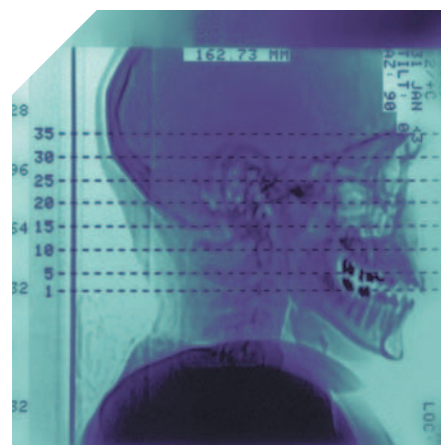


# pacs\*

## cost-benefits



by SYDNEY SCHUSTER

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—Journal  
of Digital Imaging

When it comes to picture archiving and communications systems (PACS), the conventional wisdom regarding profits has long been this: a PACS itself isn't a moneymaker, but the economies it makes possible can produce big savings in myriad ways.

PACS has only had about a decade to prove it can earn its keep, and in that time it has undergone many technological upheavals. Because initial financial outlays can be hefty, the upgrades many, and the payback period lengthy, the votes are just now starting to come in. Is PACS a good buy? Does it really save hospitals money? The results may surprise you.

It turns out that facilities that use PACS definitely make more money — lots more money — than facilities that don't. According to the *Journal of Digital Imaging*, average revenue for PACS sites was \$38.2 million in 1999 (the most recent figures) versus \$13.5 million for non-PACS sites.

So what kind of economies are responsible for figures that impressive? It's a long list: equipment savings, FTE reduction, and workflow efficiencies,

for starters. The benefits of eliminating film and its associated costs, of course, top of the list and are well documented, while new ancillary technologies such as speech recognition are reducing the need for transcriptionists. In facilities where staff shortfalls are a problem, PACS can enable existing radiologic technologists (RTs) to work faster and be more productive.

The *Journal of Digital Imaging* also found that hospitals with PACS have more beds and doctors than hospitals without PACS, in addition to faster image distribution capability. PACS has turned out to be a boon for hospitals looking for an edge in attracting referring physicians, who find the promise of shorter turnaround times on radiologists' reports very attractive. It all adds up to better health care: shorter wait times for diagnoses and treatment, and less overtime for overworked hospital personnel. For health care providers, that translates to increased patient throughput and greater profits.

### ► The price is right

Despite the promise of those big-ticket revenues, calculating the cost/benefits of PACS still can't be accomplished with any pat formula. Once attainable only by the largest institutions, PACS are now available in many sizes and configurations, and available to anyone, from private neighborhood practices to sprawling metro hospitals. One of the few things potential purchasers have in common is the first thing they notice about a PAC system, and that's its price tag.

The range spans from four to five figures for modest clinic-sized systems up to the mid-seven figures for multi-site hospital systems. For that reason, vendors' sales pitches were long weighted toward easy-to-demonstrate long-term benefits, such as increased productivity and film-related cost savings, especially when trying to close multimillion-dollar-system sales. Even then, an established hospital looking to deploy PACS to eliminate film would never be truly filmless until it replaced its existing x-ray systems with computed radiography or digital radiography, an expense that was not always computed into the PACS price and had to be dealt with at some point.

In addition, return on investment can be offset by having to hire IT staff to maintain the PACS, especially at smaller facilities that may not already have IT departments in place; this can effectively cancel out any savings achieved by eliminating darkroom and film library personnel, messengers, and the like. Other factors to consider are expenses for upgrades, service, and replacement parts. Experts say that for maintenance alone, facilities should budget another 10% to 18% of the purchase price for the annual service contract.

Another factor affecting the calculation of cost/benefits in PACS environments is temporary productivity plateaus that occur in the implementation process. A study conducted by the Society for Computer Applications in Radiology (Great Falls, Va) and IMV Medical Information Division (Des Plaines, Ill) found that the introduction of PACS freed up RTs' time for increased image acquisition activity ("81% of RT time is spent in this activity in filmless operations compared with 71% in film-based departments"), but that gain was "accompanied by a critical 'learning curve' period in which productivity may be temporarily low-

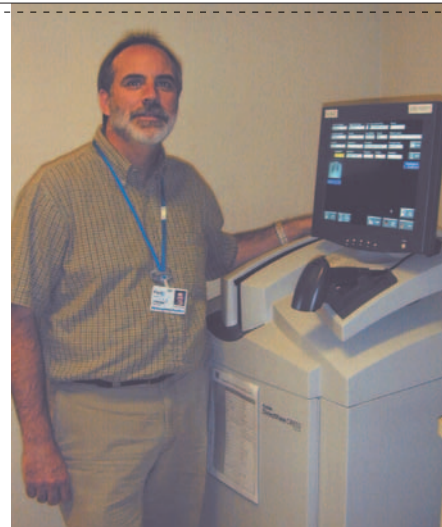
Paul Sylvester, RT, director of radiology at Alpena (Mich) General Hospital, expects to realize a payback in 2 to 2.5 years on his facility's recent Kodak PACS installation—including a savings of \$1.7 million in staff reductions over 5 years and \$2.1 million in film and chemistry savings.



ered." According to the SCAR/IMV study, the median RT productivity level declined initially by 10.8%. Other setbacks to first-year PACS productivity gains are system downtime and problems caused by insufficient integration among IT systems.

For those and many other reasons, the art of PACS cost justification is still a work in progress. Ranjan Jayanathan, CTO of Dynamic Imaging, Inc (Allendale, NJ), says the cost/benefits equation will continue to change as long as the overall price of PACS keeps coming down. "One reason for that is the availability of Web technology and concurrent-use licensing, so you don't have to tie [software] licenses to a particular device. If at any time only 10 users need to use the system, but altogether there may be thousands, it doesn't matter. You buy only 10 licenses. Plus, you now have the ability to run PACS on standard PCs." The reduction of license fees combined with the use of standard desktop PCs in place of costly high-end workstations translate into considerable savings.

Another reason the price of PACS is falling, says Jayanathan, "is the steady decline in storage costs. People now expect to have all data online, instead of just 3 to 6 months online. The third reason PACS prices are falling is that the market is much better educated



now and there's much more competition." A Web-driven PACS for a particular institution versus a so-called traditional "big-iron" PACS, says Jayanathan, "would cost maybe 25% to 30% less. At the same time, it will have much broader reach and from 2 to 10 times the amount of storage online."

### ► Unexpected bonuses

Hospitals that took the chance on PACS did enjoy increased productivity and film-related cost savings. They found that the time was reduced between a request for an exam and the results. They started reclaiming floor space once dedicated to film libraries. Remote access and fast retrieval have proven invaluable in places such as emergency rooms and understaffed facilities that share radiologists, where those functions dramatically reduce time to intervention.

Additionally, PACS users discovered unexpected benefits that represent new variables in the cost/benefits calculation process. They discovered that the same networks they were installing for digital image and record management could also support wireless technologies that improved patient care and reduced paper output. They found their digital images weren't getting lost the way their films had, which made life better

for radiologists who rely on reviewing priors. PACS also eliminated the trouble and expense of retakes. Elimination of retakes also means patients avoid additional radiation exposure, and radiology work schedules aren't impacted by interruptions for exam duplications.

Another bonus for hospitals is how referring physicians have proven easier to attract when PACS is available, because they like the convenience of remote electronic image access. Payors like remote access too, because it reduces the time and costs of processing claims. That means health care providers get paid faster.

Jayanathan says the true test of whether PACS was a prudent purchase is to ask a hospital this: "If you had a choice of getting all your money back and then living in a film-based world for the next 5 years, would you choose that?" I would be shocked if I found even five hospitals in the US that would."

#### ► Good value

One of the best ways to find out what PACS is really worth is to ask someone who uses one. Alpena General Hospital,

a 146-bed acute care facility in Alpena, Mich, recently deployed a prototype DirectView PAC System 5 from Kodak Health Imaging (Rochester, NY). The hospital serves 100,000 people in four counties and figures on a payback period of 2 to 2.5 years on its PACS.

Paul Sylvester, RT, director of radiology, says a good chunk of the cost savings will actually come from job elimination. He estimates he'll save \$1.7 million in 5 years by downsizing file clerks alone. "We're able to lay off a little bit of the staff and still do the same amount of work, if not more. The only problem we're having right now is we're still printing film for another month or so. That's creating delays. Once we eliminate the film printing, we'll have much faster patient throughput."

Sylvester estimates that total film and chemistry savings will run about \$2.1 million. In the month's time since the hospital acquired CR and DR, he says the productivity gain from those modalities alone is about 10%.

According to Kodak, implementing a PACS on a scale similar to Alpena's installation would cost approximately \$1 million to \$1.5 million. A similar CR/DR component would add another \$500,000

to \$1 million to the price tag.

"Our estimated total savings after 2007 is going to be \$6.1 million," Sylvester says. It would have been even greater, except the hospital decided to outsource its image archiving and spent an extra \$171,000 to do that. "Every image that's over 3 years old, I shipped to an off-site storage facility." Films are digitized there on an as-needed basis, he says, "and we use the Web to view those films if we need them."

Lost films were an issue that was costing the hospital time and money but that the new PACS has resolved. Patients were losing their fair share of hard copy, joined by the ER, surgery, and outside medical facilities that often just never returned films. "It was probably less than 5%," says Sylvester, "but there's a cost associated with copying films and paying staff to do it." Then there were the complications caused by having to retake exams, and the cost of "having to credit people because we couldn't find their films. Now we'll be giving CDs to patients with their images on them. They'll be diagnostic quality. The CDs are theirs to keep. They can put them on any computer with a CD reader. Patients just ask us for their images, and we burn

## The Cost-Benefits Diagram\*

With these fairly conservative projections, a savings of \$7.57 per procedure is indicated, bringing the cost per PACS procedure down to \$19.43. Then, if you're paying for the system based on \$9 per procedure, your total cost of ownership with PACS will be \$19.43 + \$9, or \$28.43. The CFO can now make a determination whether the intangible and strategic benefits are worth the \$1.43 increase in cost per procedure (see Figure 1). The cost of capitalizing the system with upgrades would be considerably more than \$171,600 or even \$205,920 per year.

**Figure 1:** Differential cost of PACS vs film-based system when paying for PACS on a usage basis.

	@ 80% CURRENT VOLUME	@ 100% CURRENT VOLUME	@ 120% CURRENT VOLUME
Number of studies per year	96,000	120,000	144,000
PACS cost/year @ \$9/procedure	\$864,000	\$1,080,000	\$1,296,000
Less savings/year @ \$7.57/procedure	-726,720	-908,400	-1,090,080
Differential cost of PACS vs film-based system per year	\$137,280	\$171,600	\$205,920
<b>Credit:</b> *Diagram and text provided by Gary Reed, president of Integration Resources, Inc.			



the CD in a couple of minutes and hand it to them. Or, if they go to their doctor and forget their films, their doctor can call us. We can either email the images to the doctor, or allow him into our PAC system on a one-time-only password and he can view them on the Internet."

Another place Alpena General was able to save substantial sums of money was in image-viewing stations. Wherever possible, PCs are in place instead of more costly dedicated workstations. "We set up a more expensive diagnostic workstation in the emergency room," says Sylvester, "and one PC for the orthopods with a high-resolution monitor. On our general floors we have two PCs with high-res monitors, and we have three of those in surgery. In the physicians' lounge, we've put in regular monitors. We have two remote workstations, one in the ICU and one in the emergency room. The diagnostic stations used by the radiologists have 3 MB monitors."

Alpena General is in the process of setting up a Kodak DirectView Web distribution system, mainly in anticipation of providing electronic images to a large concentration of referring physicians located nearby. "About a quarter of a mile from the hospital, 40-50 physicians have built their offices," says Sylvester. "We're thinking of running cable there so there won't be a monthly cost, like there is for T1. Another option is



ogy should pay for the purchase, despite clear benefits of PACS for the rest of the institution. Radiology departments then go about financing PACS the way they finance their desktop computer equipment. That is not the best way, says PACS consultant Gary Reed, president of Integration Resources Inc in Lebanon, NJ.

"The majority of PACS installed to date were acquired through capital budget methods," says Reed, mainly as a result of habit rather than logic. There is a much better way, he maintains, and that is buying PACS with your operating budget instead.

"Radiology departments have traditionally paid for PACS functionality from the operating budget. Radiology departments have long been acquiring images [on film], archiving images [on shelves, in fold-

ers or jackets containing film and reports], transporting images [via couriers and sneaker-net rather than electronic networks], and managing the whole film storage and retrieval process [manually rather than with information systems]. These 'PACS' functions have been supported with operating budgets since the beginning of radiology. So why, when the hospital wants to replace a manual system with an electronic one, does it consider it a capital expense that must be presented and approved by the capital equipment committee? Why require what has usually been supported by

operating funds to be cost justified and supported by capital dollars and decision criteria?"

Reed says that because PACS is essentially an IT product, "the assumption is that it must be purchased through the capital budget process. A close look at PACS characteristics suggests that the operating budget may be more appropriate for acquiring PACS functionality. In fact, the high capital cost of PACS has been the greatest obstacle in the widespread adoption, implementation, and expansion of this technology. Capital budgeting has also been a major reason why installed systems have been inadequately configured and slow to deliver operating and economic benefits. Far too many PACS implementations compromised reliability and fault tolerance to project a more favorable return on investment to the capital budget committee. Then these reliability and redundancy issues made it impractical to eliminate film and to reduce the film-based system's costs."

Noting the trend illustrated by Alpena General Hospital's all-digital installation, Reed says that "most hospital executives include CR and DR as part of the PACS purchase decision, even though they are actually acquisition modalities. CR and DR generate revenues, have predictable life cycles of 7 to 10 years, and at the end of these cycles have a projected fair market value. Their disposable and service costs are also predictable."

For these reasons, he believes CR and DR should be financed as a straight capital purchase separate from the PACS, which should be part of the operating budget. "Capital funding lends itself to products with defined life cycles and predictable fair market values. Operational costs usually apply to disposable items and services, and reoccur yearly. Workstations, software, interfaces, archives, archive media, networks, and monitors have a relatively short useful life and little or no residual value. You can't capitalize components with a 30- to 36-month life span on a 5- to 7-year depreciation schedule. By structuring a PACS acquisition with a mix of capital and operating funds, a more positive outcome can be achieved."

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going wireless." The hospital has applied for a government grant to pay for the project.

Sylvester says PACS will enable Alpena to outsource reading, too, which is welcome news for the hospital's staff. "The radiologists are looking at nighthawk services. This is to give them a better life, basically, because now they're up all night."

### ► Budgeting outside the box

The penetration of PACS into hospitals today is roughly 20%. Part of the reason more facilities talk about PACS than buy one is cash, and who in the organization will foot the bill is sometimes a subject of heated debate.

At first glance, the primary beneficiary of a PAC system appears to be the radiology department. The logic that follows is that radiol-

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