



The increasing role of bioengineering and medical physics in the practice of medicine

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This issue of the *NZMJ* contains a paper presenting the safe introduction of a medical device into Auckland Hospital.¹ This paper raises the entire issue of medical devices (which are technology integral to modern practice, both patient diagnosis and care) and the importance of practitioners having a broad understanding of technologies to enable them to work with staff who assess and mitigate the risks associated with the new technologies.

The article studies the introduction of RFIDs (radio-frequency identification) for tracking of inventory within an Auckland ICU. The authors demonstrate that under normal circumstances the system is safe and causes no interference with the other equipment within the ICU. However, by exploring extreme circumstances they found non-real world situations where their equipment could fail.

The article is significant for two reasons. Firstly it confirms that the new technology is implemented in a safe way within a New Zealand hospital. Secondly, and more importantly, it highlights the medical professions' increasing dependence on technology and devices, thus raising unfamiliar risks and responsibilities for many medical practitioners.

Dependence on technology extends from diagnosis through to treatment. Our hospitals and care systems rely on technology to track and organise patients, and to disseminate tests and results. Our medical research is also highly dependent on medical physics and bioengineering. Computer modelling and imaging are of growing importance across many disciplines.

A common example is diagnostic radiology. Commonly the image is digital from the time of acquisition, through to its eventual display and radiologist reporting. Digital images and reports are disseminated to the referrer. While there are clear benefits, this digital pathway has introduced some risks that may not be recognised by clinicians. For example, a referrer may have access to a study moments after it was obtained and well before it is seen by a radiologist.

While many benefits flow from this early access, many referrers are not aware of the pitfalls that they may encounter on their remote viewing station. Common pitfalls include incorrect monitor setups or image viewing parameters that can lead to a significant finding being overlooked.

In the interpretation of diagnostic imaging, while the referrer is not expected to be able to understand the nuances of digital image display and image manipulation, there is a requirement for them to have basic computing skills and access to technical support so that they can safely operate the system.

The diagnosis and treatment of some patients can be solely based on medical devices—e.g. obstructive sleep apnoea may be diagnosed by a medical device such as

a pulse-oximeter used during sleep. Treatment is then another medical device, a home CPAP machine. While most practitioners are trained in giving advice on medication safety, few have training to allow sophisticated advice on the optimal use of such devices and any potential hazards that may occur secondary to device malfunction from external factors.

Another area where the roles and responsibility of practitioners is changing, is the increasing use of electronic systems to organise and track patients and their therapies. In a hospital setting this includes ordering of testing and viewing results. In future, computer systems are likely to become the norm for drug charts and patient notes.

Up until now, practitioners have understood the system they use (e.g. paper notes) and are able to identify system errors. As these systems become more complex, practitioners hand over responsibility for design and specification to support staff. Thus an important input into system design and safety is lost. In my radiological practice, 5 years ago we had film packets containing a patient's studies.

If a study was to "fall off" the reporting pile and get lost behind a desk a single patient's study might go missing. Awareness of these problems allowed radiologists to develop departmental systems to prevent problems. However, now an error in the computerised work list could allow thousands of patient exams to remain unreported without being noticed.

Unfortunately with computerised systems, practitioners often retreat from involvement with the system design and specification. This can leave the support staff guessing at the relative importance of features and safety checks when buying or commissioning systems.

For general practitioners implementing electronic record systems, a broad level of understanding is required in appreciating computer security and data archiving requirements so they are able to engage with the computer vendors.

In summary, technology is playing an increasing role in the diagnosis and care of our patients. This trend will continue. Practitioners need to have a broad appreciation of the technology they use. In particular they need to understand the benefits as well as the potential risks that that increased technology brings both at the patient level and at a systems level.

In all of the above examples, including the RFID paper in this issue, having a broad understanding of technology allows practitioners to work closely with groups developing and implementing care systems. This can only be good for the patient.

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Reference:

1. Houliston B, Parry D, Webster CS, Merry AF. Interference with the operation of medical devices resulting from the use of radio frequency identification technology. N Z Med J. 2009;122(1297). <http://www.nzma.org.nz/journal/122-1297/3657>