

## Interview with Dr. Avery Nathens

UTMJ Interview Team



Dr. Avery Nathens

**A**very Nathens, MD, MPH, PhD, FRCS, FACS is a trauma surgeon, senior scientist, and Surgeon-in-Chief at Sunnybrook Health Sciences Centre, Canada's largest level I trauma centre. He is a Professor of Surgery at the University of Toronto and holds graduate appointments at the Institute of Medical Sciences as well as the Institute of Health Policy, Management, and Evaluation. He is also a Senior Adjunct Scientist at the Institute for Clinical Evaluative

Sciences. Dr. Nathens is a Canada Research Chair in Systems of Trauma Care, Chair of the Ontario Trauma Advisory Committee, and Director of the American College of Surgeons Trauma Quality Improvement Program. He has published over 400 peer-reviewed papers including over 250 that focus on trauma system design and implementation.

**UTMJ:** Can you tell us a bit about your educational background and what led you to trauma surgery?

**AN:** I went to Queen's Medical School and wanted to go into surgery because I enjoyed the relatively quick feedback – do something and get a pretty instant response. I started in general surgery because I liked the fact that you care for the whole patient, and then early on as an intern, I did an elective at Sunnybrook and was very impressed. I specifically remember a patient coming in who was hypotensive after a car crash, and an immediate laparotomy and splenectomy made the patient better. In an instant we identified the problem, fixed the problem, and the patient around. I really found it rewarding and enjoyed the excitement around that.

Also, as a result of the fact that you don't really have a lot of data to act on, you have to rely on a number of algorithms and to some extent you need to play the odds to make the right decision. I liked that feeling of working on the fly, and it was exciting to see patients get better so quickly. That is how I ended up in trauma: exposure to a few cases early on in internship and residency.

**UTMJ:** Can you speak to the different models of a Trauma Team Leader (TTL)?

**AN:** In the US, it is predominantly the trauma surgeons that run the trauma resuscitations. That is just the

way it has evolved. In Canada, it has evolved in a different way because a lot of trauma is non-surgical, and it makes sense for others to be involved as well. In Canada, there is a mix of emergency room doctors, anesthesiologists, general surgeons, etc. We understand that each of the specialties bring something unique to the environment. To say that it only has to be a surgeon as the TTL is probably not necessarily the right way to go in this environment. In Europe, they have a different model: trauma surgeons are orthopedic surgeons. So, there are different models, and each of them evolved just because of peoples' interests and how the environment is structured – there is no right way to do it.

When you look at our performance as a trauma center in terms of mortality outcomes, we do fairly well as compared to other centers in North America – pretty much generally the case for most trauma centers in Canada – we provide high quality care. Although everyone writes about challenges with access to care in Canada regarding waiting lists, that is not a problem in trauma at all: people get the care they need when they need it.

**UTMJ:** Can you describe your research in Quality Improvement and Trauma Systems?

**AN:** Quality Improvement

I run a program that was first developed in 2010 through the American College of Surgeons called the Trauma Quality Improvement Program (TQIP). For years before that, the way trauma centers were verified or accredited was entirely based on what resources they had and what structures they had. However, there are 3 domains to quality improvement: structures (having the right people and the right OR), processes (having the right protocols) and outcomes (what we are trying to achieve). The American College of Surgeons verification program, which accredits centers, only looked at structures and processes and ignored outcomes. Then, based on success in elective surgery, we developed a program that would allow "trauma centre A" to compare itself to "trauma centre B" and would allow further improvements in care. What that means is that you have a spectrum of 500 trauma centers: some are high performing, and some are not so high performing. All of them have the same structures and processes. So, if we could identify the ones that are high performing, they are doing something different than other centres, who

should be using and learning from that information. Without showing them their data, we would never know where they stand – now we make it clear so that centres will learn and can improve their care.

This led to a lot of research into determining what protocols and procedures are used by the centres that have better outcomes. We survey centres, look at the data, try to understand how they provide care, and then we publish our findings. If the high performing centres are doing X, then the lower performing centres need to adopt that. This is, in essence, where comparative effectiveness studies meet quality improvement. We now have 750 hospitals in that program and use survey research combined with outcome data to get at the answers we need. If we want to understand why people with brain injuries do better in some hospitals, we survey all hospitals and ask (as an example), “How is your neurosurgical critical care structured,” and that helps us gain insights, which we publish and share with other centres.

#### Trauma Systems

Trauma systems are really designed to get the right person to the right place at the right time. Now, that might be easy in an urban environment, but it is not so easy in rural Ontario, where you have significant distances and geographic impediments. The further north you go, there are fewer roads, fewer hospitals, and you are more likely to rely on air transport, which might be impacted by weather and other issues. For years, we have been studying access to trauma care in Ontario and have shown that there are opportunities for improvement. We started evaluating this in 08/09: if you were injured in a remote area, you were looking at 9-10 hours to get to definitive care. Over the years, we have developed better protocols to allow EMS to transport patients to trauma centres. We are also supporting smaller, non-trauma centres in their identification of patients who need to be transferred quickly, and that has helped. Overall, we have improved access to care to the point that many of the trauma centres, particularly in the Toronto area, are now overwhelmed with the volume of patients as protocols have changed. More patients are coming directly from longer distances – that saves lives – but we already have an occupancy problem here at Sunnybrook, with occupancy typically around 110%.

**UTMJ:** What is the biggest barrier to different centres implementing recommendations?

**AN:** The biggest challenge centres have is that once they identify an opportunity for improvement, they tend to know what they need to do, but the implementation piece is very challenging. What we have set up are collaboratives – for example, a number of collaboratives in TQIP where small groups of centres get together and share ideas and experiences. All QI is

local, so it has to be adapted to the specific environment. The more we get people talking to each other and saying, for example, “I did X here. My specialists didn’t want to do this, but we found that if we create this standardized order set, our care improved substantially.” Simple things like that, where those conversations happen, lead to the collaborative model of QI. It’s rarely the money, rarely the number of people. It is usually the commitment and willingness to change. It is all about understanding how to effect change in your environment – changing people’s behaviour is 99% of it.

**UTMJ:** You mentioned that Sunnybrook is operating at 110%. What are the biggest contributors to the backlog?

**AN:** People aren’t being cared for in the right environment. Patients with alternate level of care (ALC) needs don’t need a hospital setting, but there are no other facilities for them to go to. We need either a skilled nursing facility, which is common in the US and provides a place for patients to go that is not quite a hospital and offers more support than available through CCAC (home care). They get the care they need but don’t occupy a hospital bed. Also, access to rehab is very different. People can wait several days for rehab, and that means patients are ALC waiting for rehab, whereas in other settings, they are discharged to rehab when they are ready to go. We also have fewer beds than anybody else per population, reflecting a lack of investment in the hospital system.

**UTMJ:** Can you tell us a bit about your “Stop the Bleed” Initiative?

**AN:** There was a consensus conference called The Hartford Consensus that was held in the wake of the Sandy Hook shooting, where 26 people were shot at an elementary school in Connecticut. As a result of that, Hartford, Connecticut was the site at which a group of people who represented trauma surgeons, EMS, Department of Homeland Security, FBI, etc. got together and asked how they can improve the probability of survival after an incident like this. The group came up with several recommendations. One was an understanding that it takes about 8-10 minutes for police/EMS to arrive. That means no one gets care for a critical few minutes, yet there might be many people who are not injured, who, if they had the right skills might be able to control active bleeding. If you look at the Boston Marathon incident, there are a lot of pictures of people with exsanguinating lower extremity hemorrhages and people next to them who are actually stopping bleeding with pressure and tourniquets.

This led to the development of the Bleeding Control course in which we teach lay people how to stop

bleeding – that is, just putting pressure on wounds and putting tourniquets on. This came out the Hartford consensus in response to an active shooter incident but was designed really for any sort of injury where there is bleeding. It is a little like teaching the public how to do CPR – but with a focus on bleeding. We know that in the Yonge and Finch van incident, some tourniquet use probably made a difference.

We elected to send a team down to Chicago at the ACS headquarters to get trained in teaching the course, which has led to us training a number of people here in Toronto. We do know that the course is now spreading across Canada. In major venues now, just like you have AED, we are now seeing bleeding control kits (tourniquets, gauze, gloves).

**UTMJ:** Can you talk about Sunnybrook’s response to the Code Orange event you recently had?

**AN:** We are very thankful that we had been rehearsing. We made a decision about a year ago that we are committing to practicing in anticipation for an event. You could imagine that when everyone is so busy, this is not a top priority, particularly given that we are at 110% occupancy. Nonetheless, we learned how to create OR capacity; who needs to be in the emergency department (ED) triaging patients; and how best to communicate. We also identified some real practical issues, like an insufficient number of stretchers or chest tubes.

When this happened at 2 PM that afternoon, there was a Code Orange minor on the overhead. I heard this and went downstairs to the ED and quickly had a sense of what we had to do. I understood what was happening with the OR. I put the ORs on hold, so no more elective surgery would take place until we knew what was coming. I also set up a group of doctors, each of whom would form a team around each of the sickest patients. For the less sick patients, they were distributed throughout the ED and had emergency doctors and other folks taking care of them without the whole team. Everybody got care very quickly, and we learned a lot about what our capacity was with all hands on deck. We learned more about how we can use people to the extent that their skills allow. We had medical students, residents, and other individuals stepping up. Altogether, the response and the team was excellent.

**UTMJ:** What was your biggest challenge and things you hope to improve for the future?

**AN:** There were challenges with identification – most people were unidentified and distributed all over the ED. However, the triage of patients (sick versus not sick) was done fairly effectively. The triaging of patients in terms of deciding who gets to the OR first, who gets CT first – that was all pretty straightforward. We were

fortunate because it was middle of the day on a Monday, and we had all the resources and people available. This might have been a little more challenging in the middle of the night.

We had another drill last week that was a table-top exercise with a big blast injury and a large number of patients, which provided further learnings regarding how we can put in place processes to identify patients. We are coming up with strategies pertaining to how we can quickly register patients, as the usual process takes too long when there are multiple casualties.

**UTMJ:** In the wake of the tragic Orlando nightclub shooting, you hosted the trauma team that was directly involved in caring for the patients to describe their experiences. What lessons did you learn from them?

**AN:** I heard the Orlando team speak twice: once at TQIP and then when we brought them to Toronto last year. They told us about issues with supplies – like chest tubes – things like that you don’t think about. It is helpful to us – now, we have supplied ourselves with the right equipment just in case. It is a small community of trauma centres that have been through this and that community talks to each other. Just like we have these collaboratives where people learn QI, it is no problem to talk to people in Las Vegas and Orlando and ask, “How do you identify patients? What is your strategy?” For example, they told us that they will have 100 patients who are pre-registered with a medical record number and name. As patients come in, they just get the armband because there is no need register them. They are already pre-registered, and you can add exact dates and times. Everyone talks and shares ideas, and Sunnybrook has joined that community.

**UTMJ:** What advice do you have for medical students who want to get involved in trauma?

**AN:** Each surgical specialty (and critical care) has a trauma component. Depending on where you work, trauma might only be a small fraction of your activity, and you have to like the other 90%. For example, if you’re interested in orthopedics, there are dedicated fellowships that focus on orthopedic trauma. These doctors really learn how to work in the context of multiple teams, so an orthopedic trauma surgeon speaks the same language as the other surgeons involved in trauma care. There is a lot of coordination of care and working as part of a team is so critical. Many who take care of trauma patients understand the principals of damage control – do what you need to do to immediately save a life or limb; resuscitate the patient, and then return to the operating room for definitive care. The term “damage control” is actually derived from the US Navy, where they focused on strategies to repair a shift sufficiently just to get back to port.

For general surgery, you have to like and be comfortable operating in the neck, chest and abdomen – as well as the lack of planning that comes with the speciality. The surgical oncologist has the opportunity to review CT scans and spends time at multidisciplinary tumour boards discussing what the best plan might be for a particular patient. Trauma is very different from a general surgical perspective – there is none of that – but we have to work as part of a team and have to be able to prioritize all of the patients' injuries. To become a trauma surgeon, many do a fellowship in trauma surgery, often combined with critical care. This provides a good perspective on these patients' needs and makes you a better trauma surgeon.

If you want to focus on trauma but prefer anaesthesia or emergency medicine as your core speciality, many ensure they get additional trauma exposure at a trauma centre and often have additional areas of focus like critical care. This gives a better sense of how to prioritize patients and the full spectrum of trauma care – from resuscitation to rehabilitation.

If you're interested in this big picture, you should probably do surgical or ICU training. If you're interested primarily in the resuscitation phase, then emergency medicine might be the right speciality.

**UTMJ:** What do you think of getting a PhD in a surgical field?

**AN:** The Department of Surgery has a Surgeon Scientist Program. It is very well supported. There is also the MD/PhD program. In terms of the clinical context, it is probably more helpful if you do a PhD later in your residency training. Granted, it depends on what you are doing for your MD/PhD. If you're an engineer, it probably doesn't matter, but if you're doing health services research, which a lot of trauma surgeons do, the clinical context is pretty important. It is nice to have lived it a little bit and then study it. Incorporating a PhD in a residency program is great – the program is still heavily invested in your success because you are still a resident. The only people I know who have pursued their PhD during medical school are engineers or basic scientists. For the most part, people tend to do it as part of their surgical training.

**UTMJ:** Going back to the Code Orange and training these multidisciplinary teams – how do you go about training in trauma simulation and eliciting a real-life response?

**AN:** You can never make it as real as possible. In an exercise we did last week – a table top exercise, people are basically in a room and someone is reading out where patients are and moving these little representative figurines around. We did another exercise in October where we actually had stretchers with people on them, and that was very realistic. Does it elicit a cortisol response? I don't know, but it is close. We

did a research study looking at trauma resuscitations outside of the mass casualty incident piece and created different levels of stressful trauma scenarios. We measured the cortisol response in the residents going through the trauma simulation in the simulation centre. There was no question that there were cortisol and heart rate responses. In a mass casualty incident simulation, if doing it with moulage patients and stretchers moving, there could be a response there as well.

We are also trying to improve team performance in the trauma bay. We have created a far more structured environment. Now, we have a support zone, observer zone, active team zone, etc., and it is pretty well organized. This led to a little more control in that environment. We are looking at developing a program (either going to be video debriefing or black box) where people will be able to capture the environment and really **QI** the activity that occurs in the trauma bay. This will lead to better ergonomics and better communication. This is a big focus of ours.

**UTMJ:** You hold many involved positions. What do you like to do in spare time and how do you balance work and life?

**AN:** I spend a lot of time outdoors. I did triathlons for a while, but now I just run and do a lot of hiking. I lived in Seattle for a while and fell in love with the outdoors. I also do a lot of cycling up north around the Caledon/Orangeville area, and about a year ago, I got into photography and enjoy it. Photography is a combination of art and technical skill, which is the perfect blend for me. If I can't get up north, I go to Leslie Street Spit and could walk 5 km out in the middle of Lake Ontario and take great bird pictures, great sunsets, sunrises, etc. It is amazing what Toronto has to offer if we look for it.

I work in two countries. I have a visa that allows work in US, and activities with the American College of Surgeons are so different than what I do here – I enjoy both of my positions, but there is no question that working in two countries is challenging!

What allows me to continue is that I think what I do makes a difference, and it is enjoyable. I can impact patients' lives day-to-day at Sunnybrook, and I can impact thousands through policy-related work. Small policy decisions in Ontario and the development of **TQIP** has probably saved thousands of lives. My work has a broad reach and I work with a great community of surgeons. I have been in trauma since being at Harborview in Seattle, and I've slowly made my mark in a variety of things: trauma centre access is a big one, and **QI** is another. I did a lot of work related to emergency general surgery and **QI** programs around that. I've backed off that now because trauma has been my number focus. Blending all that with family life is hard, but I try to protect weekends.

Most doctors work five days a week. Trauma surgery is different. We have one week where we're very busy, and then we hand over the service to the other doctor. We work Friday to Friday typically once a month. It is a very busy week and we take in all comers: all the trauma patients and usually all the emergency general surgery patients. But we know on Friday morning, we can hand those patients over. That model, which is common for trauma centres, allows us to do clinical work in a concentrated way – patients get good care because they are our only focus for that week – and then we do a bit of research on the side.

**UTMJ:** Do you think there is room for a two-tiered health-care system?

**AN:** There is room for two-tier model. Rigid adherence to the Canada Health Act has probably ensured higher level of care for all Canadians. In Canada, people coming to the ED are just at a higher level of health, and as a result, outcomes are typically better. In Seattle, patients would come in with no care for 20 years – morbidly obese, uncontrolled diabetes. We don't see that here. So, I think we have got pretty far with the model that we have. But with the complexity of health care and increasing demands for services, we need new funds in the system, and the only way is through private sources.

People are concerned that there will be truly a two-tiered system where you have private and public, but we could probably come up with hybrid model that better serves our population... no politician has yet to make this decision, but someone has to at some point.

**UTMJ:** What can we look to in the next decade in terms of advances in trauma?

**AN:** We are very good at controlling hemorrhage right now. If a patient makes it to hospital, we are almost always going to stop the bleeding. People are still dying from head injuries, and we don't really have effective approaches for the management of patients with severe traumatic brain injuries. We need advances there and that might be cerebral protection, whereby we do something with the brain so that it can recover.

The other thing we haven't addressed as well is functional recovery after injury. While everyone focuses on trauma survival, the fact is, 93% of patients survive and probably 25 to 40% of those patients are significantly impaired with anxiety, depression, PTSD, chronic pain. We haven't come up with good approaches to identifying and managing high-risk patients. That is a big focus of many organizations now for improving functional outcomes. We actually received funding to build a multidisciplinary trauma clinic, which is probably opening next year, to try to address this issue.

Other than that, we can probably look forward to better interconnectedness of what happens in the field and what happens in the hospital setting. There are walls around each of these areas. We could probably start field interventions for the right types of patients much earlier and better identify who would benefit from trauma centre care using point of care imaging or other technologies.