Hamilton Health Sciences

CPER Update

CENTRE FOR PARAMEDIC EDUCATION & RESEARCH

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In This Issue:

Congratulations to Niagara EMS

submitted by D. Munkley, MD

Niagara Emergency Medical Services is proud to recognize their Paramedic colleagues who became International Trauma Life Support champions at a competition November 10th and 11th, 2012 in Florida. Eight Niagara EMS Paramedics, two four-person teams, competed and the winning team included Paramedics Tracey Groziebl, Jon Dyck, Chris Guay and Brianne Lavery. The efforts by the second EMS team should also be recognized and this team included Shane Eickmann, Brock Browett, Carolyn Chandler and Hal Klassen. The three-day competition consisted of teams from Canada, The United States, Japan and Slovenia.

"Competitions such as these serve as further training opportunities contributing to the overall quality of patient care Niagara Emergency Medical Services aims to provide to Niagara residents and visitors," states John Cunnane, Chief of Niagara Emergency Medical Services. "Once again, Niagara EMS demonstrated their high level of knowledge and skills, and dedication to patient care and the profession by placing first in such a prestigious international competition."

The International Trauma Life Support competition consists of three simulated incidents in which the Paramedics respond using trauma life support principles. Each simulation is judged by several trauma care specialists from around the world and observed by a gallery of spectators. Scoring is extremely detailed for each simulation.

International Trauma Life Support was founded 30 years ago by Dr. J. Campbell and is a global organization dedicated to preventing death and disability from trauma through education and emergency trauma care.

Mission, Vision and Values | by Tim Dodd

Tim Dodd
Regional Program Manager/Director CPER

The following Mission, Vision, Values and Program Goals are the result of a Strategic Planning exercise that was conducted from September to December of 2012. The objectives of the Strategic Planning exercise were

- To define the Mission, Vision and Values of the Centre for Paramedic Education and Research
- To establish Base Hospital Program Goals

These declarations will be integrated into the process of establishing a new organizational structure for the program and allow us to achieve our commitment of providing service excellence to all of our partners in prehospital care.

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The process adopted for the Strategic Planning exercise incorporated internal staff and external stakeholder feedback as well as guidance from Hamilton Health Sciences Senior Leadership. In order to conduct an environmental analysis, participants were asked to reflect on our current successes and consider any gaps that may exist from their own perspectives. Comments were then gathered from all parties through portfolio and stakeholder meetings, surveys, a SWOT analysis and staff participation into the creation of the Mission, Vision, Values and Goals recorded. The statements will be put forward for acceptance by Hamilton Health Sciences and for approval by the Ministry of Health and Long Term Care.

Mission Statement:

To promote outstanding prehospital care for the communities we serve through innovation and excellence in medical oversight, clinical education, quality improvement, and research.

Vision Statement:

We will lead excellence in prehospital care.

Values:

Excellence: We will achieve the highest quality in all that we do.

InnovationWe will be creative and open to new ideas and opportunities.

Accountability: We will create value and accept responsibility for our activities.

Teamwork: We will support each other and work together as "one".

Respect: We will treat every person with dignity and courtesy.

Caring: We will act with concern for the well-being of every person

Program Goals

***MISSION CRITICAL GOALS** are indicated by bolded lettering

	System Improvement	Focus areas
1	***We shall improve communication between CPER Portfolios, with EMS Service Operators, with Paramedics in our Region and with the Field Office.**	• **Internal – CQI and Education/ Certification, Medical Council** • **External – Paramedics and EMS Service Operator (Improve perception), Ministry Field Office**
2	We shall consider efficiency and effectiveness in all aspects of work and incorporate these concepts into all targeted areas.	• Day to day processes • Targeted areas of interest • New projects and initiatives
3	We shall optimize and integrate processes within our Program and with stakeholders.	• Integrate CQI and Education/ Certification • Chart review and Investigations with EMS Service Operators • Develop provincial and local certification initiatives

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***MISSION CRITICAL GOALS** are indicated by bolded lettering

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	Staffing/Structure/Resources	Focus areas
4	***We shall build and implement a Program structure that will enhance communication and collaboration between all team members, with EMS Service Operators and enable Program Goals to be achieved.**	• **Consider all internal and external input of Strategic Planning exercise** • **Work with HHS Senior Leadership and Human Resources**
5	We shall invest in staff through professional development opportunities, succession planning and identifying skills and knowledge in order to take advantage of strengths.	• Interdepartmental discussion and collaboration • Look for individual opportunities for professional development
6	We shall work to attain adequate resources in order to meet the Performance Agreement and focus on value added services and Program expansion.	• Efficient use of budget, Business cases to the Field Office • Research initiatives • Expand Outreach Program
	Complete and Utilize Data	**Focus areas**
7	***We shall utilize the available data set to steer Portfolio objectives, set priorities and enhance cross Portfolio teamwork in order to achieve Program success.**	• **Integrate existing data into day to day and project decision making** • **Utilize comprehensive data set as available to enhance Program functions and meet Performance Agreement benchmarks** • **Implement Certification module of MedicNet**
8	We shall work to achieve a comprehensive data set containing the Provincial Minimal Data Set, Paramedic information, EMS Service Operator information and Quality/Education/ Certification information.	• Work to find a local and provincial solution for eACR/ePCR data integration • Begin work to integrate a data solution on paramedic information
	Technology	**Focus areas**
9	We shall maintain a high level infrastructure to support Program staff in an environment where optimization and attainment of Goals is possible.	• Give staff the knowledge and tools that they require • Acquire needed hardware and software to optimize technology impact and ensure products are adaptable to future needs

Greg Soto
Paramedic Educator

Linking the Lit – Game Changer 2 | by Greg Soto

The purpose of "Linking the Lit" is to connect prehospital research to paramedic practice. I summarize journal articles related to prehospital care and bring home lessons that may shape your practice on the road.

The RAMPART Study: IM vs. IV Benzodiazepines for Prehospital (PH) Status Seizures

Introduction

Scenario: Today you are working on a transport vehicle with an ACP/PCP configuration. Upon arrive at scene you find an adult male in obvious grand mal seizure uninterrupted for 15-20 minutes. The patient has a long history of frequent seizures. After full assessment including glucose testing, history and stabilization you are in a position to treat the patient with midazolam under the ACP Seizure medical directive. One look at this violently seizing patient and you know getting an IV is going to be difficult, certainly delayed and maybe unobtainable.

Evidence:

You know enough about evidence and through experience to know that patient outcomes are better when seizures cease early. Firstly, mortality among patients who present in status epilepticus is 15 to 22%; among those who survive, functional ability will decline in 25% of cases.[1] Secondly, the longer seizures persist, the harder they are to terminate pharmacologically.[2] Under the ACP directive there are 4 routes that can be used to administer midazolam: IV, IM, intranasal (IN) and Buccal. But which of these 4 routes is the most effective, works the fastest, has the best safety profile and is the best choice[#] for this patient in this circumstance?

What new evidence can we look to with respect to route to guide our choice? Welcome to RAMPART. No, not the Base Hospital for the medics on the '70s show *EMERGENCY!*; for you old timers like me! In this case I am referring to **R**apid **A**nticonvulsant **M**edication **P**rior to **AR**rival Trial.[3] RAMPART is a rare thing in prehospital research – a game changer (a landmark study that alone is capable of changing practice). And what's great about Ontario's medical directives is we don't have to wait 3 years for the next upgrade. You can change your practice tomorrow – given the right circumstances.

RAMPART

This US study enrolled over 2,000 patients and involved over 4,000 paramedics, 33 EMS agencies and 79 receiving hospitals across the US. It was funded by the National Institute of Neurological Disorders and Stroke (NINDS) – the same organization that funded some of the earliest tPA for ischemic stroke studies.

Rationale: There is a growing trend in PH IM midazolam use yet little evidence to demonstrate effectiveness and safety of this route vs. IV. The authors' set out to determine if IM midazolam was at least as good as the best IV benzodiazepine: lorazepam.[3] Lorazepam is rarely carried in the prehospital world because it becomes unstable unless refrigerated.

Methods: RAMPART is a randomized, controlled, multi-centre, double-blind non-inferiority* trial. All seizing patients > 13 kg who met the study protocol received either IM autoinjector administration of weight appropriate midazolam dose or placebo. The

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medics proceeded to start an IV and administer a weight appropriate dose of either IV lorazepam or placebo. A clock and voice recorder was activated when paramedics opened the study drug kit. Paramedics used oral statements to record when drugs were given, time IV access was gained, time seizures stopped/recurred and seizure status on arrival in ED. If unsuccessful in IV access after 10 minutes intraosseous access was performed and study drug administered as if by IV.

Study Outcomes: Primary outcome measured was termination of seizures before arrival in ED without need for paramedics to administer rescue therapy (additional anticonvulsant therapy). Secondary outcomes measured included time to termination of seizures, hospitalization status, need for intubation and recurrence of seizures.

Results: IM midazolam route was successful in meeting the primary outcome in 73% of cases vs. 63% in the IV group. These findings were statistically significant for non-inferiority ($p<0.001$) and superiority ($p<0.001$). In other words, these findings were not a result of chance – IM midazolam was at least as good if not superior to IV lorazepam at stopping status seizures without the need of rescue benzos prior to arrival at ED. Secondary outcomes reflected similar non-inferiority or superiority of IM midazolam vs. IV lorazepam. For example, the hospitalization rate was higher (57.6%) in the IV lorazepam group vs. the IM midazolam group (65.6%).

Conclusions: To quote the authors: *Intramuscular administration of midazolam by EMS is a practical, safe and effective alternative to the intravenous route for treatment of prolonged convulsive seizures in the prehospital setting.* Additionally, in an editorial in the same issue of NEJM Hirsch concludes: *…the findings in this study should lead to a systematic change in the way patients in status epilepticus are treated enroute to hospital.*[4]

Takeaways

Does this mean IM should become our primary choice? Maybe it will become our most common route but it shouldn't necessarily become our first choice. Each situation is different and should be judged accordingly. If we spend the time to properly assess (including BS) and manage ABCs by the time we're ready to treat the seizures they've either stopped or we should have a pretty good idea what route will work best for the situation at hand. For the patient in the above scenario I wouldn't hesitate to use IM. If the patient was less "violent" with great veins and I had the resources to safely secure the patient I might start an IV lock and go IV. Well…maybe. If it were an infant I would go with buccal (I had a case this summer and the seizure ceased within seconds). If I had a seizing HIV/Hep B or C patient I would use IN. Efficacy is very important…but so is safety. As Medic Marshall says on JEMS.com: *"I like to think I'm pretty decent with my IV sticks, but attempting vascular access on these patients is definitely not easy—not to mention potentially dangerous, and putting you or others around at risk for an accidental needle stick. Not to say attempting an IM injection isn't as dangerous, but generally you need only one stick as compared with multiple sticks for vascular access."* [5] Just a suggestion: if you choose IM, IN or buccal as the initial route, your next action should be to start an IV.

Thanks to RAMPART you have a little more ammunition in your arsenal. So keep your options open, judge the situation, be safe and try IM. Drop me an email if you have an interesting or challenging seizure call and let me know how it goes. I'm always looking for good case studies for CME.

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Notes and References:

- some paramedics operate under the mistaken belief that they must use the first route listed in the directive, in this case IV. The routes are listed left to right in order of general preference of the OBHG – MAC based on the best available evidence at the time. The discretion is left to the clinical judgement of the ACP based on circumstances. At CPER we ask ACPs to document why they chose the route selected so that we can better understand the circumstances.

* - Non-inferiority trials are intended to show that the effect of a new treatment is not worse than that of an active control by more than a specified margin. Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC59590/

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Implications of Anticoagulants | by Patrick Harvey, MD

submitted by Dean Casement

From JEMS August 2012 Issue | Used with Permission
Note: The names of the medications have been changes to match Canadian Medications

Risky Anticoagulants

Prehospital providers need to be familiar with commonly used anticoagulants and their risk factors.

A 76-year-old woman slips and falls while walking through her home. She sustains a minor laceration to her forehead. Her daughter, who is with her, calls 9-1-1. At the scene, you find her alert, reporting pain only at the site of the laceration. She and her daughter report no loss of consciousness. Her medical history is significant for hypertension and atrial fibrillation. The daughter hands you the medication list, which shows metoprolol, Pradax and Colace. Vital signs are unremarkable, and her Glasgow Coma Scale (GCS) score is 15. Her finger stick blood sugar is 5.4 mmol/l. An 18 g IV is placed in her right anticubital vein.

You elect to take to her to a nearby community hospital. En route, she becomes agitated and attempts to pull out her IV. After you arrive at the hospital, the staff gives her 1 mg of Ativan via IV to help with agitation. A computed tomography (CT) scan of her head shows a traumatic subarachnoid with an overlying moderately sized subdural hematoma. After the patient is out of the CT scanner, she becomes more combative, and her GCS deteriorates to an 8. She's immediately intubated for airway protection.

The patient is given fresh frozen plasma (FFP), prothrombin complex concentrate and activated Factor-VII in an attempt to stop the bleeding. The community hospital doesn't have neurosurgical capabilities, so the patient is transferred to a trauma center. At the trauma center, she's taken to the operating room. Unfortunately, a post-op head CT scan shows brain herniation. She doesn't awaken, and her family withdraws her life support two days later.

Anticoagulants

Anticoagulants have been on the market for more than 80 years. They're used to treat a variety of disorders, including atrial fibrillation, pulmonary embolism and acute myocardial infarction. Until recently, the mainstays of treatment have been heparins and Vitamin K antagonists (e.g., warfarin).

Side effects, dietary restrictions and expensive monitoring have fueled a search for alternative agents to these traditional treatments. In the past few years, novel anticoagulants have started to enter the American market. It's important for EMS providers to be familiar with both old and new anticoagulants and their implications for triage and treatment of the injured patient.

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Patient Population

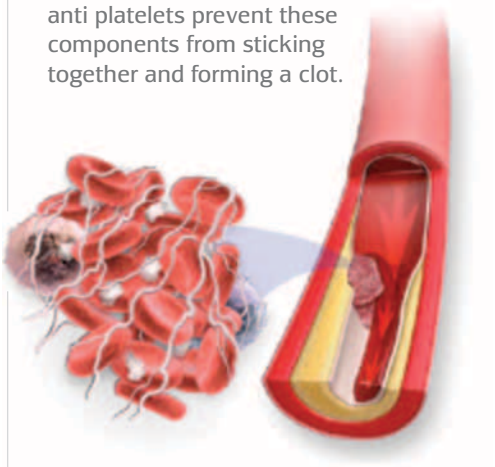
Anticoagulants have a large and increasing presence in the healthcare system. In the US the number of dispensed outpatient prescriptions for Warfarin increased 45%—from 21 million in 1998 to nearly 31 million in 2004.[1] As the above case illustrates, the presence of an anticoagulant on a patient's medication list can change a minor fall into serious trauma. The patient population that takes these medications varies from a young woman on therapeutic anticoagulation for a pulmonary embolism to a nursing-home resident on subcutaneous heparin for deep venous thrombosis prophylaxis. Despite this variety, these medications are prescribed disproportionately to geriatric patients who are at the greatest risk for bleeding complications.[2]

Physiology

Different classes of anticoagulants target different parts of the body's normal coagulation pathways. Coagulation works as a cascade with earlier parts of the system activating later parts, leading to a positive reinforcement cycle.

The final common pathway for all the enzymes is the enzyme thrombin. Once activated, thrombin cleaves fibrinogen into fibrin, the main component in the fibrous mesh that makes up a clot. Warfarin and other Vitamin K antagonists block function of upstream enzymes of the clotting cascade, preventing thrombin from becoming active. Heparin activates a thrombin inhibitor, slowing fibrin formation. Newly developed agents can bind to thrombin, directly decreasing its activity. The mechanism of action has important implications for the strategies of reversal of these medications in the bleeding patient.

Blood clots are made up of red blood cells, platelets, fibrin and white blood cells (shown below. Anticoagulants and anti platelets prevent these components from sticking together and forming a clot.



Implications for EMS

As the case presentation illustrates, anticoagulants can turn a low-risk injury into a life-threatening hemorrhagic event. Anticoagulation is key in the treatment of many conditions, but the focus in prehospital and emergency settings is often on reversing these drug's effects. Understanding the mechanisms of action for these agents is important because the target of a particular anticoagulant will determine the best strategy for its reversal.

Caring for a bleeding patient who has been anticoagulated can be complicated, often requiring various blood products and reversal agents. In the case of some of the newer anticoagulants, these reversal measures may not be effective, placing increased emphasis on early and effective source control and adequate supportive measures.

It's imperative that prehospital providers be familiar with the commonly used anticoagulants and their effects on bleeding. Some EMS systems have developed quick reference cards to assist providers in identifying drugs that cause coagulopathy. A bleeding or potentially bleeding patient who's taking these medications should be routed to the nearest facility capable of giving large volumes of blood products, performing hemodialysis and surgically controlling a site of bleeding.

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Types of Anticoagulant Agents

Coumadin (Warfarin)

Initially discovered in naturally occurring sweet clover, warfarin and other Vitamin K antagonists inhibit the formation of Vitamin K-dependant clotting factors II, VII, IX and X. As the first effective oral anticoagulant, warfarin has gained wide use and popularity. Its narrow therapeutic window and many drug and dietary interactions make it a cumbersome medication to manage.

Bleeding is a major concern with warfarin therapy. After insulin, warfarin is the most common drug implicated in the U.S. emergency department visits for adverse drug events.1 Its ability to inhibit all aspects of the coagulation cascade can make relatively minor vascular injuries life-threatening bleeds. All bleeding patients require source control and, if necessary, replacement of blood products. Patients who bleed while they're on vitamin K antagonists also need to take exogenous vitamin K and fresh frozen plasma (FFP) to reverse their coagulopathy.

Heparin and LMWHs

Used commercially since the 1920s, heparin is a naturally occurring sugar polymer. Medical heparin ranges in size from 5,000 to more than 40,000 daltons. Heparin activates antithrombin III, a potent inhibitor of thrombin and other coagulation proteins. Low-molecular weight heparins (LMWHs) are purified polysaccharide chains that weigh less than 8,000 daltons. They can be given subcutaneously less frequently than traditional heparin, making them useful in bridging patients to Coumadin or for patients who can't tolerate oral agents.2

Heparin can be reversed with the peptide molecule protamine sulfate. This positively charged molecule will bind to and inactivate heparin. The protamine-heparin complex is then removed from the body. Low molecular weight heparins are also typically reversed with protamine. This antidote is less effective for LMWH, however. Protamine reverses only about 60% of the anticoagulant activity of LMWH, leaving significant amounts of active agent in the body.(3)

The LMWH parenteral (can be given IM/sc) anticoagulants that may be used by patients at home are : heparin, dalteparin (Fragmin), enoxaparin (Lovenox), fondaparinux (Arixtra), tinziparin (Innohep). These injectable anticoagulants - antithrombotics are used to prevent blood clots such as DVT in people who are immobile because of major surgery or the need for bed rest due to having hip replacement, knee replacement, or stomach surgery. It can also be used with aspirin to prevent MIs.

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Pradax (Dibigatran)

Marketed as Pradax is an oral anticoagulant from the class of the direct thrombin inhibitors. It is used for various clinical indications, and in some cases it offers an alternative to warfarin as the preferred orally administered anticoagulant since it does not require frequent blood tests for international normalized ratio monitoring, while offering similar results in terms of efficacy. It has predictable pharmacokinetics that allow for twice-daily dosing without regular lab monitoring.(4) It's been investigated for use in prevention of deep venous thrombosis (DVT) after orthopedic surgery, treatment of DVT and prevention of stroke in patient with atrial fibrillation.

Despite the predictable dosing, bleeding has become a major concern with this drug. Currently, no reversal agent for dibigatran exists, which raises concerns about treating severe bleeding. Such traditional reversal agents as FFP or prothrombin complex concentrates (PCC) aren't thought to be effective at reversing this agent because they don't have sufficient amounts of thrombin to replace the depleted stores. Dialysis has been discussed as a possibility to reverse bleeding complications. It's estimated that up to 60% of the drug can be removed from the body using hemodialysis.(5,6) Currently, treatment of bleeding while on dibigatran focuses on stopping the drug, source control and supportive care. The drug company that makes dibigatran, Boehringer-Ingelheim, has confirmed that there were 260 fatal bleeding events worldwide between March 2008 and October 31, 2011.(7) The Food & Drug Administration is currently reviewing the safety concerns of Pradax in light of these data.

Anti-Platelet Medications:

Clopidogrel (Plavix)

Clopidogrel is an oral medication used the secondary prevention, or management of strokes and MIs. This drug is an anti-platelet drug, which means that it prevents platelets from sticking together and forming blood clots that can lead to strokes and heart attacks. People with bleeding ulcers, brain bleeds or other bleeding conditions may not be able to take this drug. According to the National Institutes of Health, clopidogrel can cause headache, dizziness, stomach pain, nosebleed, diarrhea, nausea and excessive tiredness.

Ticlopidine

Ticlopidine is an oral antiplatelet drug in the thienopyridine family. Like clopidogrel, it is an adenosine diphosphate (ADP) receptor inhibitor. It is used in patients used to reduce the risk of stroke in people who have had a stroke or have had warning signs of a stroke where aspirin is not tolerated, or in whom dual antiplatelet therapy is desirable. This drug should be used with caution in people who have liver disease, low blood cell counts, high cholesterol, kidney disease, high triglycerides and bleeding disorders. Possible side effects of this drug include diarrhea, stomach pain, gas, itching, upset stomach, vomiting, loss of appetite and headache. Seek immediate medical attention for unusual bleeding and bruising, skin rash, light-colored stools and signs of infection.

Ticagrelor

Ticagrelor (Brilinta) is an oral antiplatelet treatment for acute coronary syndrome (ACS) in a new chemical class called cyclopentyltriazolopyrimidines (CPTPs). works by preventing the formation of new blood clots and maintaining blood flow in the body to help reduce a patient's risk of another cardiovascular event (called atherothrombotic events) such as a heart attack or cardiovascular death. Brilinta is the first reversibly-binding oral adenosine diphosphate (ADP) receptor antagonist.

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The Plato study demonstrated that that treatment with Brilinta with aspirin led to a greater reduction in the primary endpoint [a composite of death from vascular causes, heart attack (myocardial infarction or MI), or stroke] compared to patients who received clopidogrel with aspirin. 10

Rivaroxaban & Apixaban

Rivaroxaban is an oral anticoagulant invented and manufactured by Bayer; in a number of countries it is marketed as Xarelto. It is the first available orally active direct factor Xa inhibitor and is based on proteins isolated from leeches,. Rivaroxaban is well absorbed from the gut and maximum inhibition of factor Xa occurs four hours after a dose. The effects lasts 8–12 hours, but factor Xa activity does not return to normal within 24 hours so once-daily dosing is possible. Xarelto is indicated for the prevention of veneous thromboembolic events (VTE) such as total hip replacements, DVTs and prevention of strokes and sustemic embolisms from atrial fibrillation. There is no specific way to reverse the anticoagulant effect of rivaroxaban in the event of a major bleeding event, unlike warfarin.11, 12

Apixaban is marketed as Eliquis, is also a direct factor Xa inhibitor, approved in Canada for VTE prevention following elective orthopedic surgery and is currently under review at Health Canada for the prevention of stroke and systemic embolism in patients with atrial fibrillation. There has been no evidence found on antidotes for this anticoagulant either.12

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