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On the Threats to Imaging.... Should We Be Worried?

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Key Points

- Imaging has been at the forefront of innumerable technical developments over the last two decades.
- Radiology was the lead in developing CT and MR, and led the charge into the transition to digital in the '00s.
- However, in recent years, imaging changed from being a profit centre to a cost centre, inpatient care was deemed too expensive, and outpatient care was the way to go. This has affected imaging in many ways.
- When the prevailing thought is that imaging is slow and cumbersome and expertise is not always easily and readily available ('not at the table'), the idea that "we can do it better ourselves" threatens to take hold. This creates threats for imaging.

The older one gets, the more reflective one becomes. Especially upon retiring, taking stock is not unusual I feel. One might thus ask themselves, what contributions have been made, what insights have been gained, and which of my experiences might be of some use to the next generation of imagers?

There is no doubt imaging has been at the forefront of innumerable technical developments over my 40 years of practice. Since the early '80s, the diagnostic armamentarium has expanded exponentially, leading to an unprecedented ability to be the central cog in the diagnostic process.

One might think this will continue, with personalised medicine and more insured patients likely leading to more imaging tests. But as with all things, there are some downsides, maybe even threats, to these developments in the field of imaging.

How We Got Here

Let's begin with a fact: there is rarely a diagnosis made or rejected in the hospital without input and support from imaging, with the possible exception (research is ongoing) of psychiatry and dermatology.

Almost 50% of all inpatients interact with radiology at least once during their hospital stay - and the number of imaging interactions is much higher when outpatients are considered. And in more than 50% of patients presenting for medical care, the imaging results decide the further course of medical/surgical action. This is partly what makes - and has made - imaging such an attractive career.

We also have the neatest tools, but they are also (at least perceived as) the most expensive ones. Radiology was the lead in developing CT and MR, and led the charge of the medical realm's transition from analogue to digital data acquisition, storage and distribution in the '00s.

In the '70s and '80s, we were all familiar with bins of film jackets, often left overnight to be looked at the next day. Reports were attached to these film jackets a few days later, infrequently if seldom read. If a clinician wanted to have a result before this trajectory was completed, he or she would have to come to the reading room to discuss the case. Concurrently the development of the digital patient record (Electronic Patient Record, EPR) allowed the diagnostic process to speed up even more.

Indeed, this was a wonderful development. Imaging was proud to be leading in these developments until the early 00's. Not so much now though, IT departments having taken over. It may turn out that we have been so far in the front that we have forgotten to look back at those we were leading.

Over the last two decades or so, the world has also changed in a few very distinctive ways. First, social change and media have fostered a prevailing attitude of 'I want it now, or earlier.' From news, to opinions, to results of anything at all, speed of delivery and sound bites seem to prevail over contemplative, careful thought and analysis. The younger generation types quickly and error-free, is connected all the time, and wants their lives to be fast paced, ready for the next thing that comes along. And yes, this plays out in imaging as well.

Secondly, during this time, we can no longer ignore the sobering fact that in the U.S. we spend $1 out of $5 on health care, as opposed to an average of $1 in $8 to $10 in the European Union (EU). Along with the troubling statistic that millions of people in the U.S. have no access to healthcare at all has led to slow

steps toward a form of national health care solution, step two of that process being the ACA.

The result? Imaging, perceived as expensive, evolved from being a profit centre to a cost centre. Cost cutting became prevalent, inpatient care was deemed too expensive, and outpatient care was the way to go. This has affected the practice of imaging in many ways.

Less Imaging (or More Indicated Imaging)?

To 'lower' the imaging bill, several strategies took hold:

The insurance companies simply started paying less for the service. In the last two decades, the professional reimbursement of all we do plummeted—for a chest radiograph, roughly 90% during the last two or so decades. Attempts at reigning in healthcare costs through bundled payments as well as capitation, as ongoing alternatives for the traditional fee-for-service model, have further eaten away at how imaging gets paid for. Particularly in Europe, capitation has developed apace, leading to a form of 'rationing' of care. Some form of that will evolve in the U.S.

Thus, transforming the imaging department from a profit centre to a cost centre for hospitals was the inevitable result, not in the least aided by the decreasing technical component for imaging reimbursement to hospitals. This makes imaging, imaging (and its machines) perceived to be "expensive," and thus thought of by non-medical 'managers' as expensive. All of this may further the notion that imaging is 'just a com-modity' to be traded for a cheaper or more efficient model. As a former CEO once told me: 'if your radiology department makes us money, we will not bother you.'

The other cost-cutting method has been to require preauthorisation of the more advanced, thus more expensive, imaging studies such as CT and MR. This is now a common occurrence if the study is not ordered by the emergency department (ED). And so we have the following scenario: Imaging departments cannot proceed with scheduled studies without approval by the payor leading to extra work on all sides, inefficiency and increased labour costs.

At the same time, referring clinicians increasingly send patients to the ED so imaging can be done more speedily, without preauthorisation. This is why we image so much in the ED, yet we are surprised that ED's are overcrowded. Add to that, in this malpractice environment especially, that we cannot afford to send a patient home with a wrong diagnosis and it is more expensive to do imaging in the ED.

This leads, most distressingly, to frustration and adversarial situations between the imaging department and referring clinicians where there used to be collegiality. Of course imaging attempted to remedy this. To try and improve the dialogue as to what imaging is best in what clinical situation, as well as to bridge the literature-based evidence between specialties, imaging initiated best practices, also known as the appropriateness criteria. These developed out of multi-specialty committees that addressed which imaging modality is best for what clinical indication. Unfortunately, in many cases, this has proven to be another bone of contention - often specialties are not even aware these criteria exist, and many have not readily accepted them. It's a classic case of too many cooks….

Who Does the Imaging?

A common perception in imaging is that it is used as a stethoscope and, as an extension, fosters the loss of the "art" of medicine.

All too often, imaging is done first, before anyone has examined, let alone taken more than a token history of, the patient. Scenarios abound: barely trained physician extenders ask walk-in patients where it hurts and fill out the imaging requistion form; ambulance/helicopter staff decide, often in the field, what needs to be done once the patient arrives at the ED; shift hospitalists order imaging studies not knowing (or bothering to look up) whether previous studies were done or what the report of previous studies said. Meanwhile, the volume of imaging grows unabated.

This is compounded by the fact that ordering imaging studies in the EPR can be cumbersome, thus perceived as slow. A final report can take "a while" (not further specified, but really expected right away). And reaching someone in imaging can be quite a challenge, as well as the reverse.

When the prevailing thought is that imaging is slow and cumbersome and expertise is not always easily and readily available, the idea that "we can do it better ourselves" takes hold.

This plays out in at least two distinct threats:

1. On the radiation side, radiologists traditionally have to become licensed in order to perform the imaging itself. But slowly other image-interested specialties are encroaching: for instance, orthopaedics can now install their own CTs and hire a radiologist to oversee the imaging, bill for it and finalise a report. The same is true for cardiologists/cardiac surgeons, where we tenuously hold on to a 'cooperative' management of the studies and reporting of these studies together, also neurology specialists, who are even more involved in the neuro-interventional realm and, in some institutions, totally in control of the imaging/IR rooms. Neurosurgeons have a real need for post-processing of CTs and MRs, to define the opera-tive path. Some centres have developed post-processing labs for this reason, to lessen the burden on the reporting radiologist and serve the image-avid specialties like cardiology, neurosurgery and orthopaedics.

2. On the 'non-radiation' front, ultrasound (US) and magnetic resonance (MR): for the former one needs to look only at the modern ED staff, doing their own (FAST) imaging and gradually being allowed to bill for it by hospital administrators. This development is aided by reams of emergency room imaging papers being published in non-traditional (and not always peer-reviewed) imaging journals.

Much of what is happening in CT is valid for MR as well. MR centres run by non-imagers are more and more common, opening the door for non-imaging trained specialists to muscle in on imaging

territory.

3. The day cannot be far away, I fear, that the clinician will simply ask the imager for the raw data of the study and do their own post-processing, reconstructions and pre-op planning.

Today's Reality

During the last decade-plus, imaging commendably confronted its "image problem." Radiologists understood their profession needed to be more visible to referring clinicians and patients themselves. After all, oft-quoted, when you are not at the table, you are apt to become the main course!

The solution was sought in 24/7 availability, in person, through teleradiology or a hybrid form. This, however, puts a tremendous strain on the imaging department, both on personnel (night shifts, reviewing teleradiology reports the next day) and on productivity, with risk for interpretative mistakes occurring when radiologists work too fast or with less attention. After all, other specialty faculty rightly insist on imaging faculty during 'off-hours'!

For some imaging departments, an answer is to decentralise the reading room, putting neuroradiology on/near the neuro floors and the chest imagers near the ICUs.

This stress on the imaging personnel cannot be understated. It is well documented that overnight shifts are physically hard, disruptive to family life and lonely. In imaging, two to three years is the typical "lifespan" of these night workers, and almost all will want to revert to regular work hours. Where do we find replenishment for these professionals in a market where "part-time" is embraced in the majority of young graduates from medical school? Where the new generations prize their 'away from work' time much more than decades ago?

Ever higher volumes of imaging studies also do not lead to increasing revenues. Radiologists who have to report these studies simply cannot keep up, in both the volume and their energies - which leads to the inevitable, growing complaints from clinicians. Is the next step radiographers interpreting and final reporting cranial CTs, as is happening in the UK? Or nurses doing the same for skeletal trauma, like in Scandinavia?

No wonder burnout among imagers is at roughly 40% and rising fast. Anecdotally, it's just no fun anymore, leading ever more imagers to even retire from the profession.

Question of Quality

There also simply are no reproducible quality measures for imaging, especially in a society where numbers rule. Yes, we measure how fast a study can be scheduled, performed and dictated, but there is no standard turnaround time generally accepted, thus usable, as a quality measure.

Even more vexing: what constitutes a good imaging report? Is it accuracy? If so, how do we measure this? Is it speed? (Is a 30-minute turnaround time good or bad?) How about legibility? Can the referring colleague read it and comprehend it? Should it be structured or free text? And what about the lay-person reading their own reports - should we tailor the report accordingly?

Then: wrong sidedness. In the old days, a patient might come to radiology with a requisition that reads "right hand," except that the bandage is on the left, and the pain is also, according to the patient. The technologist would cross out "right" and insert "left" and do the imaging. Try that today! Trying to reach the requesting person is time consuming (for both parties) and prone to irritation. However, the statistics on this "wrong-sidedness" are kept as a quality measure.

Even more difficult to talk about is the quality of training for our trainees as a result of all these threats. Do they get the chance to develop? Practice our craft under adequate supervision? Formulate their own thoughts in preliminary reports, or is there no time for that these days?

Is Artificial Intelligence a Threat?

In no other field of healthcare are the inroads of big data (sets) more evident, and Artificial Intelligence (AI) strikes at the heart of imaging practice.

Have you noticed the ads that pop up on your phone or computer relating to a site you just visited? In imaging, it will grow into a major threat: imagers do spatial recognition yet AI does it just as well. (I recommend you watch 'the Social Dilemma' on Netflix. Disturbing!). Algorithm (deep) learning will allow for machines to ever improve in the detection and interpretation of data. Many routine imaging tests can thus likely be done as well, if not better than, the trained imager. Will it be just the routine imaging that is at risk, or even the complex imaging we do?

Future Shock

Clairvoyance is needed. I am an optimist at heart, love my (paediatric) specialty, but I have a hard time seeing anything but mammography, interventional (IR) imaging and paediatric radiology surviving these threats long term.

Why these three? As to mammography - no breast surgeon or oncologist wants to do screening, and thus are quite happy with the mammography expertise, as well as the pre-op localising skills of mammographers. IR is not likely to take that aspect over. AI on the other hand does need the human input (on-site presence) in this field, at least for now. Thus my confidence that mammography will be around for a while yet.

IR, and mammography also, will have to address the increasingly importance of the liquid biopsy, where a simple blood test will screen for oncologic diagnoses. Non-surgical tasks performed in the imaging department will likely remain cheaper than the operating theatre based interventions, thus likely securing this 'partially clinical' part of imaging a longer lifespan.

I know I am subjective, but paediatric imaging is unique. It takes special people to deal with kids, and the respect still generally enjoyed by paediatric imagers will likely guarantee long-term cooperation and survival of this sub-specialty.

Yes, I am worried. I hope I am (mostly) wrong. Unfortunately, the adage that your achievement of today is your baseline of tomorrow may not hold for imaging, as a whole, going forward.

Conflict of Interest

None.