Measure for Measure

by Sasha Henriques

The IAEA is drafting guides for proper use of diagnostic imaging technology

There has been a boom in the use of ionizing radiation for diagnosis and treatment of illnesses all over the world. This is generally good, contributing to accurate diagnosis of disease and preventing unnecessary exploratory surgery. Research has shown that with these tests there is a tendency towards overuse, and up to 50% of the machines involved in these procedures may not be set up correctly. Jim Malone in the IAEA's Radiation Protection of Patients Unit addresses some of the possible risks.

Question: Patients sometimes get too much radiation. Does the equipment have to be old for this to be a problem?

Jim Malone: No. I know of very new digital equipment which was set up in two clinics. For a long period patients were getting eight to 10 times the dose they needed because the equipment was set up that way, and the technologists didn't notice.

This is a big problem with digital equipment — you get a perfect image every time regardless of the dose. It's not like film where you're guided by an image that's too dark or too light. Digital systems pull the image into an area where it's nicely visible no matter what the dose.

A big problem with older equipment was that you'd get a dreadful image and have to repeat the procedure. But with modern equipment you get a nice image no matter what and you may be getting it at the right dose, at half the dose, or at 10 times the dose.

Question: Where does the problem come from?

JM: If you don't have well trained technologists you get much more of this type of thing. You need staff, maintenance, and quality assurance, all of which have a very high overhead in training. Modern equipment is very particular. You need people who are well trained on the specific machine that they're working with.

That's a bigger problem today than it was 20 years ago. Then, the equipment was fairly generic and didn't have a lot of possibilities. It couldn't do as much, but you couldn't go as far wrong with it.

You also have problems if you don't have the equipment regularly maintained. This is a bigger problem in developing countries because they often don't have the budget to sustain the equipment.

But even in the best funded and best resourced places, to make sure the equipment is doing what it's supposed to, you need a quality assurance programme. So one of the things the IAEA advocates is having a good quality assurance programme for whatever equipment you've got.

Question: What are good Quality Assurance protocols?

JM: Studies have been undertaken to find out what is the best technical and clinical way to do a chest radiograph or a paediatric CT scan of the abdomen for example. The information is available, practitioners just need to use it. Good radiology involves a partnership with the industry which supplies the equipment. In diagnostic radiology the relationship between the industry and users in clinics and hospitals is not entirely satisfactory.

There was an audit done in the Nordic countries that found that roughly 20% of the examinations were of no value to diagnosing or solving the problems patients were experiencing. There was also a survey done in an American emergency room which found that 45% of the examinations weren't of any serious value.



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If you have lower back pain for example, and you go to your doctor and he recommends that you have what's called a lumbar spine x-ray, the only thing you can be sure of, is that that x-ray is normally not so useful. Lumbar spine x-rays are high dose examinations, and unless you have other complicating factors, they will tell absolutely nothing that's of any value in deciding how the back pain will be treated. It's really like a placebo.

So the first step in any protocol is: "Is this examination of any use? Is it worthwhile?"

The next aspect of the protocol is that for heavier people you need more x-rays than for small people. So your protocol should include adjustments for the size and shape of the person.

It's well known for example that for years children were receiving much higher doses than they needed because with CT scanning, the same protocols were used for children as for adults. This is now improving.

Question: What is the IAEA doing?

JM: This is an issue that we're putting a lot of effort into. The key is to distribute information and develop good protocols. We are producing publications, training materials, courses and advice on our website to meet these needs. This includes trying to get good protocols suitable for children, and which are size-dependent in adults.

But it's hard to give a simple answer because the field is developing all the time. And as soon as you've got one problem sorted out another one crops up. So, as soon as you've addressed the issues plaguing plain radiography with film, film goes out of style and you have digital imaging. As soon as you've solved issues with digital imaging and film, they become less important than CT scanning. And you sort CT scanning out in an environment where MRI is beginning to find a foothold.

So we're shooting a moving target. Trying to create patterns of stable good practice in an evolving field is very difficult.

Also, one of the weaknesses in trying to set up quality assurance programmes is that it demands highly trained technical input that isn't always easily available to a hospital.

Question: If doctors know that the scans you mentioned earlier are useless, why do they keep ordering them?

JM: The reasons are grounded in all kinds of things that are common to all forms of human behaviour.

- People get into the habit of doing them. For example, there's a really strong habit of doing chest x-rays for people seeking employment and for people going to the operating theatre for surgery. In western countries neither of those practices has any value unless people have other symptoms. They only add to the radiation burden.

- Protocols are not up-to-date.

- There's often an economic/business incentive to do the scan even though it's useless. That's obviously in systems where medicine isn't socialised.

- Knowledge sharing isn't good enough. Creation and dissemination of knowledge is an area that needs a lot of work. Because valuable knowledge is local, just as patterns of disease and treatments are local. What's the best answer might not be the same in every part of the world. You might have very good MRI equipment but an inexperienced team. So it might be better to go for a CT scan, because then at least you have a chance of getting the right answer.

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