Aetiology of hospital setting adverse events 2: 'clinical futile cycles'

Introduction

The first (p. C170) of these two articles examined the James Reason model of 'Swiss cheese' that to date has been the predominant theory to explain health-care adverse events (Reason, 1997). It described the limitations when applied to hospital systems, with specific reference to the 'deteriorating patient' – the final common pathway for most adverse events when patients suffer harm.

This article proposes 'clinical futile cycles' as a model for the explanation of many hospital setting adverse events. A clinical futile cycle describes clinical activity and actions that do not help or improve a patient's condition (Buist et al, 2007; Buist and DeVita, 2010). In this model weight is given to the influence of the variable nature of the hospital micro-culture and, in particular, the traditional hierarchical referral model of care that occurs at a departmental, unit and ward level. Clinical futile cycles best describe hospital setting adverse events where causation is complex, prolonged, and there is involvement of numerous clinical staff across profession, discipline and seniority. Root cause analysis of these complex adverse events with the lens of the clinical futile cycle should lead to recommendations and interventions at the level of the individual clinician, clinical team, and ward or unit.

This article first describes what a clinical futile cycle is and the evidence to support this model. It then takes a previously documented and actual (Buist, 2011) severe, hospital adverse event, and analyses this event through both the lens of the Swiss cheese model and that of clinical futile cycles. It concludes by recommending the use of the concept of clinical futile cycles to better understand more complex hospital setting adverse events with the aim of designing interventions that are more focused on a hospital's core business; the patient and the staff who manage that patient (Bodenheimer and Sinsky, 2014).

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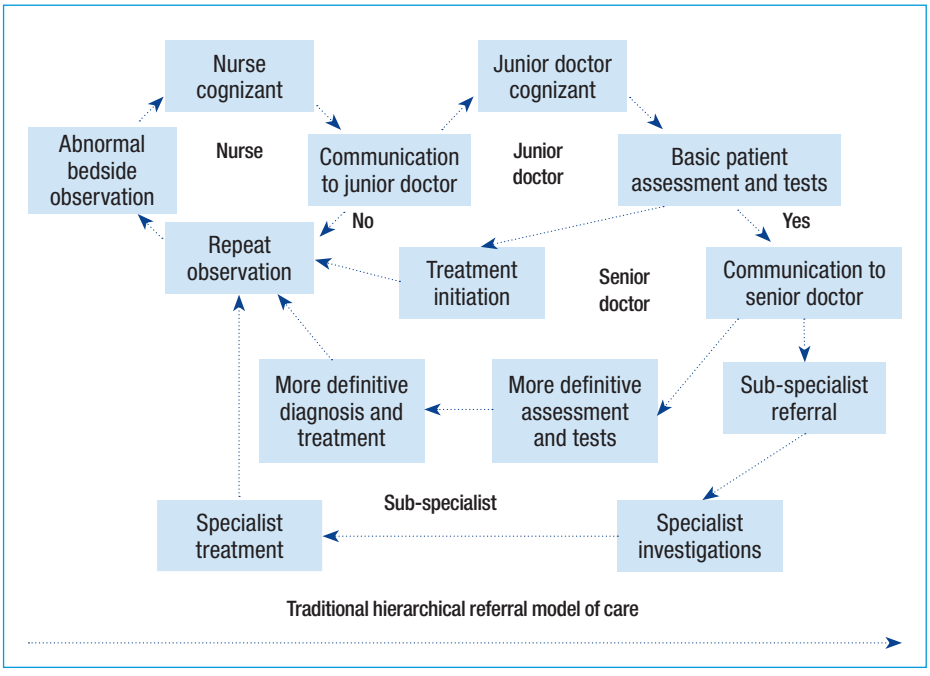
Clinical futile cycles and the traditional hierarchical referral model of care

The term 'futile cycle' is used in cell biology and biochemistry to explain the conversion of one substance to another and back to the original substance by two, always on, reciprocal enzymatic pathways. However, despite the enzymatic activity and energy utilization there is no net output or gain from this energy-consuming and active process. This is exactly what we see with many hospital adverse patient events; a lot of clinical activity, none of which effectively alters the trajectory of the patient towards the adverse event. The clinical activity occurs in a traditional hierarchal referral model of care, that by its very nature is often either unresponsive or slowly responsive and where the hospital policy and procedures are often variably implemented or simply ignored (Buist et al, 2007; Buist and DeVita, 2010).

In the hospital, the clinical futile cycle (*Figure 1*) often starts at the bedside with the interaction between the junior nurse and the patient. With a clinical abnormality, be it an observation, a wrong drug order, or a procedural failure, the junior nurse needs to make a decision as to the significance of the abnormality and the importance of reporting it to a more senior team member, either a senior nurse or the most available and usually junior doctor. However, that decision to escalate the issue depends very much on the workplace culture that exists in the particular micro-environment of that bedside and that ward at that time.

If the concern or abnormality is escalated it is to the next person in the care hierarchy of the team looking after that patient. This is often the junior doctor who then needs to attend, assess and then make a decision again about whether or not to escalate the

Figure 1. Clinical futile cycles. From Buist et al (2007).



issue to the next person in the hierarchy. This is important because for the most part the junior doctor does not have the skills or emotional intelligence to appropriately manage a lot of these clinical situations (Buist et al, 2001; Stevens, 2002; Cooper, 2004).

Next the issue is escalated to often a middle grade doctor, one who is often a specialist in training, and who as such may be difficult to find. Unlike their juniors often this grade of doctor does have the technical and clinical abilities to deal with the particular issue. However, they are often over-committed with ward rounds, clinics and operating theatre. Additionally this grade of doctor is diagnosis focused and they often give instructions (usually appropriately) for specialized investigations and other speciality consultations. There is nothing wrong with this process, and it works well when all the calls and reviews are done in a timely manner. However, often calls are not made and reviews delayed which puts the patient at risk of further deterioration (Buist et al, 1999).

Hospital setting adverse events: human factors or hospital system errors?

In support of the clinical futile cycles model is the limited literature that has looked at the causation of hospital setting adverse events. These studies can assign almost all causation to three human factor issues at the patient interface: competency, cognition (or failure thereof) and culture. Analysis of the causative factors associated with the adverse events in the Quality in Australian Health Care Study found that cognitive failure was a factor in 57% of these adverse events (Wilson et al, 1999). In this analysis, cognitive failure included such errors as:

- Failure to synthesize, decide and act on available information
- Failure to request or arrange an investigation, procedure or consultation
- Lack of care or attention
- Failure to attend
- Misapplication of, or failure to apply, a rule, or use of a bad or inadequate rule (Wilson et al, 1999).

A two-hospital study from the UK, that looked at 100 sequential admissions to the intensive care unit from ward areas, found that 54 had sub-optimal care on the ward before transfer (McQuillan et al, 1998). This group of patients had a mortality rate of 56%. Some of the sub-optimal cultural and cognitive factors included failure to seek advice, lack of knowledge, failure to appreciate clinical urgency, and lack of supervision (McQuillan et al, 1998).

Perhaps the most disturbing example of this was described in the MERIT study – a randomized cluster control study of medical emergency teams in 23 Australian hospitals in 2002 (Hillman et al, 2005). Nearly 500 cardiac arrests occurred during the 6-month study. In more than a third of these cardiac arrests staff took abnormal patient observations in the 15 minutes before the cardiac arrest, but did not activate an emergency response. This was despite the presence of explicit policy and procedure to do so at least in the hospitals randomized to the medical emergency team intervention.

Put another way, in your average Australian hospital in 2002, if you looked as if you had and had documented abnormal signs in the 15 minutes before a cardiac arrest, up to 40% of the time the staff were not going to call for help by activating some sort of emergency response team. Furthermore, in the intervention hospitals that had an intense education process on the new medical emergency team activation policy and procedure, the incidence of calling for help was only 10% greater than the control hospitals. It is here at the bedside with the pre-cardiac arrest patient that the staff are trapped in a clinical futile cycle, unable to get out of it either as a result of clinical incompetency (not able to recognize and act for the pre-arrest patient) and/or culture whereby calling for help (Buist, 2008) may be considered not the norm in that ward, on that shift at that time (Kitto et al, 2015).

A case of clinical deterioration: Swiss cheese or clinical futile cycles?

The case presented here is reproduced from Buist (2011): 'A middle aged, previously completely well, male underwent a semi-elective thoracotomy for an empyema. He had previously been admitted 3 weeks ago with three fractured ribs after a motor vehicle accident. The surgical procedure and anaesthetic were uneventful. The patient returned to the ward at 15.00 hours with a heart rate of 130 beats per minute. Otherwise his observations were unremarkable. The surgical registrar was concerned about the heart rate and the patient's inability to pass urine postoperatively. The registrar instructed the house officer to insert a urinary catheter if the patient failed to pass urine by 18.00 hours. At 18.00 hours there was no urine output, the heart rate was 140 beats per minute. Despite the house officer's insistence, the patient refused to have a urinary catheter inserted. Otherwise the patient's condition was stable. The house officer handed over the patient in a verbal report to the night resident medical officer at 22.00 hours.

The night resident medical officer was summoned urgently to see the patient at 23.30 hours when the patient dropped his blood pressure to 85/60 mmHg. The heart rate was now 150 beats per minute. The resident medical officer assessed that the patient was hypovolaemic and administered 2 litres of intravenous fluid, and ordered a blood transfusion. With this intervention, the blood pressure improved and the resident medical officer went about his other tasks. There were no further observations on the patient until 02.30 hours when the blood pressure was observed to be 75/55 mmHg. The resident medical officer again responded promptly and commenced further fluid resuscitation. Again there was a transient improvement in the patient's condition. At about 04.00 hours the resident medical officer was concerned enough about the patient to telephone the on-call, but off site, surgical registrar. The resident medical officer explained the patient's condition to the registrar. The surgical registrar was concerned and stated that he would come in early at 07.00 hours to review the patient before the start of his operating list. At 05.30 hours, the patient lost consciousness, and the nursing staff, put out a cardiac arrest call. Despite the best efforts of the anesthetic registrar and the intensive care unit registrar, the patient could not be resuscitated and he was deceased at 06.00 hours.' (Buist, 2011).

Root cause analysis of this man's death using the Swiss cheese model would be quite simple, most notably that at multiple times various members of staff failed to call the hospital rapid response system. This failure occurred despite a very clear and well-implemented policy and procedure for the activation of the rapid response system. A reasonable recommendation would be to

amend the rapid response system policy and procedure to remove any discretionary capability of bedside staff and make activation mandatory (Buist and Shearer, 2010).

However, analysis with clinical futile cycles would require more in-depth analysis of the events that night. The staff was indeed concerned about the patient's condition, and in many instances implemented appropriate management including fluid resuscitation and blood transfusion. However, the interventions, although initially beneficial, gradually became futile as the patient's condition deteriorated. So why didn't the staff call for help or activate the rapid response system (Buist, 2008)? The nursing staff on that night was happy that the night resident medical officer had attended the patient promptly when called and had implemented appropriate management. As such, in their opinion, implementation of the rapid response system was not necessary. The resident medical officer was concerned about the patient, but was of the opinion that rapid response system activation was a nursing responsibility (Stewart, 2008). However, further analysis revealed that on this particular surgical ward, the nursing staff sometimes used the activation of the rapid response system as a punitive action against their junior doctors. If they were satisfied with the performance of the junior doctor they would not activate the rapid response system, whereas if they were dissatisfied with the junior doctor the rapid response system would be activated. In response to this, sometimes the junior doctors would instruct the nursing staff not to activate the rapid response system, despite the patient's condition warranting such a call.

This analysis resulted in the hospital's response to this adverse event being a new lecture on the importance of rapid response system activation at the resident orientation programme, and introducing a multi-profession education programme out of the organization's simulation centre on the recognition of clinical deterioration and appropriate use of the rapid response system. Furthermore, this understanding of clinical futile cycles has been an important rationale for the development of electronic track and trigger systems (Jones et al, 2011b) and continued research into the effect of cultural interventions at a ward level to improve the outcome of the deteriorating patient (Buist et al, 2015).

Conclusions: using clinical futile cycles to safety proof health from the sharp end back

The model of clinical futile cycles allows for more directed interventions to prevent hospital setting adverse events. In particular, there needs to be more resource and attention directed to how clinical teams operate and interact with each other. Within these clinical teams, there also needs to be more scrutiny of individual competence and capability along with more explicit understanding of the ever-changing clinical team, unit and ward micro-culture.

The importance of the clinical futile cycle to the individual clinician regardless of profession, area of specialisation, experience or seniority, is quite simply the cognisance of being caught in one during a clinical episode. This recognition, particularly when confronted with patient deterioration, should result in a change of strategy to a more effective intervention. Such interventions could be as simple as activation of a rapid response system or obtaining an urgent review by intensive care staff (Harrison et al, 2004). For the hospital understanding clinical futile cycles should lead to the implementation of systems that decrease their deleterious effects such as rapid response systems (Jones et al, 2011a), hospital at night (Hamilton-Fairley et al, 2014), and electronic track and trigger systems (Jones et al, 2011b).

We need to focus attention on the core business of health care; the interaction at the bedside and clinic between the patient and the various health-care professionals. Clinical futile cycle gives a practical platform to understand this culture. We need to accept that an abnormal or inappropriate workplace culture, along with some significant issues of professional competency, is at the heart of every major inquiry into the quality of hospital care (Hindle et al, 2006). These issues cannot be fixed by administrative policy and procedure that focus on system issues. Every report into these enquiries recommends change, yet 30 years on from Bristol (Department of Health, 2001) we had mid-Staffordshire (Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry, 2013). So what have we really learned from the reports and thousands of pages of recommendations? Nothing that is discernible at the bedside.

We need a different strategy – one that puts the patient and his/her wellbeing first.

KEY POINTS

- A 'clinical futile cycle' is clinical activity and actions that do not help or improve a patient's condition.
- Clinical futile cycles can be dangerous when a patient's clinical condition is deteriorating, when often well-intentioned clinical actions fail to improve a patient's clinical condition.
- The traditional hierarchical referral model of care in hospitals can mean that in the one clinical episode there can be multiple clinical futile cycles from the most junior bedside staff up to and including consultant level clinicians.
- An understanding of clinical futile cycles during a patient's clinical deterioration should led to alternative and more effective clinical actions to improve the patient's condition, e.g. more timely activation of staff or teams with resuscitation expertise.
- Rapid response teams (such as critical care outreach), hospital at night, and electronic track and trigger systems are all useful tools to decrease the deleterious effects of clinical futile cycles.

This should be followed by the implicit understanding that our core business is that interaction with the patient from the most basic and junior levels. The bedside health-care team needs to be trained, credentialled and supported to deliver better health care, not as individual players, but as members of a team. **BJHM**

Conflict of interest: Professor M Buist is a shareholder in Patientrack. He was the founder and has been a director of this company; Dr S Middleton: none.

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