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Redesigning systems for fundamental improved infection prevention and control

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> 'Every system is perfectly designed to get the results it gets.'
>
> Paul Batalden

This oft-repeated quote from an international leader in healthcare improvement, reminds us that when results are poor, it is almost always the case that the underlying systems are poor.

Multiple articles in this edition of *Healthcare Infection* reflect the challenge of system redesign that must be confronted if we are to improve infection prevention program results, and the ongoing costs of not doing so.

When isolation precautions are not correctly applied to an infectious case of measles presenting to a teaching hospital, how many of us have sighed? Shaken our heads at a 'failure' of colleagues in the emergency department (ED)? Lamented the lack of familiarity of young clinicians with a classical presentation of an important disease? Suggested that the undergraduate medical curriculum needs revision? Made a mental note to include measles in next year's intern orientation talk and raise awareness with ED staff? However, it is much more realistic and constructive to recognise that in general, we have archaic and *ad hoc* systems that are designed perfectly to get the results they do.

In general, performance in healthcare relies on well-meaning clinicians working under pressure in poorly designed physical environments to not only consider and respect the individual needs and circumstances of patients and carers they meet, to interact constructively with other members of the healthcare team, to navigate disjointed and fragmented networks of service providers, to document their thoughts and actions accurately, but *also* to consistently recall countless relevant facts and figures accurately and instantly, and then remember the correct action to take based upon this recollection. We have yet to invest sufficiently in designing systems to support healthcare workers in reliably producing excellent performance. We, and our patients, deserve better.

Reliability in healthcare

Reliability is the probability that a system will consistently perform as designed. In healthcare, it is defined as 'the capability of a process, procedure, or health service to perform its intended function in the required time under commonly existing conditions'.[1] It is providing the right care to the right patient at the right time.[2] A patient with measles (or tuberculosis, chicken pox or methicillin-resistant *Staphylococcus aureus* (MRSA)) admitted to hospital *should* get an appropriate diagnostic test and isolation precautions applied to protect other patients and staff. Healthcare workers *should* have pre-employment screening and appropriate vaccination. A patient having a hip replacement *should* get the correct type and dose of antibiotics given at the optimal time to prevent infection. All healthcare workers *should* follow international standards for hand hygiene in the workplace. All these processes *should* reliably occur, but don't.

With highly educated and motivated staff, and a superabundance of evidence to guide practice, why does this happen? There are multiple underlying causes, including the following:

1. Use of improvement methods that are ineffective strategies, and do not recognise the nature of human fallibility. Traditionally, in healthcare, improvement is expected to occur if individuals pay attention and work harder (e.g. talking to the staff involved in an error or misdiagnosis as 'feedback', writing a reminder for a staff newsletter, highlighting measles in intern orientation, displaying staff vaccination posters in the staff room).
2. Lack of visibility of the problem to individual clinicians. In the absence of transparent and credible performance monitoring, poor reliability isn't visible. How many healthcare workers knew hand hygiene compliance was so poor before audits commenced?
3. Clinical autonomy allows wide performance margins.
4. Organisations fail to respond to errors in a manner that prevents recurrence. Rewriting a policy or disciplining an individual healthcare worker does not prevent recurrence.
5. Processes are rarely designed to meet specific goals of reliable performance over time.[2]

Designing for reliability

Consider how you have developed reliable systems in the everyday life of you or your family? How do you find your

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car keys? How do you remember to bring reusable 'green' bags when going to do the supermarket shopping? Telling your spouse or children to remember next time is obviously not going to be a successful strategy. Having a designated place to put keys or a large colourful key ring, having green bags in a prominent storage place outside the front door or stocked in the car boot are more sophisticated solutions that incorporate understanding of human error and fallibility.

Resar *et al.* from the Institute for Healthcare Improvement have created an approach to support redesigning for reliability in healthcare.[3] Such resources provide practical advice for those working in infection prevention who are frustrated with seeing the same errors or omissions occurring again and again.

Redesign strategies that incorporate human factors include:

- avoiding reliance on memory;
- using constraints/forcing functions;
- using protocols and checklists to generate standard care;
- decreasing 'lookalikes' and 'soundalikes';
- reducing the number of handovers;
- automating carefully; and
- taking advantage of habits and patterns.[3]

Papers in this journal suggest useful redesign ideas for reliability could occur in infection prevention and control.[4,5] For example, in most Australian EDs, clinicians enter a presumptive diagnosis into an IT system. As well as using this data as a surveillance system, it could be used to provide automated prompts or notification to remove reliance on memory and build into existing work patterns. For example, on entry of the diagnostic code of 'Influenza' or 'Measles' or 'tuberculosis', an automatic pop-up could be triggered, alerting the healthcare worker to appropriate tests to perform and infection control precautions to apply. Other possible innovations would be adding a 'forcing function' that requires action or acknowledgement before proceeding to the next screen, triggering of an automatic SMS to infection control staff or an automated diagnostic test request.

Despite evidence that these approaches to quality improvement work in practice and improve patient safety, they have yet to be widely adopted. Checklists to guide central line insertion and for use prior to surgery are prominent recent examples of human factor-based process redesign that demonstrated significant beneficial impacts for patients without any additional cost.[6] However, three and a half years after the publication of the paper by Pronovost *et al*., the use of central line checklists is not uniform practice in every Australian ICU.[7]

We get the results our system is designed to produce. If we want different and better outcomes, we need different and better systems. These ideas and skills should become part of the armamentarium of all of us aiming to continually improve infection prevention and control.

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