Users' Perceptions of Picture Archiving and Communication Systems and Teleradiology

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In 1994, the Concord Consulting Group (Concord, MA) undertook a mail survey of users and potential users of Picture Archiving and Communication Systems (PACS) and teleradiology in hospitals and imaging centers. Usable questionnaires were returned from 242 respondents, and results were reported to subscribers in a study issued in January 1995. A similar survey is currently under way, and results will be available later in 1997.

Respondents were asked about current installations, including the year in which installed systems had been purchased, and about future plans for installation. Thus, the data provided an indication of interest in PACS and teleradiology as reflected in actual or anticipated purchases. In addition, the survey provided additional information about the usefulness of PACS and teleradiology for solving various problems that attend operation of modern radiology departments.

TYPES OF PACS

Recognizing that PACS and teleradiology embrace a variety of systems, the survey defined for respondents 10 kinds of systems:

1. Full PACS—image management system embracing all or nearly all modalities including x-ray.
2. Digital PACS—image management system embracing all or nearly all of the digital modalities.
3. Mini-PACS—image management system confined to a single cluster of instruments, eg, ultrasound, nuclear medicine.
4. Teleradiology, department to home—system to transmit images to a radiologist on call.
5. Teleradiology, remote facility to department—system to transmit images from remote facility to a radiology department for diagnosis or review.
6. Teleradiology, department to other users—system to transmit images from the radiology department to other users (eg, physicians in an intensive care unit or emergency room).
7. Remote archive—system that permits off-site storage of films supported by teleradiology to transmit images as needed to radiology department.
8. Image distribution network—system to distribute images on a local network so that referring physicians can retrieve reports and selected images.
9. Digital archives—electronic storage of images as the primary archival record without retention of films.
10. Imaging workstations—electronic workstations for purposes other than routine windowing and filming (eg, for image enhancement).

All of these are systems (as opposed to components) in the sense that they can stand alone and perform useful functions. In addition, all of the systems short of full PACS have the potential for expansion into more elaborate systems, leading to full PACS, which eliminate film entirely.

FINDINGS

The findings from the survey are summarized in Figures 1 to 3. Figure 1 indicates the percentage of hospitals of more than 100 beds that have installed or plan to install systems in the period 1986 to 1995. Figure 2 shows similar data for imaging centers. Figure 3 indicates the extent to which images are being read or expected to be read on monitors instead of film.

Other questions in the survey dealt with the factors that were important to purchasers in justifying the cost of PACS (Table 1).

DISCUSSION

The most striking finding from this survey is the marked upturn of interest in all kinds of PACS and teleradiology beginning around 1992 and continuing until the present. The apparent decline in interest after 1995 or so in most of the charts is, we believe, not an indication of actual decline but of

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Figure 1(a)

Figure 1(b)

Figure 1(c)

Fig 1. Percent of hospitals with more than 100 beds that have installed or plan to install various kinds of PACS, according to a survey conducted in 1994.

respondents' inability to anticipate purchases several years into the future.

The reasons for increased interest stem largely from the rise of managed care and (at the time) uncertainty over the anticipated effects of govern-

ment-sponsored health care reform. Not only do PACS and teleradiology hold out the expectation of more efficient imaging operations, but also they support the increasingly common regionalization of healthcare facilities.

Figure 2(a)

Figure 2(b)

Fig 2. Percent of imaging centers that have installed or plan to install various kinds of PACS, according to a survey conducted in 1994. Unlike hospitals, imaging centers showed almost no interest in full PACS, digital PACS, and mini-PACS.

In addition, now that PACS of various kinds are becoming more common, more potential users recognize the value of PACS and are convinced that earlier deficiencies—such as slow response, inadequate displays, and cumbersome interfaces—have been alleviated or eliminated. These developments are reflected in the expectations of respondents that a steadily increasing percentage of images will be read on monitors.

Figure 3

Fig 3. Expectations of respondents about the extent to which images of various kinds will be read for primary interpretation on monitors without printing film.

Table 1. Percentage of Respondents Who Judged Each Factor as Essential or Very Important in Justifying PACS

Factor	Hospital	Imaging Centers
Reduced film and processing costs	65	43
Reduced costs for technologists	50	35
Reduced clerical costs	53	41
Improved radiologist productivity	62	62
Reduced storage costs	70	55
Reduction of retakes	66	47
Reduction of lost films	72	52
Faster access to archived images	70	46
Better service to referring physicians	78	75
Better service to patients	69	69
Better diagnosis	44	68
Enhanced competitive position	52	61

The findings with regard to factors used to justify PACS indicate that, although there are variations, all of the factors are important to most users and potential users. As might be expected, problems that stem from organizational complexity are more important in hospital radiology departments than in imaging centers, but not by so wide a margin as might have been thought. To some extent, imaging centers do not have to carry the overhead burdens common to hospitals, and therefore they may be less sensitive to cost issues.

Future surveys will allow a comparison with this historical review and an indication of changes in users' perceptions of PACS and teleradiology.