DR CHRISTIAN VAILLANCOURT

At the heart of prehospital care

Senior Scientist **Christian Vaillancourt**'s research spans the full spectrum of health science and seeks to enhance the care and survival for out-of-hospital cardiac arrest and trauma victims Additional contributors: **Dr Ian Stiell** and **Deputy Chief Peter Kelly**



On a personal level, what attracted you to a career in the field of prehospital care?

Growing up, I spent most of my weekends downhill ski racing in the Laurentians, north of Montreal, where my dad was part of the St John Ambulance ski patrol. Many of his friends and fellow ski patrollers were also paramedics; so, very early on, I developed respect and fascination for the work they do.

As a child, I witnessed my fair share of broken bones and other injuries. I also participated in cervical-spine immobilisation and chairlift evacuation exercises. In the summer, the same group of ski patrollers provided first aid care at the Montréal Formula 1 Grand Prix. I volunteered there as well, first as a parking lot attendant, and ultimately as a race track physician. I also moonlit for Montréal's Urgences Santé as an emergency medical service physician while completing my Royal College residency training in emergency medicine at McGill University. Overnight, I would often be the only physician on the road with advanced life support training for a catchment area of over 1 million people.

Could you outline your current work on cardiac arrest and trauma victims?

Although I am involved in a variety of research topics and projects with a number of collaborators, my primary research focus is on prehospital care for cardiac arrest and trauma victims.

Regarding the care for trauma victims, we have recently validated the use of the Canadian C-Spine rule by paramedics in the field. We are currently completing an implementation study, allowing Ottawa paramedics to evaluate trauma victims in the field, and selectively immobilise their cervical spine (or not) using the Canadian C-Spine Rule previously developed by Dr Ian Stiell.

For those who do not know, what is the Canadian C-Spine Rule?

A clinical decision rule is derived from original research and is defined as a decision-making tool that incorporates three or more variables from the history, examination or simple tests. These rules help clinicians and other healthcare professionals with diagnostic or therapeutic decisions at the bedside. The Canadian Cervical-Spine Rule was derived and validated to help clinicians safely remove the immobilisation equipment applied in the field by paramedics before transport, without the need for X-ray imaging.

What would you cite as some of the most exciting research opportunities you have been involved with?

There are many. I would start with our publication of the first national statistics on cardiac arrest and prehospital care in 2004. This project took place early in my research career and facilitated collaboration with some of the brightest cardiac arrest researchers in Canada.

Since then, I have had the opportunity to join the Resuscitation Outcomes Consortium as a co-investigator (Dr Ian Stiell is the principal investigator for the Ottawa site). This North American consortium is the biggest clinical trials network in the world focusing on very large outof-hospital cardiac arrest and trauma random clinical trials research.

I recently joined other delegates from the Heart and Stroke Foundation of Canada on the International Liaison Committee on Resuscitation, the organisation responsible for reviewing the science leading to resuscitation guidelines. Not long ago, I also led the publication of the Canadian Association of Emergency Physician's national position statement on bystander cardiopulmonary resuscitation (CPR). This publication was presented during a press conference and received extensive television, radio and paper media coverage.

How do you anticipate your work will positively contribute towards the constantly evolving healthcare landscape?

As the general population is ageing and striving to live healthier, longer lives, more people will be at risk of sudden cardiac death. Over the past 10 years, I have designed and led a number of innovative projects with the objective to improve 911 dispatch-assisted CPR instructions and increase community bystander CPR. These projects include a succession of systematic reviews, surveys, pilot data, observational data, randomised control trials (RCT), and ongoing interventional trials integrating knowledge translation.

How do you see your research career progressing over the next 10 years?

The next decade promises to be exciting. Much of the past decade has been spent laying down the foundation for our research programmes. The following 10 years will be spent moving forward with prospective implementation studies that will have a real impact on cardiac arrest and trauma victim outcomes.

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Ruling out **discomfort**

In close collaboration with paramedics, a series of studies at the **Ottawa Hospital Research Institute** in Canada is gaining support for new protocols to improve care at the scene of an incident

PREHOSPITAL CARE REFERS to emergency medical services that provide acute out-of-hospital medical treatment, which can range from basic first aid and cardiopulmonary resuscitation (CPR) to caring for trauma patients. It provides timely interventions to treat patients at the scene of the incident. Quick and appropriate care is particularly vital in cases of trauma and cardiac arrest, as immediate medical attention can help increase survival rates and prevent further – and possibly permanent – injury to the patient.

Ottawa Hospital Research Institute Senior Scientist Christian Vaillancourt's work focuses on the field of prehospital care. His recent studies have looked at improving emergency dispatchers' ability to recognise cardiac arrest over the phone and increasing bystander CPR rates. It is hoped that if dispatchers are able to identify abnormal breathing over the phone – an indicator of cardiac arrest – they can then give instructions on how bystanders can administer CPR to the victim.

The idea is promising – Vaillancourt's studies have shown that bystanders CPR rates have increased from 15-29 per cent after dispatchers started to provide CPR instructions to 911 callers. "Moreover, we have recently completed a community-based consultative and Delphi consensus process to help us design a public health intervention most likely to improve bystander CPR rates in people aged 55 or older, the group most likely to witness a cardiac arrest," he expands. "We estimate that these two interventions will save the lives of an additional 200 Ontarians annually."

TREATING TRAUMA

In addition to improving out-of-hospital care for cardiac arrest victims, Vaillancourt and his partners have looked at optimising care for trauma victims. It is estimated that annually 1.3 million patients in Canada receive emergency medical treatment for risk of injury to the cervical spine as a result of falls or motor vehicle accidents. In order to transport these patients to hospital, they are placed in immobilisation equipment - such as a backboard, collar and neck supports - to prevent further injury to the spine. Yet, less than 1 per cent of these victims will actually suffer from a fracture of the cervical spine, meaning for the vast majority of patients, immobilisation is unnecessary and can lead to adverse events such as back pain, pressure sores, and respiratory restrictions.

Therefore, a clinical decision rule - known as the Canadian C-Spine Rule - was developed to evaluate trauma victims with cervical spine injuries and reduce the need for immobilisation equipment and X-rays. By considering factors in alert patients such as numbness or tingling in extremities and the ability to rotate the neck, a decision can be made as to whether immobilisation and X-rays are necessary. Dr Ian Stiell, who developed the rule, outlines a few of its benefits: "This decreases radiation exposure for some trauma victims, decreases healthcare costs associated with diagnostic imaging, and helps patients get out of constricting and painful back boards and cervical collars much faster".

SUPPORTING THE C-SPINE RULE

The Canadian C-Spine Rule was initially derived with emergency physicians. Specifically, a threeyear study involving 10 Canadian emergency departments and over 8,900 patients concluded that using the C-Spine Rule was an effective method for determining if immobilisation devices could be removed from patients. Furthermore, the study's results suggested that using the C-Spine Rule more widely across the country could ease patient discomfort and reduce overcrowding in emergency departments.

The C-Spine Rule received further support from a separate validation study involving another 8,300 patients which compared it to the National Emergency X-Radiography Utilization Study (NEXUS) Low-Risk Criteria (NLC), another decision rule to aid medical professionals on the use of cervical-spine radiography in trauma patients. When both methods were applied, the C-Spine Rule was found to be more effective in reducing the number of patients referred for an X-ray. In fact, it is estimated that just one patient with a serious injury would have been missed by medical professionals using the C-Spine Rule, whereas the NLC would have missed 16 patients.

PARAMEDIC PROTOCOLS

The Rule has been shown to be effective in helping medical staff to determine if it is safe to remove immobilisation equipment. However, it would be even more beneficial if the Rule could also be used by paramedics – who are usually

By considering factors such as tingling in extremities and the ability to rotate the neck, a decision can be made as to whether immobilisation and X-rays are necessary the first ones at the scene of an incident – to determine that no injury is present which requires the person to be immobilised.

As a result, there was a need to validate the use of the Canadian C-Spine Rule with paramedics to ensure its reliability before it is used for out-ofhospital care. "Paramedics have a different clinical training background, they see patients much earlier after their initial injury and they often evaluate trauma victims in a much more chaotic environment," Vaillancourt explains. "Because of this, it was important to validate their use of the Canadian C-Spine Rule before its adoption and implementation in the field."

Therefore, a trial involving paramedics was conducted in Ottawa, Canada. Low-risk trauma patients who were alert and in a stable condition but with a possible c-spine injury were evaluated according to the Rule. Paramedics then decided if the individual should be immobilised prior to transportation, but continued to follow standard trauma protocols and immobilised the patients. The results of the study were analysed to consider a number of elements, including how often paramedics failed to identify fractures using the Rule and the proportion of patients transported without immobilisation. "In the end, paramedics were able to identify all victims with a significant c-spine injury, and would have been able to transport many others safely and faster without c-spine immobilisation," Vaillancourt reveals.

According to Vaillancourt, the validation of the Rule was greatly helped by the collaboration and cooperation of paramedics in Ottawa. "The Ottawa Paramedic Service and the Regional Paramedic Program for Eastern Ontario both got really involved in the methodological and operational aspects of study implementation for the ongoing study," he highlights. "They put in time, effort and resources to ensure the success of the study."

UNTOLD BENEFITS

Since the C-Spine Rule has been validated, it has been well-received by medical staff and is gaining attention in the community. Deputy Chief Peter Kelly of the Ottawa Paramedic Service shares his support for the Rule: "Current standards for c-spine immobilisation are opinion-based and not scientifically supported. Our current implementation study appears to show that paramedics can safely and accurately evaluate the cervical spine of trauma victims in the field".

The implications of a scientifically sound method for evaluating trauma victims are far reaching and will benefit patients, paramedics, and hospital staff. Since the Rule allows paramedics to assess victims at the scene of the incident, patients can have ease of mind, knowing they do not have a serious fracture. Not immobilising patients also means they can be transported more quickly, which also frees paramedics to respond to other calls.

Vaillancourt's research into the C-Spine Rule and his studies into cardiac arrest care have the potential to save hundreds of lives a year in Ottawa alone. As they gain wider acceptance and implementation in the coming years, even more benefits may be seen and more lives can be saved.

INTELLIGENCE

PREHOSPITAL CARE FOR CARDIAC ARREST AND TRAUMA VICTIMS

OBJECTIVES

The primary research focus is on prehospital care for cardiac arrest and trauma victims. The aim is to improve the ability of 911 dispatchers to recognise cardiac arrest over the phone. The team also recently validated the use of the Canadian C-Spine Rule by paramedics and is completing an implementation study, allowing Ottawa paramedics to evaluate trauma victims and to decide whether or not to immobilise their cervical spine.

DISPATCH STUDY

Research Coordinator: **Ann Kasaboski**, Ottawa Hospital Research Institute

Co-Investigators: **Dr Ian Stiell**, Ottawa Hospital Research Institute; **Dr George Wells**, University of Ottawa Heart Institute; **Dr Lisa Calder**, Ottawa Hospital research Institute

Collaborator: **Peter Kelly**, Deputy Chief, Ottawa Paramedic Service

Funding: Heart and Stroke Foundation

C-SPINE STUDY

Research Coordinator: **Manya Charette**, Ottawa Hospital Research Institute; Research Assistant: **Julie Sinclair**, Regional Paramedic Program for Eastern Ontario

Co-Investigators: **Dr Ian Stiell**, Ottawa Hospital Research Institute; **Dr George Wells**, University of Ottawa Heart Institute

Collaborators: **Dr Justin Maloney**, Medical Director, Regional Paramedic Program for Eastern Ontario; **Peter Kelly**, Deputy Chief, Ottawa Paramedic Service

Funding: Canadian Institutes of Health Research (CIHR)

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