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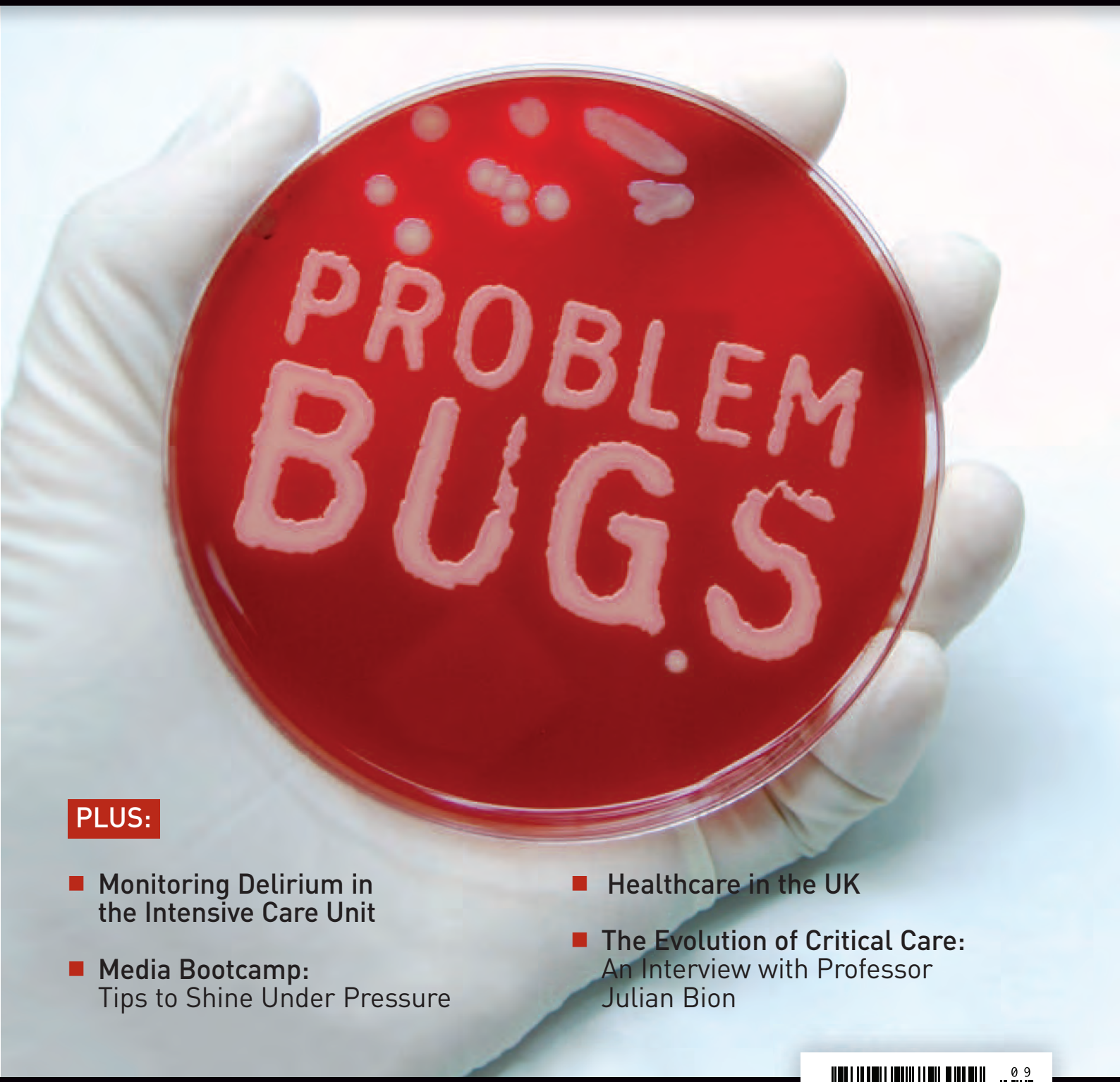

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- Monitoring Delirium in the Intensive Care Unit
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- The Evolution of Critical Care: An Interview with Professor Julian Bion

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PROBLEM BUGS

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Despite considerable marked efforts over the years, infections among critically ill patients have continued to be an almost insurmountable hurdle for clinicians to cross. The Extended Prevalence of Infection in Intensive Care (EPIC II) study confirmed this prevalence of infection, with 51% of the 13,796 adult patients classified as infected, and 70% undergoing anti - biotic therapy.

The results also showed a relationship between the number of days spent in the ICU before the study day and the rate of infection: The infection rate increased from 32% for patients with an ICU stay of no more than a day to more than 70% for patients with a stay of more than seven days before the day of the study.

As EPIC II gathered data on patients from 1,265 ICUs in 75 countries, including those in Central and South America, Asia, and Africa, we can ascertain that this issue of PROBLEM BUGS affecting critically ill patients is indeed a global one.

In this issue of ICU Management, Prof. Grundmann (The Netherlands) attempts to unravel the spread of nosocomial infections through healthcare networks while Prof. Topeli (Turkey), writes about Ventilator-Associated Pneumonia caused by high risk microorganisms. From the Mayo Clinic in Arizona, (US), Prof. Orenstein sends us an article aimed at reminding clinicians of the best practices to protect patients from clostridium difficile infection. In our final article in the Cover Story, Prof. Vogelaers and his colleagues from Ghent University (Belgium) question the cost effectiveness of establishing infectious diseases specialist consultation in the ICU.

> *"Infections in ICUs are common and patients are more likely to get them the longer they stay there."*

Matrix features include part one of two-part overview on conventional and non conventional interfaces for non invasive respiratory support, and an interesting look at monitoring delirium in the ICU. If you have ever faced a media barrage or had to respond to a journalist's delving questions on a difficult or highly publicised case, our Management feature on facing the press will assist in some basic media training.

In our Country Focus on the United Kingdom, we highlight the roll-out of the national PACS programme and discuss the importance of clinical research in improving patients' quality of care. Finally, in the Viewpoints section of the journal, Prof. Julian Bion discusses the cultural shift in healthcare in the UK, the evolution of the field of intensive care and what he sees as the greatest threat to patients in part one of a very timely interview with Managing Editor Sherry Scharff.

Infections in ICUs are common and patients are more likely to get them the longer they stay there. Use of infection control measures that prevent cross-contamination from other patients or the ICU environment itself is of primary importance, and should be continued, but as noted in the EPIC II report (JAMA), these measures will not completely eliminate the risk of infection or antibiotic resistance. Limiting the use of antibiotics in patients with evidence of infection rather than colonisation, and discontinuing antibiotic use when their benefits have been obtained as well as utilising biomarkers in decision-making and in response to the increasing number of antibiotic-resistant pathogens, new drugs are urgently needed.

Jean-Louis Vincent

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IN EVERY ISSUE

EU NEWS

Council Agrees on New Rules for Patients' Rights in Cross-Border Healthcare

The Council in charge of Employment, Social Policy, Health and Consumer Affairs has agreed on a draft directive concerning the application of patients' rights in cross-border healthcare.

The draft directive aims to facilitate the access to safe and high-quality cross-border healthcare and to promote cooperation on healthcare between member states. The compromise reflects the Council's intention to fully respect the case law of the European Court of Justice on patients' rights in cross-border healthcare while preserving member states' rights to organise their own healthcare systems. The draft directive provides clarity about the rights of patients who seek healthcare in another member state and supplements the rights that patients already have at the EU level through the legislation on the coordination of social security schemes.

The draft directive contains the following provisions:

- As a general rule, patients will be allowed to receive healthcare in another member state and be reimbursed up to the level of reimbursement applicable for the same or similar treatment in their national health system if the patients are entitled to this treatment in their country of affiliation;
- In case of overriding reasons of general interest a member state of affiliation may limit the application of the rules on reimbursement for cross-border healthcare; member states may manage the outgoing flows of patients also by asking a prior authorisation for certain healthcare or via the application of the "gate-keeping principle", for example by the attending physician;
- In order to manage ingoing flows of patients and ensuring sufficient and permanent access to healthcare within its territory a member state of treatment may adopt measures concerning the access to treatment where this is justified by overriding reasons;
- Member states of treatment will have to ensure, via national contact points, that patients from other EU countries receive on request information on safety and quality standards on their territory in order to enable patients to make an informed choice;
- The cooperation between member states in the field of healthcare is strengthened, for example in the field of e-health and through the development of European reference networks which will bring together, on a voluntary basis, specialised centres in different member states;
- The recognition of prescriptions issued in another member state is improved; as a general rule, if a product is authorised to be marketed on its territory, a member state must ensure that prescriptions issued for such a product in another member state can be dispensed in its territory in compliance with its national legislation; and
- Sales of medicinal products and medical devices via internet, long-term care services provided in residential homes and the access and allocation of organs for the purpose of transplantation fall outside the scope of the draft directive.

www.consilium.europa.eu

RESEARCH NEWS

World's First Transcontinental Anaesthesia: Researchers Pioneer Anaesthetics Via Videoconferencing

Videoconferences may be known for putting people to sleep, but never like this. Dr. Thomas Hemmerling and his team of McGill's Department of Anaesthesia achieved a world first on August 30, 2010, when they treated patients undergoing thyroid gland surgery in Italy remotely from Montreal, Canada.

The approach is part of new technological advancements, known as 'Teleanaesthesia', and it involves a team of engineers, researchers and anesthesiologists who will ultimately apply the drugs intravenously which are then controlled remotely through an automated system. This achievement is a product of an on-going scientific collaboration between Dr. Hemmerling's team and the Italian team of Dr. Zaouter of the Department of Anaesthesia of Pisa University (Chairman Prof. Giunta).

"The practice has obvious applications in countries with a significant number of people living in remote areas, like Canada, where specialists may not be available on site," Hemmerling said. "It could also be used for teaching purposes, allowing the resident to perform tasks without the physical presence of a tutor, thus increasing his or her confidence level."

Four strategically placed video cameras monitored every aspect of patient care in Pisa, Italy, in real time. Ventilation parameters (such as the patient's breathing rate), vital signs (ECG, heart rate, oxygen saturation) and live images of the surgery are monitored by each camera, with the fourth used for special purposes. A remote computer station ('anaesthesia cockpit') is required, as is a workstation that handles the audio-video link between the two centres. "Obviously, local anaesthesiologists can override the process at any time," Hemmerling explained. Prior to the operation, an assessment of the patient's airway and medical history is also performed via video-conferencing.

The researchers are also looking at the possibility of preoperative assessment of patients at home. It used to be that invasive blood tests or other tests were required in preparation for many surgeries, but that's no longer the case. Many patients take very long journeys and often wait hours to see an anaesthesiologist who will ask them specific questions, but video-conferencing could eliminate these logistical problems and probably reduce the preoperative stress of the patients coming into the hospital before surgery. "The next steps will be to confirm the results of this pilot experience with further studies," Hemmerling said.

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THE GEOGRAPHICAL DIMENSION OF HOSPITAL-ACQUIRED INFECTIONS

UNRAVELLING THE SPREAD OF NOSOCOMIAL INFECTIONS THROUGH HEALTHCARE NETWORKS

Hajo Grundmann, *Prof.*

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Hospital-acquired infections (HAIs) are a constant battle for hospitals, often making the headlines. But how do these infections spread and what can be done to stop them? This article investigates the use of mapping tools for epidemiological investigation, which could allow for early warning and response for hospital infections.

The Epidemiology of Hospital-Acquired Infections

Hospital-acquired infections resemble each other. They are likely to be caused by opportunistic pathogens carried by patients as part of their 'normal' flora and are usually associated – in some way or the other – with antibiotic consumption, either of the patient himself or among the fellow patients in the rest of the ward or hospital. It therefore comes as no surprise that in hospitals, where on average about one of three patients are receiving systemic antibiotic chemotherapy, most bacteria that cause nosocomial infections express some type of resistance to first or second line antibiotics or occasionally even compounds of "last resort". This provides them with the edge over their susceptible competitors.

Moreover, de novo emergence of antibiotic resistance in hospitals is a relatively rare event and mainly restricted to some special bacteria or resistance mechanisms. Most antibiotic resistance is encoded by genes and more often, assemblages of genes (so called genetic elements), which are frequently mobile and can spread between different bacteria. Antibiotic resistance of this type is mainly disseminated by bacterial strains, which have acquired these elements and are carried by patients. Naturally, these antibiotic resistant strains are also more frequently transmitted between patients who share the same facilities and some have evolved into notorious hospital clones (groups of bacteria that are all genetically related and descended from a single, common ancestor) with the potential to cause outbreaks if given the chance. In absence of the high antibiotic selection pressure and the multiple opportunities for transmission that exist in hospitals, these strains are constrained in their ability to spread far and wide in the community and if this paradigm holds one should be able to observe a geographical concentration of typically hospital-acquired clones.

The European Network Approach of the Staphylococcal Reference Laboratories

We have tested this hypothesis by utilising one of the most successful networks for the surveillance of antimicrobial resistance, the European Antimicrobial Resistance Surveillance System (EARSS). With this approach we intended to identify the geographic distribution of Staphylococcus aureus clones that cause invasive infections in patients treated in European hospitals.

S. aureus lives on the skin and in the nose of about a third of healthy people. These bacteria usually coexist peacefully with their human hosts but occasionally can cause trivial infections such as spots or boils, or even less frequent, serious, life-threatening conditions such as blood poisoning and pneumonia. These latter infections require professional management in hospitals and treatment with antibiotics. Unfortunately, in some parts of Europe many of the S. aureus clones that are typically encountered in hospitals are resistant to most frequently prescribed group of antibiotics the betalactams and are then referred to as methicillin-resistant.

Epidemic clones of methicillin-resistant S. aureus (MRSA) infections can be a particular problem in hospitals and other healthcare facilities (so-called hospital-acquired MRSA), but a few clones can also occur in otherwise healthy people who have not been admitted to a hospital and are then called community-acquired MRSA. With the help of the EARSS network, we were able to garner the support of Staphylococcal Reference Laboratories (SRLs) from 26 European countries.

Together with the experts from these laboratories, we agreed on a standardised approach to identify different clones of S. aureus using the most advanced genetic characterisation consisting of sequencing the DNA of a particularly variable gene the so called spa gene. The SRLs also secured the participation of up to 25 hospitals per country (Figure 1). These hospitals were chosen to provide a representative geographic as well as demographic coverage at the national level. Using a common sampling frame,

participating hospitals collected successive methicillin-susceptible (MSSA) and MRSA isolates from patients with invasive S. aureus infection. All isolates were then sequenced at the spa locus at the respective national SRL and all data were aggregated into a single database.

The Geographical Distribution of S. Aureus

In the course of the study (September 2006-February 2007), we were able to collect data on approximately 3,000 isolates from 450 hospitals of which one third consisted of MRSA the others were MSSA. The non antibiotic resistant isolates, the MSSA showed a very large diversity with individual clones distributed all across Europe. However, the genetic diversity of MRSA differed considerably between countries. Especially for the most dominant MRSA clones, we could identify distinctive geographical clusters. Some of these clones were clearly confined to national boundaries. Others had spread regionally and had become mainly prevalent in neighbouring countries. Others still were found in single hospitals which most likely resulted from local outbreaks.

For visualisation and interrogation we built an interactive web-based mapping tool that provides detailed information for clinicians, diagnostic microbiologists, infection control teams and hospital management on the dynamics of the S. aureus and especially the MRSA population. We also made this tool freely available online at www.spatialepidemiology.net/srl-maps/.

The Role of Hospital Networks in the Dissemination of Nosocomial Pathogens

Obviously, the difference in geographic concentration between resistant and susceptible isolates was intriguing. The most plausible explanation lay in the fact that acquisition of resistance by MSSA to become MRSA is a relatively rare event. Therefore, there are far fewer MRSA clones compared to MSSA clones and they are very young in evolutionary history since they mainly emerged since the availability of antibiotic chemotherapy during the last 40-60 years.

Figure 1. The geographic distribution of participating hospitals from www.spatialepidemiology.net/srl-maps

MSSA on the contrary is much older and therefore had time to diversify.

Since hospital-acquired MRSA clones have their special selective advantages over MSSA when antibiotic use is high, they expand in hospitals and attain geographic spread by repeated admissions and referrals between hospitals by patients the carry them. These patients typically belong to a frailer or more ill segment of the population, which normally don't travel large distances. We therefore have reasons to believe that the geographic concentration of MRSA clones is a reflection of patient movement between hospitals that are part of a collaborative referral structure.

By analysing the admission pattern of patients in the Netherlands and England we could show that indeed, all hospitals in each country are interconnected by means of patients that they share over a single year. This patient traffic mainly happens at national level since hospital referral structures only occasionally reach out over national borders, and we believe that it is this national healthcare utilisation pattern that determines the spread of nosocomial pathogens in modern healthcare systems.

Improving the Understanding by Collaborative Mapping Exercises

By establishing a large collaborative network and then combining molecular and spatial analytic techniques, we were able to map specific strains across large geographic regions. At its most basic, we could show that MRSA clones were not randomly distributed but clustered. But the study also illustrated other potential applications of this approach. Combining demographic with clinical outcome data and more detailed genetic characteristics such as toxin genes or virulence properties, these mapping-tools may become extremely versatile for epidemiological investigation.

They will allow for early warning and response to emerging hospital as well as community pathogens. This information may provide a better understanding of transmission, also across the interface between distinct ecological habitats such as farm animals, environmental reservoirs and humans, risk factors such as occupation or exposures to healthcare, nursing homes, etc and may therefore be able to help protect vulnerable populations. Certainly, this is only the beginning of an initiative that will be followed up by more extensive and intensive generation of pertinent data. ■

EUROPEAN SAFETY PIONEER ROLLS OUT AGILIA SMART PUMPS

St George's Healthcare NHS Trust in London, UK, administers every drug and fluid through smart pumps with built-in drug libraries.

Here, key players explain how drug libraries reduce the risk of IV drug dose errors and describe the process to implement more than 750 MC Agilia pumps in the Trust.

Dr Linda Murdoch
Lead Clinician Paediatric ICU
Joanne Harding
Assistant Chief Pharmacist for Operational Services

How do smart infusion pumps relate to improved patient safety?

LM: We know that errors made at the point of drug administration are very unlikely to be detected; there's very good literature that suggests that less than 2% of errors made at this point are detected. Drugs given by the IV route tend to be more potent, and generally IV drug administration errors aren't picked up. Smart infusion pumps with built-in drug libraries alert clinical staff to potential drug dose errors at the point of administration. So it's a very good place to start in making medication safer.

Clearly, you should look at the whole of the medication-use process, including prescribing, preparation and administration, to make the whole of medicines management safe, but most Trusts can't afford to introduce everything in one go.

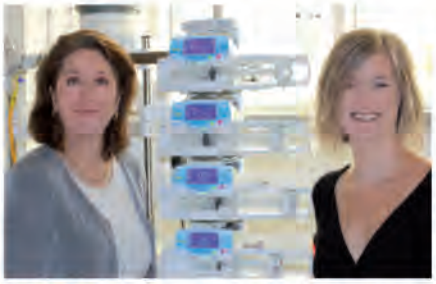
JH: From a safety perspective, the National Patient Safety Agency issues alerts that Trusts must respond to. A key one in 2007 was NPSA Alert 20: Promoting Safer Use of Injectables.

LM: Alert 20 gave us some more ammunition to push for organisational change. A smart pump forces you to implement new practices, and makes it hard to administer drugs incorrectly. When we decided to have smart infusion technology, we decided we needed it throughout the Trust. And the step to smart infusion technology is quite a step for any Trust.

"With Agilia smart pumps we can make medication administration much safer for both patients and staff."

Why did St George's choose the Agilia infusion pumps?

LM: The Vigilant Agilia drug library is the most important aspect of the Agilia series for us. Clearly, it protects the patient from a number of drug-administration errors. An error can potentially kill a patient or alter their life quite significantly, but the staff member also has to live with the consequences. With Agilia smart pumps we can make medication administration – or one aspect of it – much safer for both patients and staff. We've done our utmost to make sure that these drug libraries are fully utilised.



Dr Linda Murdoch (left), **Joanne Harding**

JH: The other thing for us was the ability to design our libraries locally. When we were choosing our standard way of giving a drug, we looked at existing guidelines.

LM: Our drug libraries support national guidelines, but are then adapted for local policy.

"All wards, including the Critical Care units, now each have a standard way of administering every drug."

What are the benefits of the Agilia infusion pumps?

LM: From a nurse perspective, the interfaces for the volumetric and the syringe pumps are very similar, they're easy to use. I'm very surprised at how well received these have been, and relatively quickly.

JH: Also, because we're introducing the same model of pump across the organisation, there's a real benefit to nursing staff. So if you're going from a Critical Care area to an Adult area to a Paediatric area, it's the same pump, used in the same way.

LM: Another benefit is that we have standardised the way of administering drugs in the Trust. We have written six drug libraries, each with a matching preparation guide. All wards, including the Critical Care units, now each have a standard way of administering every drug. That's revolutionised the way we prepare drugs.

"You have to decide which protocol, or protocols, you are going to have, and bring all the clinicians and pharmacists on-side."

No other hospital in Europe seems to deploy drug libraries so extensively. Why?

LM: Designing the libraries is a huge undertaking. You have to design a preparation guide, discuss with other pharmacists and clinicians, and, importantly, with nursing staff. When there are six different protocols for the same drug, you have to decide which protocol, or protocols, you are going to have, and bring all the clinicians and pharmacists on-side. That's very time-consuming. You can't do that alone. It has to be done by clinician and pharmacist. One should not underestimate the time required.

Which environment did you start with?

LM: Adults are the largest section of the hospital, so we decided we would have to do an Adult Critical Care and an Adult Ward drug library. We did the Critical Care library first: it has 252 drug entries. We didn't go across all adult ICUs to start with. We started with one wing: the Neurology ICU, then the Neurology wards. Then we moved on to Cardiac ICU and Cardiac wards to complete one wing.

How did you write the libraries?

JH: For each drug, we looked at three core recognised reference texts - the British National Formulary, the Summary of Product Characteristics, and Medusa, the NHS injectables guide – and elsewhere if we needed to.

LM: The drug libraries and preparation guides were written, and the software programmed, by a senior clinician and specialist pharmacist team with input from nursing and other clinician colleagues from the relevant clinical area.

JH: The drug libraries and preparation guides were then validated by an independent senior pharmacist - an essential part of the process.

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Who's responsible for the drug libraries?
JH: Linda is clinically responsible for the drug libraries' content. Linda and the Project Team have charged Pharmacy with ensuring quality. I reassure Linda and the Team that the process of writing and validating the libraries is robust, and is unlikely to result in errors.
The drug libraries will need to be constantly updated with changes in practice, new medicines, etc. We're looking at an annual update of each library and the corresponding preparation guide, with one done every two months. It will need to be collaborative. Maintaining the libraries couldn't be left to pharmacists or to clinicians alone.

How did you reconcile any differences between your reference sources?
JH: We took decisions on the best practice for our organisation, and amended existing local policies when necessary.

> "When you say 'This way's safer', the clinical staff are very much on-board."

How did you ensure clinician acceptance?
LM/JH: Consultation!
JH: We engaged with them and said, "How do you want this written?" When you say "This way's safer", the clinical staff are very much on-board.

> "Fresenius Kabi has been instrumental in facilitating the implementation of our smart pump policies."

How did you train the staff?
LM: Fresenius Kabi staff have trained the nursing staff, and the medical staff who've required training. They've co-organised it with St George's staff, but it's been delivered by Fresenius Kabi trainers, who are fantastic. They've required no real supervision; they've come in and been very proactive. You'd actually believe they were part of St George's.
JH: They haven't just said "I'm here to train them to use the device". Fresenius Kabi has been instrumental in facilitating the implementation of our smart pump policies.

What's the plan for continuing training?
LM: Fresenius Kabi will come in and deliver "Train the Trainer" sessions at regular intervals. These local trainers will do ongoing training for new staff and also update training. In an institution like this, there are always training needs.

Alan Thorne
Director of Transformation

Where do your new smart pumps fit into St George's change programme?
AT: The MC Agilia infusion pumps are our flagship patient-safety project. It shows that the Trust's change programme is about developing a greater culture of patient safety within the organisation, and not just efficiency and cash release. The pumps primarily maximise the use of technology to do two things: one, ensure patient safety; and two, change a culture within the organisation. This has been a partnership with the supplier, with joint delivery of training and strategy. The company has specialist skills that they bring to the table, particularly in terms of training and also in terms of project management.

Have you already observed benefits?
AT: Any move that starts to standardise our medical equipment and facilitates the training of our staff, protects patient safety. Some of the cultural benefits, we'll see down the track – reductions in what are quite low reported incidents already, to nil incidents involving the infusion of drugs or fluids, hopefully.


Alan Thorne

Is nil incidents achievable?
AT: I believe so. The more you automate and standardise, the more you reduce that risk... And I believe the rollout has delivered some financial efficiency – not so much in the standardisation of the pumps themselves, but in the standardisation and efficient management of the supply chain, for consumables as well.
Non-standard pumps meant using a variety of giving sets, and not maximising our product numbers or purchasing power – all that comes into play, as well as the underlying patient-safety issue.

Sarah Shah
Matron, Neurology ICU

What's your assessment of the MC Agilia pumps?
SS: I think they're user-friendly. We've had them a year now, so everybody's very used to them. The pumps have a big screen. The menu's quite easy to go through. You test it quickly and easily as a system – when you've got the sets in, it tells you what to do. Loading the sets is easy and straightforward. Being able to stack several and carry three in one go – they clip into each other – is quite useful. Obviously, the pumps increase patient safety.

Sarah Piper
Clinical ICU Technologist and Equipment Library Manager

What are the benefits for St George's Trust of standardising the MC Agilia pumps?
SP: We needed a pump that could be configured to different needs. So the main benefit is that we can standardise all our training. There's less risk to the Trust because the nurses are less likely to make a mistake in setting up the pump, or be confused on giving sets. So it's safer for the patient. It also means we can save on training and storage resources – we don't need to have all the different sets everywhere, and the technicians don't have to be trained on different pumps.

What are the advantages of the MC Agilia range?
SP: The Agilia pumps are lightweight; and they're very, very user-friendly and easy to set up. We need an intuitive pump: if the nurses have never seen it before, they must be able to work out very quickly how to use it. The nurses could set the Agilia infusion pumps up without any formal training. Also, the drug library was superior to other manufacturers'.

■ Interviews conducted by Paul Jones

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VENTILATOR-ASSOCIATED PNEUMONIA CAUSED BY HIGH RISK MICROORGANISMS

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Infection is a major problem in intensive care units (ICU) as it is the leading cause of death in non-cardiac ICUs around the world. Ventilator-Associated Pneumonia (VAP) presents a special challenge for intensivists, not only because of its high attributable mortality (up to 40% when high risk microorganisms are concerned), but also because of causing increased morbidity and cost. Emergence of multi-drug resistant microorganisms lead to frustration since very few treatment alternatives are available for them. Very recently, there have been reports of bacteria containing the New Delhi metallo-lactamase-1 (NDM-1) gene called "superbugs" which are resistant to all antibiotics.

Although VAP is a problem in every ICU, each country and even each institution face with different bugs. Well known EPIC I (Vincent et al. 1995) and EPIC II (Vincent et al. 2009) studies revealed the fact that the microbiologic profile differed among countries all over the world. For instance, according to the EPIC II study, methcillin resistant S aureus (MRSA) is a greater problem in North America compared to other regions, whereas Acinetobacter and Pseudomonas spp are more prevalant in Southeast Europe and in Asia. The EU-VAP/CAP study (Koulenti et al. 2009) showed almost similar results, where high risk microorganisms i.e., MRSA, P aeruginosa, A baumannii and S maltophilia, accounted for more than 60% of isolates in late onset VAP.

Contributing to both EPIC II and EU-VAP/CAP studies, Acinetobacter and Pseudo - monas spp account for about three quarters of isolates in VAP in Turkey, and more than 60% of them are multi-drug resistant (resistant to at least two groups of antibiotics) (Korten et al. 2007). Colistin, which is the only effective antibiotic for these microorganisms is unfortunately not easily available in Turkey, therefore treatment of the patients infected with these microorganisms poses a great challenge. For these reasons, we undertook a matched case-control study to determine the impact of high risk microorganisms on mortality and morbidity (Aybar Turkoglu and Topeli Iskit 2008).

The Study Design

A matched cohort study was conducted in the medical ICU of Hacettepe University Hospital, Ankara. Patients ventilated for more than 48 hours were enrolled and patients who were admitted to the ICU after receiving mechanical ventilation for more than 48 hours in another place were excluded. For clinical diagnosis of VAP, standard criteria were used based on the presence of a new infiltrate on a chest x-ray with the presence of two of the criteria: Hypo- or hyperthermia, leukocytosis or leukopenia, purulent secretions and increase in hypoxemia. For the microbiologic diagnosis, quantitative endotracheal aspirate cultures were mostly used. Patients having positive quantitative culture results for high risk microorganisms including P aeruginosa, Acinetobacter spp, S maltophilia and/or MRSA, in addition to clinical findings were accepted as the case patients. Control patients were selected from the ventilated patients who had no clinical and microbiological evidence of VAP. Each case patient was matched to one control patient according to the duration of mechanical ventilation, (i.e., duration of mechanical ventilation of the control patient was at least as long as the duration of mechanical ventilation prior to the onset of VAP for the case patient); APACHE II score and age (values for case and control patients were within ± 8 and ± 13 points, respectively); and date of admission of the case and the control patients was within 16 months.

Results

During the study period, 536 patients were admitted and stayed in the MICU for > 24 hours, among which 216 patients received mechanical ventilation with intubation. Sixty patients were excluded from the study. Of the remaining 156 patients 60 patients had developed VAP, 45 of whom with high risk microorganisms. Thirty five case patients could have been matched with 35 control patients. Baseline characteristics (age, APACHE II score, sex, admission diagnosis, type of underlying disease, sedative and steroid use, and use of enteral nutrition, type of stress ulcer prophylaxis, reintubation rate, prior antibiotic use) were similar in case and control patients. Median age and APACHE II score of case patients were 69 and 20, respectively and of control patients were 67 and

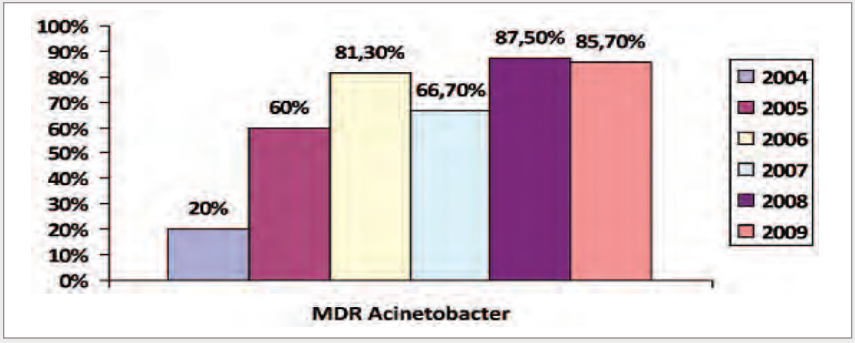

Figure 1. Distribution of multi-drug resistant (MDR) Acinetobacter isolates over time. Appropriate empiric antibiotic treatment was given in only 24% of cases, which was even lower than the rate reported in the first study discussed above.

19, respectively. Duration of mechanical ventilation prior to the development of VAP in the case patients was 6 [3.5-9.5] (median [25th-75th percentile]) days and total duration of mechanical ventilation in control patients was 8 [6-11.5] days ($p< 0.01$).

In case patients, 43 high risk microorganisms were isolated. Acinetobacter spp were isolated in 15, P aeruginosa in 15, MRSA in 10 and S maltophilia in 3 patients. According to the resistance patterns appropriate antibiotics were prescribed in only 53% of patients. Isolated Acinetobacter or Pseudomonas spp in four patients were resistant to all aminoglycosides, carbapenems, third and fourth generation cephalosporins, piperacillin and quinolones and all of these patients died. Antibiotic resistance rate in Pseudomonas and Acinetobacter spp was very high. In P aeruginosa, resistance rate to carbepenems was 53%, tobramycin 93%, amikacin 67%, ceftazidim 87%, piperacillin 80%. In Acinetobacter spp, resistance rates for the above mentioned antibiotics were 73%, 13%, 67%, 67% and 93%, respectively.

Although there was no difference between the case and the control patients in terms of the development of organ failures (acute renal failure, acute respiratory distress syndrome, shock requiring vasopressor therapy and disseminated intravascular coagulation) in this study, case patients were exposed to invasive procedures such as tracheostomy and central venous catheterisation more than the control patients.

ICU mortality rate was similar between case and control patients (80% and 71%, respectively, $p= 0.58$) as was hospital mortality rate (80% for both groups). However, length of ICU stay was longer in case patients than in control patients (20 [11-30] days and 13 [8-19] days, $p< 0.01$). Length of hospital stay was also longer in case patients than in control patients (29 [20-44] days and 22 [13-37] days, $p= 0.05$). In addition, duration of mechanical ventilation was longer in case patients than in control patients (18 [10-25] days and 8 [6-11] days, $p< 0.01$). Therefore, VAP caused by high risk microorganisms resulted in an increase in length of ICU stay and hospital length of stay by seven days, and in duration of mechanical ventilation by 10 days.

Discussion

VAP is believed to increase mortality rate, however it is important to differentiate the mortality due to the underlying disease process or the infection itself. Therefore there are conflicting results about attributable mortality rate in VAP and there are few studies mainly looking at the attributable mortality rate in VAP caused by high risk microorganisms. Most studies are subgroup analysis. Similar to our study, there are some studies which could not demonstrate an increased mortality caused by VAP (Garnacho et al. 2003). However, there are some which showed an attributable mortality rate of 43% when Pseudomonas or Acinetobacter spp were concerned (Fagon et al. 1993).

Although sample size is small due to being conducted in a single centre and due to the nature of the study design being a matched case-control study, the major findings were considerably increased length of ICU and hospital stay and duration of mechanical ventilation in VAP caused by high risk microorganisms. Similar to our results, in the literature, an increase in length of ICU stay attributable to VAP caused by high risk microorganisms ranges between 6 to 12 days (Heyland et al. 1999). In addition to these findings, we have also shown that development of VAP due to high risk microorganisms was an independent risk factor for prolonged length of ICU and hospital stay, and duration of mechanical ventilation. There are also conflicting results in the literature about whether high risk microorganisms increase development of organ failures.

> *"VAP is believed to increase mortality rate, however it is important to differentiate the mortality due to the underlying disease process or the infection itself."*

When factors related with prolonged length of ICU stay, i.e., length of stay more than the median value (16 days), prolonged length of hospital stay (>26 days) and prolonged duration of mechanical ventilation (>11 days) found in bivariate analysis were put into a logistic regression model, VAP caused by high risk microorganisms was found to be an independent risk factor for increased length of ICU and hospital stay (OR 6 [CI 1.8-19.7] and OR 4 [CI 1.2-16.4], respectively) and increased duration of mechanical ventilation (OR 11 [CI 2.1-54.5]). Almost similar results were observed when outcome variables were evaluated separately for Pseudomonas, Acinetobacter spp and MRSA.

Reasons for the finding of insignificant difference in mortality rate between case and control patients could be the small sample size and presence of similar frequencies of organ failures and similar

Continued on page 30

PROTECTING PATIENTS FROM CLOSTRIDIUM DIFFICILE INFECTION

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Protecting patients from acquiring Clostridium difficile infection has become a major challenge for healthcare institutions worldwide. Antimicrobial stewardship, early isolation, accurate diagnosis, and environmental disinfection are the key steps to prevention.

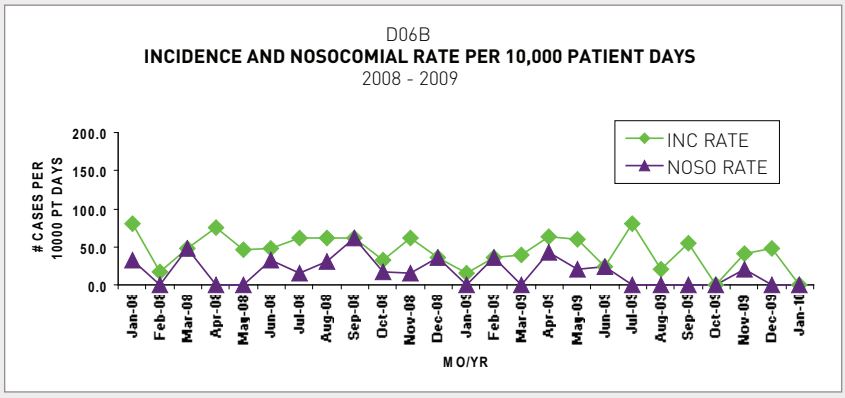
Clostridium difficile infection (CDI) is an increasing menace across the entire healthcare spectrum. It is now the leading healthcare acquired pathogen and accounts for over 165,000 cases which have their onset in US hospitals. The downstream impact of this is enormous, affecting another 50,000 persons after discharge and over 263 million nursing home residents. The costs in dollars, deaths and loss of independence are staggering. This all comes at a time of an aging population with a higher risk of acquiring and developing complications of this disease. There are two principal modifiable factors, which may mitigate risk, reducing antimicrobial exposure and reducing the acquisition of C. difficile. Nationally recommended strategies have focused on enhanced isolation practices (contact isolation), hand hygiene compliance, an early alert system of notification of lab results and more recently, antimicrobial stewardship and environmental cleaning (Cohen et al. 2010).

Clostridium difficile is an anaerobic toxin producing organism, which colonises the lower gastrointestinal tract. The frequency of colonisation is dependent upon healthcare and antimicrobial exposures, the host's immune state and the competitive fecal biome. Disruption of any one of these factors may enhance the risk of acquisition and disease due to this organism.

There are several potential approaches to prevention:

1. Preventing acquisition from the environment;
2. Preventing colonisation of the gut;
3. Enhancing host immune defenses; and
4. Providing early, effective treatment.

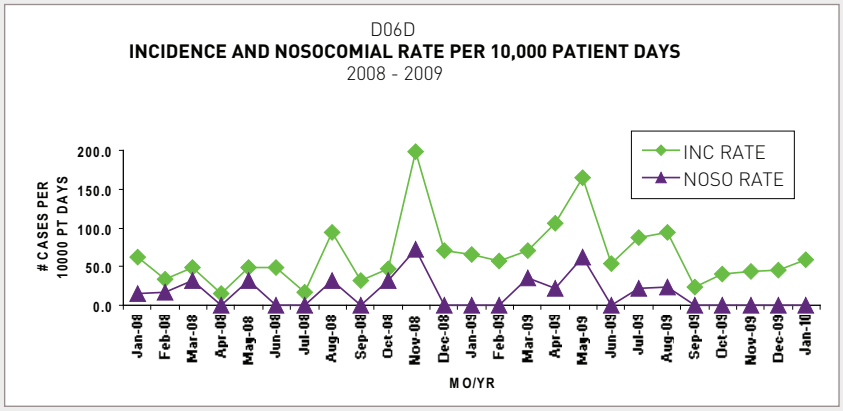
A simple three step approach may help reduce acquisition and transmission. The initial step for clinicians is to **think C. difficile** – when planning a course of therapy for a patient. Physicians should consider the risk of CDI associated with a particular antimicrobial and its duration of use. Specific factors to consider are older age >60, recent healthcare exposure, long duration of hospitalisation, severe underlying illness, and the use of acid lowering medicines.



The second step is **early isolation and rapid testing** of suspected CDI cases. Hospitalised patients with diarrhea should be placed in contact isolation preemptively until the diagnosis is excluded by a sensitive C. difficile toxin test. Many of the currently used EIA assays for toxins A and B may miss significant portions of cases (Sloan et al 2008). The use of a sensitive assay allows more rapid initiation of therapy and limits unnecessary isolation. Immediate phone notification of clinicians of a positive C. difficile toxin assay markedly reduces the time to initiation of treatment (Verdoorn et al 2009). Early treatment also may reduce the duration of their symptoms and risk for nosocomial transfer. Oral vancomycin reduces diarrhea and improves symptoms faster than oral metronidazole and may be another strategy employed to reduce healthcare transmission (Al Nassir et al 2008).

The third step is the **prevention of transmission** from colonised and infected patients and their environment to healthcare personnel and other patients. Barriers such as gowns and gloves, and dedicated patient equipment (rectal thermometers, blood pressure cuffs, stethoscopes) have been shown to reduce transmission.

Patients infected with C. difficile continue to shed organisms into the environment even



after their diarrhea has ceased. We recommend that patients remain in contact isolation throughout their hospital stay. Isolation may reduce transmission if compliance is high but fails when healthcare workers contact contaminated surfaces and fail to remove C. difficile from their hands. Thus, reducing environmental contamination is important. This is accomplished by ensuring adequate cleaning of high touch surfaces and monitoring its effectiveness. Audit and feedback to housekeepers engages them in the process of protecting patients from harm. A well-cleaned hospital room reduces bioburden but cannot eradicate C. difficile spores which requires cleaning with sporicidal agents such as bleach. The targeted rooms and frequency with which they should be cleaned with sporicidal agents, remains unanswered.

In our hospital, despite high compliance with isolation practices and all the other measures previously noted, nosocomial rates remained elevated. We identified units with the highest endemic rates of nosocomial C. difficile and introduced a targeted intervention to wipe out C. difficile using germicidal bleach wipes. Three published studies (and several unpublished have shown hypochlorite disinfection to reduce rates of CDI, particularly in the setting of high colonisation pressure (Mayfield 2000, Wilcox 2003). These studies have shown a 1:10 dilution of household bleach to be an effective sporicide against C. difficile. Recently, several manufactures have produced germicidal bleach wipes for use in cleaning hospital rooms. These are easier to use and need to be left to dry to achieve the 10 minute wet contact time to kill C. difficile spores. The cleaned surfaces often have a salt residue and if visible this should be wiped with wet cloth to improve appearance.

At our institution we identified 2 medical units with the highest nosocomial rates of CDI. These units cared for patients with chronic gastrointestinal and pulmonary diseases and had an incident rate of CDI 10-fold above the institutional rate, reflecting a high colonisation pressure.

Prior to the intervention we monitored the effectiveness of room cleaning with audits and use of Clean Trace. All rooms on these units were determined to have been effectively cleaned. We then met with the unit nursing, clinical and environmental services staff and outlined our vision of how to wipe out C. difficile by eliminating spores from the patient and work environment. The intervention consisted of housekeeping staff cleaning each room on these two units every day using Clorox brand germicidal bleach wipes 6.15%-5200 ppm active chlorine. The bleach wipes were used on all high touch surfaces and allowed to dry to achieve the recommended 10 minute contact time. Surfaces that showed salt residue were re-wiped with a water dampened cloth to eliminate any concerns that the surfaces were dirty. We explained the rationale to housekeeping and advised them of the potential irritant side effects from the bleach product. Like any bleach product, the odor was noticeable at low concentrations. The wipes have a masking agent but we found that cleaning in a closed non-ventilated space was irritating to the environmental services staff. Mitigation was provided for those bothered by the irritant effects in the form of a plain surgical mask and ensuring adequate ventilation of the area. The product was well tolerated by patients, even those with respiratory ailments and by nursing staff. No equipment damage was reported during the trial. We continued to monitor cleaning effectiveness and surveyed patients and staff regarding their acceptance of the new product. As CDI rates became available each month we met with housekeepers to review the survey data and rates to show them how effective their work was at reducing CDI and to address any of their concerns.

Daily and terminal cleaning of all rooms on the affected units with the germicidal bleach wipes resulted in a 92% decline in hospital-acquired CDI on these two high risk units over a 6 month period. The intervention and its results have been sustained now for over 8 months (see figure for one of the two units).

This reduction in clinical cases of C. difficile infection was achieved in the absence of any other interventions, in rooms known to be effectively cleaned and with no change in hand hygiene practices. Rates elsewhere in the institution on non-targeted units did not decline. The change was easily implemented with education of environmental service staff and is exportable to other high-risk units. ■

References

Cohen SH, Gerding DN, Johnson S, et al. (2010). Clinical Practice Guidelines for Clostridium difficile infection in adults: 2010 Update by the Society for Healthcare Epidemiology of America and the Infectious Diseases Society of America. Infect Control Hosp Epidemiol 31(5): 431-455

Donaldson L, Beasley C, McCracken J. (2010) Clostridium difficile infection: How to deal with the problem. Department of Health, Health Protection Agency, UK

Mayfield J, Leet T, Miller J et al. (2000) Environmental Control to reduce transmission of Clostridium difficile. Clin Infect Dis 31:995-1000.

Sloan LM, Duresko BL, Gustafson DR et al. (2008) Comparison of real time PCR for detection of the tcdC gene with four immunoassays and culture in diagnosis of Clostridium difficile infection. J Clin Microbiol 46:1996-2001).

Verdoorn BP, Orenstein R, Wilson JW, et al. (2008) Effect of Telephoned Notification of Positive Clostridium difficile Test Results on the Time to the Ordering of Antimicrobial Therapy. Infection Control Hospital Epidemiol 29(7):658-60.

Wilcox MH, Fawley WN, Wigglesworth N, et al. (2003). Comparison of the effect of detergent versus hypochlorite cleaning on environmental contamination and incidence of Clostridium difficile infection. J Hosp Infect 54:109-114.

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INFECTIOUS DISEASES SPECIALIST CONSULTATION IN THE INTENSIVE CARE UNIT: WORTH THE MONEY?

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Particularly in an intensive care unit setting, patients admitted with or developing infection during their stay are at increased risk for adverse outcomes, unless presence or onset of infection is diagnosed early and appropriate antibiotics are administered promptly. This brief overview will elaborate on the contributing role of infectious diseases specialist consultation in achieving the aforementioned goals.

Introduction

It is acknowledged that the presence of infection, in particular when the pathogen is multidrug resistant, is a key outcome determinant for critically ill patients (Blot 2008; Depuydt et al. 2008). Two major factors: Early diagnosis and administration of appropriate antibiotics can significantly influence infection prognosis. Conversely, delayed recognition and initial inappropriate treatment are associated with adverse outcomes, including attributable mortality (Vandijck 2008; Blot and Vandewoude 2004).

As part of a bundle approach, routine microbiologic surveillance cultures, introduction of antibiotic practice recommendations, and infectious diseases specialist consultation may contribute to achieving prompter diagnosis and appropriate antibiotic treatment of infections.

Establishing an Infectious Diseases Consultation Programme in the ICU

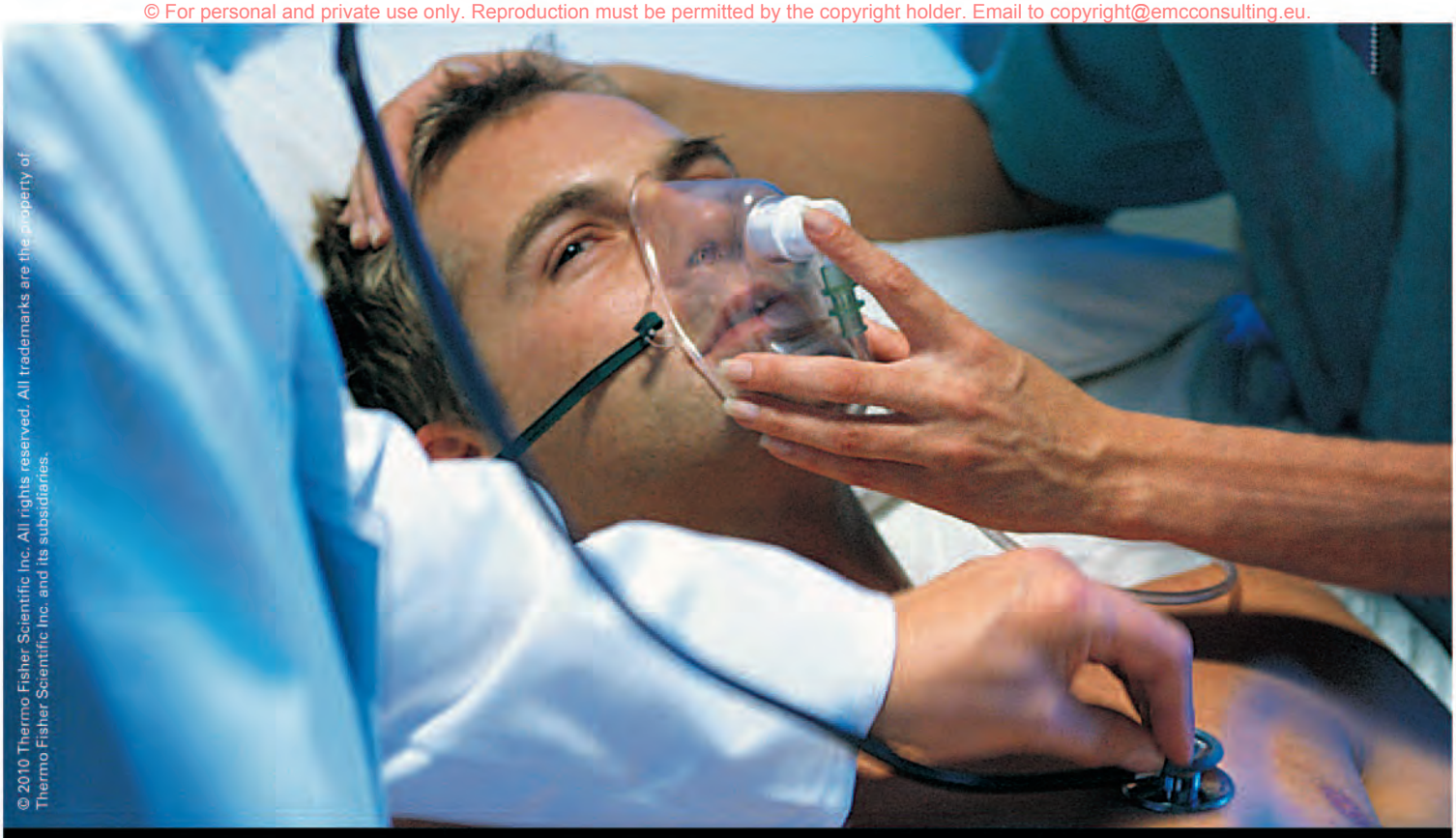
In general, there are different main ways to establish an infectious diseases consultation strategy in an ICU. First, as in our hospital (Ghent University Hospital, Belgium), the attending intensive care physician is able to contact the infectious diseases specialist at any time in conjunction with weekly multidisciplinary meetings attended by the ICU medical team, infectious diseases specialists and microbiologists. A second approach consists of consultation by an infectious diseases consultant, or an attending intensive care physician's request, according to need. Third and lastly, a strategy in which the infectious diseases specialist provides regular advice without any specific request from the attending intensive care physician is possible, considering that more than half of patients suffering critical illness receive at least one antibiotic during their stay in the ICU (Warren et al. 2005).

Impact of Infectious Diseases Specialist Consultation in the Intensive Care Unit

Microbiologic surveillance culturing strategies in patients suffering critical illness have been demonstrated to contribute to improved outcome by increasing knowledge of patients colonisation status, earlier diagnosis and consequently more appropriate choice and timing of antibiotic treatment (Blot et al. 2005; Depuydt et al. 2008a; Rello et al. 1997).

In contrast, few studies have evaluated the potential impact of infectious diseases specialist consultation on the management of patients admitted to the ICU. Raineri et al. investigated all patients suffering critical illness with a possible or definite diagnosis of infection, that received antibiotic therapy in a four year period, and assessed appropriateness of the administered therapy before and after the implementation of a systematic infectious diseases specialist consultation policy (Raineri et al. 2008).

The number of appropriately treated infections increased from 68.8% to 83.7% ($P < 0.001$) when comparing the period before and after implementation of their programme.



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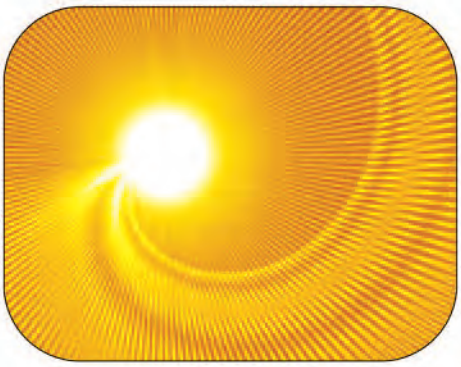
1 Müller B et al. Crit Care Med 2000, 28(4): 977-983 **2** Harbarth S et al. Am J Respir Crit Care Med 2001, 164: 396-402 **3** Christ-Crain M et al. The Lancet 2004, 363(9409): 600-607 **4** Marc E et al. Arch Pédiatr 2002, 9: 358-364 **5** Chromik AM et al. Langenbecks Arch Surg. 2006 Jun; 391(3): 187-94 **6** Nobre V et al. Am J Respir Crit Care Med 2008, 171: 498-505 **7** Luyt CE et al. Am J Respir Crit Care Med 2005, 171(1): 48-53



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After introduction of the infectious diseases specialist consultation programme, a significant reduction in the proportion of untreated infections (11.2% vs. 3%, P = 0.001), and of inappropriate drug choice (9.8% vs. 2.5%, P = 0.003) was observed.

Compliance to local empirical antibiotic recommendations increased from 63.4% to 83.8% (P < 0.001), as well as the number of patients who were administered appropriate antibiotics (from 63.8% to 80.8% (P < 0.001)).

In the subgroup of appropriately treated patients, significantly shorter duration of antibiotic treatment (P < 0.001), mechanical ventilation (P < 0.001), ICU stay (P < 0.001), and lower ICU (23% vs. 36%, P = 0.01), and crude hospital mortality (29% vs. 44%, P = 0.006), were demonstrated (Raineri et al. 2008).

These findings confirm other studies investigating the impact of an infectious diseases specialist consultation programme on patient outcomes. Gomez et al. found that the implementation of such a strategy resulted in a significantly increased proportion of appropriate first-line treatments, as well as an increase in correction of first-line inappropriate treatments (Gomez et al. 1996). Two other reports observed that the implementation of an infectious diseases consultation strategy resulted in a higher number of patients receiving appropriate antibiotic treatment (Byl et al. 1999; Nathwani et al. 1996). In the former report by Byl et al. who performed a hospital wide evaluation of patients with community vs. nosocomial-acquired bloodstream infection, a higher degree of appropriate initial empiric antibiotic therapy in the latter group was found when comparing prescriptions of infectious diseases specialists vs. other physicians. Also, significantly lower mortality was found, however, not in the subgroup of patients with septic shock due to small sample size (Byl et al. 1999). Fowler et al, who studied a cohort with Staphylococcus aureus bacteraemia, reported that patients were more likely to receive appropriate treatment and were less likely to relapse when advice given by the infectious diseases specialist was followed, although more metastatic infections were present at onset (Fowler et al. 1998). An improvement in diagnosis of infection was also

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The DebugIT project (www.debugit.eu), a consortium of leading European clinical, academic and industrial partners such as the University Hospitals of Geneva-Switzerland, INSERM-France and Linköping University-Sweden, and Agfa Healthcare-Belgium, aims at developing an IT-framework to allow healthcare systems to better address these emergent problems and improve their management.

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- Learning: Advanced data mining techniques are applied on multimodal, multi-source, structured and unstructured data to detect patterns relevant for patient safety and the better treatment of infectious diseases.
- Storing Knowledge: The gained know - ledge is stored, validated, visualised and aggregated with pre-existing knowledge in a federated knowledge repository.
- Applying Knowledge: Appropriate software tools are integrated into available clinical and public health information systems. Decision support tools apply the newly generated knowledge and help the clinician to improve choice, dose and administration of antibiotics. The new knowledge is applied to monitoring ongoing care activities and outcomes and may help to predict future outcomes.

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BOOKS IN REVIEW

Infection Control in the ICU Environment (Perspectives on Critical Care Infectious Diseases)

Authors: Robert A. Weinstein and Marc J.M. Bonten

Infection Control in the ICU Environment provides the details of the most common infection control problems facing intensive care units. Authors include noted scientists, intensivists and epidemiologists from the United States and Europe as well as infection control experts from the Centers for Disease Control and Prevention. Acinetobacter, methicillin resistant staphylococcus aureus and vancomycin resistant enterococci are examined in detail. This volume also includes cutting edge information regarding the potential for prophylactic and pre-emptive therapy of fungal infections in intensive care units. Innovations in vascular catheter care and prevention of bloodstream infections are discussed in this volume as well as the newest information in mathematical modeling to understand the epidemiology and control of infections in intensive care units.

obtained through an infectious diseases consultation programme and a prospective microbiologic surveillance strategy in patients admitted to a trauma ICU (Fox et al. 2001). Infectious diseases specialist consultation was associated with 49% higher odds than a diagnosis of infection based on microbiology, and a 57% reduction of antibiotic-related expenditures per hospitalisation day in patients admitted to a medical ICU. The surveillance strategy contributed to both, better identification of patients colonisation status, and high rates of early appropriate antibiotic therapy with more limited use of broad-spectrum antibiotics (Depuydt et al. 2008a).

Critical Appraisal

The available literature demonstrates that the interaction between the infectious diseases specialist and the attending intensive care physician may improve diagnosis of infection and subsequent administration of appropriate antibiotics. Also, an infectious diseases consultation programme may help reduce the duration of antimicrobial therapy, through reassessment of indication. Furthermore, this interaction is associated with more favourable clinical and economic outcome in terms of improved survival rates, and a reduction of resources use including shorter length of stay in both the ICU and hospital, shorter duration of high technological supportive therapy, and decreased consumption of antibiotics, which benefits not only the individual patient but also the collective of patients within the healthcare institution, from an ecologic perspective, through reduced selection and spread of antimicrobial resistance.

It can be argued that the necessary interactions between both disciplines, i.e. infectious diseases and intensive care specialists, is not feasible in all centres because of resource constraints. However, in our opinion, infectious diseases specialist consultation may be cost-effective because the reduced administration of antibiotics and decreased infection-related comorbidities/therapies counterbalance the extra financial expenses associated with an infectious diseases specialist's time and diagnostic prescription (Vandijck et al. 2008). Additionally, potential future savings because of reductions or control of multi-drug resistance secondary to reduced broad-spectrum antibiotic use should also be taken into account. These issues should be investigated further.

Conclusion

The implementation of an infectious diseases consultation programme may lead to earlier diagnosis of infections, improve the appropriateness of the antibiotic treatment prescription, reducing antimicrobial therapy duration, and the adherence to local antibiotic recommendations. In turn, appropriate therapy is associated with improved patient outcome and may contribute in lowering infection-related costs. ■

References

Blot S (2008). Limiting the attributable mortality of nosocomial infection and multidrug resistance in intensive care units. Clin Microbiol Infect; 14: 5-13.

Blot S, Depuydt P, Vandewoude K & De Bacquer D (2007). Measuring the impact of multidrug resistance in nosocomial infection. Curr Opin Infect Dis; 20: 391-6.

Byl B, Clevenbergh P, Jacobs F, Struelens MJ, Zech F, Kentos A & Thys JP (1999). Impact of infectious diseases specialists and microbiological data on the appropriateness of antimicrobial therapy for bacteremia. Clin Infect Dis; 29: 60-6; discussion 67-8.

Depuydt PO, Vandijck DM, Bekaert MA, Decruyenaere JM, Blot SI, Vogelaers DP & Benoit DD (2008b). Determinants and impact of multidrug antibiotic resistance in pathogens causing ventilator-associated-pneumonia. Crit Care; 12: R142.

Fowler VG, Jr., Sanders LL, Sexton DJ, Kong L, Marr KA, Gopal AK, Gottlieb G, McClelland RS & Corey GR (1998). Outcome of Staphylococcus aureus bacteremia according to compliance with recommendations of infectious diseases specialists: experience with 244 patients. Clin Infect Dis; 27: 478-86.

Fox BC, Imrey PB, Voights MB & Norwood S (2001). Infectious disease consultation and microbiologic surveillance for intensive care unit trauma patients: a pilot study. Clin Infect Dis; 33: 1981-9.

Gomez J, Conde Cavero SJ, Hernandez Cardona JL, Nunez ML, Ruiz Gomez J, Canteras M & Valdes M (1996). The influence of the opinion of an infectious disease consultant on the appropriateness of antibiotic treatment in a general hospital. J Antimicrob Chemother; 38: 309-14.

Nathwani D, Davey P, France AJ, Phillips G, Orange G & Parratt D (1996). Impact of an infection consultation service for bacteraemia on clinical management and use of resources. QJM; 89: 789-97.

Raineri E, Pan A, Mondello P, Acquarolo A, Candiani A & Crema L (2008). Role of the infectious diseases specialist consultant on the appropriateness of antimicrobial therapy prescription in an intensive care unit. Am J Infect Control; 36: 283-90.

Rello J, Gallego M, Mariscal D, Sonora R & Valles J (1997). The value of routine microbial investigation in ventilator-associated pneumonia. Am J Respir Crit Care Med; 156: 196-200.

Vandijck DM, Decruyenaere JM, Labeau SO, Depaemelaere M & Blot SI (2007b). Economic impact of catheter-related sepsis in the intensive care unit. ICU Management; 7: 10.

Vandijck DM, Depuydt PO & Blot SI (2008c). Antibiotic Resistance in the ICU: Clinical and Cost Aspects. Neth J Crit Care; 12: 18-23.

Warren MM, Gibb AP & Walsh TS (2005). Antibiotic prescription practice in an intensive care unit using twice-weekly collection of screening specimens: a prospective audit in a large UK teaching hospital. J Hosp Infect; 59: 90-5.

CONVENTIONAL AND NON CONVENTIONAL INTERFACES FOR NON INVASIVE RESPIRATORY SUPPORT IN ADULTS AND CHILDREN

PART ONE: RATIONALE AND PHYSIOLOGICAL APPROACH

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Conventional management of acute respiratory failure (ARF) in adults and children consists of endotracheal intubation with their associated risks such as the need for sedation, infections, ventilator-associated pneumonia, and laryngeal-tracheal damage. Non invasive respiratory support (NRS) is an alternative form of respiratory treatment, which includes various techniques for augmenting alveolar ventilation, oxygenation, and unloading of respiratory muscles without the need of an endotracheal tube (Nava and Hill 2009).

Introduction

NRS includes continuous positive airway pressure (nCPAP) and positive pressure ventilation (nPPV) delivered via an interface (nasal facial mask, mouth-piece or helmet) and ICU or home mechanical ventilators. By virtue of its effectiveness NRS has become more frequently used in different acute and chronic pathologic conditions in adult and paediatric patients. In adults high-level of evidence supports the use of nCPAP in cardiogenic pulmonary oedema and post-operative patients and nPPV in exacerbation of COPD, neuromuscular disorders or respiratory distress in the immunocompromised patients. Conversely, the application of NRS in infants and children is less well established, and so far, case series constitute the vast majority of the available knowledge (Calderini et al. 2010).

During NRS for ARF or long term mechanical ventilation, the efficacy of the treatment as well as patient comfort are important to determine the success of the treatment. The choice of the interface is a major determinant of NRS success or failure, mainly because the interface strongly affects patient comfort. Furthermore, the interface choice can strongly influence the development of NRS drawbacks, such as air leak, claustrophobia, facial skin erythema, acneiform rash, skin damage, and eye irritation (Nava et al. 2009).

The choice of each interface depends on:
a) Anatomical characteristic of the patient;
b) The clinical condition and disease;
c) The NRS used;
d) The expected duration of the treatment; and
e) The environment where the NRS will be provided in acute setting.

In Part One of this brief review, we will discuss the role of conventional and non conventional interfaces in acute (short term) and chronic (long term) settings. We will continue with descriptions of each interface and the advantages and contraindictations of using each in Part Two, which will be included in the upcoming issue of ICU Management.

Rationale for NRS

NRS is the delivery of respiratory support without the need of an endotracheal tube. NRS could be delivered as non invasive continuous positive airway pressure (nCPAP) and non invasive positive pressure ventilation (nPPV) (Nava and Hill 2009). nCPAP applies a constant distending airway by increasing intrathoracic pressure throughout the entire respiratory cycle, while the patient is spontaneously breathing. In other words during nCPAP the pressure applied to the respiratory system is only applied by the respiratory muscles. Main physiological effects of CPAP are:

- Prevention of atelectasis and increase in functional residual capacity thus increasing oxygenation;
- Counterbalancing intrinsic PEEP (PEEPi) thus reducing the work of breathing;
- Improvement in left ventricular afterload and haemodynamics;
- Preventing obstructive apnoea by stenting and stabilising upper airways; and
- Stabilising the high compliant chest wall in infants and pre-term babies.

Conversely, during nPPV the pressure applied to the respiratory system is generated both by patient's respiratory muscle and by the ventilator in the so called "assisted modes" or only by the ventilator during "controlled modes". In the former modes the patient is active and patient's spontaneous inspiratory effort triggers the ventilator to provide a volume (volume targeted ventilatory modes) or pressure (pressure targeted ventilatory modes). Thus, during

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each spontaneous inspiration, the patient receives a volume or pressure supported breath. Conversely, in controlled modes the patient is passively supported by the ventilator. The main physiological effects of nPPV, particularly when using "assisted modes" as pressure support ventilation (PSV), are:

- Compared to CPAP, improvement in breathing pattern (increasing in tidal volume and decreasing in respiratory rate) resulting in a better respiratory muscle unloading and decreased work of breathing;
- Alveolar recruitment thus improving ventilation/perfusion mismatching. Recruitment is then maintained by the contemporary use of CPAP;
- Compared to CPAP, better CO_2 washout due to alveolar recruitment and/or an improvement in breathing pattern.
- However, because air leaks are common during NRS patient-ventilator asynchrony may become a major issue leading to nPPV treatment failure (Vignaux et al. 2009).

Contraindications to NRS for both adults and children in the acute setting are:

- Cardiac or respiratory arrest;
- Non respiratory organ failure like severe encephalopathy (i.e. GCS<10), severe upper gastrointestinal bleeding, hemodynamic instability or unstable cardiac arrhythmia;
- Facial surgery, trauma or deformity;
- Upper airway obstruction;
- Inability to cooperate, protect the airways, clear secretions (absence of cough) and swallowing;
- Severe air leaks causing severe patient ventilator asynchronies leading to NRS failure; and
- High risk of aspiration.

Characteristics, Advantages and Disadvantages of the Various NRS Interfaces

The main characteristics of an ideal NRS interface are:

- Leak-free;
- Good stability;
- Nontraumatic;
- Lightweight;
- Long lasting;
- Nondeformable;
- Nonallergenic material;
- Low resistance to air flow;
- Minimal dead space;
- Low cost;
- Easy to manufacture (for the moulded interfaces); and
- Available in various sizes.

On the other hand, the main characteristics of an ideal NRS ideal securing system are:

- Stable (to avoid interface movements or dislocation);
- Easy to put on or remove;
- Nontraumatic;
- Light and soft;
- Breathable material;
- Available in various sizes;
- Works with various interfaces;
- Washable, for home care; and
- Disposable, for hospital use.

Because patient anatomy differs dramatically, proper selection of the interface size is mandatory to achieve the best clinical results. Interfaces include standard commercially available, ready-to-use models in various sizes (paediatric and adult small, medium, and large) or custom-fabricated, moulded directly on the patient or from a moulded cast previously obtained. In the last few years the industry has made a great technological effort to better meet the needs of clinicians and provide more comfortable, better-tolerated, easier-to-use, and safer interfaces (Fraticelli et al. 2009; Gregoretti et al. 2002; Navalesi et al. 2000; Girault et al. 2009).

Custom-fabricated masks still find a role in the management of chronic respiratory failure. It has been demonstrated that the likelihood of skin breakdown may be reduced in long term mechanically ventilated children by using tailored custom-fabricated masks.

According to the mode of application to the airway NRS interfaces may be divided into the following:

- Mouthpiece: placed between the patients lips and held in place by lip-seal;
- Nasal pillow or plugs: inserted into the nostrils;
- Nasal mask: including the nose but not the mouth;
- Oronasal or full face mask: including the nose and mouth;
- Total full-face mask: including the mouth, nose, and eyes; and
- Helmet: including the whole head and all or part of the neck; no contact with the face or head.

Some important issues related to masks characteristics must be emphasised:

- Masks may be formed from single or double pieces of material. In the latter case, they are composed by: 1) the cushion of soft material (transparent noninflatable, transparent inflatable, full hydrogel, full foam) that forms the seal against the patient's face, and 2) the frame or "body mask" of stiff material (polyvinyl chloride, polycarbonate, or thermoplastic), which in many models is transparent. The two parts may be glued or hooked together. The size of the "body mask" may theoretically affect CO_2 clearance (see the dedicated paragraph);
- Masks may have or not have the vent system (one or more holes or slots built in the frame or in the swivel connector) to prevent rebreathing. These masks belong to the so called intentional leaks circuit. The vented masks should not be used with a circuit that has separate inspiratory and expiratory limbs or with an expiratory valve or other external device for CO_2 clearance;
- Masks may be connected to the ventilator circuit with a connector, swivel piece, and/or adapter, which may be externally applied or built into the frame. Again, as mentioned before there are masks that can have a built-in vent system in the swivel connector;
- The swivel connector of the vented full-face or total full-face mask may include an anti-asphyxia valve that automatically opens to room air in case of ventilator malfunctioning when airway pressure falls below 3 cmH_2O; and
- Some mask can also have additional ports in the frame, to add oxygen or measure airway-opening pressure and/or end-tidal CO_2.

The level of intentional leaks in the vented masks may range from 12 to 45 L/min for different given pressure levels. The presence of an intentional leak may influence both the inspiratory trigger performances as well as the capacity to achieve and maintain the set inspiratory pressure. This may lead to a significant reduction in delivered tidal volume. Interestingly, expiratory cycling seems not to be affected by the level of intentional leaks except in obstructive lung conditions (Borel et al. 2009).

Non intentional air leaks may reduce the efficiency of NRS, decrease patient tolerance, and increase patient-ventilator asynchrony, possibly causing awakenings and sleep fragmentation. In patients with neuromuscular disorders receiving nocturnal NRS, leaks are also associated with daytime hypercapnia.

In order to decrease air leaks during NRS, the following issues must be taken into consideration: a) Proper interface type and size; b) Proper securing system; c) Appropriate mask-support ring and comfort flaps; d) Tube adapter; e) Hydrogel or foam seals; f) Chin strap; g) Lips seal or mouth taping.

Masks may cause friction and skin damage at the bridge of the nose, the upper lip, and the nasal mucosa. Skin irritation is sometimes due to skin hypersensitivity to certain materials or excessive sweat. However, the most important strategy to prevent skin damage is to avoid an excessively tight fit (Gregoretti et al. 2002). Some simple and easy suggestions to reduce the risk of skin damage during NRS by masks are: a) Rotate various types of interfaces; b) Proper harness and tightening; c) Skin and mask hygiene; d) Nasal-forehead spacer (to reduce the pressure on the bridge of the nose); e) Forehead pads (to obtain the most comfortable position on the forehead); f) Cushioning system between mask prong and forehead.

A Physiological Approach to the Interfaces: The Interface Volume and its Effect on CO_2 Rebreathing and Patient Effort

The dead space added by the interface may be also recognised as a major problem, in particular for the treatment of hypercapnic patients, because it may reduce NRS effectiveness in correcting respiratory acidosis. Bench studies have suggested that CO_2 rebreathing is significantly increased with masks having a large internal volume, and conversely decreased with masks having a built-in vent system. These findings may raise concern about the use of facial masks with a large internal volume and without built-in vent system, as those designed for use with double-circuit critical care ventilators (Navalesi 2009).

Alveolar ventilation decreases as dynamic dead space (the physiologic dead space plus the apparatus space) increases. The physiologic dead space depends on tidal volume, whereas the apparatus dead space depends on the inner volume of the interface. It was found, comparing the dead space between a nasal mask and a full face mask, that although the in vitro difference was significantly higher with the oro-nasal mask, the in vivo results (which took into account anatomical structures) were similar (118 vs. 97 mL with full face mask and nasal mask, respectively) (Kwok et al. 2003). In this regard the nasal pillows and masks add very little dead space and can be as effective as face mask in reducing arterial carbon dioxide and increasing pH, but are less tolerated by patients. Different flow patterns and pressure waveforms may also influence the apparatus dead space. It has been shown that a face mask increased dynamic dead space from 32% to 42% of tidal volume above physiologic dead space, during unsupported breathing. The addition of positive end-expiratory pressure lowered dynamic dead space nearly to physiologic dead space. Pressure support without positive end-expiratory pressure reduced dynamic space less, which left dynamic dead space higher than physiologic dead space (Kwok et al. 2003). Other investigators confirmed the importance of the site of the exhalation ports on CO_2 rebreathing (Schettino et al. 2003).

The clinical efficacy of a total full-face mask versus an oronasal mask was assessed in patients with acute hypercapnic respiratory failure in a recent randomised controlled study (Girault et al 2009). None of the measured parameters including carbon dioxide showed statistically significant differences between the masks at each time point throughout the study period.

Physiologic effects of four interfaces with different internal volumes in patients with hypoxemic or hypercapnic ARF receiving NRS through ICU ventilators have been evaluated (Fraticelli et al. 2009). Breathing pattern, inspiratory effort, arterial blood gases, comfort, and patient–ventilator interaction have been assessed with three facial masks with very high (977 mL), high (163 mL), and moderate (84 mL) internal volume, and a mouthpiece having virtually no internal volume. Despite these major differences in internal volume, compared with spontaneous breathing, NRS decreased inspiratory effort and improved gas exchange with no significant difference between the four interfaces. An increased rate of air leaks and asynchrony as well as a reduced comfort were observed with the mouthpiece, as opposed to all three facial masks. Although this study does not exclude that some rebreathing may occur, it definitely indicates that its extent is limited and of no clinical impact.

In patients undergoing NRS in the acute setting, the addition of a dead space through a heat-and-moisture exchanger was shown to reduce the efficacy of NRS, by increasing arterial carbon dioxide, respiratory rate, minute ventilation, and the work of breathing (Pelosi et al. 1996). The reasons why increasing the internal volume of the mask does not result in similar effects are not entirely clear. However, the application of continuous pressure throughout the expiratory phase has been shown to reduce the actual (dynamic) dead space of the mask. Furthermore, as suggested by the authors, the leakage around the mask could act as a bias flow resulting in mask CO_2 washout, which could minimise the possible differences in dead space.

The helmet has a much larger volume than any of the other interfaces (always larger than tidal volume), and the helmet behaves as a semi-closed environment, in which the increase in inspired partial pressure of CO_2 is an important issue. In a pressurised aircraft a fresh gas flow of about 200 L/min/passenger is usually needed to keep the inspired partial pressure of CO_2 at the recommended value. Inspired partial pressure of CO_2 in a semi-closed environment depends on the amount of CO_2 produced by the subject(s) and the flow of fresh gas that flushes the environment (with a helmet this is called the "helmet ventilation"). Thus, the volume of the helmet does not

Continued on page 26

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Continued from page 23

directly affect the inspired partial pressure of CO_2, but only the rate at which the predicted inspired partial pressure of CO_2 is reached. Therefore, decreasing the size of the helmet will not necessarily prevent CO_2 rebreathing. Anything that increases helmet ventilation (e.g. air leak, delivery of fresh gas) may decrease the inspired partial pressure of CO_2. A bench study with a lung model and helmets of various sizes found that a 33% reduction in helmet volume had no effect on the amount of CO_2 rebreathing at steady state (Patroniti et al. 2003). During either CPAP or NRS, the helmet affects CO_2 clearance. Helmet ventilation may require doubling the minute ventilation to maintain an end-tidal carbon dioxide value similar to that with mask ventilation. High gas flow (40–60 L/min) is required to maintain a low inspired partial pressure of CO_2 during helmet CPAP. In contrast, when CPAP was delivered with a ventilator, considerable CO_2 rebreathing was found (Taccone et al. 2004). A critical care ventilator with a double-limb circuit should not be used to deliver helmet CPAP. In the absence of air leaks, which can modify the helmet ventilation by flushing CO_2, CPAP is delivered with a gas flow that is equal to the patient's minute ventilation and hypercapnia can easily occur.

Patient-ventilator asynchrony may increase with interface volume (Racca et al. 2006). However, a recent study comparing two full-face masks with different dead space found no significant negative effect of dead space on gas exchange or patient effort (Girault et al 2009). In contrast, studies on masks versus helmets found helmets less efficient in unloading the respiratory muscles, especially in the presence of a resistive load and with a higher likelihood of patient-ventilator asynchrony (Racca et al. 2006). This may be explained by the longer time required to reach the target pressure, because part of the gas delivered by the ventilator is used to pressurise the helmet. Some portion of inspiratory effort is unassisted because of greater inspiratory and expiratory-trigger delay.

In addition, because a PSV breath is flow-cycled, delayed expiratory triggering should be expected because of the helmet's characteristics. However, it has been suggested that, although delay is prolonged with the helmet, the pressure-time product is initially smaller than with a face mask during PSV, which means less work of breathing because of the high volume the patient can access. Increasing the level of PEEP or PSV decreases the delay in helmet PSV and should therefore be considered whenever possible (Chiumello et al. 2003). In a prospective crossover study in patients at risk for respiratory distress the authors applied in random order a face mask and a helmet with "baseline" ventilatory settings and helmet with "specific" setting (50% higher PSV level and highest pressurisation rate). Compared with the facemask, the helmet with the "baseline" settings worsened patient-ventilator synchrony, as indicated by longer triggering-on and cycling-off delays. When the "specific" settings were used the triggering-on delay with helmet was significantly reduced compared to "baseline" settings (Vargas et al. 2009).

The ongoing technical improvement of the helmet has now made possible to reduce the inspiratory and expiratory trigger delay (unpublished data). This upgraded version of the helmet is expected to be released on the market.

Conclusion

Interfaces play a relevant role in the success of NRS. A wide "armamentarium" of conventional and non conventional interfaces may lead to NRS success both in acute and chronic setting. Part Two of this article, which will be featured in the next edition of ICU Management, will include a detailed description of these interfaces, as well as the advantages and contraindications of utilising each. ■

References

Borel JC, Sabil A, Janssens JP, et al. Intentional leaks in industrial masks have a significant impact on efficacy of bilevel noninvasive ventilation: a bench test study. Chest. 2009; 135: 669-77.

Calderini E, Chidini G, Pelosi P. What are the current indications for non invasive ventilation in children? Curr Opin Anaesthesiol. 2010;23:368-74

Chiumello D, Pelosi P, Severgnini P, et al. Performance of a new "helmet" versus a standard face mask. Intensive Care Med. 2003; 29: 1671-9.

Fraticelli AT, Lellouche F, L'Her E, et al. Physiological effects of different interfaces during noninvasive ventilation for acute respiratory failure. Crit Care Med. 2009; 37: 939-45.

Girault C, Briel A, Benichou J, et al. Interface strategy during noninvasive positive pressure ventilation for hypercapnic acute respiratory failure. Crit Care Med. 2009; 37: 124-31.

Gregoretti C, Confalonieri M, Navalesi P, et al. Evaluation of patient skin breakdown and comfort with a new face mask for non-invasive ventilation: a multicenter study. Intensive Care Med. 2002; 28: 278-84.

Kwok H, McCormack J, Cece RM, et al. Controlled trial of oronasal versus nasal mask ventilation in the treatment of acute respiratory failure. Crit Care Med. 2003; 31: 468-73.

Nava S, Hill N. Non-invasive ventilation in acute respiratory failure. Lancet. 2009 Jul 18;374(9685):250-9.

Nava S, Navalesi P, Gregoretti P. Interfaces and Humidification for Noninvasive Mechanical Ventilation. Respir Care. 2009;54 :71– 82

Navalesi P. Internal space of interfaces for noninvasive ventilation: dead, but not deadly. Crit Care Med. 2009 Mar;37:1146-7.

Navalesi P, Fanfulla F, Frigerio P, et al. Physiologic evaluation of noninvasive mechanical ventilation delivered with three types of masks in patients with chronic hypercapnic respiratory failure. Crit Care Med. 2000; 28: 1785-90.

Patroniti N, Foti G, Manfio A, et al. Head helmet versus face mask for non-invasive continuous positive airway pressure: a physiological study. Intensive Care Med. 2003; 29: 1680-7.

Pelosi P, Solca M, Ravagnan I, Tubiolo D, Ferrario L, Gattinoni L. Effects of heat and moisture exchangers on minute ventilation, ventilatory drive, and work of breathing during pressure-support ventilation in acute respiratory failure. Crit Care Med. 1996 Jul;24(7): 1184-8.

Racca F, Appendini L, Gregoretti C, et al. Effectiveness of mask and helmet interfaces to deliver noninvasive ventilation in a human model of resistive breathing. J Appl Physiol. 2005; 99: 1262-71.

Schettino GP, Chatmongkolchart S, Hess DR, Kacmarek RM. Position of exhalation port and mask design affect CO_2 rebreathing during noninvasive positive pressure ventilation. Crit Care Med. 2003 Aug;31(8):2178-82.

Taccone P, Hess D, Caironi P, Bigatello LM. Continuous positive airway pressure delivered with a "helmet": effects on carbon dioxide rebreathing. Crit Care Med. 2004; 32: 2090-6.

Vargas F, Thille A, Lyazidi A, et al Helmet with specific settings versus facemask for noninvasive ventilation. Crit Care Med. 2009; 37: 1921-8.

Vignaux L , Vargas F, Roeseler J, et al. Patient–ventilator asynchrony during non-invasive ventilation for acute respiratory failure: a multicenter study. Intensive Care Med. 2009; 34: 1416-25.

DELIRIUM MONITORING IN THE INTENSIVE CARE UNIT

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Delirium is an acute confusional state associated with increased mortality in the Intensive Care Unit (ICU) and long-term global and neurologic impaired functional recovery. Despite its elevated incidence and major impact in the outcomes of critically ill patients, delirium remains underdiagnosed. Presently, there are validated instruments to diagnose and monitor delirium, allowing the detection of early organ (CNS) dysfunction. Epidemiologic data shows that beyond patient's non-modifiable risk factors, there are modifiable clinical and environmental aspects that should be assessed to reduce the occurrence and severity of delirium. Recent studies demonstrate that interventions aiming to reduce sedative exposure and to improve patients' orientation and to implement early mobility are associated with reduced delirium rates. In a patient safety perspective delirium should be seen as a preventable adverse event and a low incidence of delirium should be targeted and considered as a measure of quality of care in the ICU.

Introduction

Delirium is an acute confusional state that encompasses a wide array of clinical manifestations (Pandharipande et al. 2005). Delirium prevalence in ICU ranges from 28% to 83% (Janz et al. 2010; Morandi et al. 2009; Ely et al. 2001b). Such variation can be attributed to heterogeneity in the evaluated population (e.g. severity of illness, ventilated versus non-ventilated) as well as in the definition and instrument chosen for delirium detection (Morandi et al. 2008; Salluh et al. 2009). Despite its elevated prevalence, delirium remains largely unrecognized (Salluh et al. 2009). There is current evidence demonstrating that delirium is associated with worse outcomes for critically ill patients including increased duration of mechanical ventilation, hospital length of stay and mortality (Ely et al. 2001a; Pandharipande et al. 2005; Ely et al. 2004). Furthermore, ICU patients that present delirium are at increased risk of impaired global functional recovery and long-term neurocognitive sequelae (Girard et al. 2010; Van Rompaey et al. 2009b). Therefore, understanding delirium epidemiology and risk factors is the key to implement effective monitoring and preventive strategies.

Risk Factors and Non-pharmacologic Prevention

Risk factors for delirium are divided in modifiable and non-modifiable (Van Rompaey et al. 2009a). Among non-modifiable factors are patient's characteristics such as:

- Age;
- Gender;
- Personal habits (e.g.-smoking, alcohol abuse);
- Comorbidities;
- Prior nervous system deficits;
- Genetic characteristics (e.g. APO-E4 mutation) (Ely et al. 2007); and
- Dementia (Pandharipande et al. 2008; Inouye 1999).

ICU physicians should focus on modifiable risk factors, especially in patients at high risk of developing delirium. The typical ICU environment represents a risk factor for delirium, due to the patient isolation and absence of natural daylight and clocks. Minor interventions, as allowing natural light through windows, access to visual and hearing aids and minimising sleep deprivation may humanise the ICU (Inouye et al. 1999). Additionally, invasive life support, tubes, drains and catheters are risk factors for delirium and should be removed as soon as possible. In a landmark study, Inouye et al. (Inouye et al. 1999) evaluated 852 hospitalised, non-ICU patients and instituted a multicomponent intervention consisting of reorientation of the patients, a nonpharmacologic sleep protocol, early mobilisation and early removal of catheters and restraints, use of eyeglasses and hearing aids and early correction of dehydration and electrolytes. The intervention significantly reduced the incidence of delirium

(15.0% in the usual care versus 9.9% in the intervention group; OR = 0.60, 95% CI = 0.39 to 0.92). These results were subsequently confirmed in the postoperative setting (Marcantonio et al. 2001). Recently, early physical and occupational therapy has been shown to reduce delirium in ICU patients (Schweickert et al. 2009).

Another risk factor for delirium is sleep deprivation. ICU patients experience reduced sleep, sleep disturbance and fragmentation (Salas and Gamaldo, 2008). In healthy subjects, sleep deprivation causes inattention, fluctuating mental status and cognitive dysfunction (Dinges et al. 1997), characteristics that are present in delirious patients. Moreover, neurohormonal changes and anatomical sites are equally involved in delirium and sleep disturbances. Also, risk factors for delirium and sleep disturbances overlap, including benzodiazepines, that diminish slow-wave and REM sleep leading to serious sleep fragmentation (Bourne and Mills, 2004). Therefore, it is plausible that delirium may be precipitated by sleep deprivation and non-pharmacologic interventions to avoid it should be introduced (Weinhouse et al. 2009).

Sedation also plays a role in the development of delirium. Avoidance of oversedation is beneficial for a wide range of clinical outcomes (Kollef et al. 1998), including ICU-acquired infections (Nseir et al. 2010), duration of mechanical ventilation and length of ICU stay (Kollef et al. 1998). Interestingly, not only sedative exposure, but also the type of sedative may influence the development of delirium. There is increasing evidence that the use of benzodiazepines is strongly associated with the occurrence of delirium (Pandharipande et al. 2007; Pandharipande et al. 2008). In a cohort of trauma and surgical patients, more than 70% presented delirium during ICU stay, and the strongest predictive factor was midazolam exposure (Pandharipande et al. 2008). Similarly, lorazepam was shown to be an independent risk factor for transitioning to delirium in mechanically ventilated patients (Pandharipande et al. 2006).

Therefore, the use of non-GABA (or benzodiazepine-sparing) sedation strategies was tested in patients undergoing mechanical ventilation. Data from the MENDS study, demonstrated that the use of dexmedetomidine was associated with increased coma/delirium free-days (median days, 7.0 vs. 3.0; P=0.01) when compared to lorazepam (Pandharipande et al. 2007). Subsequently, the SEDCOM (Safety and Efficacy of Dexmedetomidine Compared with Midazolam) trial (Riker et al. 2009) demonstrated that dexmedetomidine-treated patients spent less time on the ventilator (3.7 days [95%CI, 3.1 to 4.0] vs. 5.6 days [95%CI, 4.6 to 5.9]; P=.01) and experienced less delirium (54% vs.. 76.6% difference, 22.6% [95% CI, 14% to 33%]; P<.001), as compared to those sedated with midazolam. Results from these RCTs suggest that the use of benzodiazepine-sparing strategies may be associated with a lower risk of developing acute brain dysfunction among other relevant clinical benefits (Wunsch and Kress, 2009). A recent subgroup analysis showed that these clinical benefits are especially relevant in patients with sepsis (Pandharipande et al. 2010b).

How to Diagnose and Monitor Delirium?

In 2001, Ely et al. published a prospective study that evaluated the efficacy of the Confusion Assessment Method (CAM) modified for nonverbal patients (CAM-ICU) in the ICU (Ely et al. 2001c). The CAM-ICU was able to detect delirium in this population with high interrater reliability. In the same year the authors validated the CAM-ICU for mechanically ventilated patients and delirium was diagnosed in 83.3% patients, (Ely et al. 2001b). A large-scale implementation by nurse staff was proved to be feasible. Sixty-four nurses evaluated 711 patients and the overall agreement between bedside nurses and reference raters was excellent (Pun et al. 2005).

Based on the definitions of Diseases and Statistics Manual of Mental Disorders IV (DSM-IV), Bergeron et al. created an eight criteria checklist (Intensive Care Delirium Screening Checklist – ICDSC). In its validation study, the ICDSC presented high sensibility (99%) and lower specificity (64%) (Bergeron et al. 2001). In a single centre study of 174 subjects Plaschke et al. compared the ICDSC and CAM-ICU in surgical ICU patients and observed a good agreement between the methods (kappa=0.80; CI 95%0.78-0.84; p<0.001) (Plaschke et al. 2008).

There are also other methods for detecting delirium. Luetz et al. prospectively evaluated three instruments: CAM-ICU, Nursing Delirium Screening Scale and the Delirium Detection Score (DDS), using ICDSC as the gold-standard. Once again, the CAM-ICU was able to diagnose delirium with high inter-observer agreement. The DDS was the less sensitive tool (30%) (Luetz et al. 2010). Van den Boogaard et al. evaluated 1742 subjects testing the effect of implementation of delirium monitoring. ICU staff reached a good compliance (92%), and delirium was diagnosed almost twice as much than before the implementation (10% vs. 23%, p<0.001) (van den Boogaard et al. 2009).

Why We Must Monitor Delirium: A Patient Safety Issue

There are reports demonstrating that 32-66% of delirium cases remain unrecognised, probably due to several confounding factors (Ely et al. 2001d). First of all, the appropriate terminology and definition were only proposed recently (Morandi et al. 2008). As the most frequent presentation is the hypoactive form, and usual clinical evaluation may not detect delirium in calm, somnolent delirious patients, the largest proportion of these subjects are still not diagnosed. However, despite this knowledge, the use of clinical evaluation as opposed to the implementation of validated tools seems to be frequent among ICU physicians (Patel et al. 2009, Salluh et al. 2009). Considering that delirium has a major impact on clinical outcomes and subsequent quality of life of ICU survivors this represents a major gap between the current knowledge and its translation into practice. Clearly, the hyperactive form with agitation and hallucinations are a major source of concern about patient safety. Accidental extubation, catheter removal and other self-inflicted injuries can lead to severe consequences and worst outcomes (Garrouste Orgeas et al. 2008). In addition, patients with hypoactive delirium have up to threefold higher chance to be reintubated, and also a threefold increase in 6-month mortality (Ely et al. 2004).

Delirium should be monitored routinely to allow the early diagnosis and to provide accurate data on its frequency in the ICU (Jacobi et al. 2002). Monitoring delirium at the ICU is important not only as a surrogate of an early organ dysfunction, but also to prevent accidental injuries, promoting safe care and allowing the institution of preventive and therapeutic measures. This may lead adequate rehabilitation potentially diminishing losses in quality of life (Schweickert et al. 2009). Recently, the ABCD bundle was purposed (Awakening and Breathing Coordination of Daily sedation and ventilator removal trials; Choice of sedative or analgesic exposure; Delirium monitoring and Management; and Early mobility and exercise), as a strategy to stimulate clinicians to adopt these practices in daily care (Pandharipande et al. 2010a).

The increasing knowledge in this relatively young medical field shows that a low delirium incidence should be a quality improvement goal in the ICU, and could represent the achievement of better process of care and optimal patient-centred outcomes.

Conclusion

Delirium is a common acute manifestation of brain dysfunction in critically ill patients that is now recognised as a major source of short and long term morbidity. Routine monitoring of delirium using a validated tool should be implemented to optimise diagnosis and allow early recognition. The institution of non-pharmacologic preventive measures is a feasible and efficient way to reduce delirium incidence. Monitoring the adherence to process of care measures and trends in delirium prevalence should be introduced and used as quality indicator in the ICU. ■

For full references cited in this article, please send a request to:
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Continued from page 12

disease severities observed in our case and the control patients. Still, the mortality rate in our control patients was relatively higher in that period. Since then, observed ICU mortality rate decreased in time reaching down to 24% despite APACHE II score remaining around 21, due to various reasons such as adapting a closed ICU organisation (Topeli et al. 2005), improvement in the physical properties of the ICU and the hospital, increase in number of experienced nurses and physicians, continuous medical education and implementing various protocols for severe sepsis, sedation, weaning, etc. and bundles especially for VAP. In addition, although antibiotic resistance rates to all antibiotic groups including carbapenems (excluding colistin increased in time up to almost 90% in Acinetobacter spp in year 2009), rate of VAP decreased from 17.5/1000 ventilator days in 2001 to 8.1/1000 ventilator days in 2009 in our institution (from Cetinkaya-Sardan. Reports of the Infection Control Committee of Hacettepe University Hospital, Ankara).

Appropriate empiric antibiotics were started in about 50% of patients, which is a very low rate increasing mortality and morbidity. The difficulties in finding colistin timely in Turkey is one of the reasons for that.

After completion of this study, we conducted another descriptive study (unpublished yet) where we looked at appropriate empiric antibiotic use, antibiotic resistance patterns and prognosis in VAP and primary bacteremias caused by Acinetobacter spp between January 2004- August 2009. Accordingly, in 64 patients, VAP caused by Acinetobacter spp developed on the 12th day [6-25] of mechanical ventilation. ICU and hospital mortality rates in these patients were 52% and 64%, respectively. Lengths of ICU and hospital stay were very long being 37 [15-60] and 49 days [33-91] respectively. Of these isolates, 69% were considered to be multi-drug resistant. Resistance rates to carbapenems were 83%, aminoglycosides 52%, sulbactam-cefaperazone 80% and piperacillin-tazobactam 99%. As seen in Figure 1, resistance rates increased over time.

Conclusion

We believe this study is important, since it is one of very few matched case-control studies investigating the attributable mortality and morbidity of VAP caused by high risk microorganisms. It revealed that VAP caused by high risk microorganisms had not increased mortality, however, it independently increased ICU and hospital length of stay and duration of mechanical ventilation. Finally, although pan-resistance is a great problem in Turkey especially for Acinetobacter spp, VAP rates could stil be lowered with implementing protocols and bundles. ■

References

Aybar Turkoglu M, Topeli Iskit A. Ventilator-associated pneumonia caused by high risk microorganisms: Amatched case-control study. Tuberk Toraks 2008;56:139-49.

Fagon JY, Chastre J, Hance AJ, et al. Nosocomial pneumonia in ventilated patients: a cohort study evaluating attributable mortality and hospital stay. Am J Med 1993;94:281-8.

Garnacho J, Sole-Violan J, Sa-Borges M, et al. Clinical impact of pneumonia caused by Acinetobacter baumannii in intubated patients: a matched cohort study. Crit Care Med 2003;31:2478-82.

Heyland DK, Cook DJ, Griffith L, et al. The attributable morbidity and mortality of ventilator associated pneumonia in the critically ill patient. Am J Resp Crit Care Med 1999;159:1249-56.

Korten V, Ulusoy S, Zarakolu P, Mete B. Antibiotic resistance surveillance over a 4-year period (2000-2003) in Turkey: results of the MYSTIC program. Diagn Microbiol Infect Dis 2007;59:453-7 (doi:10.1016/j.diagmicrobio.2007.06.016).

Koulenti D, Lisboa T, Brun-Buisson C, et al. Spectrum of practice in the diagnosis of nosocomial pneumonia in patients requiring mechanical ventilation in European Intensive Care Units. Crit Care Med 2009;37 (doi:10.1097/CCM.0b013e3181a037ac).

Kumarasamy KK, Toleman MA, Walsh TR, et al. Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study. Lancet Infect Dis 2010;10:597-602 (doi:10.1016/S1473-3099(10)70143-2).

Topeli A, Laghi F, Tobin MJ. Effect of closed unit policy and appointing an intensivist in a developing country. Crit Care Med 2005;33:299-306.

Vincent JL, Bihari D, Suter PM, et al. The prevalence of nosocomial infection in intensive care units in Europe: results of the European Prevalence of Infection in Intensive Care (EPIC) study. JAMA 1995;274:639-44.

Vincent JL, Rello J, Marshall J, et al. International Study of the Prevalence and Outcomes of Infection in Intensive Care Units. JAMA 2009;302:2323-9.

Lunch Satellite Symposium at the 23rd ESICM Annual Congress

Alpha$_2$ agonists and sedation

Tuesday, 12 October, at 12:30–14:00
Room Rome, CCIB, Barcelona.

CHAIRS
Mervyn Singer London, UK
Jean Mantz Paris, France

AGENDA

Introduction

Mode of action and pharmacology of alpha$_2$ agonists used in sedation
Riku Aantaa Turku, Finland

Alpha$_2$ agonists in sedation – Evidence from clinical trials
Pratik Pandharipande Nashville, USA

Alpha$_2$ agonists in clinical use
Robert Sladen New York, USA

Discussion

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FACING THE PRESS

EFFECTIVE MEDIA TRAINING FOR CLINICIANS

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Imagine you are about to appear on TV to answer allegations over lapses in patient safety in your unit. You have never been on TV before, but you pride yourself on your communication skills. (You really know your subject and have been invited to lecture all over the world). In the studio, you find yourself competing for airtime against an earthquake in Chile, a world summit at the UN, the death of a Hollywood star and arms negotiations in Geneva.

You have only three minutes on air and feel upset because you make every possible effort to answer the questions – and explain the complex background to the story. But the correspondent isn't interested in this. Moreover, you spend so much time answering his questions there is no time to say what you want to say. He has a different agenda.

This is a common experience. Effective media communication means turning what you do normally on its head and forgetting conventional structure - "beginning, middle and end".

A news story will almost invariably begin with the "conclusion". There is a good reason for this. If every news story included background information of the kind many managers routinely provide by way of introductory information in presentations, we would need wheelbarrows for our daily newspapers and the average broadcast interview would last 10-15 minutes. Enough news already arrives each day at any large media outlet to fill four or five fat novels and flood column and airspace several times over.

Thus, the interviewee needs not only to know his subject, but how much the audience needs to know. Think of this page as representing the sum total of your specialist knowledge. Now take a pin and insert it into any one of the words of the last sentence. That tiny pin-prick will probably represent all you need for a typical consumer media interview.

For example, take a BBC TV interview with a haemophilia specialist about a 12 year-old boy who had a blood transfusion from a donor with Creutzfeldt-Jakob disease (CJD). The interview ran for two minutes 20 seconds (452 words). The doctor had 238 words to explain "this terribly distressing case". (By way of comparison, this paragraph contains 79 words). His problem was compounded by interruptions and the need to correct the interviewer twice.

> *"Effective media communication means turning what you do normally on its head and forgetting conventional structure – 'beginning, middle and end'."*

Communications and media training programmes are designed to identify which pinpricks of knowledge are needed for particular audiences. Consumer audiences, for example, will want to know about the benefits rather than features. This critical distinction between features and benefits will become apparent when you think how we react as consumers.

For example, your interest in a new oven will probably be restricted to the benefits it produces in terms of cooked food, whether it is safe, what it looks like, how much it costs and whether it will fit into your kitchen. You will probably not be interested in its internal features, such as how the gas gets to the saucepan or how the design varies the intensity of the heat.

Similarly patients are not interested in the features that make up the day-to-day professional lives of hospital managers. They will not be interested, for example, to hear that you have read this article. Their concern is for patient care and safety.

Media Training Programmes

A typical media training programme includes:

- Introductions: Participants describe their media perceptions and experience;

- How the media operates and what makes news?
- Key messages and sound-bites;
- Preparing for an interview; and
- Filmed interviews with participants, followed by analysis.

The introductory session: Most participants feel nervous about "performing" in front of colleagues. Training can actually be more nerve-wracking than a live interview in a TV studio or outside a hospital, but this session usually helps to break the ice and allay fears - but some anxiety is inevitable and indeed desirable.

What makes news? We all know what makes news, but what about why it does so? It is not always enough to have a compelling story. News does not occur in a vacuum. Each published story should be seen within the context of the daily news agenda. There will only be so many stories about medical advances or hospital administration on any one day. A story, which is "big" in the late afternoon may quickly become "small". A story I wrote as a UK national newspaper medical correspondent was to have been the page one "splash" or "lead story". In the event, the "splash" was a tragedy, which claimed 31 lives – a fire at the King's Cross railway station in London. My story was reduced to just five column inches on page 57.

Key messages: A key message is a take home message, ideally short, snappy and simple. Think of "the elevator test" – getting your message across between the first and third floor of a hotel, when the person you are talking to will get out. Allow 10-15 seconds or so per message. Stick to two or three key messages in an interview. Key messages can either be simple statements of fact or wrapped up in sound-bites – a short summary of the story. A vivid sound-bite may provide a headline or a broadcast clip. The paradox is that preparing simple key messages can be notoriously difficult and time consuming. Many scientists and healthcare professionals and administrators spend far more time preparing for lecture presentations than for media interviews, even though they have significantly more control over the former (until question time). Key messages should be supported by evidence.

Preparing for an interview: Most interviewees are "one-dimensional" and think what's in it for me? Good interviewees think in three dimensions: What's good for the journalist? What's good for the audience? What's good for me? No, of course, you cannot please all the people all of the time. But one dimensional-thinking is unlikely to please anyone,

Everyday conversation conditions us to answer questions – and, overall, we try to do an honest job. A common error is to treat a media interview like an everyday conversation even though you may have only two or three minutes to get your key messages across. Your time will run out if the journalist has a different agenda to you and you try to answer his/ her questions in full. A large part of our training programmes is dedicated to techniques to help interviewees drive their agenda and put across their key messages.

Interviews: Performance analysis takes up most of the time. Interviews are usually filmed. This may seem inappropriate because about 90% of media interviews are done on the phone, but the camera is widely recognised as a highly effective training tool, and it gives sessions an invaluable sharp edge.

Training interviews last about four minutes even though most print interviews last much longer. The idea is to encourage participants to get their key messages across quickly, simply and succinctly. Participants are given their film clips. On seeing her father on screen at home, the daughter of one trainee asked: "Daddy, why is that man being so horrible to you?"

Do we try to be 'horrible'? The emphasis is on a broad spectrum approach embracing the three main styles of interviewing: 'collaborative', 'informational' and 'confrontational'. Overall, we try and make the sessions a little harder than they are likely to be in a live interview. Preparation is the key to success. It is hard to prepare unless you know what you are being prepared for – and it is best to prepare for the worst possible scenario.

> *"The interviewee needs not only to know his subject, but how much the audience needs to know."*

> *"Key messages can either be simple statements of fact or wrapped up in sound-bites – a short summary of the story."*

Risk Benefit Ratio

Irresponsible reporting and the constraints of working with the media discourage good potential spokespeople, but think of the risk-benefit ratio. Overall, publicity works and generates significant benefit. This is why governments and industry all over the world invest so much time and money on it. Moreover, what would happen if hospital managers and executives were to turn their backs on the media?

The answer was best summed up by London psychiatrist Dr. Philip Timms, who warned: "Psychiatrists should not be discouraged from talking to or writing for the media. If we do not represent our position, it will be misrepresented by the media." What he said is as true for any other discipline as it is for psychiatry, but dealing with the media does not come naturally to most people. Healthcare and the media are disparate culture. The right kind of preparation and training can help to bridge the gap. ■

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ICU MANAGEMENT

OVERVIEW OF HEALTHCARE IN THE UNITED KINGDOM

Healthcare in the United Kingdom (UK) is mainly provided by the National Health Service, a public health service, which provides healthcare that is free at the point of use to all permanent residents of the UK, and is paid for from general taxation. Though the public system dominates healthcare provision in the UK, private healthcare and a wide variety of alternative and complementary treatments are available for those willing to pay.

History

Since its launch in 1948, the NHS has grown to become the world's largest publicly funded health service. The NHS was born out of a long-held ideal that good healthcare should be available to all, regardless of wealth. That principle remains at its core. With the exception of charges for some prescriptions and optical and dental services, the NHS remains free at the point of use for anyone who is resident in the UK, currently more than 60 million people. It covers everything from antenatal screening and routine treatments for coughs and colds to open heart surgery, accident and emergency treatment and end-of-life care.

Although funded centrally from national taxation, NHS services in England, Northern Ireland, Scotland and Wales are managed separately. While some differences have emerged between these systems in recent years, they remain similar in most respects and continue to be talked about as belonging to a single, unified system.

Employment

The NHS employs more than 1.7 million people. Of those, just under half are clinically qualified, including 120,000 hospital doctors, 40,000 general practitioners (GPs), 400,000 nurses and 25,000 ambulance staff. Only the Chinese People's Liberation Army, the Wal-Mart supermarket chain and the Indian Railways directly employ more people.

The NHS in England is the biggest part of the system by far, catering to a population of 51 million and employing more than 1.3 million people. The NHS in Scotland, Wales and Northern Ireland employ 165,000, 90,000 and 67,000 people respectively.

The number of patients using the NHS is equally huge. On average, it deals with 1m patients every 36 hours. That's 463 people a minute or almost eight a second. Each week, 700,000 people will visit an NHS dentist, while a further 3,000 will have a heart operation. Each GP in the nation's 10,000-plus practices sees an average of 140 patients a week.

Funding

When the NHS was launched in 1948 it had a budget of £437million (roughly £9billion at today's value). In 2008/9 it received over 10 times that amount (more than £100billion). This equates to an average rise in spending over the full 60-year period of about 4% a year once inflation has been taken into account. However, in recent years investment levels have been double that to fund a major modernisation programme.

- 60% of the NHS budget is used to pay staff ;
- 20% pays for drugs and other supplies;
- 20% split between buildings, equipment and training costs on the one hand and medical equipment, catering and cleaning on the other.
- Nearly 80% of the total budget is distributed by local trusts in line with the particular health priorities in their areas.

The money to pay for the NHS comes directly from taxation. According to independent bodies such as the King's Fund, this remains the "cheapest and fairest" way of funding healthcare when compared

Statistics:

Total population: 61,231,000

Gross national income per capita (PPP international $): 36,240

Life expectancy at birth m/f (years): 78/82

Healthy life expectancy at birth - both sexes (years, 2007): 72

Under-five mortality rate (per 1 000 live births): 6

Adult mortality rate – both sexes (per 1 000 adults 15-59 years): 78

Total expenditure on health per capita (Intl $, 2006): 2,784

Total expenditure on health as % of GDP (2006): 8.4

Figures are for 2008 unless indicated.
www.who.int

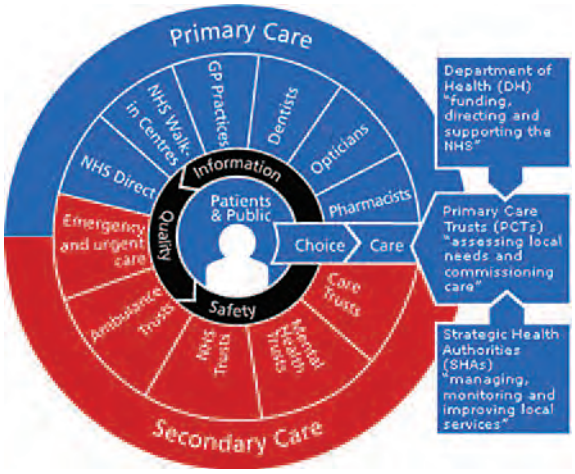

Figure 1. As can be seen on the diagram, the NHS is divided into two sections: Primary and Secondary care. Primary care is the first point of contact for most people and is delivered by a wide range of independent contractors, including GPs, dentists, pharmacists and optometrists.

with other systems. The 2008/9 budget roughly equates to a contribution of £1,980 for every man, woman and child in the UK.

NHS Structure

The Department of Health controls the NHS. The Secretary of State for Health is the head of the Department of Health and reports to the prime minister. The Department of Health controls England's 10 Strategic Health Authorities (SHAs), which oversee all NHS activities in England. In turn, each SHA supervises all the NHS trusts in its area. The devolved administrations of Scotland, Wales and Northern Ireland run their local NHS services separately.

Secondary care

Secondary care is known as acute healthcare and can be either elective care or emergency care. Elective care means planned specialist medical care or surgery, usually following referral from a primary or community health professional such as a GP.

Primary care trusts

Primary care trusts (PCTs) are in charge of primary care and have a major role around commissioning secondary care, providing community care services. They are central to the NHS and control 80% of the NHS budget.

As they are local organisations, they understand what members of their community need, so they can make sure that the organisations providing health and social care services are working effectively. The PCTs oversee 37,000 GPs and 21,000 NHS dentists. ■

Adapted from information available at **www.nhs.uk**

THE ENGLISH NATIONAL PACS PROGRAMME

BUILDING ON THE SUCCESSFUL NATIONAL ROLL-OUT OF PACS AND MOVING FORWARD WITH IMAGE SHARING

Mary Barber

Programme Director
NHS Connecting for Health

Picture and archiving communication systems (PACS) are now embedded into the day-to-day work of the NHS in England. By December 2007 all hospital trusts in England were using PACS, digital imaging technology which enables x-rays and scans to be made available simultaneously at multiple locations within a hospital trust.

PACS has been helping to support major improvements in both the speed and quality of diagnosis and treatment of patients and they are getting faster, safer treatment as a result. Now that the technology is in use across England it's easy to forget how big an achievement the national roll-out of PACS actually was. While it was a massive undertaking, involving hospital trusts across the country, it took just three years to complete.

Compare this to the fact that, prior to the national PACS programme, only 50 trusts had implemented digital imaging systems of some form, and many of these were confined to radiology departments rather than being site or enterprise-wide. It took 14 years to reach that point and of these 50 trusts, 18 eventually switched to the solutions provided under the national PACS programme.

The picture prior to the national programme was therefore very patchy, with no real momentum on a national basis to deploy PACS. The national PACS programme saw a team from NHS Connecting for Health (part of England's Department of Health) work closely with colleagues in the Strategic Health Authorities, individual hospital trusts, clinicians and their representative bodies and IT service providers to ensure that trusts were able to implement the technology, and therefore benefit from film-less working, as quickly as possible.

The national programme's collaborative approach has seen it win recognition both nationally and internationally, with many foreign health services keen to learn from our experiences.

Moving Forward with Image Sharing

Now that countrywide PACS coverage has been achieved, the national PACS programme has been working to 'join up the dots' by increasingly focusing on the safe sharing of diagnostic images and reports across trusts in order to support patient clinical pathways.

The long term ambition is for clinicians to be able to gain access to images and reports via the use of the patients' electronic care records – otherwise known as the 'NHS Care Records Service'. However, the feasibility and timescales of this depends on the roll-out of summary care and detailed care records in England, plus other factors including the wider adoption of the NHS Number (the unique patient identifier for NHS patients in England). There is, however, a golden opportunity and a clinical imperative to share images and reports to support patient pathways in England, particularly with the growth of stroke, trauma and cancer networks, by implementing technology available today that would allow clinical staff to Find, View, and Source diagnostic images and reports when required.

Rather than be held back by the availability of future technology, the programme has been working with its many stakeholders in a creative, pragmatic and cost-conscious way to implement solutions which meet many of clinicians' most pressing requirements now. The major advancements today are in the "View it, Source it" area and a mechanism to signpost clinicians to the trust where the patient was last treated is being investigated.

The "View it, Source it" concept is extremely straightforward. As the images with PACS are digital they can be viewed via secure web links; this is already standard within hospital trusts and can with some PACS be expanded for trust-to-trust viewing. Then, if the clinicians believe they need the 'image and report', the images can be transferred to them via a number of mechanisms. Because clinicians are choosing to look for images and reports in specific locations they can ensure they have the necessary patient consent and have a legitimate right to view the information locally.

Many trusts have been using the 'web view' facility offered by their PACS in order to view images acquired at other trusts as part of a patient's care pathway. An initiative known as the North West PACS Web Portal builds on this approach. It was conceived by Dr. Rhidian Bramley, part of the national PACS programme's clinical team and a champion for PACS both in the North West of England and nationally.

The portal provides a single point of access to the local PACS of any participating site, enabling clinicians to request remote web access to trusts' PACS where this supports patient care. Access requests are sponsored by the Caldicott Guardians at each organisation through an agreed data sharing protocol. Authorised users are given a PACS login ID for the trust they wish to access and the trust firewalls are configured to allow remote access. The portal overcomes the issue of users having to remember multiple login IDs, through an agreement whereby trusts cooperate to provide each user a single unique user login ID for all PACS access via the portal.

Using the portal, clinicians can review images and reports remotely but also arrange point-to-point transfer of images where further analysis is required.

As of today, the portal has 44 participant trusts, most of which are in the North West and West Midlands, although interest further afield has seen a number of trusts from outside the region 'sign up' too.

Being able to view the image before acquiring it for your trust reduces network traffic and volume of image transfer, however it may be that the clinician does require the image and report and this is where image routing technologies come in to play. Image routing technologies are mechanisms by which trusts can share images, and sometimes reports, with agreed and trusted partners via a hub and spoke arrangement – these have emerged as an important element in our image sharing approach. The aim is to initially link up known clinical pathways, where trusts have an agreed referral pattern. It is felt by a number of clinicians that, equipped with a web viewing tool and an image router, they would be able to meet the majority of clinical requirements supported by data sharing.

In London, for example, the programme has been rolling-out a system called PACS Exchange, which enables the hospital trusts' existing PACS to post images to and access images from a centralised point. So, if one London trust refers a patient to a different London trust for a specific scan, all the relevant x-rays and images can be called up on PACS. The referring trust simply searches for their patient, highlights the images needed and selects PACS Exchange on the menu to send them to the receiving trust. Images are sent to one of two folders on PACS Exchange – the 'emergency folder' or the 'elective folder'. Images in the emergency folder are available for 18 hours, and images in the elective folder are available for eight days. The 'receiving' trust can then access the images during whatever period for which they are available.

Following successful pilots at the Royal Marsden and Mayday hospital trusts, 11 trusts were using PACS Exchange as at the beginning of February 2010, and more will follow during the course of this year. The system is starting to make a real difference, particularly to multidisciplinary team meetings, where clinicians at different trusts and sites need to discuss particular cases. The only drawback is that this solution is for London only and many patients are referred to the major London hospitals from other parts of the country. So a more nationally available solution is required.

A further image sharing initiative – one with a more national outlook - is the Image

Continued on page 46

CLINICAL RESEARCH AND THE DELIVERY OF EXCELLENCE

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To many, the natural path to clinical excellence would lie through a 'professional' rather than a 'commercial' approach, with 'management' seen as a function of the latter, not the former. This article argues that critical care managers can deliver clinical excellence through a modern commercial approach, that engagement in clinical research facilitates this approach, and explores the barriers, and solutions, to clinical research.

The word 'brand' was derived from the old English word brond, meaning a fire, flame or piece of burning wood, and in the 1550s described the process of marking livestock with a hot iron in order to identify to whom they belonged. By the early 19th century the proprietorial connotation of the word had expanded to refer to goods 'belonging' to a specific manufacturer or supplier. In the contemporary commercial sense the word now describes a much larger concept. 'Brand' now conveys the emotional and psychological link between a business (or institution, or hospital) and its "customers" and conveys complex messages relating to value and quality; intangible but highly valuable properties. Far from irrelevant 'marketing spin' the importance and value of the concept is reflected in the exponential increase in academic papers published in peer-reviewed business journals with the word 'brand' in the title (Figure 1). But the concept of 'brand' not only has value externally, to the market, but also internally to the business itself as a means of remaining faithful to the core values (innovation, durability, design excellence, practicality, value etc…) that yielded the external brand dividend in the first place. The external value of branding is reflected in tangible benefits such as brand loyalty, market share (competitive advantage), brand equity and share price. For those who think this only applies in commerce one only has to think of organisations with internationally recognised 'brands', for example Harvard University, Oxford University, or Cambridge University, to see that this is not the case (Sung and Yang 2008); and this is no less true for healthcare organisations (Knapp 2001).

To build a brand you have to know what a brand is...and what a brand is not. A brand is not your logo, product, personal identity, plush corporate offices, employees, corporate culture, or even what you say it is (2009). Your brand is generated and sustained in the minds and hearts of people who interact with your organisation – be they patients, the professionals who refer patients, relatives, professional visitors (including students and trainees), inspectors, local and central government politicians, the media, or suppliers of other goods and services. It reflects the way you are, not the way you aspire to be. This is a long-recognised truth. Twenty-four centuries ago Aristotle wrote in the Nicomachean Ethics "…the good of man is a working of the soul in the way of excellence in a complete life…for as it is not one swallow or one fine day that makes the spring, so it is not one day or a short time that makes a man blessed and happy…". Will Durrant's oft-quoted interpretation of this sentiment that " excellence … is not an act, but a habit" is the thread that runs through Peters and Waterman's seminal 1982 management book "In Search of Excellence" (Peters and Waterman 2004) in the sense of a corporate "habit" shared throughout the work force. A clinical culture that embraces clinical research has woven within its fabric the strands that lead to clinical excellence. Is this really so? In the UK's National Health Service, for example, there is a significant difference in the number of publications listed in the US National Library of Medicine's PubMed database for the last five years between the ten best and ten worst performing hospitals (Figure 2). So how might the link between clinical research activity and excellence arise?

Clinical Research And Clinical Practice

History has repeatedly shown us that, unencumbered by external oversight of either clinical efficacy or financial probity, clinicians offer therapy based on "a moral commitment to intervention…even in the absence of reliable knowledge" (Freidson 1988) resulting in a geographical variation in clinical practice inexplicable by the demographics of disease (Millenson 1997). Even in the face of convincing evidence clin-

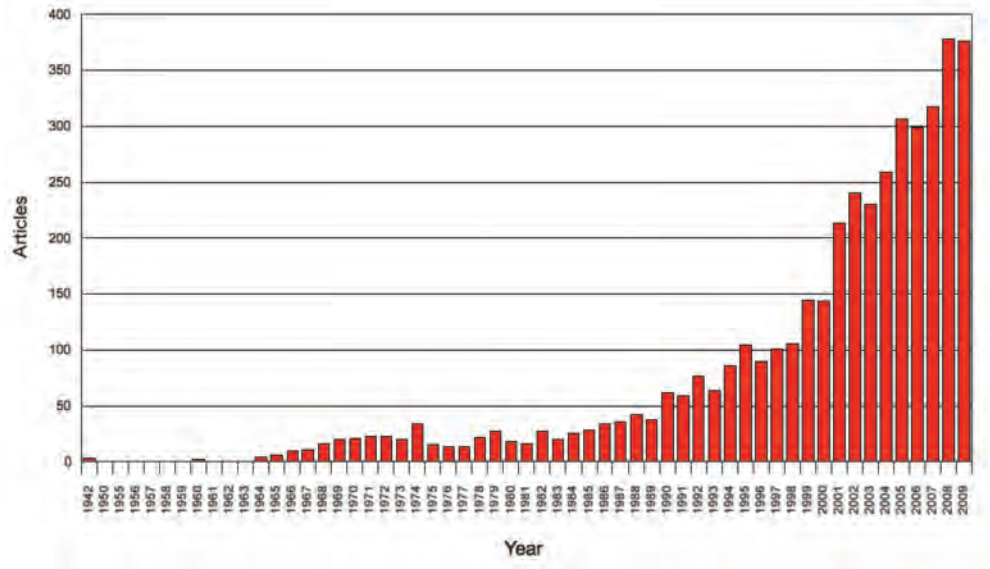

Figure 1. A search for "brand" in the title text of articles in EBSCO Host's 'Business Source Premier' database yielded 29,504 publications between 1942 and 2010, of which 4,317 were peer-reviewed. The latter, up to 2009, are shown here by year of publication.

ical practice has been slow to change, with a significant financial and human cost attached to the laggard's professional autonomy. The current challenge is therefore "to promote the uptake of innovations that have been shown to be effective, to delay the spread of those that that have not yet been shown to be effective and to prevent the uptake of ineffective innovations" (Haines and Jones 1994), with the aim of maximising efficacy and minimising costs. The factors that determine the evidence-based migration of practice are acknowledged to be complex, poorly defined and inter-twined, and relate to the innovation, the adopters, the process of diffusion, the organisation, and the extra-organisational environment (Greenhalgh et al. 2005). An environment in which management-supported multi-disciplinary research is the norm will have attributes that have been shown to facilitate the adoption of innovative practice. These include familiarity with the process of sourcing, collating and appraising research evidence; an instinct to question tradition or convention; an enhanced capacity to absorb new knowledge; and enlarged horizons in which the possibilities of alternative strategies can be seen (Greenhalgh et al. 2005). Moreover an organisation that is comfortable with the evaluation of experimental therapies is less likely to view change with suspicion. Participation in the development and evaluation of new strategies also enhances uptake (Greenhalgh et al. 2005), as was shown in the evaluation of the National Cancer Institute's 'Community Clinical Oncology Program' for the management of breast cancer. When this was evaluated in 1995 the investigators commented "[oncologists who participated in ongoing clinical trials] were more likely to adopt the new treatment, adopted it at a much faster rate, and were less likely to abandon the state-of-the-art treatment after initial use (Warnecke et al. 1995)." Useful by-products of research arise from the process by which the results of this activity are disseminated and include the generation of an institutional reputation for innovation and the production of national 'opinion leaders.' Positive influence from the latter has also been shown to help with the adoption of change (Greenhalgh et al. 2005) and, if nationally recognised, can result in the organisation acting as a 'pace setter', rather than having to adopt innovations developed by others.

Clinical research activity can also have benefits at the bedside for both patients and staff. There is evidence of better outcomes for patients who participate in clinical studies compared to those who do not (Braunholtz et al. 2001; Robinson et al. 2009; Hallstrom et al. 2003), whilst the presence of additional research staff provides additional flexibility of rostering, and the availability of research-related assays or equipment enhances the interest and educational value of the clinical environment. An enhanced profile from a presence on the national research stage improves both the quantity and quality of job applicants, easing recruitment. Similarly, a vibrant and inquisitive clinical atmosphere associated with innovations recognised nationally contribute to job satisfaction, organisational pride and an 'esprit de corps' - qualities more related to employee satisfaction than either wages or benefits (Charmel 2009), with knock-on benefits in terms of enhanced productivity, reduced absenteeism, and reduced staff turnover. So if clinical research activity is a route to clinical excellence what are the barriers to clinical research and how might these be overcome?

Barriers, and Solutions to Clinical Research

National Strategy Level

In the UK the importance of clinical research in improving both the quality and cost-effectiveness of healthcare have only been recently recognised. In 2006 the government published 'Best Research for Best Health' (2006), an important and far-reaching review of the UK's national clinical research strategy. Two key strands of this review were, on the one hand, the restructuring of national R&D funding and, on the other, simplification of the research governance process.

Historically R&D funding included the 'Service Increment for Teaching and Research', the 'Locally Organised Research Scheme' research budgets managed by the

Figure 2. Box and whisker plots showing the median (bar), interquartile range (box) for the number of publications listed for each hospital since May 2005 in the US National Library of Medicine's PubMed database. Data is from the ten best and ten worst performing hospitals out of the UK's 169 hospitals providing acute and specialist care. Aggregate score for quality, as judged by the UK's Care Quality Commission, was calculated by assigning a score of 1 to 4 for the CQC's labels of 'Weak', 'Fair', 'Good' and 'Excellent' in the 'Quality of Service' and 'Use of Resources' categories for the financial years 2005/06, 2006/07, 2007/08, and 2008/09 for a possible maximum score of 32. Aggregate quality scores ranged from 10 to 13 and 29 to 32 for the ten worst and ten best hospitals, respectively. The number of papers published since May 2005 was significantly greater for the ten best hospitals (median 54, interquartile range 11.5 to 109.5) compared to the ten worst hospitals (median 7.5, interquartile range 1.5 to 22.25; Man-Whitney test, p = 0.02).

Department of Health and the Regional Health Authorities, as well as specific allocations to the London Postgraduate Special Health Authorities. Following the Cullyer Report in 1994 these allocations were brought together in 1998 as the 'NHS R&D Levy', but the fairness and appropriateness of these allocations was open to question and the potential for recipient organisations to divert these funds to front-line activities made this an ineffective way of supporting research. Starting in April 2006, therefore, the 'NHS R&D Levy' was gradually withdrawn in a three year transitional arrangement and, over the same period, an increasing source of funding became available through the UK's newly formed National Institute for Health Research (NIHR) supporting NIHR Infrastructure, NIHR Faculty, NIHR Programmes and NIHR Systems. Much of this funding is now disbursed as targeted and auditable grants; a mechanism resistant to diversion by recipient healthcare organisations. However, funding to meet the NHS Service Support Costs of NIHR studies is now channelled through 25 'Comprehensive Local Research Networks' and 6 'Topic Specific Networks' but still paid to healthcare organisations, rather than investigators. These allocations are now within the gift of regional, variably efficient, potentially partisan, quasi-autonomous organisations on the one hand, and delivered to investigators via cash-strapped hospital management, on the other. For some critical care units this arrangement has allowed the recruitment of research nurses, enabling them to participate in national and local studies. For others, however, funds meant to support research have failed to reach the investigators. Evidence that this is the case comes from a recent UK-wide survey conducted prior to the 2009 meeting of the UK Critical Trial Forum which showed that although 78% of the respondent's hospitals had recruited critical care patients into a study, only 45% employed a research nurse (Mackenzie et al. 2010). When negotiations between the hospital and CLRN are unsatisfactory, there may be recourse for action by appealing to the Network Board or, failing that, through the CLRN complaints and governance route. On the other hand, persuading a hospital not to help itself to an overly generous proportion of the funding cake is a different matter, particularly if the hospital is one of the new breed of autonomous Foundation Trusts, answerable only to Monitor. Under these circumstances there may be little researchers can do to change attitudes and without a proven track record in clinical research or 'big names' to secure high value and prestigious, clinical research grants, the situation is a 'Catch 22'.

The Integrated Research Application System (IRAS) was introduced in 2008 as a web-based platform designed to prevent duplication of data collection for clinical research regulatory approvals in the UK. Although this has simplified the process the regulatory burden in the UK remains substantial, to the point that the proportion of the world's clinical trials conducted in the UK fell 66% from 2000 to 2006, and the number of National Research Ethics applications fell 35% from 2004/5 to 2009/10. In January 2010 the UK Academy of Medical Sciences (AMS) expressed concern about the negative impact of the regulatory burden, a view echoed more recently by the BMA's annual Conference of Medical Academic Representatives, and on the 25th March 2010 the AMS was asked by the then Secretary of State for Health, Andy Burnham, to review regulation and governance in this area. Nevertheless regulatory burden will remain until this review is completed and its conclusions acted upon.

Organisational Level

In the UK Government-set targets have become the measure by which hospitals are judged, forcing resources to be focused on meeting these targets. Without specific incentives, therefore, or a visionary understanding of the medium- and long-term benefits of clinical research, hospital managers are unwilling to provide effective support in a number of ways (Table 1). Reporting by hospitals of the number of research participants, described in the NHS Operating Framework for 2010/11, may help a little but without stronger incentives little is likely to change in the immediate future.

AUTHOR GUIDELINES

ICU MANAGEMENT

Content

Articles may focus on any management or practice issue in intensive care related to economics, quality of care or patient outcome. We only accept scientific papers with a clear connection to management and practise issues. We also invite opinions for publication in our Viewpoints section, which can be personal opinions of the author and/or reactions to articles published in prior issues. These are published at the discretion of the editors. Submissions may not have been published previously or be currently submitted for publication elsewhere. Articles must be written by independent authorities and any sponsors for research must be named. If manufacturers are named in an article, the text must present an unbiased view, not in support of any particular company.

Submission Guidelines

Authors are responsible for all statements made in their work, including changes made by the editor and authorised by the submitting author. The text should be provided as a word document via email to editorial@icu-management.org. Please provide a contact email address for correspondence. Following review, a revised version, which includes the editors' comments and recommendations, is returned to the author (at the contact email address) for authorisation.

Length

- Articles: maximum 1400 words (less if figures or tables are included)
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- News/research/product updates: maximum 200 words

Please note that contributions longer than the specified number of words may not be accepted.

Structure

Article texts must contain:

- Title
- Names of authors with abbreviations for the highest academic degree
- Affiliation: Department and institution, city and country
- Main authors are requested to supply a portrait photo (see specifications below)
- Summary of one or two sentences (no more than 30 words) describing the content
- Contact name for correspondence and an email address which may be published with the article
- Website, if appropriate
- Acknowledgements of any connections with a company or financial sponsor
- Introduction, main text and summary/conclusion, with subheadings as appropriate
- Authors are encouraged to include checklists and/or guidelines, which summarise findings or recommendations
- References or sources, if appropriate, as specified below

Writing Style

Articles must be written in UK/British English (e.g. organisation, not organization), with short sentences, a clear structure (see above) and no bias. Full stops in numbers may only be used to indicate a decimal place; otherwise use commas as separators.

Images

Main authors are asked to supply a portrait photo for publication with their article. This and any other relevant images for publication with an article should be sent by email as separate files (only high resolution images with 300dpi) and their order of placement in the article must be clearly indicated. Only the electronic formats ".tif" or ".jpg" can be used for images, i.e. not Microsoft Word or PowerPoint. Images must be no smaller than 9cm x 9cm at 100% scale. Only images meeting these specifications can be published. If an image has been published before, permission to reproduce the material must be obtained by the author from the copyright holder and the original source acknowledged in the text, e.g. © 2010 Sherry Scharff.

Format for References

Any references that are deemed important to understanding of the article should be cited in concise form within the article. Please use the Harvard reference system. Citations within the text for a single author reference should include the author surname and year of publication; for a citation with two authors include both author surnames and year of publication; for more than two authors, include the first author surname followed by "et al." and the year of publication. Multiple citations should be separated by a semicolon, and listed in alphabetical order.

Example of within text citation: (Edwards 2004; Edwards and Miller 2002; Miller et al. 2003).

Reference lists should be alphabetised by lead author and included at the conclusion of the submission.

Example of standard journal reference: Sydow Campbell, K. (1999) "Collecting information; qualitative research methods for solving workplace problems", Technical communication, 46 (4) 532-544.

Authors are responsible for the accuracy of the references they cite.

Acceptance

It is always at the discretion of our editorial board to accept or refuse submissions. We will respond to submissions within 8 weeks of receipt. We reserve the right to revise the article or request the author to edit the contents, and to publish all texts in any EMC Consulting Group journal, on the Internet and to list them in online literature databases.

Thank you,
The ICU Management Editorial Team
editorial@icu-management.org

Table 1. Organisational Barriers to Clinical Research.

- Reduced ability to acquire and appraise new knowledge (reduction in library staffing, reduction in library opening hours, increased costs for photocopying or inter-library loans, reduced access to sources of literature)
- Failure to recognise research as a legitimate work-time activity for clinical staff
- Unwillingness to provide essential support services for clinical research, for example from pharmacy (receiving, stocking, and dispensing trial medication) or clinical laboratory services (handling and storage of research specimens)
- Unwillingness to release staff for secondment to internal research posts
- Unwillingness to provide office space for research staff to work and store research-related files and records

Clinicians

Between 2001 and 2006 there has been a 12.5% reduction in the total number of clinical academics, defined as those with a substantial proportion of their job allocated to research. Within anaesthesia, the parent discipline of most of the UK's intensivists, clinical academic posts have fallen by 11% in the period 2000 to 2005 and two departments have closed entirely (Pandit 2005). In general, the decline in academic medicine has been attributed to disincentives to entry and barriers to progression (Bell 2003). In addition academic anaesthesia has fallen out of favour within universities because of its marked inability to attract significant research funding3 or to score highly in the Research Assessment Exercise (RAE), a system that determines a university's income from Higher Education Funding Councils (HEFC) for research activities and infrastructure. It remains to be seen whether changes to the training structure for clinical academics, described in the Walport Report (Academic Careers Sub-Committee of MMC and the UKCRC, 2005), will have the desired effect with regards to recruitment and retention, or whether academic anaesthesia can be resuscitated by the Royal College of Anaesthetists' 2005 strategy (Pandit 2005).

Non-academic consultant medical staff in the UK may have 21-25% of their working week allocated to 'research, teaching, audit and continuing professional development', but little could realistically be achieved with the pro-rata research allocation of 2.5 hours per week. Insufficient time for research was identified by a number of respondents in the UK Critical Care Trials Forum (UKCCTF) 2009 survey as a reason for not participating in research (Mackenzie et al. 2010). Given that research would thus entail the commitment of non-NHS time, competing with time more lucratively spent in the private health sector, it is not surprising that only 10-15% of NHS anaesthetic consultants (Pandit 2005) express any interest in research. As clinical research has always played a very minor role in anaesthetic training in the UK few critical care clinicians have any expertise in research methodology, such as formulating an appropriate research question, study design, securing funding, or analysing data. These were all identified in the UKCCTF survey as areas where support and education would be appreciated (Mackenzie et al. 2010). Where regional or national collaboration might have provided access to these missing skills, it appears that this is currently impeded by regional rivalries and distrust. Nevertheless, the future of large-scale clinical trials will only be possible through regional collaborations amongst like-minded clinicians as in, for example, the West Midlands, or by national collaborations supported by the UK's Intensive Care Society or brought together through the UK's Clinical Trials Forum.

Conclusion

In modern healthcare the pursuit of excellence is as much a commercial, as a professional, imperative and is best achieved in a culture that embraces clinical research. National and organisational strategies must nurture and facilitate multi-disciplinary participation in clinical research. ■

References

(2006) Best Research for Best Health. A new national health research strategy. London.

(2009) Seven Things Your Brand Is Not – And One That It Is.

ACADEMIC CAREERS SUB-COMMITTEE OF MMC AND THE UKCRC (2005) Medically- and dentally-qualified academic staff - recommendations for training the researchers and educators of the future. London, UK Clinical Research Collaboration and Modernising Medical Careers.

BELL, J. (2003) Resuscitating clinical research in the United Kingdom. BMJ, 327, 1041-3.

BRAUNHOLTZ, D. A., EDWARDS, S. J. & LILFORD, R. J. (2001) Are randomised clinical trials good for us (in the short term)? Evidence for a "trial effect". J Clin Epidemiol, 54, 217-24.

CHARMEL, P. A. (2009) Building the business case for patient-centred care. IN FRAMPTON, S. B. & CHARMEL, P. A. (Eds.) Putting patients first. Best practices in patient-centred care. 2nd ed. San Francisco, Jossey-Bass.

FREIDSON, E. (1988) Profession of medicine: A study of the sociology of applied knowledge, Chicago, The University of Chicago Press.

GREENHALGH, T., ROBERT, G., BATE, P., MACFARLANE, F. & KYRIAKIDOU, O. (2005) Diffusion of innovations in health service organisations. A systematic literature review., Oxford, Blackwell Publishing Ltd.

HAINES, A. & JONES, R. (1994) Implementing findings of research. BMJ, 308, 1488-92.

HALLSTROM, A., FRIEDMAN, L., DENES, P., RIZOPATRON, C. & MORRIS, M. (2003) Do arrhythmia patients improve survival by participating in randomised clinical trials? Observations from the Cardiac Arrhythmia Suppression Trial (CAST)and the Antiarrhythmics Versus Implantable Defibrillators Trial (AVID). Control Clin Trials, 24, 341-52.

KNAPP, D. (2001) Building and maintaining genuine brands in the world of medicine. International Journal of Medical Marketing, 1, 289-98.

MACKENZIE, I., PERKINS, G., BION, J. & GAO, F. (2010) The United Kingdom Critical Care Trials Forum. Journal of the Intensive Care Society, 11, 73-6.

MILLENSON, M. L. (1997) Demanding medical excellence: Doctors and accountability in the information age, Chicago, The University of Chicago Press.

PANDIT, J. J. (2005) A National Strategy for Academic Anaesthesia. London, The Royal College of Anaesthetists.

PETERS, T. & WATERMAN, R. H. (2004) In Search of Excellence: Lessons from America's Best-Run Companies, London, Profile Books Ltd.

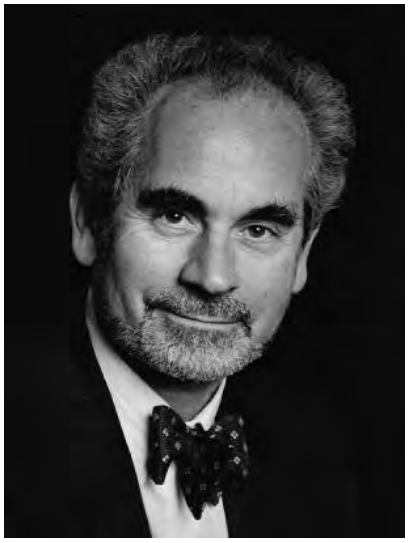
ROBINSON, W. R., RITTER, J., ROGERS, A. S., TEDJARATI, S. & LIEBERENZ, C. (2009) Clinical trial participation is associated with improved outcome in women with ovarian cancer. Int J Gynecol Cancer, 19, 124-8.

SUNG, M. & YANG, S.-U. (2008) Toward the model of university image: The influence of brand personality, external prestige, and reputation. Journal of Public Relations Research, 20, 357-76.

WARNECKE, R. B., JOHNSON, T. P., KALUZNY, A. D. & FORD, L. G. (1995) The community clinical oncology program: its effect on clinical practice. Jt Comm J Qual Improv, 21, 336-9.

CRITICAL CARE IN THE UNITED KINGDOM: AN INTERVIEW WITH PROFESSOR JULIAN BION

- Part One



Professor of Intensive Care Medicine at the University of Birmingham, Prof. Julian Bion also has an honorary consultant appointment with the University Hospital in Birmingham. He also has a number of high-profile national and international roles in the field of intensive care, including being an Editorial Board Member of ICU Management and is a former President of the European Society of Intensive Care Medicine (ESICM).

One of the most significant national projects Prof. Bion is currently involved in is setting up a new faculty of Intensive Care Medicine for the United Kingdom. This is seen as a major step forward for the discipline as a whole, and will have some impact on helping to establish Intensive Care Medicine as a recognised discipline at the European level – as a multidisciplinary speciality. In the first of this two-part interview, Prof. Bion shares his views with Managing Editor Sherry Scharff on the evolution of the discipline, the challenge of integrating care, and battling bugs in UK hospitals.

S.S. Are there particular issues you deal with in the UK that are unique from others around the world?

J.B. There are a number of things, which distinguish the United Kingdom, and while not unique to the UK, when you put them together as a package it makes the healthcare picture in this country a much more interesting one. I think first of all, there have been major social changes in the United Kingdom over the last 30-40 years, which could probably be best summarised as a questioning of authority. This has resulted in a lot of medical care now being negotiated rather than mandated. What I mean by that is that patients and families now expect much more communication, more explanation, which I wholeheartedly endorse. In my opinion, this is much preferred over the scenario of 50 years ago, where the doctor was always right. Of course, the challenge is that you need to spend much more time in providing a thorough explanation, listening, discussing… and while I think that is fundamentally important, and I wouldn't think to surrender it for a moment, time isn't always on our side. Our working hours, for the senior staff and consultants, are very arduous; we certainly do not adhere to European working time directive standards.

The second is that intensive care research in the UK is really starting to take off. It has been a very long time in coming because it has been difficult to access research funding but with the establishment of the National Institute for Health Research (NIHR), critical care now has its own specific support mechanism for research, which makes it a bit easier to engage funders and to provide some sort of infrastructure for clinical research, so that has been very important. We have a professional network of specialty groups for critical care under the umbrella of the NIHR, which is being chaired by Prof. Tim Walsh. The Intensive Care Society has its own critical care research forum and we also have an informal critical care trials group which meets every year, which is just an informal collaboration of researchers. We also have the Intensive Care National Audit & Research Centre (ICNARC), the director of which is Prof. Kathy Rowen and that has provided us with tremendously important case mix data which provides the basis for health research and quality improvement to some extent, although they are not yet developed, the basis for a quality accreditation process.

An exciting recent development has been the establishment of the faculty of Intensive Care Medicine, led by the World College of Anaesthetists with representation from all the royal colleges, and we have just established the board for the faculty. We will be holding our first meeting before the end of the year. We still have to elect a dean of the faculty, but since we have a faculty, we have, for the first time, a formal presence in both undergraduate and post-graduate training to support the professional presence that has been provided through the intensive care society, so it is a very important development for us.

> *"This has resulted in a lot of medical care now being negotiated rather than mandated."*

S.S. What poses the greatest threat to patients in ICU's?

J.B. I think the lack of integration of care poses a very real threat to patients. The acutely ill patient crosses many professional boundaries and also presents an unstable

state over time so you have three challenges to overcome at once. The first is that patients move from one location to another while in the hospital. They may be seen in their community, but often not by their GPs, because their GPs no longer have to do on-call at night, extraordinarily! So patients are picked up by the emergency service, brought to the emergency department and then must be moved through (within four hours) to either acute medicine admission wards or surgical wards. In that transition, they often move into the care of different individuals; often junior staff if it is out of hours. If it is a surgical patient, the patient enters theatre, and then returns to a surgical ward. If their condition deteriorates, then they may be moved to intensive care or even go directly to intensive care from theatre. Medical patients go from the medical admissions unit to the acute medical unit and from there to a medical ward and from there to an intensive care if they deteriorate. After intensive care, the majority will recover (with an overall 20-30% morality rate) and go back to a ward. These are multiple transitions in space and time and at the same time, patients are enduring multiple transitions of doctors and nurses because these people are now, apart from the consultants doing shift work. So the only constant is the specialist, the consultant. The trainees will move- some shifts, in emergency departments for example, start at 6 pm in the evening and 2 am in the morning and then you have a new shift starting again at 2. These are pretty unfriendly rotas, and while they satisfy the European Working Time directives, they don't do anything for patient care or the trainees. So the consultants have the responsibility of integrating care, and it is really quite difficult to do that.

> *"…lack of integration of care poses a very real threat to patients."*

The third element is as I've said, that the patients condition is continuously changing- creating a moving target. These three components make management of the acutely ill patient particularly challenging. So I think we haven't quite learned how to manage this moving target effectively. Birmingham provides a major centre for understanding how best to care for acutely ill patients, because not only do we have the largest patient catchment area anywhere in the UK, we also have more patients than any hospital in the UK, in addition to housing the Royal Centre for Defence Medicine, where all the conflict casualties come. We are engaged with our military colleagues; both physicians and nurses, learning from the military experience and applying that knowledge to the acutely ill patient generically; so I think that is special area of expertise, which we are developing.

> *"There is really an environment now, certainly, of widespread awareness of the dangers of cross-infection, and more willingness to follow the rules."*

S.S. As this issue is focused on Problem Bugs, can you comment on any specific Hospital-acquired Infections with regards to your institution, or the UK in general?

J.B. In the UK, we've seen a significant and very satisfying reduction in MRSA infections /MRSA bacteraemia, because that is the benchmark. Some of that has come about through routine measures and adherence to basic standards of hygiene including the ready provision of alcohol-based hand rubs throughout the hospital. There certainly is a great deal more awareness, I mean we are not perfect, but there is a high level of adherence and a greater willingness, for example, of nurses and junior doctors to question the behaviour of more senior staff. Of course, that is just one example; I am not implying that junior nurses are perfect and beyond reproach and senior consultants are useless or need to be carefully observed-I don't mean that at all. There is really an environment now, certainly, of widespread awareness of the dangers of cross-infection, and more willingness to follow the rules.

I do think, however, that self-discipline and teamwork do continue to be areas, which are problematic in all areas of healthcare, as they are here in the UK. So further to simply adherence, implementation of best practice is still an area for improvement.

One aspect that I am closely involved in is the project, being led by the National Patient Safety Agency, called "The Matching Michigan Project". This is a quality improvement study being funded by the department of health for two years, and I am the clinical lead for England. It is focused on reducing blood stream infections from central venous catheters. Initially it is a project for intensive care units, but we hope to spread it throughout the whole hospital. We are already experiencing a reduction in blood stream infections from central venous catheters as a result of this. One of the interventions is indeed a checklist, but even more central to the success of this initiative is showing people that there is a problem worth addressing, as not everyone thought there was. Providing data is transforming critical care. Using a checklist as a means of promoting best practice is important but we also included a range of other behavioural measures focused on improving patient safety. This database that we are creating pools information from other centres in Spain, Australia, among others, and we are working very closely with Prof. Pronovost in the US, who is one of the advisors on the project. ■

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SPECIAL FOCUS

ON ESICM CONGRESS

The 23rd Annual Congress of the European Society of Intensive Care Medicine held in Barcelona, Spain is one of the major intensive care meetings taking place in 2010. It features 10 parallel sessions including over 500 lectures, presentations, debates, round table discussions, tutorials and interactive educational sessions.
Presentation of original research is one of the priorities of this series of congresses, as a result upwards of 1000 oral and poster presentations of unpublished research are on display.

One unique feature of this years' congress is the addition of the LIFE campaign. Besides positive patient outcome, expression of satisfaction or gratitude in letters sent by patients or their families is one of the most important rewards for caregivers in our ICUs. With the LIFE campaign, the ESICM aims to Link Intensive care to Family Experience.

Intensive care professionals from all countries were asked to contribute to LIFE, to submit letters from patients or their families, respecting patients privacy, as a testimony of the intense human relationships that arise in the ICU. All letters are displayed on the walls of the congress centre, in their original language, to be read by congress attendees. On the opening day of the Barcelona Congress, five letters will be drawn among those selected by members of the ESICM Council on the basis of their emotional content and of the human values highlighted. Submitters of these five letters will receive a free registration to the 24th Annual Congress of the ESICM to be held in Berlin in 2011. This is a unique opportunity to connect the general public to our specialty through stories of patients that recognise the devotion and excellence of intensive care professionals. Campaigns such as LIFE help us highlight the outstanding commitment of critical care teams to save lives.

The 23rd Annual Congress in Spain offers a rare combination of thematic presentations, education, discussion and debate of new data as well as innovative and responsive features. These elements, in addition to the entertaining social programme and the exciting host city, Barcelona, create an intoxicating mixture that makes this congress an event that should not be missed. ■

Rui Moreno,
ESICM President

Jean-Daniel Chiche,
Chairman of the ESICM Congress Committee

Andrew Rhodes,
ESICM President-elect

Continued from page 37

Exchange Portal (IEP). Initially conceived as a means of supporting the sharing of images and associated reports between hospital trusts and NHS-commissioned independent sector healthcare providers, NHS feedback led to the scope of the IEP to be widened so that it can be used to support image sharing between NHS trusts.

As with PACS Exchange, IEP involves the routing of images (and reports) via a centrally managed router. The service is based on an established referral relationship between the requester, sender and recipient. By the end of January there were 54 trusts and four independent sector healthcare providers able to use IEP for sending and receiving imaging studies and we are working to have 120 trusts live with the system by the end of March.

Image router solutions like the Image Exchange Portal and PACS Exchange are set to become the prime image sharing solutions within England, at least for the next few years.

Meeting Needs Now

In conclusion, solutions that allow clinicians to "View it, Source it" are meeting a need at local, regional and – in the future – national level. The missing part of the equation is "Find it" and the feasibility of including a patient's imaging history in the summary care record is being investigated. The current available solutions are helping trusts to reduce the time, cost and effort of moving images around, protecting patient information and freeing-up staff to perform other activities In the past, many of these images would have been burned onto CDs, requiring many hours of staff time. Now, electronic solutions are beginning to ensure that images and reports are safely shared electronically in a matter of minutes. ■

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AGENDA

NOVEMBER 2010

5-6 1st ESA Autumn Meeting 2010
Budapest, Hungary
www.euroanaesthesia.org

16-18 Doppler-Echocardiography in Intensive Care Medicine
Brussels, Belgium
www.intensive.org

30-2 16th Postgraduate Refresher Course
Brussels, Belgium
www.intensive.org

DECEMBER 2010

2-4 Resuscitation 2010
Porto, Portugal
www.congress.erc.edu

5-8 Respiratory Monitoring
Rome, Italy
www.intensive.org

JANUARY 2011

15-19 Society of Critical Care Medicine (SCCM) Annual Congress
San Diego, California, US
www.sccm.org

19-20 IT @ Networking 2011
Brussels, Belgium
www.hitm.eu

FEBRUARY 2011

24-26 16th International Symposium on Infections in the Critically Ill Patient
Porto, Portugal
www.infections-online.com

MARCH 2011

22-25 31st International Symposium on Intensive Care and Emergency Medicine
Brussels, Belgium
www.intensive.org

JUNE 2011

11-14 Euroanaesthesia 2011
Amsterdam, the Netherlands
www.euroanaesthesia.org

15-17 SSAI 31st Congress on Anaesthesiology and Intensive Care Medicine
Bergen, Norway
www.ssai2011.com

In our Next Issue

COVER STORY - Triage

MATRIX
- Non-invasive Ventilation in Critically Ill Patients Part Two: Interfaces

COUNTRY FOCUS
- Turkey

PRODUCT COMPARISON CHART
- Cardiac Output Monitors

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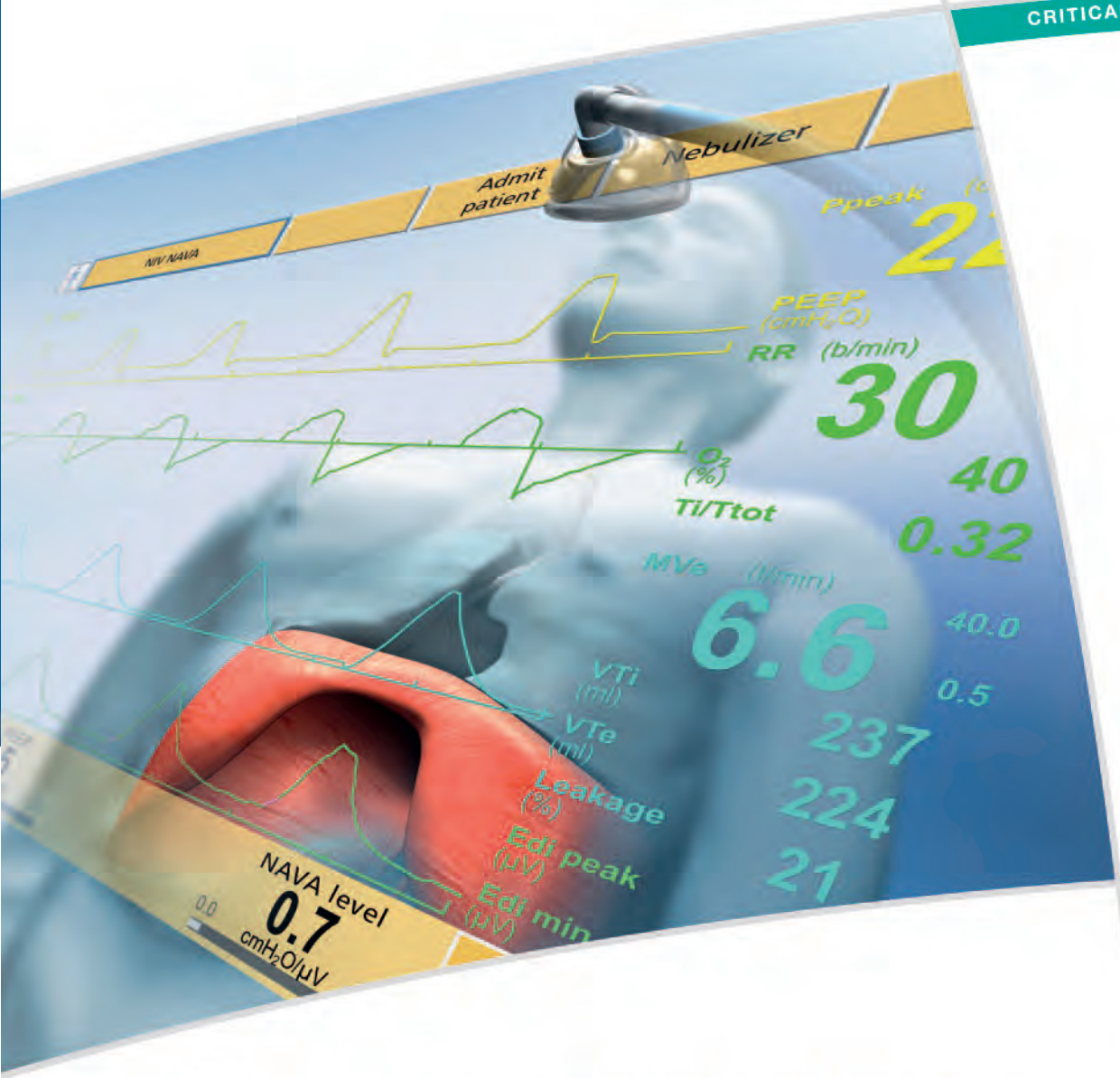

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1 Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. N Engl J Med. 2009; 360(14): 1418-1420.

2 FDA 510(k) clearance.

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