HAMILTON REGIONAL LABORATORY MEDICINE PROGRAM

LAB CONNECTIONS

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IN THIS ISSUE

WHAT'S NEW

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The Hamilton Health Sciences Massive Hemorrhage Control Protocol

What is a Massive Hemorrhage?

Massive hemorrhage refers to replacement of one blood mass or ≥10 units of packed red blood cells (PRBC) within a 24 hour period[7]. Massive hemorrhage can occur in many hospital settings, but the most frequent and severe bleeds tend to occur in the trauma and surgical populations. Bleeding is the #1 surgical killer, causing over 80% of deaths in the operating room, and over 50% of deaths in the first 24 hours postoperatively. Bleeding is also a major concern in trauma, responsible for 45% of deaths in the first 48 hours[6]. Massive transfusion occurs in less than 1% of hospitalized patients, but these patients consume 50 to 75% of all blood products[7]. The select group of patients who experience massive hemorrhage has changed our thinking about blood use and resuscitation.

What does the evidence tell us to do in massive hemorrhage?

There are six essential, evidence-based steps in controlling massive hemorrhage [1,2,3,4,5]:

- Rapid identification of coagulopathic patients.
- Appropriate use of blood products, including a ratio of plasma to PRBC that approaches 1:1.
- Maintaining permissive hypotension, defined as a blood pressure just high enough to keep the patient awake, alert and with a palpable pulse (this generally translates to a mean arterial pressure of 50 mmHg).
- Limited use of crystalloid, defined as a crystalloid to PRBC ratio less than 3:2.
- Early use of hemostatic agents, particularly tranexamic acid. Tranexamic acid has been associated with improved patient outcomes in surgical and traumatic bleeding.
- Implementation of massive hemorrhage control protocols, defined as clinical pathways that protocolize management of severely bleeding patients.

Why is it so hard to do the right thing in massive hemorrhage?

Despite the high quality evidence available to guide us, it is challenging to manage massive bleeding in the real world. From a clinical perspective, patients who bleed tend to be complex for other reasons – they often present with multisystem problems and pre-existing conditions. Despite our best efforts, their mortality is high. The systems issues that surround massive hemorrhage are also complex. Massive hemorrhage tends to occur unpredictably, so it is difficult for healthcare professionals and hospitals to ever be truly prepared for it. Clinicians and laboratorians often describe massive bleeds as "barely controlled chaos." Sample transport and provision of lab results can be delayed. Preparation and delivery of blood products is carried out urgently, yet cannot happen fast enough. And communication between doctors, nurses, ward clerks, porters, paging and the laboratory becomes challenging.

How can we manage this incredibly complex, poorly understood procedure, while making sure that all stakeholders – both clinical and non-clinical – are doing the right thing? The answer is ***process standardization***, through the use of massive hemorrhage control protocols (MHCPs).

MHCPs: Streamlining Care with Best Evidence

Massive hemorrhage control protocols (MHCPs) standardize key processes in the care of a massively bleeding patient: communication between clinical and non-clinical services; monitoring of laboratory results and patient status; ordering, transport and infusion of blood products and fluid; and use of hemostatic agents. MHCPs have been shown to reduce blood product usage, speed up time to transfusion, and increase staff satisfaction. Most importantly, MHCPs lead to better patient outcomes. A large trauma center showed that mortality rates in their trauma population dropped from 45% before their MHCP was introduced to 19% after their MHCP was introduced [7,8].

We have started our journey with MHCPs at Hamilton Health Sciences (HHS). The HHS MHCP is a set of orders and actions that will be carried out when a patient has witnessed or anticipated blood loss exceeding 10 units of packed red blood cells in six hours. The most responsible physician activates the MHCP with a single phone call to Paging, which then contacts Transfusion Medicine, Core Laboratory, and Portering. Once the MHCP is initiated, nurses are directed to send off laboratory investigations, begin fluid resuscitation, and start monitoring vital signs. Core Laboratory staff receive blood samples that are treated as "super stat" and take highest priority. Transfusion Medicine staff begin preparing packs of blood with a fixed plasma to PRBC ratio, and sending them to the clinical area automatically. Automatic delivery ensures that clinicians get a steady supply of blood products which closely adhere to appropriate ratios. The MHCP also prompts physicians to consider calling ancillary services (e.g., general surgery, interventional radiology) and using additional therapies (e.g., tranexamic acid, calcium, prothrombin complex concentrates).

The development and implementation of the HHS MHCP has been a true team effort; physicians, nurses, administrators, Paging, Portering, LIS, Core Laboratory and Transfusion Medicine have all played an active role. Comprehensive MHCP education programs for lab medicine, nursing and physician staff have been launched. In early July, Mock Runs of the MHCP were held in the Hamilton General ICU and Emergency Department. Representatives from each service area were on hand to time the simulated process, record staff feedback and troubleshoot problems. These simulations resulted in small process changes which are expected to have a big impact.

Checking In and Moving Forward

The MHCP is initially being piloted at the Hamilton General site only, because of the high blood product requirements in our trauma program and the availability of thawed plasma at our site. Our goal is to introduce the MHCP at all HHS hospital sites by the new year; we will be reaching out to key stakeholders at the McMaster and Juravinski sites to begin the implementation cycle shortly.

The protocol will "go live" at the General on **August 12**. Our hope is that proper use of the MHCP will streamline the care of bleeding patients. However, we expect that there will be growing pains as clinical and non-clinical staff become familiar with the protocol. Troubleshooting of minor issues will likely be required. To ensure that the MHCP is truly

improving the way we deliver care, we will be reviewing every activation of the MHCP as of August 12. We will also be reviewing massive hemorrhage situations where the MHCP was not called.

It is vital that all staff give us feedback on their experiences with the MHCP – both good and bad. This will allow the protocol to be fine-tuned over the coming months.

Please email Pam Foster (fostepam@hhsc.ca), co-chair of the MHCP Committee, with your feedback once the MHCP goes live. She will ensure that your thoughts are incorporated into revisions of the protocol. The MHCP Committee looks forward to sharing data on the protocol's performance with HHS staff in the fall, and appreciates your work in making this initiative a success.

Menaka Pai, MSc MD FRCPC
Assistant Professor – Dept Medicine, McMaster University
Associate Member - Dept Pathology and Molecular Medicine, McMaster University

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TAR – Opportunities & Challenges

TAR is an electronic **Transfusion Administration Record** which allows for an on-line method of documenting the administration of blood products by clinical staff in Meditech. It uses bar code verification as the method for positive patient identification for blood transfusions. The use of TAR eliminates transcription errors and eliminates the need for a two-person check when administering blood products. TAR enhances patient safety by requiring an electronic match of the patient armband, the product issued and the product available for transfusion thereby getting the right product to the right patient.

As part of the ongoing initiative by Hamilton Health Sciences to provide better quality of care utilizing information technology, a pilot project was developed to test, validate and implement TAR. A multidisciplinary team was formed consisting of representatives from Clinical Informatics, Information Technology, Transfusion Medicine (TM) and Laboratory Information Systems (LIS). The areas selected for the pilot were C3 and C4 inpatient locations at the Juravinski site. These locations were chosen based on the high volume and range of products transfused by these areas. Equally important, was the willingness of these areas to work through the processes and challenges with the implementation team.

The setup and testing of the TAR routine in the Meditech computer system brought with it several challenges. Barcode scanners had to be selected and tested. Decisions had to be made regarding system parameter settings that would cause the least process change for both the clinical side as well as Transfusion Medicine. The biggest hurdle of all was discovering that Meditech "assumed" that all lot number products had barcodes that would work with their system, when in fact not all the manufacturer's lot number products even had barcodes! The team worked with Meditech to develop custom barcode labels. The use of these labels resulted in an extra step being introduced for Transfusion Medicine staff at the time of product inventory. The positive impact of this change was that all products issued from TM could now be transfused using the TAR process.

The first product was transfused using the TAR routine on **January 29th, 2013** and blood products continue to be transfused using the TAR process in the pilot areas. The pilot has not been without its challenges. It was discovered quite early in the pilot that when a patient is transferred from Emergency to an inpatient location, they get a new updated wristband (different prefix, but same number

combination) which must be in place to allow for the TAR process to be initiated; however, some clinical staff were not replacing the wristbands which caused a problem with TAR (wristband barcode must match exactly that of the blood products). Issues identified through the pilot are in the process of being addressed and resolved. The project plan is to roll out TAR to the rest of the Juravinski site, and in the future implement TAR at the Hamilton General and McMaster sites.

On May 29th, 2013 three members of the team, Gidget Carlin, Susie Thibeault (Clinical Informatics) and Mary Kokoski (LIS) had the opportunity to present Hamilton's TAR implementation experience at the Medical Users Software Exchange (MUSE) in Washington D.C. Although TAR is currently in use at facilities in the United States, these sites only use TAR for documentation of the transfusion of routine blood products and not for "lot number" type products (ie. Albumin, factor products, etc), which sets Hamilton apart from the rest.

Transfusion Medicine has been using blood product bar codes for years to allocate products to the patient in the computer and to issue the product, recognizing the increase in safety that scanning barcodes can offer. Now with the clinical side utilizing barcodes for the transfusion administration processes we are one step closer to closing the "vein to vein" link that could eliminate transfusion errors completely. Being creative and open to new ideas and opportunities in technology allows healthcare staff to apply best practices to enhance the patient experience.

Mary Kokoski
Laboratory Information Systems Technical Specialist

Education News

The HRLMP is pleased to welcome the following new residents into our residency training programs:

Anatomical Pathology PGY 1 residents:
Mary Brett
Michael Carvalho
David Farnell
Carolyne Elizabeth Lemieux

General Pathology PGY1 residents:
Jennifer Demtrichuk
Sadaf Memon
Florentina Matea

Medical Biochemistry
Omair Sarfaraz

Medical Microbiology
Eric Gaudreault

Laboratory Medicine had nine presentations by Anatomical and General Pathology residents at the **Annual Canadian Association of Pathologists (CAP) conference 2013 in Quebec City**.

The following are the awards won by our residents at the CAP conference:

Sergey Podzynakov (PGY3): The **Donald W. Pennar Award** for best platform presentation at CAP conference (Supervisor: Dr Bane).

Miranda Schell (PGY4) **AP** resident: **Dr. Donald Rix Travel Award** for best poster presentation at CAP conference (Supervisors: Drs Sur and Ross)

Other Awards:
Aisling O'Meara (PGY3) **AP** resident won **2nd place poster presentation**, Oncology Research Day; Department of Oncology, Clinical Research Category, McMaster University(Supervisor: Dr Alice Lytwyn)

Jeremy Daniels, PGY2 **AP** resident in Anatomical Pathology, won the Postgraduate Medical Educations PSI award for 2013(Supervisors: Drs Lytwyn and Hamid)

Dr Monalisa Sur (Pathologist; Juravinski Hospital): appointed as the **Chair of the Annual Meeting of the Canadian Association of Pathologist (CAP)** conference.

Dr Monalisa Sur has been appointed for a three year term as committee member for the International Advisory Committee for the Royal College of Pathologists of U.K leading the College's global health objectives.

Dr Matthew McQueen was awarded the Honorary Fellow of the Royal College of Pathologists of U.K by the president of the RCP, Dr Archie Prentice, for his achievements and contributions in Medical Biochemistry in clinical services, research, teaching and international leadership.

For information and the latest news on our residency training programs follow the link: http://fhs.mcmaster.ca/pathres/news/index.html
Information on the postdoctoral fellowship: http://fhs.mcmaster.ca/pathology/education/postdoctoralfellowshiptraining.html

News from Chemistry

Due to a change in test platform there will be significant changes to the reference intervals for the proteins listed below:

Test Changes Effective August 6, 2013

Test		Current Reference Interval	New Reference Interval
Serum and CSF albumin reported with Oligoclonal Banding	Serum	35.5-46.7 g/L	*Age* / *Male* / *Female* 0 day-14 days: 28.0-41.0 g/L / 28.0-41.0 g/L 15 days-364 days: 25.0-46.0 g/L / 25.0-46.0 g/L 1 yr.-7yrs.: 35.0-45.0 g/L / 35.0-45.0 g/L 8yrs.-14yrs.: 37.0-47.0 g/L / 37.0-47.0 g/L 15yrs-18yrs.: 38.0-50.0 g/L / 35.0-49.0 g/L 19yrs. & over: 35.0-50 .0 g/L / 35.0-50.0 g/L
	CSF	0.13-0.24 g/L	0.14-0.25 g/L
Alpha-1-acid glycoprotein		0.39-1.15 g/L	0.51 - 1.17 g/L
Alpha-1 antitrypsin		0.9-2.0 g/L	0.88-1.74 g/L
Alpha-2 macroglobulin		1.69-4.69 g/L	1.02-2.59 g/L
Ceruloplasmin		0.21-0.52 g/L	0.22 - 0.58 g/L
C3		0.73-1.73 g/L	0.79 - 1.52 g/L
C4		0.13-0.52 g/L	0.16 - 0.38 g/L
Prealbumin		180-450 mg/L	0.18 - 0.38 g/L
Antistreptolysin - O		>3 yrs. <200 KIU/L ≤3yrs. <50 KIU/L	*Age* < 5 years: < 100 IU/mL 5 - 15 years: 166-250 IU/mL 16 years and over: < 116 IU/mL
Apolipoprotein A-1		*Male* / *Female* 1.25-2.15 g/L / 1.10-2.05g/L	*Age* / *Male* / *Female* 0 days - 364 days: 1.00-1.88 g/L / 0.94-1.77 g/L 1 year - 4 years: 1.03-1.94 g/L / 0.98-1.84 g/L 5 years - 7 years: 1.05-1.96 g/L / 1.00-1.87 g/L 8 years - 10 years: 1.02-1.91 g/L / 1.01-1.89 g/L 11 years - 14 years: 0.99-1.85 g/L / 1.01-1.91 g/L 15 years - 20 years: 0.97-1.83 g/L / 1.04-1.95 g/L 21 years and over: 0.99-1.86 g/L / 1.09-2.04 g/L
Apolipoprotein B		*Male* / *Female* 0.55-1.25 g/L / 0.55-1.40 g/L	*Age* / *Male* / *Female* 0 days - 364 days: 0.50-1.32 g/L / 0.50-1.32 g/L 1 year - 4 years: 0.47-1.24 g/L / 0.47-1.25 g/L 5 years - 7 years: 0.46-1.21 g/L / 0.46-1.23 g/L 8 years - 10 years: 0.45-1.19 g/L / 0.46-1.21 g/L 11 years - 14 years: 0.44-1.17 g/L / 0.45-1.20 g/L 15 years - 18 years: 0.47-1.24 g/L / 0.49-1.29 g/L 19 years and over: See Comment *19 years and over Interpretive Comment for Male and Females:* Intermediate and High Risk CVD target Apo B is < 0.80 g/L
Rheumatoid Factor		0-15.0 IU/mL	< 20.0 IU/mL

No change has been made to Immunoglobulin A, G or M. **These changes came into effect August 6, 2013**.

News from Microbiology

The automation project in Microbiology is moving along on schedule. The first phase of the plan has been completed, with the move of office staff out of the lab area and the movement of laboratory benches and equipment into the office space. Construction to accommodate automated specimen processing systems will begin in the next few weeks. The laboratory staff have exhibited great patience and flexibility during this challenging transition.

Thank you to everyone who has assisted us with this process and stay tuned for further updates!

This fall, microbiology services for Joseph Brant Hospital will be transferred to the Hamilton General Hospital as a first step in creating a LHIN Laboratory Network Regional Microbiology Laboratory. This will be followed by the transfer of microbiology services from Niagara Health Systems.

News from Pathology

Molecular genetic testing (on tissue) for specific genetic abnormalities in cases of suspected *sarcomas* such as small round blue cell tumor, rhabdomyosarcoma, and synovial sarcoma has been developed in our HRLMP Molecular Genetics lab at MUMC. Several probes are now available in house.

For adult cases, Dr Popovic has been incorporating it to current *sarcoma* case reporting for Hamilton and the region , as per CCO requirement. The pediatric pathology group has started using these, as well as probes for trophoblastic disease (complete and partial mole).

Many thanks to Dr. Carter and his staff for this latest development!

News from the HRLMP

HAMILTON REGIONAL LABORATORY MEDICINE PROGRAM

6th Annual HRLMP Rapid Fire Showcase

Emerging Technologies and Methodologies

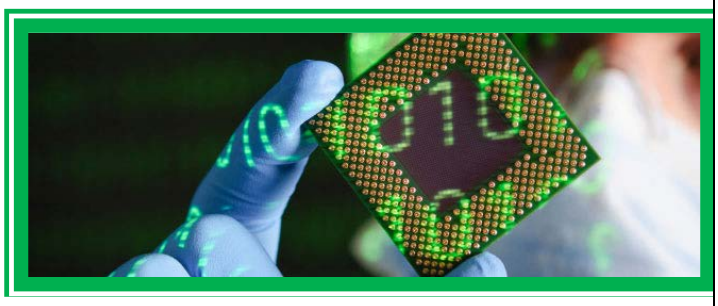
This half-day session will be offered

Saturday October 26, 2013
8:15 am – 12:15 pm

** Registration @ 7:45 am
Light Breakfast included

Miller Amphitheatre – 2nd floor Juravinski Innovation Tower
St. Joseph's Healthcare Hamilton
50 Charlton Ave. E. Hamilton, Ontario

**Register Early at
http://tinyurl.com/Rapid-Fire-Showcase



Registration Deadline: October 19, 2013

Mark Your Calendars for ….

HRLMP Open Staff Forums

Monday, September 16, 2013
(Via Videoconferencing)

1130 to 1230 Hours:
Host Site: **Miller Amphitheatre** at St. Joseph's Healthcare

Videoconferencing

MUMC site	Room 2G61
HGH site	Theatre Auditorium
JCC site	A4-4 (Auditorium)
King Street Campus	Kemp Auditorium

1330 to 1430 Hours:
Host Site: **Theatre Auditorium** at the Hamilton General Hospital

Videoconferencing

MUMC site	Room 2G61
JCC site	Room A4-4 (Auditorium)
SJH site	Miller
King Street Campus	Kemp Auditorium

~ Plan to Participate on September 16, 2013 ~