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### Critical Care: The View from Canada: An Interview with Professor Gordon Rubinfeld



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Integration of Trauma, Emergency and Critical Care at Sunnybrook is a Relatively New Model for Canada. Can You Tell Us More About the Programme and How Critical Care Fits into That?

Clinicians and researchers understand integration between these areas, but it is relatively novel as a hospital organisational approach. Hospitals are generally organised along departmental structures with surgery, critical care and emergency medicine in different places. Obviously that doesn't make much sense. Real novelty comes at the hospital and administrative level, with several advantages. It aligns the multidisciplinary team, not just the physicians, along the continuum of care, with base hospital and pre-hospital management and oversight through to hospital discharge. We are now thinking about how to integrate post hospital follow-up and rehabilitation. This structure lets us integrate, share knowledge and training, and provide continuity of care, handovers and quality improvement projects in an easier way. It gives accountability to the executive for the whole area. From a budgeting and operational standpoint it's really quite innovative and aligned with the hospital structure the way clinicians think, work academically and operate.

You Co-Authored a Paper in the Lancet About the Global Burden of Critical Illness in Adults (Adhikari NK et al. 2010). What do You See as the Biggest Challenge?

The biggest barrier to understanding the global epidemiology of critical illness is a shocking lack of data, not just from developing nations, but also from Europe.

There are two important reasons for what makes critical illness difficult to study from an epidemiological standpoint. Firstly, critical illness is an acute disease. People get it; they either die or get better. There are sequelae, but we don't think of patients having chronic critical illness. It is much harder to study acute diseases from an epidemiological standpoint, as you have a shorter window in which to capture these data. Secondly, critical illness is inextricably linked to critical care. If you don't have ventilators, for example, you're not going to have respiratory failure: people will simply die. That makes critical illness different from other diseases. When people die from pneumonia without being on a ventilator, it's hard to study their critical illness. Another factor is the difference in ICU beds per population in different countries. If there is a 10-fold difference in ICU beds, comparing for example the US and Germany to the UK, there's no way the ICU epidemiology of sepsis is going to be the same in those countries, as you simply don't have the beds to have the disease in.

The real reason we wanted to write the Lancet paper, despite the limitations of the data, was to get a dialogue going about what the epidemiology  
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might look like.

#### **How can Critical Care Develop Interventions That can be Used in Both Developed and Developing Countries?**

For a long time we've thought that all we need to do is simplify the interventions we have in developed countries, then apply them to developing country diseases. The FEAST trial by Professor Kathryn Maitland in children with sepsis challenges this assumption (Maitland 2011). That hypothesis may not be true; we may need to do some specific evaluation. I still think it's a reasonable hypothesis that we start with the idea of taking some of our interventions from developed countries, making simpler versions of them and engaging with our colleagues in developing countries to test and implement them. A number of researchers are working on this. The challenge intensivists have with engaging with this research is, for example, issues such as if it really makes sense to think about catheter-related bacteremia and infections in a country that doesn't have clean water. I think that's a fair discussion to have, and probably as a field we need to do a better job of economic evaluations of interventions. One of the areas that has engaged developing countries, where many of the pandemic infections gain a hold, is screening for pandemic respiratory infections. This is an area of intense interest, understanding how these develop, how they spread and how we might be able to limit that. In developing countries critical care means things such as crystalloid resuscitation, antibiotics and oxygen, what we think of as basic care. Those are what constitutes intensive care in developing countries, and it's a matter of getting good at that. If you think of critical care in a broader sense that probably has huge advantages for mortality reduction.

#### **You Presented at SICEM this Year on the Limitations of ICU Research, Particularly Outcomes Data on Quality of Life. Could You Explain More About These Limitations?**

People are increasingly frustrated with 28-day and 90-day mortality as the endpoint for critical care trials. Many studies were negative, then some were positive and now they are negative again. There's demand for some endpoint other than mortality, but we haven't demonstrated a valid surrogate. We've certainly shown that things like reversal of organ dysfunction, making oxygenation look like it's doing better, making blood pressure go up a little bit more, none of those things seems to correlate very well at all with mortality. We're intensely focused on organ function, which doesn't appear to be the holy grail for endpoint. The challenge with long term outcomes is that much recent research has suggested that the morbidity we are seeing after critical illness in many of our patients is probably there beforehand, so obviously we're not going to make that better. We need to be cognisant of those sorts of limitations on the outcomes, both quality of life and organ reversal.

Many of our patients come into the ICU with poor quality of life beforehand, so some of the poor quality of life we are studying afterwards is probably pre-existing, and a lot appears to be reversible on its own. Another problem is what we epidemiologists call informative censoring. What that means is, if you do for example an RCT, you are looking at long term outcomes only studying those in people who are alive, and it's very possible that if the intervention improves survival, even by a little bit, what they're doing is shifting people who otherwise would have died, now they are surviving, with a reduced quality of life, but are alive. It's quite possible that studies that improve mortality in critical care may have absolutely no effect or maybe even worsen quality of life, and we have to be aware of that limitation of using quality of life as an outcome.

None of these outcome issues in critical care is insurmountable. They are probably going to be fixed not by devising a new outcome measure, but by doing larger studies, being aware of the issues and analysing the data correctly.

#### **Do You See a Role for Telemedicine in Intensive Care Medicine Given that Many Countries have a Shortage of Intensivists?**

Almost certainly yes, if you look at it from a broad definition of telemedicine. We need to focus on what telemedicine means and what it can substitute for.

With regard to the projected deficit of intensivists, that's largely been argued in the U.S. There's a projected doctor shortage, driven by the explosive rate in which the U.S. uses healthcare and the ageing of the patient population. It's a demand problem as much as supply. Something is going to have to be done around the demand issue. Telemedicine is a way to address quality issues potentially, and what may be a shortage in intensivists now, but we need to understand the right way of delivering it. This predicted shortfall is part of a bigger problem.

#### **Why do You Think the Definition of ARDS Might Need Changing and Why Does it Matter?**

The definition needed some updating, as there was a lot of new data related to a number of smallish issues, such as excluding the diagnosis of heart failure, issues around x-ray and simplification in terminology. For example, you see frequently in the literature the term ALI/ ARDS. That does not mean anything, because anyone with ALI by the old definition also has ARDS. It was very confusing. What population are you talking about when you say ALI/ ARDS? The terminology needed to be clarified, and new data needed to be incorporated into the definition.

One of the challenges with consensus conference definitions is that they are not always evidence- based, tested or evaluated. The group came up with a fairly complicated physiologic definition for severe ARDS. Sitting round the table it sounded pretty good; it incorporated respiratory system compliance, FiO2 and some other features that all made good physiologic sense. The problem is that when going to large databases applying these more complicated definitions, it identified a very small group of patients, probably not so clinically important. The mortality really wasn't that much different than a group of patients we could identify with our criteria.

#### **Does the Definition Need to be Radically Revised?**

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There are lots of challenges with radical revisions of these kinds of syndromic definitions, in terms of applying it to previous literature and understanding who the patient population is. For example, one of the things people really wanted to be part of the definition, which makes a lot of sense, and a lot of clinical studies are incorporating this now, was to have a run-in period on standard ventilator settings, have the diagnosed severity, you don't really have that diagnosis until the patient has been on very specific settings for 24 hours then we look at oxygenation for example. It's a great idea; lots of studies are doing that. Nothing about the Berlin definition prevents people from doing that. The problem with making that as the definition is that it eliminates all epidemiology, because epidemiology relies on what doctors are just doing. If a doctor doesn't or can't put patients on these specified ventilator settings, then in a way the patient doesn't have the syndrome, so we can't study that in observational research, and that's a real limitation. There were some challenges in incorporating some things people really wanted, so I would call it an incremental improvement.

#### **What do You See as the Priorities for Intensive Care Medicine Research?**

There are a tremendous number of lives that can be saved from dissemination of fairly simple strategies to implement basic measures, such as around sepsis, mechanical ventilation, potentially checklists, medical drug error avoidance, and improving handover and communication. Systems approaches to making those sorts of changes should be really high priority for our field. They are things that most intensivists are already doing and should be easy to do. In terms of lives to be saved, those are extremely important.

#### **Canada is a Multicultural Country. Are There Cultural Differences the Intensivist Needs to be Aware of, for Example Regarding End-Of-life Care?**

The multicultural nature of Canada makes end-of-life care discussions extremely challenging, important and rewarding. It requires a whole different skill to deal with patients from many different kinds of cultures. For example, we have this kind of 'Western' modern bioethics that places a powerful role on patient autonomy, the idea that the individual directs their own life and their own care. What happens if you have a medical culture that's completely focused on that way of communicating, and it encounters a patient culture that doesn't think that way at all, that embraces the idea of the authoritarian or patriarchal physician? You have an incredible clash of culture and values, and you are speaking different languages. There are ways to address that with education. We need to have a lot more tools in our toolkit working in a multicultural environment to engage with families. That's the challenge and that's the reward too. We all go into this field because we love working with and helping people and it's a real opportunity to learn about different cultures and how they communicate.

#### **Your Team has Recently Completed a Clinical Trial on Post-Hospital Case Management to Improve Clinical Outcomes in Patients Requiring Mechanical Ventilation? Are There Any Data or Observations You are Able to Share from that Trial (University of Washington)?**

I can't comment specifically as the manuscript is in preparation. There's a growing body of literature that suggests that most ICU interventions don't work. The possible reasons are that we have been enrolling the wrong patients, that most of the patients have a morbidity that is fixed and pre-existing to the ICU, and a post- ICU intervention probably will not fix it because it's going to have its own trajectory of illness, and lastly, that we are just delivering the wrong post-ICU intervention. That is unlikely, because there have been enough trials with enough different kinds of interventions. Future research is probably going to focus on collecting the right sub-population, and spend less time on the post-ICU period. One of the challenges in long-term outcomes after critical illness is that there are a whole bunch of patients who have had a life-changing event that put them into the ICU. For example, if you're 25 and in a car crash and a paraplegic now, it may or may not matter at all what happens to you in the ICU as you have had a lifechanging event that will alter your quality of life and functional status thereafter. There are many patients who come to the ICU because of diseases that themselves alter their quality of life trajectory, for whom the ICU is a bit of a blip. It is hard to imagine that a post- ICU intervention will alter their trajectory. More importantly, in most countries these are people who are going to get specific rehabilitation for brain injury, trauma etc., and receive very targeted rehabilitation targeted at multiple domains including psychiatric.

#### **Can You Tell Us More About the Lung Injury Knowledge Network (LINK) Study?**

It's targeted at multidisciplinary teams in large community hospitals in the United States. Resources include videos and an interactive web-based teaching environment targeted at low tidal volume ventilation for ARDS. This is very simple and inexpensive, and one of the few therapies we know that are effective in critical illness, probably still under-performed.

#### **What's Your Greatest Leadership Challenge?**

Without sounding trite, effective communication is still really hard. I draw the analogy with communication with different cultures. Particularly in a programme, which integrates nurses, respiratory therapists, physiotherapists, pharmacists, neurosurgeons, burns surgeons, intensivists, anaesthetists, emergency medicine doctors, effective horizontal communication across all those different cultures may be just as different as for patient cultures. Vertical communication problems arise from translating academic and clinical speak into administrative operational language.

#### **What do You See as the Biggest Challenge in Intensive Care Generally?**

I get worried when we have these pendulum swings in critical care. People see studies that are positive then negative, and get intensely tired and frustrated about the value of research. There's a potential in our field to figure that we can't really study what we do very rigorously because what we do is complicated and so hard, so different from what everybody else does that we should just do what makes sense to an individual smart doctor or nurse. We have to fight against this kind of creeping fatigue, frustration and depression. I think it's an exciting time in critical care, I think we have learnt an incredible amount in the last 20 years, both simple and complex.

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