

# TOPIC LISTINGS FOR CLINICAL ENGINEERING DEVELOPMENT WORKSHOP

## 1. EMI/EMC Understanding the unpredictable

We have seen many new technologies introduced in the clinical environment that have a potential impact on the safe delivery of patient – and that impact is often unpredictable or unidentifiable. We are seeing wireless networking in common use, and RFID labelling for everything from stock control, equipment location and patient tracking is being touted as the next great cost saving in the hospital. Introduction of mobile communications in a responsible manner can improve patient safety.

Biomedical engineers have a responsibility to ensure the introduction of these technologies does not compromise patient safety. Give an overview of the subject, the technologies and their impact on patient safety, and the role of the biomedical engineer in developing sensible policies – recommendations to the vendor, the clinical user and the institution. What is happening overseas – it is relevant or applicable here?

## 2. Pulse Oximetry

What is it? Why do we do it? How do we do it? Who do we do it on? What are we actually measuring? Research the rationale for measuring oxygen saturation and under what circumstances it is a meaningful measure of oxygenation. Detail other allied measurements of oxygen in the body. Describe the principles of the measurement of oxygen saturation and possible causes of error in the measurement and errors in relating the measured values to pathology. Comment on the way it is used in the hospital setting.

## 3. Delivering Anaesthesia

What types of anaesthesia are available to clinicians today? Discuss the various agents, method of delivery to the patient and the technology involved in doing so. What role do medical gases, reticulated throughout the hospital, play in this? What are the risks to the patient and how are they managed and minimised? What are the cases for and against intravenous vs gaseous delivery?

## 4. To test or not to test – how much or how little?

Determine current practices for decisions related to safety and performance testing in Clinical Engineering departments. Discuss possible risk management strategies that may be employed as aids to determination. How can we find out about other examples of changes that may make testing more beneficial? Part played by Biomedical Engineering personnel with regard to development of standards. Are we testing too much or too little – how do we know? What is the role of OHS&W legislation and how should it affect approaches taken?

## 5. Introduction of new technologies

What part do CE departments play in the planning and acquisition of new technologies? What can be done to improve this process – how can we show that we can make a difference? Discuss the processes of technology assessment and product evaluation – is there a difference?

## 6. Do CEs and BMETs need to know Anatomy/Physiology etc ?

Discussion of how we can interface with and make better decision for clinicians if we know what the body does and why the clinician is so hot under the collar about one piece of equipment vs another. Do we need to know more than just A & P? Should we know about disease states, pharmacological effects, etc? What impact will A&P knowledge have on capacity to assess new technologies, estimate life of equipment, select replacement equipment?

## 7. Critical Event Response

What are the considerations to take into account when dealing with medical equipment which is thought to have resulted in a patient death – dealing with the process? What are the requirements for reporting – Hospital Executive, TGA, Coroner? Does the equipment need to be quarantined?

## 8. Impact of the changing focus of healthcare – the hospital in the home concept

Day only admissions are changing bed utilisation and the medical equipment associated with minimally invasive surgery etc. What is the influence of these changes on hospital utilisation, BME services, and healthcare in general? What is the relation between these changes and the concept of a “Continuum of care”? Address the differing specifications of home and hospital equipment, the maintenance and test routines to which they are/should be subjected, and the allocation of responsibility arising for the use of home equipment. How do you ensure this equipment is safe to use, and being used safely?

## 9. Who are we trying to impress?

Accreditation – ACHS EQUiP, ACQ, ISO

Possibly all of the above, plus our administrators and DOH. Show an understanding of the need for the accreditation process and the differences between the different systems. Discuss the certification vs accreditation issues. How do we demonstrate that staff within departments are appropriate or competent to fulfil their role? An assessment of how your healthcare establishment rates on these considerations would be interesting.

## 10. Benchmarking

How do we do it? Who do we do it with? What is it anyway? What benefits could we expect from benchmarking? What has benchmarking in Clinical Engineering or related areas achieved, or is it a feel-good buzz phrase which produces little but keeps the quality managers off our back?

## 11. Renal Dialysis – do we care about it? Do we know about it?

Clinical Engineering departments often have little knowledge of the dialysis units or the devices used therein. Should we be doing more to help our dialysis staff? Would you attempt to perform in-house or outsource? Why?

## 12. Safety when using the Electrosurgery Unit

Significant testing of electrosurgical instruments and accessories in recent years has moved the focus from the generator to the things attached to it. Give an overview of the subject, with a balanced set of recommendations. What needs testing, how often, by whom, how? What about the new modalities available – things like high voltage bipolar and low voltage monopolar modes? What are the implications for safety?

### 13. Patient Monitoring

The monitoring of patients is now beyond the bedside. Patient information is available through local networks, intranet and internet services. What are the developments, benefits and limitations of this “remote” patient monitoring?

### 14. Earth leakage in systems

“Systems” of equipment may exhibit earth leakages in excess of the allowance for individual medical devices. Are there standards that provide guidance in this situation? What is the real nature of the hazards, if any, and what approaches are appropriate?

### 15. Specifications for ICU

Consider the prospect of a hospital moving to a new site and requiring a 12 bed ICU. Address the considerations of space, data management, equipment specifications, reticulated supplies etc. We have all seen under equipped ICUs, yet over specification is wasteful. Address the balancing required, and the means of determining the optimal balance. Who would you involve in this design process? Why? What input/contributions would you expect from the representatives of various work groups/individuals?

### 16. Blood pressure measurement

Stories of discrepancy between automated and manual blood pressure measurement are legend, while invasive blood pressure measurement is susceptible to artefact associated with lines and damping devices. Explain the lot! Explain the discrepancies. De-mystify it all!

### 17. Sterilisation/Disinfection

Discuss the pros and cons of the various types of sterilisation and disinfection in common use in hospitals- steam, glutaraldehyde, paracetic acid, ethylene oxide etc. Discuss time to process, validation, cost, OH&S, detrimental effects of technique on equipment being sterilised/disinfected, and explain why different techniques are used for different equipment.

### 18. Allergic reactions to medical materials

Many medically used materials are credited with allergic reactions ranging from trivial to profound – latex, silicone, adhesives, skin preparations, glutaraldehyde etc. Tell us about them.

### 19. Trialling medical equipment

Great disasters or successes in medical equipment acquisitions are often attributable to the trial process undertaken. How do you undertake a trial, manage the sales staff, get around the inducements and staff biases to optimise the technical, financial and clinical considerations? What weighting should be given to the technical, financial and clinical aspects?

### 20. Closed loop control systems

For many years, it has been possible to monitor a number of clinical parameters in the ICU environment, and to feed these to computerised systems that would manage infusion rates and ventilation regimens to optimise patient treatment, with the option of raising the alarm in the event of patient deterioration. Where is the technology? Why?

## 21. Temperature control

“Temperature control of patients by medical equipment is more likely to compromise patient care than any of the electrical hazards for which we test extensively” – anon. True or False? Discuss the techniques and technologies used for temperature control and their function in terms of the equipment used and human physiology. Discuss the effectiveness and risks presented. How should we manage these risks?

## 22. Surgical equipment

The management of surgical equipment and instruments is seen by some as the last frontier of neglect by clinical engineering services. Surgical equipment is often not tracked, documented or individually identifiable. Questions of warranty, equipment performance, and equipment servicing and tracking arise. Is this small enough to be absorbed in the grand scheme of things, or worthy of attention? What means are available for tracking down to the individual instrument?

## 23. Cardiac Protected Electrical Areas

What are they and why do we have them? Do they save lives? Should the concept be questioned, the justification revisited or should they simply be scrapped as an expensive waste of resources?

## 24. Standards critique

There are many standards out there that we have need to use of in a range of ways, from influencing our decisions daily though to very occasional referral. Some are up-to-date whilst others no longer reflect current practice. Few are “stand-alone”, they often interact and rely heavily on reference to others. Choose a standard, series of standards or issue that is addressed in a number of standards – describe and discuss it.

## 25. Quality systems and the BME

Quality systems, quality management, ISO 9001 – they are all the buzz. We require it of our suppliers, but do we apply the same standards to our own activities? Should we?! What are quality systems? Do we need them, and should we implement them in our own departments? Many institutions already have, many are working towards them, but what are they, and are they an effective tool in managing the activities of our own departments, or just another certificate on the wall?

## 26. Risk management and the Biomedical Engineering Department

Risk analysis and risk management is where it's all happening these days. Claimed to be a tool to direct resources to where most effective and appropriate, it would seem to be a natural for application to the activities of any BME Department. AS3551:2004 recommends it. How should it be applied across a range of activities including setting of device test intervals? Could it realistically be used in a service's defence should it not capture a failure that resulted in a patient injury?

## 27. Ethics and practice?

Engineers Australia has a Code of Ethics. It is one of the tools to maintain professional standards. Give an overview of the Engineers Australia Code of Ethics, and how the code would relate to your role as a clinical engineer.

## 28. Imaging modalities, how and why?

There are a range of different imaging modalities that are available to clinicians as an aid to diagnosis. These include a variety of x-ray based systems as well as Nuclear Medicine, Ultrasound and MRI. How do they differ in principle.....and application? Which ones are increasing in popularity, are any declining, why may this be so?

### 29. Use of non-original parts for repairs

There are often a range of options available to those of us involved in the repair of medical devices. From third party pulsox probes and batteries to exchange boards from non-OEM sources. What issues should be considered when going down this path, is price the main determinant? What questions may the coroner ask should this strategy be revealed during his enquiries? What are the answers to those questions?

### 30. How can Clinical Engineering practitioners keep in touch?

In this global era the problems and issues that you face day to day, are also being faced by countless others around the world. How should we keep in touch, share our problems and establish and maintain our networks? The Internet is an obvious facilitator, is it used to best advantage and how may it be used better? What resources are out there now for us to use, what should be out there in an ideal world?

### 31. Electrosurgery – What are our choices?

Manufacturers of ESUs claim many things that supposedly set their units apart from all others. These include waveform, power and closed loop control that may all result in superior clinical outcomes, however the technicalities are often lost on the surgeons. Are these claims true? What are the real differences between brands X, Y and Z and is there hard evidence that supports any claims made?

### 32. Clinical Engineering and Information Technology – A Happy Marriage?

It is no surprise that today's clinical devices and systems employ substantial amounts of IT infrastructure, from PCs to servers and networks. How should these be supported and managed? Do CE departments have the skills and expertise? If not should they acquire them? Do IT departments understand clinical issues surrounding medical devices? Should the two departments work in a collaborative manner, how may this occur and would it result in any boundaries or grey areas? How could we clarify these and define areas of responsibility?

### 33. Career Paths for Young Engineers?

The future can be somewhat daunting for young engineers. What are the possibilities? How can individual goals be achieved within the context of the profession? Consider what changes could be made to assist young engineers to achieve their dream jobs.

### 34. Are you asleep?

Depth of anaesthesia has been a problem since the first anaesthetic was delivered. Various monitoring methods are employed to indicate patient awareness. Describe the problem, methods the solutions used to determine that the patient is "asleep".

### 35. YOUR OWN TOPIC

If you have a potential topic of clinical Engineering relevance which you would like to research, write up and present, then propose it to the workshop organisers ASAP. We cannot guarantee that your topic will be accepted, so get your proposal in early. Generally, a topic should address engineering or technology issues associated with clinical practice, and relevant to the practice of clinical engineering in health care establishments.