its rapid conversion to becoming a filmless (mammography excluded) medical center. The impact of the PACS on radiology department operations and service is discussed.

KEY WORDS: picture archiving and communications system, filmless, image conversion, report turnaround time, continuous speech recognition system, voice recognition dictation system.

ELMHURST HOSPITAL CENTER is a 543-bed medical center located in the Borough of Queens in New York City. It is 1 of 2 hospitals (the other is Queens Hospital Center) that constitute the Queens Health Network, 1 of 8 networks of hospitals and medical centers owned and operated by the New York City Health and Hospitals Corporation (HHC). Collectively, these hospitals receive approximately 5,000,000 patient visits per year, a number that increases annually.

Of these hospitals, Elmhurst Hospital Center has one of HHCs busiest emergency departments, logging over 125,000 visits in 1999. As a municipal hospital with a designated level 1 trauma center and 911 receiving station serving a culturally diverse, economically challenged, inner city population, weekends in Elmhurst’s Emergency Department are especially busy. The hospital operates a large ambulatory care walk-in clinic; 475,000 outpatient visits were recorded in 1999. The same year, there were approximately 26,000 inpatient admissions. The radiology department performed approximately 116,000 procedures, an increase of 4,000 procedures from 1998.

The radiology department is staffed 24 hours a day. There are 14 FTE (full-time equivalent) radiologists, of whom, 5 are specialists in mammography, nuclear medicine, neurology, and pediatrics. Radiologists are employees of Mount Sinai Medical School and members of the Elmhurst Hospital Physicians’ Union. (At times, residents from Mt Sinai School of Medicine with which Elmhurst is affiliated, have supplemented this staff.) As union members, each radiologist works an 8-hour shift. Examinations that do not get reviewed at the end of one shift wait the next. Overtime is computed by either compensatory time off, or the radiologists are paid on an hourly session basis.

The department facility itself is centralized. The film library is located within the department and did contain 1 year’s worth of patient examinations. The remainder are located in the hospital’s base-
ment. Because many patients visit Elmhurst Hospital only to be treated for injuries incurred by accidents, and because many do not return for follow-up treatment in spite of scheduled appointments, there is less of a need than other hospitals' radiology departments to have to regularly retrieve prior examinations.

Like many teaching hospitals, the ability to track and manage the location of patient films had been a consistent problem for years. The pace of an urban hospital is a busy one; the film library was understaffed. With 45% of all requests for radiology procedures initiated from the emergency department, the fact that films of emergency patients moved with the patients before radiologists could report them seriously exacerbated the lost film problem. Other films were spirited away by residents and medical faculty before they were read and reported. The result was that up to 25% of all examinations were never reported formally as measured by statistics at the end of each month. In 1997, with approximately 114,300 procedures performed, this equated to approximately 28,575 unread examinations.

File clerks were assigned formally to search for films on a regular basis. Cartloads would be retrieved from throughout the hospital and returned to the radiology department to be read. These would then be duly reported, often a week or more after the date the procedures were taken. In 1996, 97% of all examinations took 12 or more hours to be reported. The combination of lost films and slow reporting stimulated the practice of physicians to routinely reorder examinations for some of their patients if they did not receive a report from radiology in a clinically "reasonable" time period. It was not an uncommon phenomenon for a duplicate examination to be reported before the original one.

Elmhurst Hospital endeavored to get control of its film problems in many different ways. In addition to the film roundup crews, a conference room with a multiviewer was installed in the radiology department. Films taken during the afternoon and night shifts were loaded by night staff for immediate morning viewing and discussion by radiologists and referring physicians alike. However, these physicians were busy and did not want to take the time to come to the radiology department to confer with the radiologists.

An intrahospital image distribution system linking the intensive care unit with the radiology department was installed in 1990. Films were digitized in the radiology department and transmitted immediately for viewing in the intensive care unit (ICU) and in the emergency department. Although this mini-PACS was then state-of-the-art, the quality of the images generated by the laser film digitizer combined with the limitations of 1K low luminance monitors did not provide a satisfactory degree of detail for all examinations. In the emergency department, the problem was exacerbated by the fact that bright fluorescent lights shown on the monitor of the viewing station. These 2 factors generated mistrust in image fidelity by the clinical staff regardless of the image displayed. The system was viewed with suspicion and underutilized both in the ICUs and in the emergency department.

QUANTIFYING PERFORMANCE PROBLEMS

During 1997, a hospitalwide performance improvement project was launched. Ancillary test utilization was evaluated to determine specifically why tests were ordered, which tests were duplicated, and reasons for duplication. With respect to radiology, 2 findings were confirmed formally:

1. Physicians ordered some tests based on habit more than clinical rationale. These tests could be identified readily. For example, it was typical for a chest x-ray to be ordered every day for each patient in the ICU. The hospital administration questioned both the need and safety of this procedure for extended stay ICU patients. The radiologists worked with clinicians to establish protocols that made more clinical sense. To some degree, this reduced the number of unnecessary procedures being ordered.

2. If a physician did not receive a test result within a specific amount of time, the test was reordered. The main problem areas were the laboratory and radiology departments. A large number of repeat examinations were being ordered, and the physicians still could not get film or an interpretation rapidly enough. More than a change of protocol was needed to resolve this problem.

A new chairman of the radiology department assessed its radiology services. The investigation undertaken in 1997 statistically verified unacceptable conditions that were obvious to all. During