ICU

MANAGEMENT & PRACTICE

Education

Adult education for ICU management: a better way, *T. Dorman*

COmpetency-BAsed Training programme (CoBaTrICE) in intensive care medicine for Europe and other world regions, *F. Rubulotta & P. Gruber*

Making critical care education BASIC, *W.T. Wong et al.*

Effective education for palliative care, *C.J. Hurd*

Free Open-Access Medical education (FOAM) and critical care, *C.P. Nickson*

Physiotherapy in the ICU e-learning programme, *M. Major-Helsloot et al.*

Benefits of CRM education and simulation in intensive care and emergency medicine, *J. Barré et al.*

PLUS

Molecular diagnostics in severe respiratory virus infection, *B. Tang et al.*

Integration of nurse practitioners into the critical care team, *A.C. Dykstra & J.J. Marini*

Supply purchasing for intensive care centres, *R. Burgers & E. van Raaij*

Reducing avoidable harm and death from sepsis and acute kidney injury, *C. Hancock & A. Watkins*

Implementation of early and structured rehabilitation in ICU, *D. McWilliams*

Process indicator-based plan-do-

act-check cycle in a single-centre quality improvement initiative, *J.A.M. Heijneman et al.*

Improving sepsis outcomes in Brazil, *F. Machado*

Bringing new technologies to anaesthesia, *M. Cannesson*

Bringing new technologies to anaesthesia

Are we there yet?

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We live in a wireless world as consumers, but wireless monitoring in the perioperative setting and the ICU is not as advanced. How will it catch up?

Do we really need to go wireless in the hospital and specifically in the perioperative setting? Intuitively it sounds like we should, because having wires to some extent is problematic for patients and there are questions about patient and clinician safety. We spend a lot of time untangling wires… but there are some risks associated with wireless technologies and cybersecurity, especially in medicine. One of the problems is an increased risk of hacking with wireless technologies, so we have to balance the benefits and risks, and issues related to cybersecurity will have to be resolved and mitigated before wireless monitoring gains widespread adoption in hospitals. Many hospitals are concerned with hacking so the imperative to wireless in medicine is less than before.

In your editorials for *Anaesthesia & Analgesia* you have pointed out some of the challenges in implementing technology—financial, organisational, security, risk management, fatigue, information overload, cognitive saturation. Are you optimistic despite these challenges?

I am very optimistic by nature as a person—I tend to be over-optimistic actually. There are multiple barriers to bringing new technology from the research arena into the clinical field. The main barrier is regulatory—in the U.S. the FDA regulations and in Europe the CE mark approval process; at the same time these barriers are here to protect the patient population. We don't want innovation that will hurt more patients than help. The academic community needs to understand that we have to play the rules of the regulator if we want to bring innovation to the bedside.

When new technology is approved, how do you make hospitals and healthcare workers accept the new technologies? Clinicians have a tendency to resist changes. It's interesting that many physicians tend to adopt technology outside their work, e.g. cellphones, new cars, computers, but when it comes to their own work, they tend to be protective and very territorial with technology. We can push back as much as we want, but if it's a good technology, it's going to win.

The last barrier is cost. Hospitals and medical systems have to evaluate the return on investment of the technology. New technologies have to show value, either by purely decreasing hospital costs or by improving outcome. Overall the healthcare industry is moving this way, and there is more alignment between what the hospital wants and what the industry is developing.

What do you describe as digital quality improvement? Why do you say it's not ready for widespread use? (Gabel et al. 2016)

The concept of digital quality improvement is based on the use of digital technologies to improve quality of care. The most widely disseminated technology in hospitals is the electronic medical record (EMR), which is most often used for billing and quality improvement processes. The problem is that EMRs are not very user-friendly and it's very difficult to change or design your own EMR to improve quality of care. Only 30% of hospitals have EMRs in the U.S. and Europe. When 70% of the EMR market is wide open, and industry knows hospitals are going to buy them, they don't need to have a differentiator and take a risk to get more market share. A limited number of hospitals have this expertise, and many studies have been published in the last 5 years that use EMRs to change clinicians' behaviour and improve quality. But most of these studies were conducted using custom-made anaesthesia information management systems and thus cannot be easily disseminated. Disruption will occur when clinical decision tools are made out of major vendors' EMRs so they

can be disseminated from one hospital to the other.

Please explain your vision of a "data mart" to collect process and outcome metrics in real time about perioperative care (Cannesson et al. 2015). Will this enable a move from "big data" to "smart data"?

When we are working in hospitals where the EMR is implemented we have data. The hospital leaders—the department chairs, CMOs, CEOs and chief quality officers—know the data is here, but very few places have actually accessed the data from the EMR. We understand that these data have a lot of value, because using the data we can display outcomes and look at the process of care—what we do well and what we don't do so well. At UCLA, where we have 150 anaesthesiologists, we took the strategic decision to dedicate some of our medical time and finances to have an IT team within the department to develop a data warehouse from the EMR. We have 1.5 FTE anaesthesiologists and 1 full-time engineer employed on the data warehouse.

We own the data, we have access and the expertise on how to handle data and share data with other departments. After 3-4 years of this development the department of anaesthesiology is becoming the hub for data sharing at the healthcare system level, and other departments are coming to us. It puts the department in a very strong position. There is no doubt that hospital leadership and clinicians will want more and more data to drive strategy and decide what to invest in.

How do you overcome issues of data quality in a data warehouse project?

You need to define the source of the data by consensus, otherwise depending on the data source you are using to measure the outcome, you are going to come up with very different incidence. You need to be smart and cognisant of the limitations.

What are your thoughts on the concept of perioperative medicine?

Our motto is very simple: Excellence of care is not lacking in our western healthcare systems. We have access to the best technologies, we have the best-trained physicians,

and we have brand new and efficient therapeutics. When a patient experiences a bad outcome, it is not because excellence of care is not available. Bad outcomes happen because care is not coordinated efficiently. Perioperative medicine is becoming a hot topic, because over the past 15 years anaesthesiologists and surgeons have made the operating room (OR) the safest place in the hospital even though it's the place where you take the most risks. Today we have the lowest complications associated with anaesthesiology, and when there are complications in the OR usually we can take care of it. Mortality today in the OR is close to zero. When surgical patients have complications it happens because of a lack of optimisation before surgery or because they develop complications in the postoperative period.

> ◀◀ **the human part that we have as doctors—no machine can replace it** ▶▶

In essence, complications happen because of a lack of coordination and because of disjointed care. What we are proposing in perioperative medicine is to optimise the care of patients undergoing surgery. The idea is to take anaesthesiologists, surgeons, internal medicine, nursing and IT and help redesign care in the perioperative setting to make it better coordinated. It's also a way for specialities to change their value proposition.

What are the promises and the challenges of closed-loop systems in anaesthesiology?

The closed-loop system is a shift in paradigm. Today anaesthesiologists in the OR are more focused on the process of care, whereas what we should do is set targets—for example I want to keep mean arterial pressure at 70 mmHg, I want to keep cardiac output at 4.5 litre per minute, I want to have a Bispectral Index (BIS) value between 40 and 50. That's the value we bring—it's not delivering the care, it's setting the strategies. It has been demonstrated that there is a lot of variability in the care we provide from one practitioner to the other, so the idea is to use closed-loop systems to try to help

us be more standardised in care delivery. A closed-loop system is a good way to do it, as it makes the link between monitors and the drug infusion devices. The idea is that the clinician sets the goals of clinical management and the automated system delivers the care, like when you set the room temperature and use the air conditioner to maintain the temperature. It's very likely that in the future intraoperative care is going to be delivered more and more by mid-level providers, such as nurse anaesthetists. We will have MD-anaesthesiologists work more either on high acuity care, or outside of the OR. How can we use technology to help us keep control of medical management? These technologies will be like care extenders or midlevel providers, and anaesthesiologists will be able to focus their attention on other things. It's an opportunity, as we don't need MDs to do very mundane tasks in the OR. We need physicians to talk to the patients and family, to make shared informed decisions with the patient, and coordinate the care of the surgical patients. The human part that we have as doctors—no machine can replace it.

Should videolaryngoscopes be the first choice for intubation?

It's a matter of time that they will be used for all cases. When technology arrives to replace an old one, the new technology ends up cannibalising the old one, but it's not instantaneous, it takes time. It creates some generational gaps, when physicians who have been using the old technology complain that new trainees are not going to be able to use old technologies, but that's the nature of things.

However, we have to be mindful not to over emphasise that a new technology is superior to an old one, because in most cases old ones are much cheaper and we need to make sure that people have access to these old technologies. ■

References

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