Guest Editorial

The culmination of rare events – a global healthcare and public health concern

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Methicillin resistant *Staphylococcus aureus* (MRSA) infection and hand hygiene are universally accepted to be two of the most important infection control problems of the decade for healthcare systems in industrialised countries. Universally, the popular press and the public have developed a zero tolerance of healthcare associated infection (HAI) and other adverse events associated with the provision of their healthcare. In response, the World Health Organization (WHO) launched the *Worldwide Alliance for Patient Safety* [1] in 2004 with the goal of reducing adverse consequences of healthcare. Every 2 years, the Alliance will focus on a specific challenge to improve patient safety.

The first challenge, *Clean care is safer care*, will span 2005-2006 and refers to the cornerstone of infection control – hand hygiene. This challenge aims to improve hand hygiene and thereby reduce HAI and associated morbidity and mortality. This inaugural challenge reflects the global concern at the abysmally poor levels of hand hygiene compliance reported worldwide, in the USA [2-4], Europe [5, 6], UK [7] and Australia [8] and associated HAI. Poor hand hygiene is also evident in highly industrialised Asian healthcare systems, such as Hong Kong [9] and in China's mainland province of Hebei [10], where 61.5% of healthcare workers (HCWs), on average, practise hand hygiene less than 10 times per shift, that is less than once an hour.

The causal connection between hand hygiene and HAI is well accepted by HCWs, even without the epidemiological rigour of a randomised control trial (RCT) or cohort designs. Rather, our acceptance of the link between HAI and hand hygiene has been based on the simplest epidemiologic design; surveillance using cumulative incidence of cases to produce a rate. Because these rates are produced from an accumulation of infrequent cases, statistical adjustment for factors that may alter the risk for HAI or compliance with hand hygiene (such as case mix, antimicrobial prescribing patterns, nursing levels, occupied bed days and casual staffing levels) can never be fully achieved.

Yet, with all its methodological shortfalls, surveillance with an active feedback component can produce data that are convincing enough to accept the impact of an intervention, such as that demonstrated by Dreimanis *et al.* [11]. The authors used active feedback of rates to achieve a steady decline in the numbers of intravascular device related *Staphylococcus aureus* bloodstream infection (SAB) resulting in a lower endemic level. Their 'whole of hospital' approach, with the classic quality assurance cycle of collection, collation, analysis and active feedback, was, however, resource intensive [11]. The programme required a part-time nurse in addition to the traditional staffing level of two full-time infection control practitioners (ICP) for a 500 bed hospital.

In 1996, a survey of AICA ICPs found that this ICP ratio was common in Australian hospitals [12], a ratio recommended by the Study on Efficiency of Nosocomial Infection Control (SENIC) made in 1985 by the *Study on the Efficiency of Nosocomial Infection Control* [13]. Yet, this staffing ratio is no longer accepted in the USA as being anywhere near sufficient due to the amount and complexity of the ICPs' work [14]. In the same year, 1996, Australian ICPs in public hospitals spent 7.6 hours per week on surveillance [12]; by 2000 this had increased to 14.2 hours [15]. The benefits of additional staff who provided continuous active feedback was most certainly an important factor along the causal link, that lowered the rate of SAB to its current endemic SAB [11] and, as Sykes *et al.* [16] effectively demonstrated, without staff dedicated to active feedback, HAI rates will insidiously reach original levels.

The fact that Health Departments still fail to support infection control programmes with resources to improve the ICP to bed ratio, enabling ICPs to focus on other important components of their strategy to contain HAI, it is little wonder that MRSA remains at hyper-endemic levels in some States of Australia [16]. The groundwork for improving HAI requires a solid foundation of ICP staffing so they may spend more time working with clinicians to identify causal factors that require intervention, such as identifying the key to improving staff acceptance of hand hygiene protocols and decreasing patient exposure to invasive ventilator and intravascular devices.

Commendable efforts have been made by the Victorian Nosocomial Infection Control Surveillance System (VICNISS) to include ventilator associated pneumonia (VAP) as a component of surveillance of HAI in intensive care units [18]. The fact that no other surveillance unit in Australia has attempted VAP surveillance is not coincidental; like surveillance of central venous line associated bacteraemia, VAP requires an inordinate amount of data collection time. VICNISS report VAP surveillance was not well tolerated by participants, not simply because of the labour intensive nature of the collection of ventilator days, but the surveillance definition of VAP was not readily accepted by physicians [18].

The criteria used to label patients as being positive for HAI for the purpose of surveillance cannot be the same as those used for clinical diagnosis because of the methodological constraints imposed by HAI being statistically rare events. The criteria for HAI will result in an increased sensitivity (to ensure the criteria

rule-in as many true HAI as possible) and a reduced specificity (to ensure the criteria rule-out false positive HAI). This see-saw effect when attempting to gain sensitivity and specificity is common when screening tests are developed for many public health diseases that respond well when identified early. Where the expected prevalence of such diseases in the population is low, sensitivity of the screening test will be kept high at the expense of specificity and, although this will result in a high false positive rate, all positive screening tests are then expected to be followed up with a diagnostic test[19].

Surveillance criteria for HAI should be thought of as more like a screening test, without the follow-up diagnostic test – surveillance definitions are not clinical diagnoses. The aim of a surveillance definition is to provide clinicians with a reliable 'flag' that will raise concerns for action, not act as a net to catch all diagnoses of clinical infection. Surveillance units are encumbered to convince clinicians of this difference.

An additional burden associated with the VICNISS VAP component is the National Nosocomial Infection Surveillance (NNIS) methodology that requires labour intensive collection of exposure days and, in accordance with NNIS methodology, aggregate long and short exposure periods as if each exposure day carried the same risk of HAI. This methodological problem is common to the collection and reporting of central line days in accordance with NNIS[20]. The usefulness of VAP rates is reliant on active feedback to clinicians of rates that have had an 'adjustment' for the difference in exposure periods, such as a simple stratified rate by quartiles of ventilator days. Many units wishing to engage in NNIS methodology can continue to do so, yet still provide stratified rates for grouped ventilator days; these can flag for the clinician the exposure period associated with the majority of infected patients, such as short or prolonged ventilator exposure, or neither suggesting other management issues. The significance of the higher rates of VAP in smaller ICUs compared with larger ICUs is difficult to evaluate without such stratification.

It is hoped that during the post 2005-2006 *Clean care is safer care* challenge, our Australian ICPs will report to AICA increases in hand hygiene with concomitant decreases in MRSA and other HAI. However, unless the State Health Departments commit long-term to infection control – for example dramatically improving staffing in wards and resourcing infection control programmes to train and employ more ICPs who have time to provide active feedback as an integral component in their surveillance programme – it will not be humanly possible to expect to see the Alliance challenge met. The Alexander Pope adage "to err is human" has been used to change the blame game associated with the measures of patient safety. However, the Benjamin Franklin adage continues, "to repent divine; to persist devilish". Surely, persistence with under resourced infection control programmes by State Health Departments is devilish!

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