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Picture Archiving and Communication System and its Impact on Image Viewing in Physical Therapy Practice

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Imaging plays an increasing role in physical therapy (PT) practice. We sought to determine if picture archiving and communication system (PACS) deployment would increase the proportion of imaging studies viewed by physical therapists (PTs) at the point of care and to assess PTs' perception of the value of access to imaging information. The study was performed in a 720-bed urban teaching hospital where an average of 2,000 rehabilitation visits per month are performed by 12 PTs. We compared the proportion of imaging studies viewed by PTs before and after PACS implementation. We surveyed PTs to assess their perception on the value of access to imaging studies. Film library records pre-PACS and web server audit trail post-PACS implementation were reviewed to measure access. Chi-square was used to compare proportions and trends. During the 3-month period before PACS usage, PTs viewed 1% (6/505) of imaging studies, citing time as the primary barrier. Post-PACS, the proportion of imaging studies viewed rose from 28% (95/344, second month) to 84% (163/192, fifth month) ($p < 0.0001$, chi-square). Most PTs believed that access to imaging studies has high value and has a positive impact on clinical practice. Physical therapists rarely viewed imaging studies before PACS due to time barriers. They viewed more imaging studies (84%) post-PACS and felt that access to imaging studies has a positive impact on clinical practice. Further studies are needed to assess whether PACS enhances PTs' clinical decision making and improves patient outcomes.

KEY WORDS: Evidence-based practice, PACS, Filmless, Physical therapy

INTRODUCTION

Medical imaging is an important diagnostic tool in healthcare delivery. Picture archiving and communication system (PACS) implementation has improved access to imaging studies for

radiologists and other healthcare providers by creating an electronic platform to acquire, store, distribute, and display digital medical imaging data.^{1,2} The role of the physical therapist in rehabilitative medicine is continually expanding with the American Physical Therapy Association's stated vision that by 2020 all physical therapists (PTs) will be doctors of physical therapy (PT) and be further recognized as clinicians for the diagnosis of, interventions for, and prevention of impairments, functional limitations, and disabilities related to movement, function, and health.³ Similar to other healthcare providers,⁴ access to patient's relevant medical record at the point of care, including information from imaging studies, will be an integral part of a PT practice if this vision is to become reality.

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Most published work on PACS has dealt with the implementation process, cost savings, reduction of medical error, and effects on incidental findings.^{1,2,5-17} User acceptability of PACS has been reported as being very good across several medical disciplines.¹⁸⁻²⁰ However, there is little information regarding the use of PACS by non-physician healthcare providers.

In this study, we evaluated the adoption of PACS in an outpatient PT practice by testing the hypothesis that improving access to imaging studies through implementation of PACS would increase the percentage of imaging studies viewed by PTs at the point of care. We also assessed PTs' perceptions regarding the value of access to imaging studies on their clinical decision making.

MATERIALS AND METHODS

This study was performed in an outpatient PT service of a 720-bed urban teaching hospital, where an average of 2,000 patient visits are performed every month by 12 full-time PTs

with a mean of 9.8 years of experience (range, 1–30 years). We reviewed film library records pre-PACS and web server audit trail post-PACS implementation. The primary outcome measure was the percentage of imaging studies viewed by PTs at the point of care. Data from the first month post-PACS were excluded because this was considered the training period. Statistical analysis was performed using chi-square to compare proportions and trends. We assessed the perception of PTs regarding the use of imaging studies in clinical practice through a survey instrument, completed both pre- and post-PACS implementation (Table 1). The pre-PACS survey focused on the frequency of access to electronic medical information (radiology reports, operative notes, and physician notes). Post-PACS survey questions focused on the perception of value that PTs place on the ability to access imaging studies and its perceived impact on their clinical decision making.

PACS Intervention

All imaging studies were available through the use of standard personal computers (Compaq, Houston, TX, USA) with Windows 2000 operating system (Microsoft, Redmond, WA, USA) and using a web-enabled image viewing application delivering lossless compressed data (2.5–3 to 1) as part of a broad-enterprise PACS implementation (Centricity 2.0, GE, Milwaukee, WI, USA). Training on the application consisted

Table 1. PACS survey results summary

Questions	Time Point	26–50%	51–74%	75–100%
For every evaluation you did,				
What percentage of the time did you review the radiology reports?	Pre-PACS	0	3	7
What percentage of the time did you review the latest MD's note?	Pre-PACS	0	0	10
For every postoperative evaluation you did,				
What percentage of the time did you review the operative report?	Pre-PACS	0	1	9
Top reasons for not viewing images pre PACS	Pre-PACS		Images Not Available 1	Time to Locate Films 9
What value do you place on being able to use radiological assessment in your clinical practice as a physical therapist?	Pre-PACS Post-PACS	No Value 0 0	Some Value 1 0	High Value 9 12
What value do you place on the ability to easily access images at the point of initial patient evaluation?	Pre-PACS Post-PACS	0 0	4 2	6 10
What percentage of the time do you feel that viewing the actual image alters or improves your treatment plan for a patient?	Post-PACS	Less Than 10% 2	11–25% 3	26–50% 7

Response rate: total $n = 12$.

Pre-PACS, $n = 10$; post-PACS, $n = 12$.

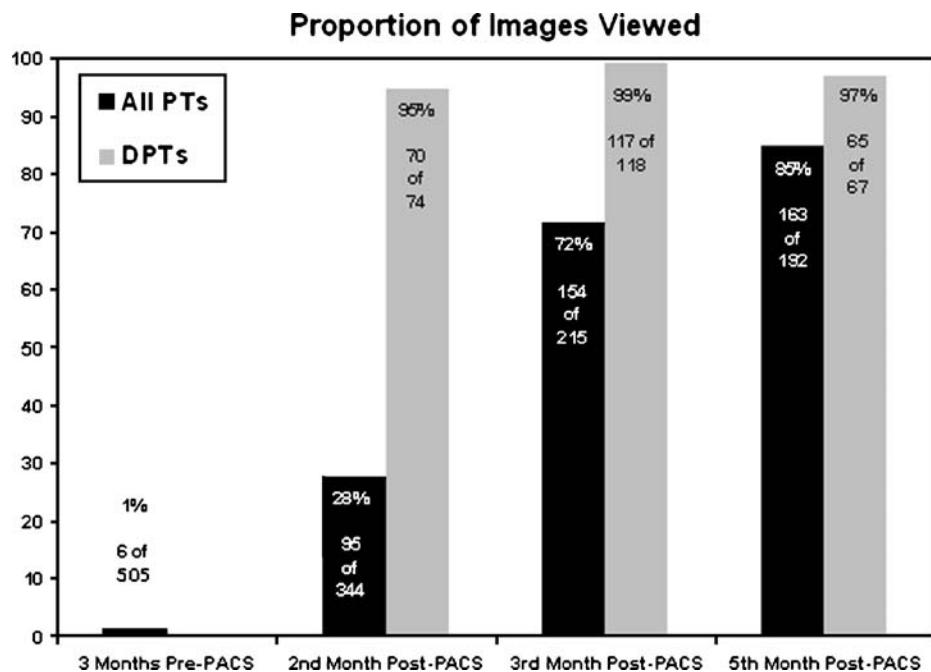


Fig 1. Proportion of images viewed by physical therapists: pre- and post-PACS implementation: all physical therapists ($n = 12$) and a subset with doctor of physical therapy degrees ($n = 4$).

of two 1-h sessions for the PT staff (a basic overview session focusing on access to PACS and an advanced session focusing on the navigation and viewing of imaging studies). Quick reference guides were posted at computer workstations and issued to all PTs, providing tips on how to access and view the imaging studies. Each of the PTs had access to PACS support personnel via phone, e-mail, and pager.

RESULTS

For the 3 months before PACS implementation, PTs ($n = 12$) viewed 1% (6/505) of imaging studies (Fig. 1), citing time to retrieve film as the primary barrier (Table 1). Excluding the first month after PACS implementation, the proportion of imaging studies viewed rose significantly from the second ($95/344 = 28\%$) to the fifth month ($163/192 = 84\%$; $p < 0.0001$ chi-square for trend) (Fig. 1). We found that PTs who had completed a transitional Doctor of Physical Therapy degree ($n = 4$), which included training in diagnostic imaging, adopted PACS more readily (Fig. 1).

The survey (Table 1) response rate was 83% pre-PACS and 100% post-PACS. Post-PACS, PTs placed a higher value on access to imaging studies

and felt that image viewing at the point of care improved their clinical decision making.

DISCUSSION

Physical therapists rarely (1%) viewed imaging studies, citing access to film as the primary barrier. Implementation of PACS resulted in a substantial increase (from 1% to 84%) in the proportion of imaging studies viewed by PTs at the point of care. Post-PACS implementation, PTs reported a high value for access to imaging studies and felt that use of PACS improved their clinical decision making.

Our findings suggest that nonphysician health-care providers can readily adopt PACS. This result is consistent with PACS adoption across other medical disciplines.^{18–20} Our findings suggest that PACS usage may have an impact on PT practice by assisting in treatment optimization and aiding in clinical decision making. This is consistent with the broad concept that access to clinical information in a timely fashion and at the point of care has the potential to improve quality of care and reduce medical errors.^{4,21} Our data may be useful

to others to help justify expenditure of resources for implementation of healthcare information technology solutions including PACS.

Our study has several limitations. Our primary outcome measure was the proportion of patients whose imaging studies were viewed by PTs at the point of care. We did not assess whether the change in practice post-PACS implementation actually changed patient management or outcomes. We did not measure savings or productivity improvements for nonphysicians having to look for imaging studies pre-PACS, or resources that were used to support the PT practice in the radiology film library pre-PACS. Given the very small proportion of patients whose imaging studies were viewed by PTs pre-PACS, the resources spent on retrieving film were likely to be small. Also, our study was performed at one academic institution and may not be generalizable to other institutions or care settings. In addition, the survey results are limited because of a small sample size of PTs and the qualitative nature of the questionnaire.

CONCLUSION

Implementation of PACS in an academic PT department markedly improved access and viewing of imaging studies at the point of care. Our survey suggests that such access may improve PTs' clinical decision making and optimize patient management strategies. When implementing PACS in any facility, radiologists and hospital administration should consider the potential patient care benefits of nonphysician healthcare providers having access to PACS. Additional studies measuring the impact of PACS usage on clinical decision making by nonphysicians, patient education and satisfaction and how this impacts patient outcomes are needed.

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