Occasional essay

Taking action to reduce medical errors: don't put the cart before the horse

Every day, in Intensive Care Units (ICU's) all over the world lives are being saved. Unfortunately, like any other practice of medicine, this also goes hand in hand with medical mishaps and disasters, mainly due to simple, stupid and avoidable errors. It has taken a long time for the medical community and patients not to accept these events as "fate". An industry and an academic base are now growing to investigate the frequency and causes of medical mishaps.

The first step in this direction, modelled largely on the aviation industry, has been to audit the rate of medical mishaps. For example, in the area of surgical procedures the following errors were found to be common [1-5]:

- operations of the wrong patient, the wrong site, or the wrong side,
- retained instruments and sponges,
- medication errors,
- equipment failure,
- faulty technique,
- errors in anaesthesia

These are all examples of errors that might have catastrophic consequences for the patient.

Once audits demonstrated to the medical world that medical errors are indeed a serious problem, research started to focus on finding the causes of the errors (e.g. root cause analysis). For example, many factors were found to contribute to human fallibility in the operating room (OR). Among these causes are [4,6-9]:

- production pressure (inability to prepare the workspace or the patient properly),
- management problems,
- workload, and
- team-work problems (e.g. lack of communication and coordination).

It is conceivable that these same problems exist in a highly-pressured environment like the ICU.

The next step, after understanding the scope of the problem and recognising the causes, is to find solutions to the problem. The press and patient safety advocates are eager to find instant solutions to prevent medical errors and implement these solutions immediately in health organisations. There is great pressure on health organisations all over the world to find solutions to counteract the rising trend in medical errors. However, there is danger in doing so in a rapid unplanned manner. Rapid solutions may be designed on the basis of quick intuitive thinking and not on solid information and theory. This reduces the chances of reaching the best outcome. Also, rapid solutions may be disseminated without any control of their implementation or without being able to measure their effectiveness (i.e. outcome).

The authors would like to give, as an example, the solution of the Joint Commission of Accreditation of Healthcare Organisations (JCAHO) to mishaps during surgical procedures.[10]

"Timeout"

The JCAHO, an American independent, not-for-profit organisation, maintains standards that focus on improving the quality and safety of care provided by health organisations. The Joint Commission's accreditation process evaluates an organisation's compliance with these standards and other accreditation requirements. Since 2003, the JCAHO's number 1 goal is: "Identify patients correctly". One of the stated sub-goals of this goal is: "Use a 'timeout' just before starting the procedure to allow the entire surgical team to ensure the correct patient, procedure and body part." Team members must verify these details before starting the procedure. A "Universal Protocol for preventing wrong site, wrong procedure, and wrong person surgery" was published (by the JCAHO) in which the timeout is defined as "active communication among all team members of the surgical team, consistently initiated by a designated member of the team".[10] This approach is just as appropriate for any procedure carried out in the ICU, even when the time-scale might be compressed by clinical urgency e.g. emergency airway access. Where procedures are carried out emergently there should be even more emphasis on ensuring the "system" for checking equipment, providing resources and ensuring team communication is robust, tried and practiced.

The reaction of the JCAHO is the first national and practical solution initiated to deal with mishaps in the OR. We agree with the JCAHO's line of thinking and believe that indeed a briefing procedure such as "timeout" may be a very good solution. However, the problem with this solution is that we as yet have no formal data regarding the implementation process, reactions to or outcomes from the program. Of concern was the response to the following question posted on a patient safety internet forum relating to the JCAHO program: "Does anybody know about a research or study that is conducted on "timeout"?". To date there have been zero responses. Reading the comments and questions in the patient safety internet forum, it is evident that individuals and teams are confused regarding the specific way that "timeout" should be conducted. Moreover, "timeout" is aimed at preventing three specific errors and is not aimed at preventing other common errors. The rate of wrong site, wrong patient, wrong side surgeries is estimated as 1 to 15,500.[11] There is no doubt that these are horrific events that need to be prevented, but there are other adverse events that are much more frequent and may also cause harm to patients. For example, according to our observations at OR's and interviews with team members there are many cases when a piece of equipment is not ready on time, or when the wrong equipment is being prepared (according to our observations, in every second surgery such an event occurs). These, are not events that draw people's attention like a "wrong patient" event, nonetheless they are alarming. Regarding the content of "timeout", it is still not clear what information exactly is most important to consider in order to prevent errors (nor what the most common errors are that we should try to prevent).

The idea of a team communication process just before a medical procedure begins is intuitively a good idea. However, such a process should be carefully designed and applied. The effectiveness of the program should also be empirically studied. The authors have the impression that "timeout" was designed without;

1) thinking of a specific theory that predicts it's effectiveness,
2) thinking of a systematic way to follow-up the teams that conduct timeout, or
3) examining the effects of "timeout".

These three omissions are probably caused by the pressure to reach solutions and to show that they work. However, this pressure is exactly what prevents effective implementation of solutions to medical errors.

Intervening in the way medical teams work is a hard task as it is. Implementing rapid solutions that then prove to be ineffective may cause great harm to future valid solutions. Team members may not even want to consider future solutions if they are jaded by the repeated implementation of ill-conceived solutions. There not so many opportunities to intervene in medical work and we should use these opportunities wisely and not waste the team's time. In addition, manipulating medical processes may have secondary, unintentional effects that are hard to predict and may potentially cause harm. It is dangerous not to closely follow-up on the implementation process and it is essential to determine that the solutions are not causing harm.

We suggest the following as essential steps in applying an effective briefing solution:

1) Decide on the most important information that should be presented at the briefing. This should be based on:
   (a) sound theory such as cognitive theory and group theory, and
   (b) effective data on types of errors/adverse events and their frequencies.
2) Design an experiment (comparing procedures that were preceded by a briefing with procedures that were not).
3) Collect data and evaluate both the way the briefing is performed and the effects of the briefing.

In general, it is essential not to act upon intuition or gut feeling, but to design solutions on a solid theoretical basis, follow the implementation process closely and measure all the effects of a planned "solution". It is all good and well to follow the lead of the aviation industry in the management of medical errors and mishaps. However, if the aircraft were as complex as the human organism, then most pilots would probably be doctors!

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Severe acute respiratory syndrome (SARS) in Hong Kong's ICUs: the lessons learned

Towards the end of 2002 there were several media reports from Mainland China of a severe form of respiratory failure resulting in both an increased antibiotic use and increased purchases of vinegar by the general public. On the 10th March 2003, the Prince of Wales Hospital in Hong Kong reported an outbreak of respiratory infections involving Health Care Workers (HCW) within the hospital. Two days later, the World Health Organisation (WHO) issued a global alert regarding cases of acute respiratory syndrome. On the 14th of March the index case at the Prince of Wales Hospital was identified and the following day the WHO named the illness Severe Acute Respiratory Syndrome (SARS). It was not until the 19th of March that the identity of the index case of the epidemic in Hong Kong and the chain of transmission from the Hotel Metropole was announced. By then SARS had well and truly taken a hold on Hong Kong.

The emergence of SARS within Hong Kong was a severe challenge to the healthcare sector, the public and to the economy. The WHO finally declared Hong Kong SARS-free on the 23rd June 2003. In Hong Kong there were 1755 cases, of which 299 died: a case fatality rate of 17%. The global case fatality rate was 9.6% (774/8090).[1] Case fatality rates from the five worst hit countries (excluding Hong Kong) were: China 6.6% (349/5327), Taiwan 10.7% (37/346), Canada 17.1% (43/251), and Singapore 13.9% (33/238). Worldwide the SARS epidemic affected 29 countries with 96% of the patients from countries in the Western Pacific Region.[1,2]

Resources within hospitals in Hong Kong were overwhelmed and this was no more so than within Intensive Care Units (ICU). Globally, the average ICU admission rate was about 20% and between 14 % to 26% of the total number of patients were reported as requiring mechanical ventilation. In SARS ICU patients, 50% to 85% have been reported as requiring mechanical ventilation for ALI/ARDS.[3-7] Mortality rates of mechanically ventilated SARS patients ranged from 53% at ICU discharge and 45% to 48% at 28 days after ICU admission.[4-5,7]

In Hong Kong, disease transmission in almost 50% of cases occurred in hospitals, or elderly or nursing homes. This was especially so in the early phases of the epidemic and before institution of protective measures.[8] HCW accounted for 23.1% of the total number of SARS cases within Hong Kong. In Toronto and Singapore, HCWs comprised more than 40% of the patients while in Vietnam 57% of cases involved HCW.[1] There is evidence both anecdotal and in the literature suggesting that specific ventilation strategies may place HCWs at greater risk.[9] Nosocomial transmission is therefore of great concern.

Following the SARS epidemic in Hong Kong there has been considerable reorganisation and restructuring within the health and healthcare systems and in particular the Department of Health (DH) and the Hospital Authority (HA) in preparation for emergent infectious diseases. Central to this reorganisation is the establishment of the Centre for Health Protection (CHP) under the auspices of the DH, which has the responsibility, authority and accountability for the prevention and control of communicable diseases within Hong Kong. The HA, which is responsible for the management of all public hospitals within Hong Kong formed the Central Committee for Infectious Diseases (CCID).

SARS highlighted the need for a high level of vigilance and alertness throughout all parts of the healthcare system. The framework of response to infectious disease outbreaks within the HA begins with watchfulness and surveillance of abnormal patterns of infections. This is part of the everyday risk management culture within the practice of medicine. When an abnormal pattern of infectious disease is detected, a swift assessment by the hospital infection control team on the significance of the infection, risk of hospital spread, availability of existing knowledge and guidance to treatment and control, and potential threat to the community. This enables the hospital to take appropriate actions to manage and control the outbreak. When it is considered that the outbreak poses a significant risk to the hospital system the HA initiates a contingency response with a clear command structure. In addition, the Government has its own alert and response system for combating infectious diseases on both a local and regional basis.

Within the specialty of Intensive Care a culture has developed where everyone recognises that their work may have wider public health implications and that an illness in one patient may have consequences for the whole ICU. As a result, the face of intensive care has changed beyond recognition in Hong Kong. Stricter vigilance and surveillance (both clinical and laboratory) is routine practice, especially with regards to new admissions to ICUs.

Many of Hong Kong's ICUs have upgraded their isolation facilities. Princess Margaret Hospital (PMH), which will be the first receiving hospital in the event of an infectious diseases outbreak, has a separate ICU specifically for the admission of SARS cases or Highly Pathogenic Avian Influenza (HPAI) patients. This facility consists of nine single rooms all with negative pressure ventilation systems. The main 20 bed ICU of PMH, consisting of two adjacent wards, has clearly delineated clean and dirty wards. There are 28 bed spaces providing greater flexibility in cohorting and isolating patients. In addition, all ICUs have contingency plans in place in the event of SARS or HPAI occurring in Hong Kong. These focus on staff deployment and training, hardware procurement, and surge capacity.

Effective protection of HCWs is of utmost importance, not only in protecting staff but also crucial in breaking the chain of transmission. Considerable time has been spent on increasing awareness, education and vigilance of all HCWs with regard to an infectious diseases outbreak and the standards required for personal protection. Training extends from the most senior of staff through to ward clerks and cleaning staff. All hospital staff under go yearly training and refresher courses in infection control. Staff within ICU undergo yearly N95 mask fit testing.

On a day to day basis, maintenance of a high level of vigilance has become paramount. All staff change into ICU attire before entering the ICU. In addition, surgical masks and jackets (not white coats) are standard uniform. All non-ICU staff entering the ICU wear surgical masks and colour-coded gowns to reflect their status. Hand washing programs are regularly monitored and reinforced. Non-clinical areas previously located within an ICU, such as storerooms, library, seminar room, doctors on call rooms, offices and kitchens have been moved out of the immediate vicinity of the clinical areas. The only exceptions are the relatives' interview room and an emergency shower and toilet. There is no eating or drinking within the ICU environs. Whereas previously patient visiting by relatives was encouraged, there are now restrictions as to duration of visits and numbers of visitors.

Monitoring and policing the system takes considerable effort. Each day there is an assigned registered nurse who acts as the monitor. Infectious diseases infringements are monitored and staff education programs are conducted on a regular basis by a senior nurse.

MRSA is endemic in Hong Kong hospitals. Contact precautions are universal and while little can be done to prevent the importing of MRSA into ICU a great deal of effort has gone into the prevention of MRSA spread within individual ICUs. It is basically the default mechanism for monitoring the infection control policies. Incidents of MRSA spread within the ICU are investigated and solutions sought. MRSA patients are cohorted, staff movement is restricted and contact precautions reinforced. The underlying emphasis in controlling MRSA is to reinforce infection control practices. As a result the rate of acquired MRSA within the PMH ICU is almost zero.

All patients are assessed as to their risk of infectious disease prior to admission. Depending on the risk there are three colour coded levels of stratification within Princess Margaret Hospital's ICU. Suspect cases are identified, isolated and screened until proven negative either for SARS or HPAI. Personal protective equipment is readily available at the entrance and at nominated sites within the ICU.

Procedures involving the airway are all viewed as placing staff at risk. Full personal protective equipment including N95 mask and face shield is routinely worn before and during endotracheal intubation, flexible bronchoscopy and percutaneous tracheostomy. In-line, closed-system endotracheal suction is routine. Nebulisers are not used in ICU and BiPAP only under strict guidelines. Patients receiving BiPAP are isolated. Training programs on manual handling of bodily secretions are regularly conducted.

In the short term the 2003 SARS epidemic was devastating to the people and economy of Hong Kong. In the longer term it has provided Hong Kong an opportunity to prepare for future infectious disease outbreaks. Many lessons have been learned and constant revision and refinement of new policies, procedures, protocols and contingency plans is ongoing. Within ICU, the epidemic has resulted in a change in ICU culture with far greater emphasis on the detection, surveillance, prevention and management of infectious diseases.

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