Improve IT … improve health

Preventable harm is one of the top three causes of death, alongside cancer and heart disease. It is costly to patients, to staff, to the NHS, and to the UK as a whole.

- IT problems (including cybersecurity risks, use error, and inefficiencies such as inadequate interoperability) are known causes of error leading to harm.
- Error happens primarily because we are unaware of it — until it is too late. This is true both of clinical IT error and IT design error.
- Error is hard to reduce when it is looked at on a case-by-case basis: scapegoating individuals is easier than addressing system problems.
- Our research has shown that ignored error in IT is widespread — affecting everything from infusion pumps to hospital IT systems. Many opportunities to manage error (to detect, block, mitigate or recover) are lost.
- IT is universal in healthcare and errors can cascade. Improving IT will reduce harm and improve quality across healthcare.

This briefing suggests a powerful way forward.

IMPROVEMENT FOLLOWS CULTURE CHANGE

Car safety has been transformed, overcoming major manufacturer resistance in the 1960s. The culture changed from "drivers have accidents ***so it's not our problem***" to "drivers have accidents ***so cars and roads must be designed to be safer***." Similarly, to improve IT for healthcare, we have to make its weaknesses and the causes of those weaknesses obvious to all stakeholders. A labelling scheme makes the key issues visible to stakeholders, and therefore drives culture change.

ALARMING EXAMPLES

Calculations are a core part of care delivery, and calculation errors are a common cause of preventable error. On the other hand, IT could do calculation perfectly — calculation is what IT was originally invented for! Yet all calculators (office calculators, calculators in infusion pumps, etc) have serious design flaws. Although DELETE is a natural way to correct error, it is not available on all calculators; and when available it is often implemented incorrectly — try 0••DELETE 5, which causes a ×10 error on many devices.

More generally, number entry (e.g., for drug doses) fails to comply with the basic Institute for Safe Medication Practices (ISMP, based in the US) guidelines on **every** device we have studied.

These are basic problems that are persistent and ubiquitous. Vendors are using obsolete development processes causing unnecessary loss of quality that users do not notice. It induces error that is inadequately investigated, and the wrong causes blamed often to the detriment of staff. While the real causes are not identified, patients, staff, and healthcare quality suffers.

The next two pictures, overleaf, are typical examples of often-overlooked problems.

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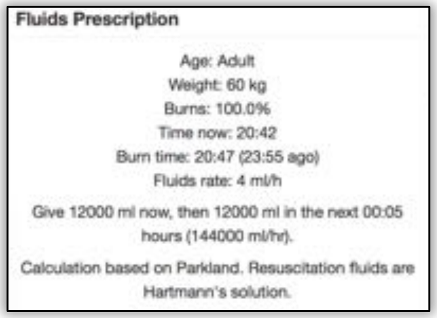
← Carefusion's flagship Alaris PC modular unit

Is this PCA pump module delivering 9 mL per hour, or 9 mg per hour?

The fixed labelling is contradicted by the program display; probably due to inadequate situated testing, itself due to poor programming practices.



← Screen shot from the award winning Mersey Burns app

Recommended infusion is an average 144 litre per hour, after 12 litre in the first 5 minutes (which alone is 2.4 times a typical adult blood volume of 5 litre). This is a faulty calculation with no sanity checking, and is due to very poor programming practices.

Mersey Burns is self-certified CE marked. Whatever blindspots the developers have are not challenged in self-certification.

← Abbott handheld blood glucometers

A criminal trial against two nurses, relying on IT-based evidence, collapsed because of IT errors.

The IT was poorly programmed with no end-to-end checks, and Abbott themselves unwittingly deleted critical data. An advert for the glucometer (shown left) says the device provides "lock-out technology" to help ensure compliance, which implies nurses are at fault. The feature, amongst others, failed to work.

There are many other examples, such as the poor quality of alarms and the unnecessary complexity of user interfaces generally that are as problematic, but harder to describe clearly in a short briefing.

TRANSPARENCY

There are many measures of IT quality, and we can add others specifically related to safety and use error. Following well-known quality improvement initiatives (e.g., labelling schemes to improve energy efficiency of white goods; quality of car tyres; restaurant food safety), we argue that every IT product should have a simple, visible IT quality rating.

When incidents occur, the fact that some devices in the proximity are recognisably not "perfect" (they are confusing or wrong) will improve error reporting. Rating schemes could be combined with QR or similar codes, so reporters can photograph the device description and include it in an incident report for automatic analysis.

QUALITY IMPROVEMENT IN OTHER INDUSTRIES

Safety ratings can be voluntary or required by regulation. The Food Standards Agency's hygiene rating is interesting in that it is voluntary, but its absence suggests there are problems. None of the rating systems shown below impose any particular techniques for improvement, but they all create market pressure for suppliers to improve how they see fit, because the customer in the transparent market is enabled to make informed purchases. The energy rating label also shows how ratings are adapted over time to accommodate market improvement: it now has extra ratings (e.g., A+++) above the original plain A.

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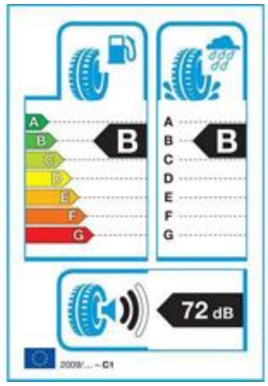

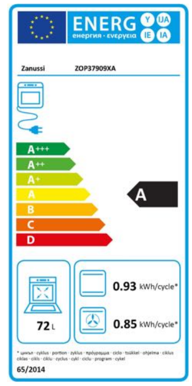

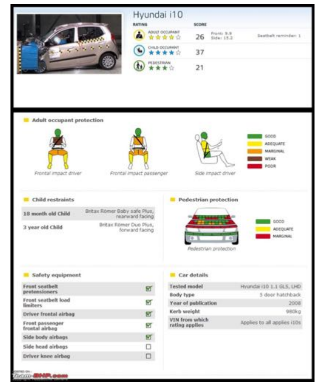

SUMMARY

IT is too often uncritically presented as a "solution" (e.g., **just** go paperless, **just** be interoperable) but the reality is that improving IT quality is a long-term challenge that requires a culture and regulatory change. It requires healthcare and IT to align, not just to play catch up. Currently the market is not transparent, and buyers cannot choose safer systems even if they want to.

When IT induced error is not monitored or reported as such, this perpetuates the myth of IT as a side-effect free solution which then makes it even harder to notice IT induced error.

All clinical interventions should be based on evidence, because we recognize that interventions may have side-effects in different ways for different patients. IT, too, is an intervention that needs to be based on best evidence, because it too has side-effects (inducing error, availability, lack of interoperability, obsolescence, etc). We have already developed a basic risk matrix label to help an NHS Trust in procurement.

An estimate of the risk and severity of IT side-effects must be visible at the point of procurement and point of use. This will improve healthcare: by enabling procurement of the most effective IT and by putting market pressure on vendors to further improve. Importantly, it will also transform incident reporting to be more systemic as it becomes obvious that incidents are not solely human problems, but that IT systems also play a significant role in incidents.

WHAT NEXT?

We have run several professionally facilitated, high-level meetings bringing clinicians and top computer scientists together. These have been very successful, because these are computer scientists trying to solve problems rather than trying to sell solutions. Some worked in aviation and security: both industries with more mature, high quality IT practices. We also need human factors, health economists and sociologists engaged.

The problems are not easy, but they deserve a long-term, thoughtful plan to help healthcare improve. We envisage a series of meetings developing an evidence-based consensual labelling system, probably best driven in collaboration with the Royal Academy of Engineering, the Health Informatics Unit (Royal College of Physicians), the MHRA, and the NICE medical technologies evaluation programme.

BACKGROUND …

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See CHI+MED http://www.chi-med.ac.uk for a larger bibliography, many insights and results.

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