

Why new medical technologies promise the world but fail to deliver.

By Dr. Shyr Chui

There's always some hype going around, the latest big thing, and how it's going to revolutionize everything. Well, in medicine, we're no different, and the subject of the current hype fest is of course Artificial Intelligence or AI. This is not an article about AI.

The advent of new medical technologies is not novel. Sure, in the last 2 decades, we've seen an acceleration in new med-tech development and an exponential rise in the numbers of available applications, but the concept of a new technology promising to make our lives easier harks back to the discovery of fire or the invention of the wheel. To be fair, fire and the wheel have revolutionized the human condition, I'll give you that, but a lot of new medical technology doesn't and so it's difficult to justify the hype. But this is not an article about early adoption, Gartner hype cycles or Roger's Theory of Diffusion.

In diagnostic radiology, the field where I work, we see a lot of new technology coming through all the time. New types of medical scanners get the lion's share of media attention but the two specific technologies that have had the largest impact on the quality of our service during my career, have arrived with a whimper and not a bang. These are the introduction of Picture Archive and Communications Systems (PACS) and later voice recognition reporting. Both have independently slashed the turnaround time for issuing medical imaging reports by 90% and together have reduced the turnaround time by a staggering 99%.

But, I hear all my clinical colleagues saying. Hang on just a minute. Why am I still waiting a day, or a week or even a month for my imaging reports to come through?

To answer this, let me take you on a little trip down memory lane.

In the early-mid 2000s, I was working for the UK's National Health Service, based at two hospitals in the Midlands separated by a 30-minute drive. These two hospitals were part of the same NHS Trust with common high-level governance and leadership, but each hospital had its own local operational infrastructure. The Trust decided, in common with every other imaging department at around that time, to move away from physical, film-based images and light box reading to a new common digital platform and PACS. At the time, the touted benefits were considerable. For starters, after digitization, all images could be available in multiple places at the same time. No more ED docs running to the x-ray department looking for a patient's film bag. Also, the digital acquisition of x-ray images would enable corrective, image post-processing and reduce the number of repeat studies due to poor quality. Less radiation for patients. Not to mention the elimination of misfiled films, missing films, film bag tracking and physical storage.

Image digitization would mean workflow changes for the radiologists. With film, the plain x-ray studies were kept in large, heavy paper bags containing all the patient's prior studies (plain x-ray reading is the most tedious and least desirable type of work a radiologist must do each day). After the technologists had x-rayed the patient, the films and film bags would be stacked on shelves in the back office waiting for reading. Depending on the urgency of the case type (ED cases most urgent, hospital outpatients least urgent) and when the radiologist had a half an hour to spare, they would visit the back office, pick up a pile of 30 film bags, take them back to their office, read them and dictate the reports either directly to a stenographer in the room or onto a tape. The mean turnaround time for reading radiology film studies was 30 days. Now with PACS, the digital images would be sent to the radiologist's office workstation for reading from dual high-resolution monitors. No more heavy film packets and no more light boxes.

The Trust decided to implement the same PACS technology across all its hospitals at the same time, including the two where I worked. After a period of training and following Go-live at both hospitals, an interesting phenomenon occurred at the two imaging departments. Over the course of a month, the backlog of plain x-ray cases to be read in one hospital imaging department disappeared and the mean report turnaround time for all imaging cases fell from 30 days to 4 days. At the other hospital, the mean turnaround time stayed at 30 days and then rose to 40 and then 50 days.

What was happening? The types of imaging studies performed before and after Go-live had not changed and all the radiologists were using their PACS workstations perfectly well.

The answer lay not in the technology, which was identical between the two sites, but with the two groups of radiologists (I was the only radiologist that worked at both sites, the others worked only at one).

You see, reading one x-ray takes a radiologist one minute. With film, the radiologist, when finding themselves with a spare 30 mins, would go and pick up a pile of 30 film bags and then read them as a batch. With PACS, the images are already on your workstation so now you can now read one x-ray in one spare minute. A radiologist has many more, free, single minutes in their day than free 30-minute blocks. The radiologists at one hospital started interleaving their plain x-rays with all their other work such as reading CT scans, MRI scans and ultrasound studies. This elimination of “batching” plain x-ray reading resulted in a precipitous fall in report turnaround and clearing of the backlog.

At the second hospital however, the radiologists stuck to their old workflow. They still waited until they had a spare half hour before switching to reading some cases from the plain x-ray worklist on their workstation. The general belief that any radiologist could access the same, plain x-ray worklist, somehow helped justify not loading a batch to read. Also, the visual reminder of seeing piles of film bags building up in the back office had now gone. Instead, there was simply a number indicating the cases still to read on the edge of the screen which didn't give you the same guilt trip. Furthermore, after that number hits 300, it doesn't feel proportionately worse when it hits 350 or 400. The reluctance of the second hospital's radiologists to change their workflow meant their report turnaround times remained unchanged after Go-live and the lack of physical reminder cues drove them even higher.

Which brings us back to the present with a valuable lesson. It's **not** the technology that will make our working lives and our patient care better, it's how we **use** it. If we insist on keeping our workflows and processes the same but just add in the technology, it will fail to deliver what it promises. Instead, all the outsized gains will come from the new workflows we can develop with the new technology. We mustn't then continue to insist that all new technology do exactly what we want and fit in with exactly how we've always done things, but instead learn to find new ways to leverage the technology. This requires a little imagination and a different mindset focused on continuous quality improvement. So, should we believe all the hype around new tech? Only if we're willing to do our part and hype the opportunities that come with it.

Shyr Chui is a radiologist and the Physician Quality Improvement Champion at the University Hospital of Northern British Columbia.

If you'd like to find out more about how a quality improvement approach can help you improve your work or solve a problem in your department visit our website at www.nhpqi.ca