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Scientific Feature

Student Confidence in Performing Transfusion Science Competencies Following Participation in a Simulated Clinical Laboratory

A Question of Ethics

PATHWAYS to Success

Official publication of:
CSMLS SCSLM
Canadian Society for Medical Laboratory Science
Société canadienne de science de laboratoire médical
PM #40063021

Fall 2015 | Vol 77, No. 3

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PERSPECTIVES

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ENGLISH EDITION | FALL 2015

Christine Nielsen
CHIEF EXECUTIVE OFFICER

Whose test is it anyway?

Ever Google your symptoms when you aren't feeling well? Don't do it. You'll be convinced you are dying. Yet, I'm pretty sure you know people who regularly turn to Dr. Google for health advice. This may be the tip of the iceberg.

A new law recently passed in Arizona allows consumers to order and pay for their own lab tests without an order from their doctor. Results are sent directly to them in about 48 hours! The change gives patients more control over their own health, which should be a good thing. But if you cringed when you heard this, as I did, then you are probably thinking that your average consumer couldn't possibly be prepared to order their own lab tests, let alone make informed decisions based on the results. Yet, this appears to be part of a shifting trend toward patients directing their own care.

You have probably heard of the company 23andMe. This is the web-based company that allows you to order a genetic testing kit through the mail. Customers provide a saliva sample, mail the kit back, and 23andMe sends a report detailing the customer's genetic traits, inherited conditions and genetic risk factors. Again, the idea behind this business is empowering individuals.

On the surface, it is hard to argue against this movement. After all, it is our body and we should have the right to check up on and manage our own health as we see fit. Why should we be dependent on a doctor deciding whether a test is called for or not? Is it time we determine what's appropriate for ourselves?

As an MLT, I'm a huge, nerdy fan of data. Information is good… but it has to have context. Genetic counsellors exist for a reason. Your family physician is there for a reason too. As a patient, you need someone who can not only correctly interpret your test results, but can also combine that information with the rest of your health factors to paint a more robust picture of your overall health. And don't get me started on the idea of patients taking their own samples. We thought we had pre-analytical errors before...Just wait!

These businesses exist for a reason. Patients want to have more control over their health care. They want to have a say in their diagnostic tests. This may very well drive changes in our industry in the next few years. I think it is interesting to contemplate how the lab community may have to adjust to this change. What will this mean for test volumes and will it affect which tests are more frequently and less frequently run?

Patient-driven health care may very well be the future. How will the lab meet the demands of patients? Will we start to think of our patients more as consumers and customers of our services? Will they need us to help interpret? Are we qualified to do this?

I don't have a crystal ball, so I can't say for certain what will happen. I can say for certain that changes will come. Game-changers lie around every corner, from amalgamations to changes in physician remuneration. Now, more than ever, it is important to anticipate changes that may have impacts on the lab and consider how we will adapt. So take a little time to consider what may be. It may prove to be more than just an interesting thought exercise.

Patients want to have more control over their health care. They want to have a say in their diagnostic tests. This may very well drive changes in our industry in the next few years.

Accountability to Each Other

Tania Toffner
CSMLS PRESIDENT – 2015

I've worked in the laboratory for more than 14 years, and in that time I've discovered that there is one phrase that never fails to raise my heart rate: It's not my job. While I do understand that everyone has a distinct role and probably a very clear job description that lays out exactly what their job entails, it is the unwritten connotation of that statement that gets me worked up. When you utter the words, "It's not my job", you could come across as saying several things. It could be read as, "I don't want to get involved", "I don't want to take responsibility" or "I don't care" and that is when I'm concerned. When you see or hear something happening that you know is inappropriate, unsafe or erroneous, it is exactly your "job" to get involved.

The CSMLS recently invested in resources to take a closer look at ethics in the laboratory. This investment was a direct effect of the outcry we heard from members, urging the Society to help guide them when navigating the tricky waters of ethical matters at work. While most workplaces likely have a Code of Ethics or expected conduct of employees, we felt it was well worth the time and resources to take a deeper look at ethics specific to the laboratory professional. The result was a survey that helped guide the development of the Code of Ethics. You can read more about the survey and the development of the Code on page 30.

The new Code of Ethics is a valuable tool for medical laboratory professionals. You are now better prepared to handle situations that may arise when you are conflicted or concerned with the level of ethical behaviour of your co-workers, employers or even of yourself. We didn't create these to cause an army of whistle blowers; this isn't intended to be a witch hunt. Instead we want you to understand the value of the work you do, and hold it to a very high standard. We want every lab professional to take accountability for the work done in the lab.

We all have a responsibility to remain accountable to the patients we serve, keeping their safety and health in mind. Ultimately, results that come out of your lab are a direct reflection of you. Are you proud of those results? Are you confident in them? If not, are you ready to say or do something about it?

Many workers believe that only a supervisor or manager can address issues or concerns with co-workers. If they are not aware, would you feel confident to approach your supervisor? Saying, "it's not my job" is an excuse to make yourself feel better for not getting involved. I urge you to get involved and become accountable. Make it your business to ensure the safety and the quality of the work done in your lab benefits your patients and co-workers. It's not just your job… it's everyone's job.

When you utter the words, "It's not my job", you could come across as saying several things. It could be read as, "I don't want to get involved", "I don't want to take responsibility" or "I don't care" and that is when I'm concerned.

The Inbox

The Inbox is meant to provide a public forum for us to address questions, concerns or issues that are raised by members. CSMLS receives feedback through written correspondence, email and through our various social media portals. If you have a question or comment you would like to have addressed in an upcoming issue, talk to us on Facebook, Twitter (@csmls) or through email at editor@csmls.org.

Early this summer, we distributed the 2015 CSMLS Member Survey (pg. 32) to all of our members to gather feedback in regards to their overall membership experience. While we analyzed the results of the survey, we came across a couple great comments which we address below.

Comment: The CSMLS website should have a page where you can view job postings.

It does! CSMLS members have access to the Career Centre on the CSMLS website. Here, members will find useful resources such as labour market data, career tips and advice specific to their career path and current job postings. To access these resources, simply visit the Career Centre on the CSMLS website and log in with your CSMLS member ID.

Comment: The CJMLS should be available online.

It is! Not only do we send a complimentary print copy directly to every CSMLS member, we provide the journal in a digital format as well. Members can access journal archives dated back to volume 70 (2008). To access this resource, simply visit the Publications tab under Members Area and sign in with your CSMLS member ID.

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EDITORIAL AND BUSINESS OFFICE
33 Wellington Street North
Hamilton, ON L8R 1M7
Phone: 905-528-8642 Fax: 905-528-4968
Email: cjmls@csmls.org

Editorial Team Cathy Bouwers, Michael Grant, Christine Nielsen
Scientific Editor Maurice Goulet
Contributors Christiane Claessens, Gene Shematek, Xiaoquan Li (Oliver), Kristina Dawson, Mary T. Emes

PUBLISHED BY:
DOVETAIL COMMUNICATIONS INC.
Dovetail Communications Inc.
30 East Beaver Creek Road, Suite 202,
Richmond Hill, ON Canada L4B 1J2
Phone: 905-886-6640
www.dvtail.com

Executive Editor Theresa Rogers
Art Director Katrina Teimourabadi
Associate Publisher Chris Forbes
Sales Manager Beth Kukkonen
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Production manager Crystal Himes

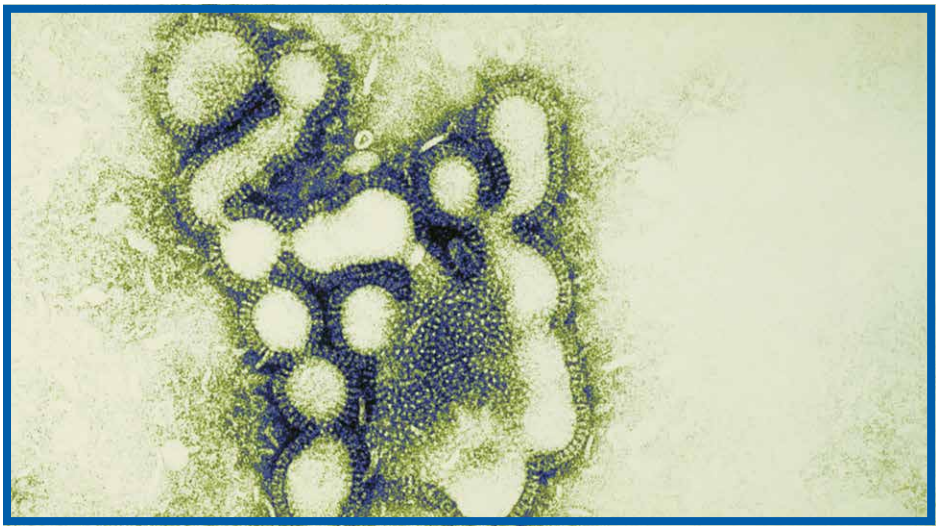
Dovetail Communications
Susan A. Browne, President

ISSN 1207-5833
Printed in Canada

The *Human Pathogens and Toxins Act* and its Regulations

The *Human Pathogens and Toxins Regulations* (HPTR) will come into force, along with the remaining sections of the *Human Pathogens and Toxins Act* (HPTA), on December 1, 2015. The HPTR establish national standards for the safe handling of human pathogens and toxins and will apply to any person conducting controlled activities with these agents in Canada. Approximately 8,500 laboratories will be affected by the regulations.

The HPTA establishes basic biosafety requirements for human pathogens and toxins. Select provisions of the Act came into force in 2009, such as the duty to take all reasonable precautions to protect the health and safety of the public when conducting activities with these agents, and a ban on any activities with smallpox virus. Most of the offence and penalty provisions have come into force, as



well as inspection powers. Prior to 2009, the federal government was limited to facilities importing under the *Human Pathogens Importation Regulations* (HPIR), which restricted the ability of the Canadian government to verify that human pathogens and toxins acquired from Canadian sources were used in a safe and secure way.

The HPTA defines and categorizes human pathogens by four risk groups. Risk Group 1 (RG1) agents have no or low individual or community risk, and are not within the scope of the HPTA. RG2 agents present a moderate individual risk and a low community risk. The agents categorised as RG3, have a high individual risk and a low community risk. For these groups of agents, treatment is available. Meanwhile RG4 agents have a high individual and community risk, and normally no treatment is available.

Under the HPTA, a toxin is a substance produced by a microorganism or derived from a microorganism and is capable of causing disease in humans. Toxins are listed in Schedule 1 to the Act and are not classified into risk groups.

Controlled activities, described in the HPTA include possessing, producing, storing, allowing access to, transferring, importing or exporting, disposing of, releasing or otherwise abandoning a human pathogen or toxin.

The HPTA does not apply to human pathogens and toxins that are in an environment in which they naturally occur, as long they are not cultivated or intentionally collected or extracted. This means that it does not apply to human pathogens and toxins contained in human, animal or environmental samples if they are left in the environment in which they were collected, even if the sample has been modified by the addition of other ingredients, e.g. by adding stabilizers. It also does not apply to any samples that have been processed, as long as the pathogen or toxin is not extracted.

When cells or cell lines derived from human or animal sources contain RG2, RG3 or RG4 human pathogens they fall within the scope of the HPTA. In most cases, cells or cell lines with oncogenes do not meet the definition of a human pathogen.

The HPTR establishes a process for issuing licences for facilities engaged in regulated activities. This licensing process will replace the current import regime governed by the HPIR. Once the HPTR comes into force, those subject to the new licensing regime will have until February 29, 2016 to apply for a licence.

Facilities performing diagnostic or laboratory tests without the production of human pathogens will not require a licence. This exemption will also apply to laboratories that carry out analyses if the production takes place in a sealed container that prevents the release of the agent and that the container and its contents are decontaminated before being discarded or reused. These facilities will still be required to take all reasonable precautions to protect the health and safety of the public while conducting these activities.

The regulatory approach is risk-based, where requirements increase with the risk of the controlled activity and the agent.

Controlled activities, described in the HPTA include possessing, producing, storing, allowing access to, transferring, importing or exporting, disposing of, releasing or otherwise abandoning a human pathogen or toxin.

The regulations also establish a specific list of RG3 and 4 human pathogens and select toxins, designated as Security Sensitive Biological Agents (SSBA), which will require additional biosecurity requirements. The HPTA requires persons accessing these agents to hold a valid security clearance issued by the Agency, or to be accompanied and supervised by a person who holds a clearance. It is estimated that 60 laboratories will be affected by the measures specific for SSBA.

The maximum period of validity of a licence will vary from one to five years, depending on the risk group of the agents involved. The majority of laboratories will be eligible for a five-year licence which authorizes the possession, handling, use, production, storage, permitting any person access, transfer, import and export of the regulated RG2 human pathogens and toxins (except the SSBA toxins). The repeal of the HPIR will eliminate the current requirement to obtain an annual permit to import human pathogens or toxins, which will reduce the administrative burden for regulated parties.

Before applying for a licence, a qualified Biological Safety Officer (BSO) will need to be designated. BSOs will have varying credentials and responsibilities based on the level of risk and types of laboratories under the licence. The designated person could be dedicated to biosafety or could have other duties such infection control or occupational health and safety. In addition to his or her role as liaison with the Agency, the BSO will be responsible for promoting and monitoring compliance with the regulatory framework and applicable national standards on biosecurity and biosafety. Among other things, the BSO will help maintain a biosafety manual and standard operating procedures, and will conduct periodic inspections and biosafety audits. The BSO has the right to access records, including inventory records, training records and records relating to the import, transfer and export activities.

The Regulations specify universal conditions of all licences, including a condition that the BSO is not to be obstructed when carrying out his or her mandatory functions. Additional conditions require that the BSO be notified before the import, export or transfer of human pathogens and/or toxins occurs and if any shipments of human pathogens and/or toxins are missing. Some conditions will be set for the licence itself and are specific to the licenced facility.

If a person conducting controlled activities discovers that they have inadvertently come into possession of a human pathogen or toxin that they are not licensed to possess, they must immediately notify the BSO. They must also ensure that the agent is appropriately handled and stored, and that the agent is transferred or disposed of within 30 days. The BSO will have the responsibility to inform the Agency of such a situation.

Facilities conducting scientific research have an additional requirement to submit information on how their facility internally manages biosafety and biosecurity. This includes information on the roles and responsibilities of key biosafety personnel or committees, before the license is issued.

Reporting requirements under the HPTA for various incidents, including potential or actual laboratory acquired infections, will help the Agency establish a national surveillance system. This national surveillance system will allow for the identification and correction of failures observed in standard operating procedures, as well as the ability to use trend analysis to detect high risk activities and take corrective measures if necessary.

The Agency will verify that the controlled activities are being conducted in compliance with the provisions of the HPTA and of HPTR by on-site inspections, evaluation of the biosafety program and analysis of the information provided by regulated parties. The Agency will continue to address cases of non-compliance through various tools with the main objective to manage the risk and bring the regulated party into compliance with the requirements through the most appropriate level of intervention. The factors taken into account when considering the level of intervention include the level of risk, the severity of the potential consequences of the offence, the compliance history of the regulated party, and the likelihood of the problem recurring.

The *Canadian Biosafety Standards and Guidelines* (CBSG) published in 2013 have been updated to incorporate the HPTR and have been published as the Canadian Biosafety Standard (CBS). The CBS provides detailed physical and operational requirements for biosafety and biosecurity when conducting controlled activities with human pathogens and toxins. The CBS will come into force on December 1, 2015, and until this time, the CBSG remains the applicable standard to follow. The CBS was published nine months before its entry into force to allow regulated parties to prepare for the transition.

The *Canadian Biosafety Handbook* (CBH) and other guidelines on biosecurity and biosafety will be available soon to provide regulated parties with additional clarification and information. The Agency will continue to provide advice and guidance to regulated parties to help them comply with the HPTA, the HPTR and the CBS.

CHRISTIANE CLAESSENS
Manager, Biosafety Inspection Program
Public Health Agency of Canada / Government of Canada

PERSPECTIVES

The Perspectives section of the *Canadian Journal of Medical Laboratory Science (CJMLS)* seeks to provide thoughts, insights, and opinions from individuals with different points of views. We hope that as this section evolves, it allows us to present a broader array of topics that reflect the varied careers and experiences of our members. If you are interested in contributing to the Perspectives section, email us at editor@csmls.org.

A SAFETY PERSPECTIVE

Transitioning to WHMIS 2015 – Hazard Classification

As we continue to transition to WHMIS 2015, one of the most significant changes has been to the classification of hazards. In fact, the variation in classification internationally was one of the prime motivators for the introduction of the Globally Harmonized System (GHS). For each of the two major hazard groupings or "building blocks" described in WHMIS 2015, several hazard classes have been described *(WHMIS 2015 – Hazard Classes and Categories: OSH Answers)*.

For the HEALTH HAZARD grouping, hazard classes include:

- Acute toxicity
- Skin corrosion/irritation
- Serious eye damage/eye irritation
- Respiratory or skin sensitization
- Germ cell mutagenicity
- Carcinogenicity
- Reproductive toxicity
- Specific target organ toxicity – single exposure
- Specific target organ toxicity – repeated exposure
- Aspiration hazard
- Biohazardous infectious materials

For the PHYSICAL HAZARD grouping, hazard classes include:

- Explosives
- Aerosols
- Gases under pressure
- Flammable solids
- Pyrophoric solids
- Oxidizing liquids
- Organic peroxides
- Self-reactive substances and mixtures
- Self-heating substances and mixtures
- Substances and mixtures which, in contact with water, emit flammable gases
- Flammable gases
- Oxidizing gases
- Flammable liquids
- Pyrophoric liquids
- Corrosive to metals
- Oxidizing solids

Each of these hazard classes has been specifically defined in terms of chemical characteristics and/or physical or health impacts. For a very thorough discussion of these hazard classes, consult the Canada Gazette – Hazardous Products Regulations or the U.S. Department of Labor Occupational Safety & Health Administration's publication, "A Guide to The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)".

Another very visible change relating to hazard classification is the introduction of standardized "pictograms"[1] applicable to the various hazards.

There are some hazardous products that meet the criteria for a hazard class or category, but do not require a pictogram. WHMIS 2015 classes and categories that do not require a pictogram are:

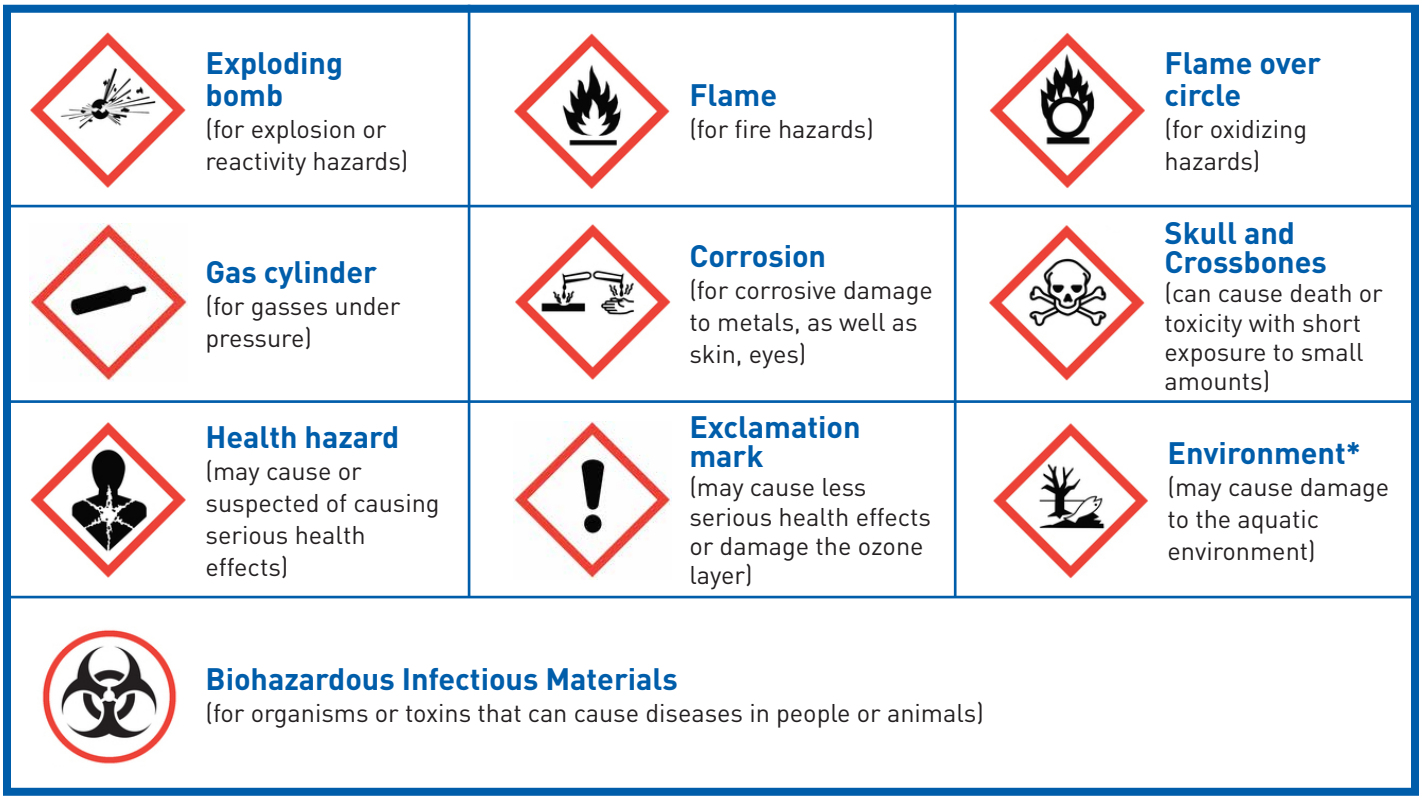
- Flammable gases - Category 2
- Flammable liquids - Category 4
- Self-reactive substances and mixtures - Type G
- Organic peroxides - Type G
- Combustible dusts - Category 1
- Simple asphyxiants - Category 1
- Serious eye damage/eye irritation - Eye Irritation - Category 2B
- Reproductive toxicity - Effects on or via lactation

To illustrate the differences, Work Safe Alberta[2] created this visual comparison of classes and symbols/pictograms.

GENE SHEMATEK
Occupational Health and Safety Consultant to CSMLS

REFERENCES:

- [1]http://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/pictograms.html
- [2]http://work.alberta.ca/documents/OHS-Bulletin-CH009.pdf
  http://gazette.gc.ca/rp-pr/p1/2014/2014-08-09/html/reg1-eng.php



**The GHS system also defines an Environmental hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.*

WHMIS Pictograms

WHMIS 1988 Hazard Class	WHMIS 1988 Symbols	WHMIS 2015 Symbols	WHMIS 2015 Hazard Class
A			Gasses Under Pressure
B1 to B6			Flammables, Self-Heating, Emit Flammable Gases, Pyrophoric Gases, Liquids & Solids, Organic Peroxides
C			Oxidizing Gases, Liquids, Solids
D1			Acute Toxicity – Oral, Dermal, Inhalation
D2			Eye Irritation, Skin Irritation, Skin/Respiratory, Sensitization, Carcinogenicity, Reproductive Hazards,
D3			Biohazardous Infectious Materials
E			Skin/Eye Corrosion Corrosive to Metals
F			Self-Reactive Substances, Organic Peroxides
N/A	N/A		Explosive Substances (Explosives are still covered under WHMIS exclusions for now)
N/A	N/A		Aspiration, STOT (Single Exposure, Repeated Exposure)
N/A	N/A	N/A	Combustible Dusts
N/A	N/A	N/A	Simple Asphyxiants
N/A	N/A	Use appropriate symbol	Physical Hazards Not Otherwise Classified, Health Hazards Not Otherwise Classified

https://www.osha.gov

In our next edition, we will review new labeling and Safety Data Sheet requirements under WHMIS 2015.

AN INTERNATIONAL PERSPECTIVE

PATHWAYS to Success

For more than 10 years, I worked as a Microbiology Medical Laboratory Technologist in southern China. I enjoyed my work at Guangzhou Center for Disease Control and Prevention, but my desire to explore the world around me propelled me to seek adventure and change. I believe I am the type of person who likes to create opportunities for myself, so I embarked on a journey to find those opportunities.

In 2007, I was selected as the only visiting microbiologist to the National Institute of Infectious Diseases in Japan. This visit was sponsored by Sasakawa Fellowship and was the result of a very select and competitive national selection. I was honoured by this and it gave me motivation to continue to grow through my work.

I was always looking for a way to develop my career in unique ways, and when I met a visiting professional from National Microbiology Laboratory in Winnipeg, I asked her many questions about not just the work she did, but the country she lived in. I learned that Canada has a good health care system and is a beautiful country that embraces multiculturalism. I was very interested in pursuing a life in Canada.

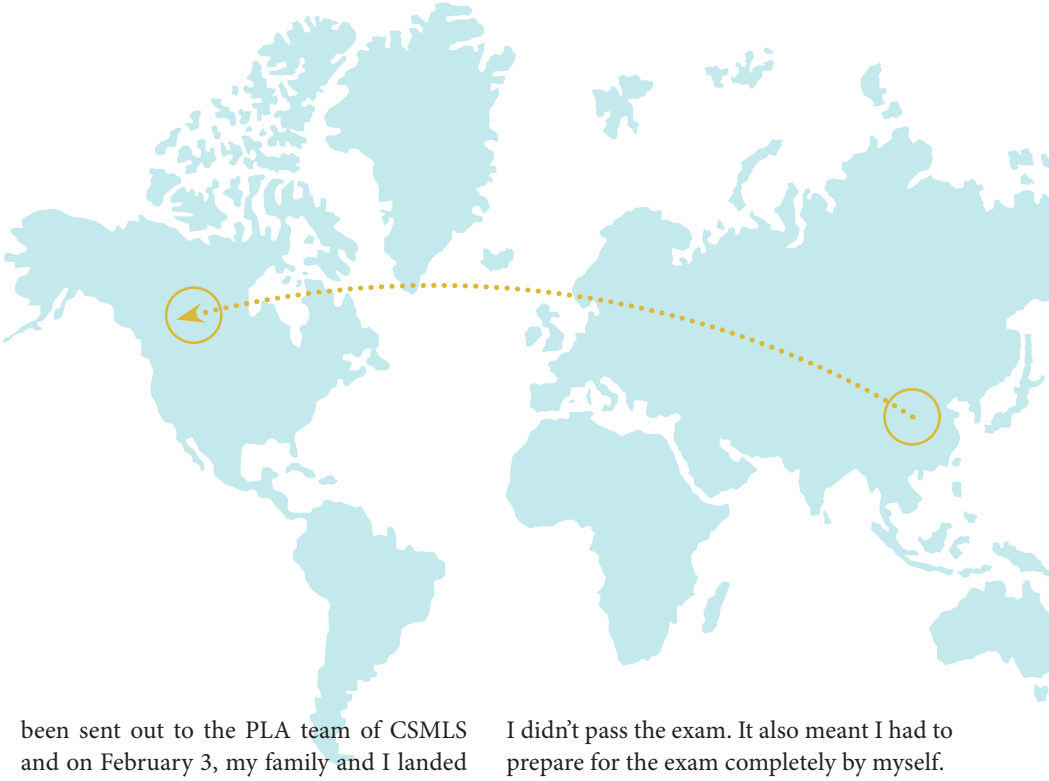
In 2011, I submitted an immigration application to Citizenship and Immigration Canada under the occupation category of "biologists and related scientists", but I wasn't approved until 2012. At that point, my family and I had a lot of work to do to prepare for our new life in a new country. My wife was working as an accountant in one of China's largest cancer centres at the time. She planned to continue to work in the health care-related accounting field in Canada.

Part of my preparation was to explore every opportunity for not just survival, but for my career success in Canada. I considered being a Pharmaceutical QA, a QC Analyst and even some survival jobs.

I knew my efforts should be focused on becoming a Medical Laboratory Technologist (MLT) in Canada. To ensure success in my career development as an MLT in Canada, I decided to take two pathways. One pathway was to gain eligibility to write the CSMLS exam through the Prior Learning Assessment (PLA) process and the second pathway was to attend a CMA-accredited MLT program.

By pursuing both options, I knew I would increase my chance of success. I read through every detail of the PLA process, spending up to four months preparing the necessary documents for my assessment. By February 2014, all documents had

Part of my preparation was to explore every opportunity for not just survival, but for my career success in Canada. I considered being a Pharmaceutical QA, a QC Analyst and even some survival jobs.



been sent out to the PLA team of CSMLS and on February 3, my family and I landed in Toronto to begin our lives in Canada. There was still work to be done. By the end of that same month I attended a two-week job search skill training provided by Employment Ontario.

In March, 2014, I received an offer and was admitted into the Medical Laboratory Science Program at St. Clair College. Shortly after, I received my PLA report, which had exciting news: I was eligible to write the CSMLS certification exam after I took an appropriate language test and met the language proficiency requirement.

I booked two different language tests (IELTS and MELA). To further improve my English skills, I attended both the Occupation-Specific Language Training (OSLT) for Health Sciences at Seneca College and the Enhanced Language Training program for Internationally Trained Healthcare Professionals from April to July, 2014.

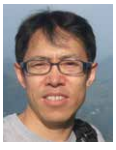
On both tests, IELTS and MELA, I met the language requirement, which made me eligible to write the CSMLS General MLT exam and my exam preparations began.

I moved to Windsor to attend the three-year Medical Lab Science Program at St. Clair College to continue on the pathway of attending a CMA-accredited program if I didn't pass the exam. It also meant I had to prepare for the exam completely by myself.

On October 21, 2014, I challenged the national general MLT exam the first time. Unfortunately, I failed the exam by only a very small margin. This gave me motivation to continue, knowing I was so close. I went back to my studies, more determined than ever. On February 19, 2015, I challenged the MLT exam the second time. As expected, I succeeded and was certified by CSMLS.

Since my examination, things have moved very quickly and there have been many changes. In May of this year, I received three job offers in just one week! I completed my first year of the Medical Lab Science Program in St. Clair College with Academic Distinction, but have chosen to leave the program to begin working as a MLT in Microbiology in Nova Scotia.

I knew that when I began the process of coming to a new country and finding success in my career, it wouldn't be easy. But I fervently believe that opportunities come to those who are prepared. J



XIAOQUAN LI (OLIVER), MLT
Cape Breton Regional Hospital
Microbiology Laboratory
Nova Scotia

A QUALITY PERSPECTIVE

Is the QC in? An overview of Quality Control processes in a core laboratory

Have you ever wondered what happens behind the scenes with QC issues in the lab? Who decides what 1 Standard Deviation (SD) is on our charts? What happens when the QC is "out" and the issue is left for the supervisor? I signed up for a CSMLS course on QC, hoping that the subject would apply to what I do as a core lab bench technologist on a daily basis. I wanted to change my thinking from simply asking "is the QC in?" to having a better understanding of quality control in the laboratory.

The course was a great reminder of the ins and outs of the QC procedure we follow daily, and it also gave me a look into the bigger picture of QC in the lab. What

actually happens when the QC is "out" and I can't find the solution to fix it myself?

The author of the course recently had an article on QC in the lab published in the CJMLS ("Stats-Free Quality: Changing the way we look at quality", Spring 2014). A central message in the article and in some of the course material was that labs haven't caught up with the times in terms of assuring the quality of results reported. I became curious about QC in my lab. Is my workplace one of her statistics? Is she right; can QC be taught better in school?

I finished the course and went to the head of my chemistry department, armed with new knowledge and little curiosity, to find out what was is done before and after my part of the QC process: accepting the QC values I run throughout the eight hours I'm on-shift in the lab.

What I learned in the course

Zoe Brooks' course, "Patient Focused Quality Competence Part 1: Understanding the Basics" reviewed some things about QC I already knew, put other QC topics in a new light, taught me some new material, and stressed one point over and over: just because the QC is "in", it doesn't mean everything is OK.

Concepts such as mean, standard deviation and Gaussian distribution that we used daily were reviewed. We all know the mean is the average of a set of values. The mean for QC material is set at the time it is put into use and we plot current values on the chart to show how they relate to the set mean. Standard Deviation (SD) is a measure of variation from the mean. Large SDs indicate the results are spread out from the mean while small SDs indicate the values are all close to the mean. Gaussian distribution is a statistical picture of how data in a stable system are expected to be distributed around the mean. If a QC chart has been properly set up (the mean and SD reflect the current system), we would expect one of the first 20 points to fall outside of 2SD. These points in isolation do not indicate a problem with the system; these are the times when your QC flags as failing the 1-2S rule, but it's OK to keep running.

Core bench technologists are all well familiar with Westgard rules, but can you list at the drop of a hat which ones indicate random or systematic error?

Core bench technologists are all well familiar with Westgard rules, but can you list at the drop of a hat which ones indicate random or systematic error? Review of Westgard rules in this course made how to categorize them very clear to me. The rules can indicate random error, systematic error or either kind of error. Only one rule is specific to random error, R-4s. It is easy to remember by the R in the name, but also obvious as a random error indicator in that the rule usually relates to error on both sides of the mean by its very definition: "two controls in the same run, or one control in two consecutive runs produce results where the range between the results exceeds 4SD" (course 4.4 QC Charts and Rules). All the rules that start with "1" (1-2S, 1-3S, 1-4S, etc.) can indicate either type of error, but as you only have one value breaking a rule (as indicated by the "1"), it's too soon to tell which type of error is in effect. What's left are the rules that are broken when looking at more than one value. Rules 2-2S, 4-1S, 10x, etc., indicate a systematic process.

New material, or at least material I did not remember from school, included total error calculations, the role of "true value" and how to determine how much error is acceptable for your method while still giving out appropriate results (Total allowable error TEa). These topics are the ones that open up quality control in the lab beyond looking at a QC chart when determining if a QC result is acceptable. From the perspective of a core bench technologist, these calculations are done "behind the scenes".

Total Error is how far your mean is from the target value (your laboratory's best guess at what the true value of your QC should be), plus the amount of error caused by your method's imprecision (SD).

The QC graphs we see daily have an assigned mean and SD. But these graphs do not have a true value on them, so how do we know how far we are from where we want to be, how much error we have in our method? And how much error is it OK to have? How much error is OK is defined as your Total Allowable Error (TEa), either in units or percentage.

So while the bench technologists regularly run QC samples and watch how the results fare with Westgard rules, it's the behind the scenes work that is looking at the method's total error and ensuring it is within the total allowable error.

The point stressed over and over in the course was that even if your QC chart looks good, it doesn't mean that the method is OK. To determine if your method is running within specified parameters, you need the true value to calculate your error. QC charts can only indicate if there has been a change in the system. This change can be good or bad but you can't tell without calculating your total error and comparing that to the Total Allowable Error.

CSMLS Journal article by Zoe Brooks

Brooks' article made the same point. QC is more than just Westgard rules. It's about method validation, allowable error limits

and peer comparisons, among other things. The author has surveyed many medical laboratory professionals, and sees a gap between what we know academically and what is actually done in the labs. Can we teach QC differently?

The Real World

With the course material fresh in my mind, I decided to sit down with my chemistry section head and see how we fare. Is my workplace using antiquated QC guidelines as suggested by the article?

Here's what happens in my laboratory using glucose measurement as an example:

Each time we get a new lot number of quality control specimens, a crossover is run by the labs in the region. The laboratory scientist for the region compiles the data to determine a true value. According to the course I just completed, this is the ideal method of determining a true value. The standard deviation is also calculated from that data. The laboratory scientist then calculates Total Error and compares it to the Total Allowable Error. The Total Allowable Error is a regional value that ensures results reported are close enough to the True Value to meet clinical requirements. In our region, TEa for glucose is based on Biological Variation, the "natural fluctuation of body fluid constituents around the homeostatic setting point" (which is the second best source to base your acceptable error on as per the course). If the region's Total Error is less than the Total Allowable Error (TEa), the lot number of QC can be put to use at each site.

Each site uses their data to determine the mean and SD for their site's QC charts. The mean for glucose must be within one SD of the regional mean to ensure our values remain within TEa. If your site's mean is not within one SD of the region, further investigation is required to determine why your site's values are so different from the peer group.

Now that the assigned mean and SD are established, QC is run daily and checked for violations of Westgard rule which indicate a change in the system. Data is also examined monthly to monitor performance over time through summary reports. External Proficiency program samples are run regularly comparing our values with others sites in our peer group.

So what happens when we notice a shift in the mean? Let's assume that after investigation it is determined that the instrument is running properly but a new lot number of reagent has been put into use at the time of the shift in the mean. Most likely the new lot number is just different enough from the last to shift our QC values. So if that's what's going on and our system is stable around a new mean, can we adjust our mean in the QC charts? Without adjusting the mean on the chart, QC values would continue to flag. The answer is yes, but only if the shift in mean keeps us within the TEa. A calculation of the new Total Error would need to be done and compared with the TEa. If adjusting our mean would take our total error beyond what is acceptable, another solution is required. Perhaps a different lot number of reagent is the solution. Consultation with the laboratory scientist is required before going ahead and making the adjustment.

Example using numbers for Glucose QC level 2:

True Value (regionally determined actual amount of glucose in QC sample) = 15.45
Original mean for site = 15.6
Original SD for site = 0.184
New mean for site= 15.55
New SD = 0.204

Original TE = |Measured mean - True Value| + (2 x SD)
= |15.6 - 15.45| + (2 X 0.184)
= 0.15 + 0.368
= 0.518

New TE = |Measured mean - True Value| + (2 x SD)
= |15.55 - 15.45| + (2 x 0.204)
= 0.1 + 0.408
= 0.508

TEa (regionally determined amount of error for glucose) = 8% or 1.236

Is the method still OK? Yes. In fact, the total amount of error has decreased so the new lot number of reagent is performing better than the last.

As a bench technologist, Westgard rules would alert me to a change in the system only. For all I know, this could have been for the better or the worse. It's the behind the scenes work done by supervisors monitoring the system that determines which it is.

What I learned

There is way much more to quality control than Westgard rules, and I now have a better idea of what some of that other part is all about.

While Brooks is right, QC charts can't tell us everything about what's going on with our method and whether or not it is OK, if they are set up correctly, they can indicate a change in the system and are an integral part of the process. Knowing something has changed is the first step toward finding out if the method is still OK. Westgard rules may not give you the answer outright, but they direct you to look further to find it. If QC charts are set up correctly (method validation before implementation; properly assigned True Value, TEa, mean and SD; regular monitoring of QC material's ability to reflect patient specimens; regular peer group comparisons), and the QC values are "in", your method is OK!

Now back to Brooks' article. **Is my workplace part of her statistics showing a gap between knowledge and application?** I don't believe it is. My exploration of the behind the scenes QC steps showed they are exactly as described in her course material. We are not a lab that makes QC charts with values pulled from a hat, but through proper, defendable procedures. While it's possible your average bench technologist may have trouble describing TEa, they will probably have no trouble telling you when to get a supervisor (who will be able to calculate TEa) to look into things. **Can QC be taught better in school?** I think it's a case of the chicken and the egg. You learn so much at once in school, QC gets lost in the mix. And most QC concepts don't truly make sense until you have worked in the field. At the same time, once you get to the bench for training, you get tunnel vision. "Is it in?" is all that matters. It probably can be taught better in school and maybe addressed specifically in the practicums to show the steps before and after verifying your QC. **Is it OK to expect one out of 20 results to be outside 2 SD?** I think our system is defendable; even given one out of 20 points outside 2SD but only when we manage a healthy margin of error. It's when the method imprecision is a limiting factor towards achieving results within the set TEa that we run into problems. For some tests, the technology just isn't there to allow us to meet error limits.

Completing this course and writing this article have helped me achieve what I set out to accomplish. While I still ask "is the QC in?", the question now has a much deeper meaning. Being more aware of what happens behind the scenes has made me a better bench technologist.

KRISTINA DAWSON, BSC, MLT
Laboratory Technologist
Ridge Meadows Hospital, BC

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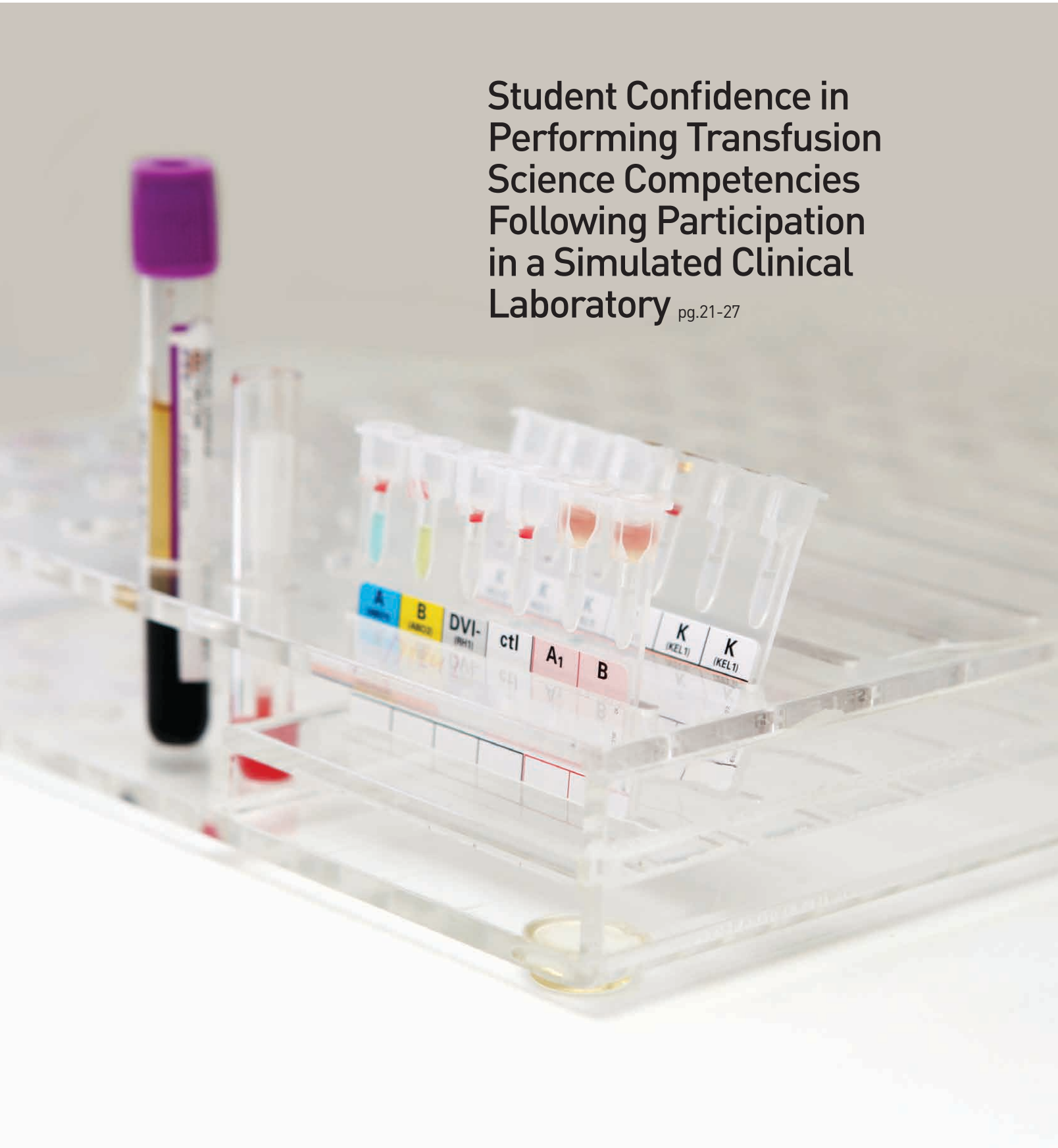
SCIENTIFIC SECTION



Student Confidence in Performing Transfusion Science Competencies Following Participation in a Simulated Clinical Laboratory pg.21-27

Student Confidence in Performing Transfusion Science Competencies Following Participation in a Simulated Clinical Laboratory

MARY T. EMES
MMedSc (Pathology)

Certificate in Adult Education, MLT, ART (CC, MI, TS)
Professor, Medical Laboratory Science and Continuing Education
The Michener Institute for Applied Health Sciences

KEY WORDS
Medical Technology, Competency-Based Education, Self-efficacy, Transfusion Science, Laboratory Simulation, Confidence

ABSTRACT

Introduction: Simulation-based healthcare education is increasing. Gaps exist in current literature regarding evaluation of simulation experiences in applied health professions like Medical Laboratory Science (MLS). This study assessed and compared students' confidence in their ability to perform required competencies before and after participation in a simulated laboratory semester.

Method: Survey methodology used quantitative and qualitative questions. Participants completed identical surveys at two time-points, pre-simulation and post-simulation, rating confidence in 14 perceptual items of Canadian Society for Medical Laboratory Science (CSMLS) Transfusion Science competencies. Quantitative data was analyzed using paired-samples t-tests comparing student confidence scores. Narrative comments on simulation experiences contributed qualitative data to confirm and explain responses.

Results: There were statistically significant differences in confidence scores before and after simulation in all 14 specific categories ($p<0.001$). Quantitative results suggest simulation experience in Transfusion Science provided noticeable improvements of students' self-perceived confidence in their abilities to complete competencies. Qualitative thematic data analysis of students' narratives confirmed participants' perceptions of increased confidence.

Conclusion: Simulation-based education is an effective tool to enhance students' confidence in their abilities in Transfusion Science competencies. This research study methodology has implications for evaluation of simulation curricula in other MLS disciplines and applied health educational settings.

INTRODUCTION

Over the last ten years, simulation has evolved to train and assess learners in a wide variety of clinical health care situations.[1,2,3] Many factors have added to this movement to increase simulations in medical education. First, more complex skills are needed to achieve the multifaceted modalities of treatment and diagnosis developed by advances in medical technology.[4,5,6] Second, patients are reluctant to allow student medical professionals to attempt complicated medical interventions with minimal prior experience.[7,8,9,10] Third, simulation is evidenced as a way to enhance patient safety and reduce medical errors while maximizing faculty time and resources to provide the best student outcomes.[1,11,12] Finally, simulation provides the ideal educational environment for students to gain confidence in their ability to complete the clinical competencies required as health care practitioners in their chosen professions.[3,13,14,15] In medical education literature, a large body of simulation research exists but

there is a lack of research pertaining to simulation in the applied health sciences.

A review of current literature revealed a shortage of research specifically evidencing the impact of simulation-based education in increasing students' knowledge and confidence in their abilities to complete selected competencies.[4,15,16,18] In Canadian Medical Laboratory Science (MLS) undergraduate programs, students require competency in essential criteria set out in the MLS Competency Profile by the Canadian Society for Medical Laboratory Science (CSMLS).[17] Although evaluation tools are common in medical education, there is a shortage of research specific to MLS programs to assess the impact of simulation on the MLS student experience.[1,4]

A literature review examined simulation health care curricula currently employed in contexts throughout the world, specifically focusing on relationships to Canadian MLS and Transfusion Science experiences. There was a paucity of data on confidence indicators and strategies to rate and improve confidence through simulation-based education.[1,4,8,12,17] Evidence exists in research literature to support the use of confidence indicators to validate simulation but no specific studies reported students' confidence in their abilities in simulation-based experiences for MLS Transfusion Science education.[1,3,5,9,12] The aim of this research study is to investigate whether students' perceptions of confidence in their abilities differ significantly at two different time-points, prior to and after participation in a Transfusion Science Simulated Clinical Laboratory semester.

METHODS

Study Design

The Michener Institute for Applied Health Sciences (Michener) in Toronto, Ontario, Canada conducts a simulated laboratory semester for MLS students. Students attend 240 hours (12 weeks) of simulation laboratory settings in each of the five MLS disciplines (Transfusion Science, Clinical Chemistry, Hematology, Histotechnology and Microbiology). Following simulation, students participate in 700 hours (20 weeks) of clinical education through a placement at clinical laboratory sites in hospitals and private laboratories.

This research study used paper-based survey methodology to explore differences in students' confidence in their abilities prior to and after their participation in the Transfusion Science simulated clinical laboratory semester at Michener. Differences in participants' confidence in completing specific competencies and overall confidence were evaluated.

The study used surveys to collect quantitative and qualitative data. Students were invited to complete the survey before (week 1) and after (week 13) the simulation semester. The survey instrument contains 6 Likert scale questions and an open-ended question. The quantitative method used was a quasi-experimental between-subject approach utilizing a pre- and post-test design. Quantitative and qualitative data were analyzed separately. While this is a quantitatively driven study, the qualitative data provides more detailed information to confirm and explain the quantitative results.

Consort Chart of Survey Responses

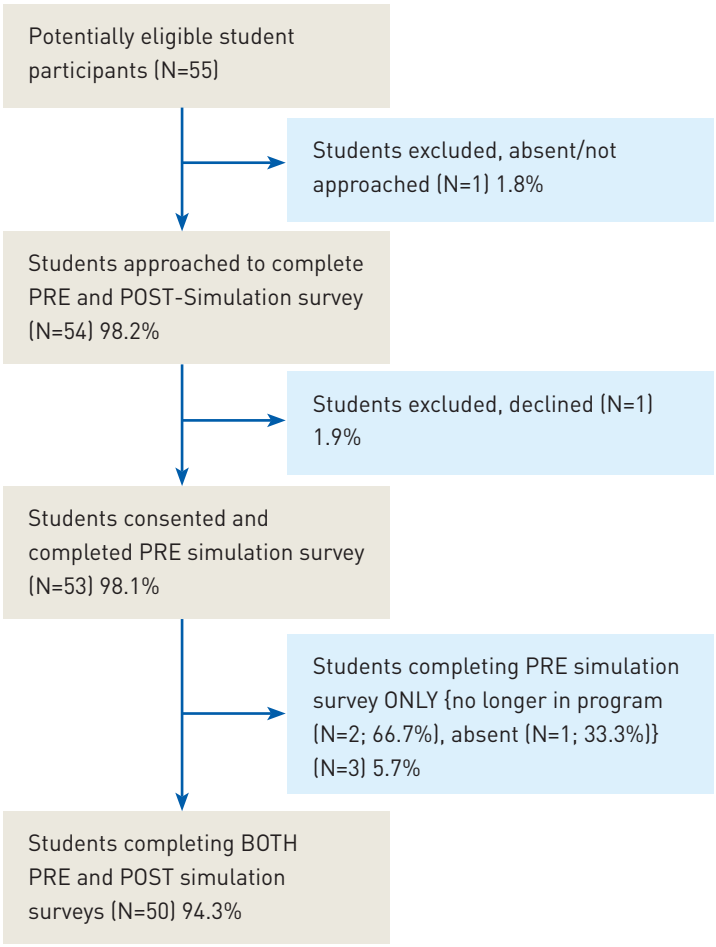


Figure 1

Participants

The cohort of second year Michener MLS students (Class of 2012) served as participants in this study (N=54). The sample size for the study analysis was 50 students (N=50) based on exclusion of some responses or participants from the data (Figure 1). Simulation

Survey Questions

Survey Question	Competency Criteria
Item #1	Applying principles of immunology to the detection of antigens and antibodies
Item #2	Identifying common red cell antigens and antibodies
Item #3	Operating of common instruments and/or equipment
Item #4	Interpreting results to determine phenotype/genotype
Item #5	Differentiating between clinically significant and insignificant antibodies
Item #6	Performing compatibility analyses
Item #7	Assessing results and initiating follow-up action as necessary
Item #8	Preparing and issuing blood products
Item #9	Assessing suitability of donor/product
Item #10	Ensuring proper storage of blood products
Item #11	Evaluating the quality of blood products
Item #12	Evaluating the appropriateness of the blood product for the patient's clinical condition
Item #13	Recognizing and investigating the adverse effects of transfusion according to established protocol and initiating follow-up action as required
Item #14	***Overall,*** how would you rate your confidence in your ability to complete the competencies required by the CSMLS related to Transfusion Science right now?

**Note: Question Item #14 is not a CSMLS Transfusion Science competency. This question asked participants to rate their overall confidence in Transfusion Science competencies. This question was included to capture participant's overall perception of confidence before and after simulation.*

Table 1

is infused throughout the Michener MLS students' learning experiences in lectures, case studies, simulated laboratory exercises and interactions with standardized patients over a two year period. A standardized patient is a healthy individual who acts to recreate a medical scenario realistically and accurately to simulate a real patient.

The research participants in this study had already successfully completed 4 semesters of MLS didactic and laboratory training as well as courses in interprofessional collaboration and research. During the simulated laboratory semester experience, students are required to integrate theoretical, technical and interprofessional competencies. Following successful completion of this simulated semester, students complete the final clinical practice phase of training in a clinical laboratory.

SURVEY DESIGN

Participants were asked to complete paper-based pre-simulation and post simulation surveys prior to week 1 and post week 13 of the semester respectively. The pre-simulation and post simulation surveys were comprised of 14 perceptual items addressing students' confidence in their abilities to complete the CSMLS Transfusion Science competencies (Table 1). All 14 items were scored on a 5-point Likert scale rating confidence from 1= "very confident" to 5= "not confident at all". One additional option of 6= "I don't know" was also provided to capture those participants who did not have a clear idea of their confidence level. An open-ended question at the end of the survey allowed participants to comment on any aspects of their simulation experiences. In the pre-simulation surveys, participants were asked to record and describe previous health care and simulation experiences. Qualitative analyses of students' comments to open-ended questions and simulation experiences were collated and arranged thematically to explain and confirm quantitative data and findings.

Ethical approval was received from Charles Sturt University (Australia) School of Biomedical Ethics in Human Research Committee (CSU Australia Project ID#: 406/2011/06) and from Michener Institute for Applied Health Sciences (Toronto, Canada) Research Ethics Board (Michener Project ID#: TMI 2011-001).

STATISTICAL ANALYSIS

Data from individual students were anonymized. Survey data were entered into IBM SPSS version 19.0 software (Somers, NY, USA) and were verified by a procedure of cross-random check. The data accuracy rate reached 99.9%. Descriptive statistics (i.e. mean and standard deviation) were used to analyze responses to 14 questions about confidence levels related to specific CSMLS competencies. Inferential statistical analyses (i.e. paired-samples t-tests) were conducted to assess the participants' confidence levels before and after the simulation semester. The narrative responses to the open-ended question at the end of the surveys were collated and sorted thematically to determine trends and frequencies of responses.

RESULTS

A total of 50 out of 54 available second-year students (90.9%, N=50)

Mean Pre- and Post Simulation Confidence in Performing CSMLS Transfusion Science Competencies

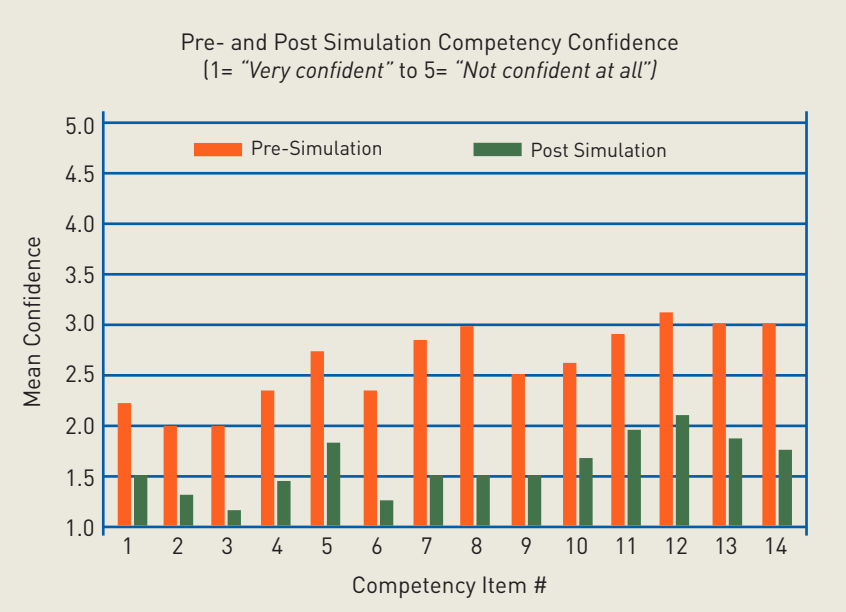


Figure 2

Paired-Samples t-Tests of Pre- and Post Simulation Confidence

Competency Criteria Item #	t-value	df	P
Item #1	6.057	49	<0.001
Item #2	7.000	49	<0.001
Item #3	9.071	49	<0.001
Item #4	8.172	49	<0.001
Item #5	8.775	49	<0.001
Item #6	10.660	49	<0.001
Item #7	10.204	49	<0.001
Item #8	8.867	49	<0.001
Item #9	9.158	49	<0.001
Item #10	6.265	48	<0.001
Item #11	6.373	47	<0.001
Item #12	8.352	49	<0.001
Item #13	7.455	49	<0.001
Item #14	9.767	49	<0.001

Table 2

completed both the pre-simulation survey and the post simulation survey. One student declined participation, one student was absent during the post-simulation survey period and two students did not complete the simulation semester (Figure 1). Data from students who did not complete both surveys was removed from the databank. Before performing paired-samples t-tests, 3 replies of "I don't know" were treated as missing values to avoid skewing the data. The final sample size for analysis was 50 student responses (N=50).

Previous health care experience was reported by 28% of participants (N=14). Previous simulation experiences were reported by 6% of respondents (N=1) as occurring outside of Michener and 56% at Michener (N=8). Just over one half of the participants (56%; N=8) identified core interprofessional collaboration curriculum content that contains use of simulation in various forms (i.e. standardized patients, role playing) as a simulation experience.

Participants reported improved confidence in abilities to complete each of the 14 competency criteria included in the study (Figure 2). The pre-simulation mean confidence values ranged from M=2.0 to M=3.2 (SD=0.70 to 1.00) and post simulation mean confidence ranged from M=1.1 to M=2.1 (SD=0.35 to 0.88) on a 5-point Likert scale rating confidence from 1= "very confident" to 5= "not confident at all".

Students' overall confidence was determined by analysis of responses to survey item 14: "Overall, how would you rate your confidence in your ability to complete the competencies required by the CSMLS related to Transfusion Science right now?" Students' pre-simulation confidence results related to overall confidence were as follows: 2% (N=1) very confident; 32% (N=16) somewhat confident; 34% (N=17) neither confident nor not confident; 28% (N=14) somewhat not confident and 4% (N=2) not confident at all. Results related to overall confidence post simulation were as follows: 32% (N=16) very confident; 64% (N=32) somewhat confident and 4% (N=2) neither confident nor not confident. The mean overall confidence scores for item 14 were 3.0 (SD=0.93) before simulation and 1.7 (SD=0.54) post simulation.

To determine if the overall level of students' confidence in their abilities before simulation differs from that after simulation, a paired-samples t-test was performed. The t-test result for Item 14:

overall confidence, t(49)=9.767 showed an increase in students' overall confidence in their ability to complete Transfusion Science competencies after simulation at a rigorous level of statistical significance ($p<0.001$).

In order to compare the level of confidence in abilities to complete each of the 13 specific items of competency criteria before and after simulation, paired-samples t-tests were conducted. As evidenced by the t-tests values (Table 2), students gave a higher rating of their own confidence after simulation in all 13 competency categories at a statistically significant level ($p<0.001$ for all 13 paired-samples t-tests). In particular, there was evidence of important variations in reported pre- and post simulation confidence for two specific competency criteria. Most notably students' confidence in "preparing and issuing blood products" (Item 8) showed the greatest improvement in confidence ranking when comparing pre-simulation (M=3.0, SD=1.00) and post simulation (M=1.5, SD=0.65), t(49)= 8.867, $p<0.001$. Participants reported the least confidence ranking of all 13 competencies in "evaluating the appropriateness of the blood product for the patient's clinical condition" (Item 12). Confidence their ability to complete competency item 12 was reported at the least confident levels of the 13 criteria for both pre-simulation (M=3.2, SD=0.84) and post simulation (M=2.1, SD=0.68), t(49)= 8.352, $p<0.001$. Both competencies (items 8 and 12) pertain to the management of donor blood products (blood donor red cells, platelets and plasma products). Although these results showed significant differences between pre- and post simulation confidence scores, relevant to other competency criteria, those related to certain aspects of blood product management (item 12) received the lowest confidence rating post simulation. These results combined have implications for curriculum review and design.

Qualitative analysis of students' comments to open-ended questions were collated and arranged thematically. In pre-simulation surveys, 6 participant responses were recorded (12% of participants). Dominant pre-simulation themes were apprehension, anticipation, low confidence and curriculum issues. Pre-simulation comments included: *"...I do not feel very confident in my abilities, because it has been one year since I last took a transfusion practical component..."* and *"I am counting on my experience in the simulated clinical to build a practical element to my competency..."*.

In post simulation surveys, 19 of 50 participants (38%) recorded narrative comments. Post simulation themes included increased perception of confidence, greater readiness for clinical placements and satisfaction with the simulation semester curriculum. Post simulation survey comments included: *"I feel more confident with the techniques and procedures in transfusion..."*, "*I didn't realize how little confidence I actually had [before simulation]"*, *"...[simulation] makes me feel much more ready for clinical practice..."* and " *I thought the course was taught in a very systematic, thoughtful, efficient way."* Almost 25% (N=4) of the students who provided post simulation narrative comments remarked that they would like additional experiences in blood product management. Seventy-five percent of respondents reported more confidence in their abilities to complete Transfusion Science competencies post simulation (N=15). Forty-two percent of respondents described simulation as a positive experience (e.g. "*fun", "educational", "enjoyable*") (N=8).

DISCUSSION

Previous health care experience was reported by 28% of participants (N=14). Previous simulation experiences were reported by 6% of respondents (N=1) as occurring outside of Michener and 56% at Michener (N=8). Just over one half of the participants (56%; N=8) identified core interprofessional collaboration curriculum content as a simulation experience. These qualitative findings helped to establish the students' previous health care experiences and to confirm the differing perceptions of students towards past simulation experiences.

Findings from this study concur with earlier research that simulation in nursing and physician educational programs can increase students' confidence their abilities to perform required competencies.[1,8,9,12] Specifically, results indicated a significant increase in students' confidence in all 13 selected items of the CSMLS Competency Profile, including an increase in overall confidence in Transfusion Science. Competencies related to blood product management (Items #8 and #12) demonstrated the greatest improvement in confidence yet the largest remaining lack of confidence respectively. Further, this research evidences an increase in students' confidence in their abilities in Medical Laboratory Technology required competencies and provides a framework for evaluation of students' confidence in their abilities in other applied health programs.

In Canadian MLS practice, blood products are prepared from volunteer donations by Canadian Blood Services (CBS) and Héma-Québec before testing and these blood products are solely available to licensed accredited Transfusion Medicine Services laboratories (Blood Banks). Blood products cannot be released to educational institutions due to strict governmental regulations of these products.

In Transfusion Science simulation laboratory exercises at Michener, blood products are represented using simulated samples or paper coursework.

The study participants evidenced limited increases in confidence in abilities in preparation, handling and management of blood products with the current model of Transfusion Science simulations (Competency Item 12). This deficiency is recognized by Michener and completion of CSMLS Transfusion Science competencies involving blood product utilization remain critical training objectives for the clinical placement sites. The findings of this study confirm the research in current health care literature highlighting limitations of simulation in specific competencies and practices.[1,2,4,7-9,11-15,17] Simulation is established as an effective educational modality to increase students' confidence in their abilities however, further research is necessary to confirm transferability of skills from simulation to real-world clinical practice situations.

Participants' comments corroborate the findings of the statistical analysis for this study. Students reported improved levels of confidence in their abilities and a positive educational experience. Some respondents described that simulation empowered them with increased confidence in their abilities for the final phase of training at clinical placement sites. Participants also identified problems with the current curriculum for Transfusion Science at Michener in which the final Transfusion Science laboratory skills course is completed almost 6 months prior to the simulation semester. These findings will help inform the design of a new program model that will distribute the Transfusion Science curriculum more evenly over the four didactic semesters and align this instruction with simulated laboratory sessions.

Some limitations of this research study include, but are not limited to, the subjective self-reporting of confidence in their abilities by students in a single cohort. Results of the study cannot necessarily be generalized to other disciplines, professions or student cohorts. A challenge in simulation-based education remains in evaluating impacts beyond the level of satisfaction. Further research will focus on this opportunity however, initial profiles of students' confidence in their abilities identified in this research was an important first step in that direction.

This research is an exploratory study and provides an initial step towards further research into simulation-based education in the MLS context. The study format is an addition to previous research investigating the correlations of students' confidence in their abilities in simulation and the evaluation of simulation curricula.[1,9,17] Similar study formats can investigate levels of students' confidence in their abilities in other Medical Laboratory Science disciplines (Clinical Chemistry, Hematology, Histotechnology and Microbiology). Similarly, research within other applied health care professions (e.g. Medical Radiation Sciences, Chiropody, Respiratory Technology, Diagnostic Cytology and Genetics Technology) may be augmented by this confidence assessment design. Finally, a follow-up evaluation of students' confidence in their abilities following the clinical placement semester could offer additional feedback for the impact of Michener's simulation programs.

This research study provides useful information to evaluate, review and revise the simulation-based curriculum to foster enhanced learning in Transfusion Science competencies. The research established a new methodological approach at Michener to evaluate students' confidence in their abilities using an established professional competency profile. The impact of simulation-based education using this evaluation method has promise when applied to other disciplines.

In conclusion, this research study evidenced a significant increase in students' confidence in their abilities in all competencies following simulation. The study outcomes demonstrate that the current model of simulated Transfusion Science laboratory experiences increased students' confidence in their abilities in the performance of CSMLS competencies prior to the final clinical placement training in the MLS program. Adaptations of this study methodology have significant implications for evaluation of simulation curricula in other MLS programs and in other applied health care educational settings. ■

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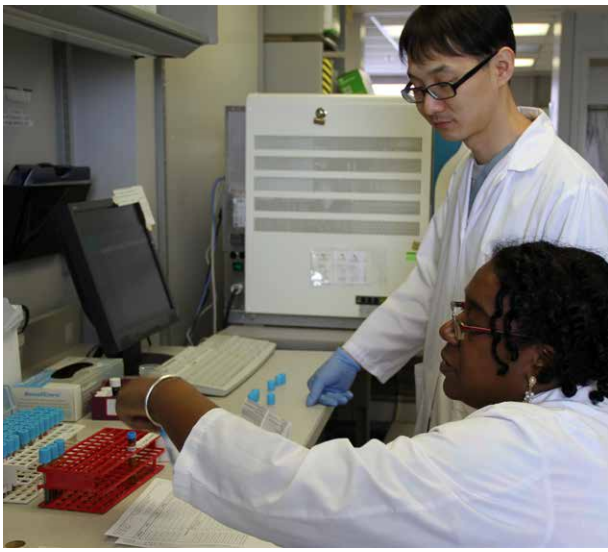
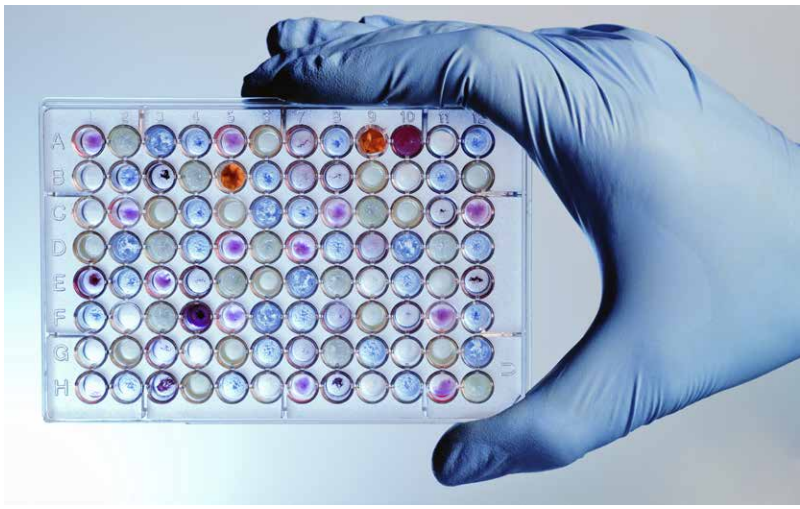
SOCIETY NEWS





canadian
JOURNAL
of medical laboratory science

VOLUNTEERING FOR THE BOARD OF DIRECTORS

Over the years, thousands of member volunteers have given back to the medical laboratory profession by devoting their time and expertise to CSMLS. Many of these individuals begin small – dedicating just a little time – and quickly realize how rewarding it can be. Some take on additional volunteer opportunities and some strive for the larger commitments – like the CSMLS Board of Directors.

Applying to be on the CSMLS Board of Directors is a significant commitment to your profession and your personal growth. With this level of responsibility comes reward, and that's what CSMLS member Lucie Alain has recently discovered.

Lucie has been an active member of the Society for more than 25 years and serves as the Quebec Director on the CSMLS Board of Directors. Shortly after receiving her pin signifying her 25-year membership, she knew it was time to give back and do her part to help the profession. "I could either watch the train go by or climb aboard and become the conductor; join other members in becoming the leaders of change," says Lucie.

Volunteering as a Director on the Board can be a rewarding experience as you:
- ✔ Learn new aspects of the profession
- ✔ Work with like-minded professionals
- ✔ Be part of decisions affecting the professional community

Lucie's desire to be a member of the Board stems from personal reasons as well. "I wanted to understand the relationship between CSMLS and the provinces, the roles each play in the standards of practice and the regulation of our profession," she says.

Have you considered running for the Board? It can be your time to join others in becoming the leaders of change. We are looking for dedicated members who are ready to make a commitment to the Society and to the future of the medical laboratory profession.

Nominations for the CSMLS Board of Directors are now open.

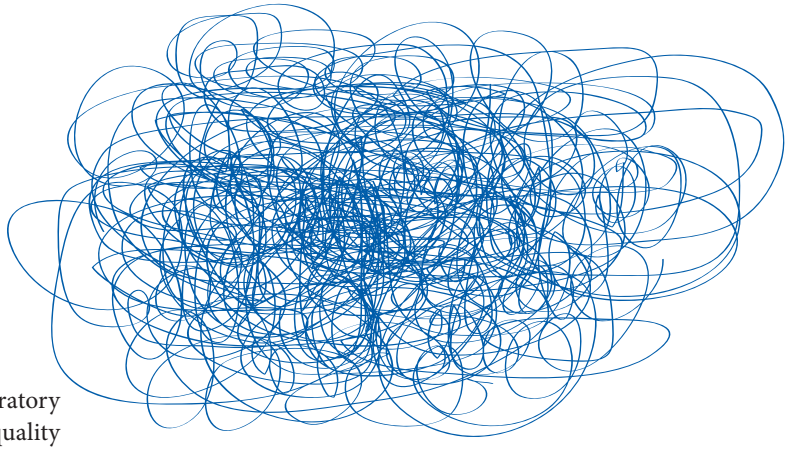
Open Offices 2017-2019

- ✔ Bilingual Director
- ✔ Atlantic Director
- ✔ Alberta & Northwest Territories Director

Deadline: February 18, 2016

More information is available at **www.csmls.org**

A Question of ETHICS



The CSMLS has been dedicated to providing medical laboratory professionals with the resources and tools needed to provide high quality work within the laboratory. By listening to our members, we heard your need for guidance when dealing with ethical issues at work. We know that ethical dilemmas cause workplace stress and can affect one's mental wellness. Mental wellness has become a hot button topic in the past few years, but it has been around for many more. We've learned that on any given week, more than 500,000 Canadians will not go to work because of mental illness. This time results in approximately $51 billion that is lost each year to the Canadian economy because of mental illness.

The question of dealing with ethical dilemmas reaches out beyond the lab, and we wanted to help. We asked ourselves "How can we contribute to deterring this burden and improve the mental wellness of our members in the workplace?"

The CSMLS decided to start investigating ways to tackle the issue of ethics and provide our members a tangible resource to guide them. In 2014 we convened an Ethics Working Group consisting of experts to review relevant literature and complete a needs assessment. The group determined that a Code of Ethics (COE), along with supportive documents would be valuable for members, and so started the ground work for the methodology and construction of a COE package. This proposal was approved by the Board.

As part of this development, we wanted to be sure we kept our members' needs in mind. At LABCON2014 we hosted an Ethics Think Tank, a place for members to discuss issues and concerns around ethics and work together for possible solutions. We took note of these conversations and with them, and other data gathered, we had valuable insights into our stakeholders' opinions on ethics and what a Code of Ethics should include.

The Ethics Working Group began the first level of beginning to create a Code of Ethics. Along with the Code, we wanted to ensure users have significant support and so the recommendation was made for the availablity of ethics education for members. At LABCON2015 we took the opportunity to present all our research and developments to the CSMLS membership, showing the work that was put forward for this initiative thus far.

Where are we now?

The CSMLS Board of Directors is pleased to have approved this timely and valuable resource for not just CSMLS members, but for the entire medical laboratory community. The CSMLS has released an updated Ethics Course, which is available online through The Learning Centre on the CSMLS website. We are soon to release the Code of Ethics, which will be available on our website.

The CSMLS is thankful to everyone who participated in the initial research and development of these resources, including those that filled out surveys, participated in the Think Tank or in the Working Group, and gave of your time and expertise to make the Code of Ethics a reality.

Alternate Careers Update

In 2014, CSMLS launched a new website as a resource for individuals looking for information on Alternate Careers. The website was created as a result of extensive research, funded by the federal government, and contains information on several potential alternate careers for those who may want to look for meaningful career options outside of the medical laboratory field. After nearly a year since the launch, the Alternate Careers website has had a positive response. Here is what we learned over the past year:

Top 10 countries users are from:

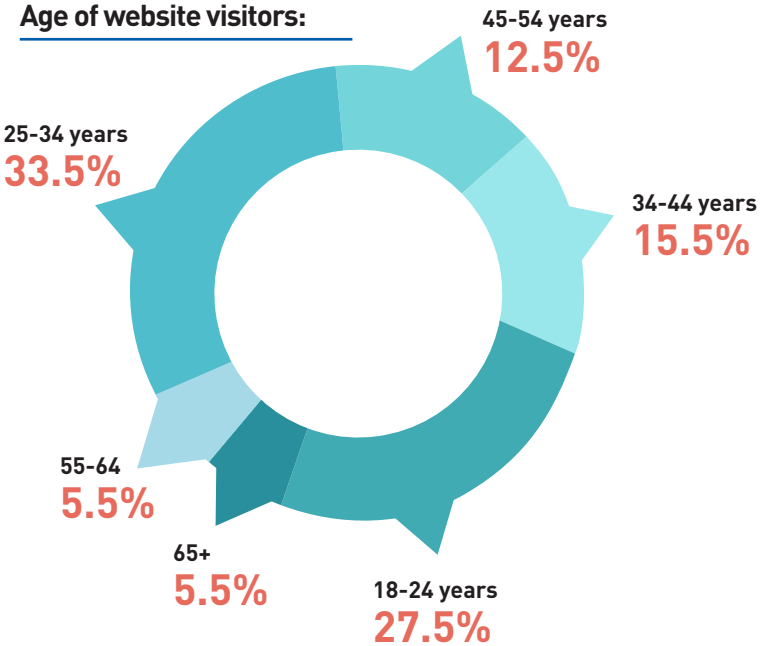
1. **Canada**
2. **India**
3. **United States of America**
4. **Philippines**
5. **Nigeria**
6. **Australia**
7. **United Kingdom**
8. **Saudi Arabia**
9. **Kenya**
10. **France**

Since January 1, 2015, we've had

3,502

UNIQUE VISITORS TO THE SITE, AVERAGING 21 USERS A DAY

Age of website visitors:



Top 3 most viewed fact sheets on the website

1. **Medical Laboratory Assistant**
2. **Health Information Management Professionals**
3. **Pathologists' Assistants**

Please visit **altcareers.csmls.org** for more information about Alternate Careers to medical laboratory technology.

Member Survey

In May 2015, CSMLS distributed a survey to capture valuable information about our members. The information collected from the survey helps us to understand the needs of our members. The information here is only a snapshot of what we learned from this year's survey.

Respondents from each Province

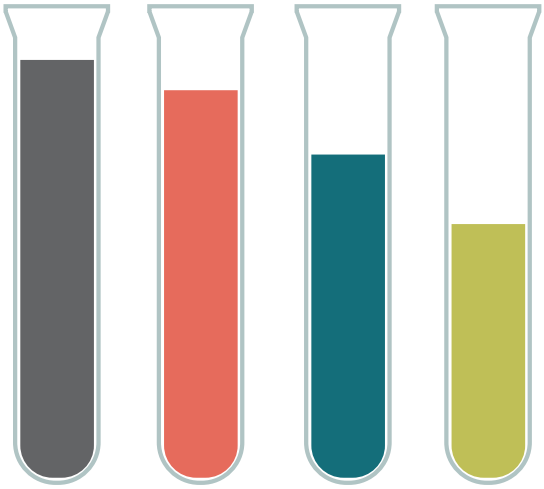
Top 5 Most Valued CSMLS Member Benefits

☆	Advocacy for the profession
🚶	Professional Liability Insurance
📖	Continuing Education & Professional Development
🔍	Access to Laboratory Standards & reference materials
🎤	Member rates for courses and events (LABCON)

Member Satisfaction with CSMLS

83%

OF RESPONDENTS ARE **SATISFIED** WITH THEIR CSMLS MEMBERSHIP



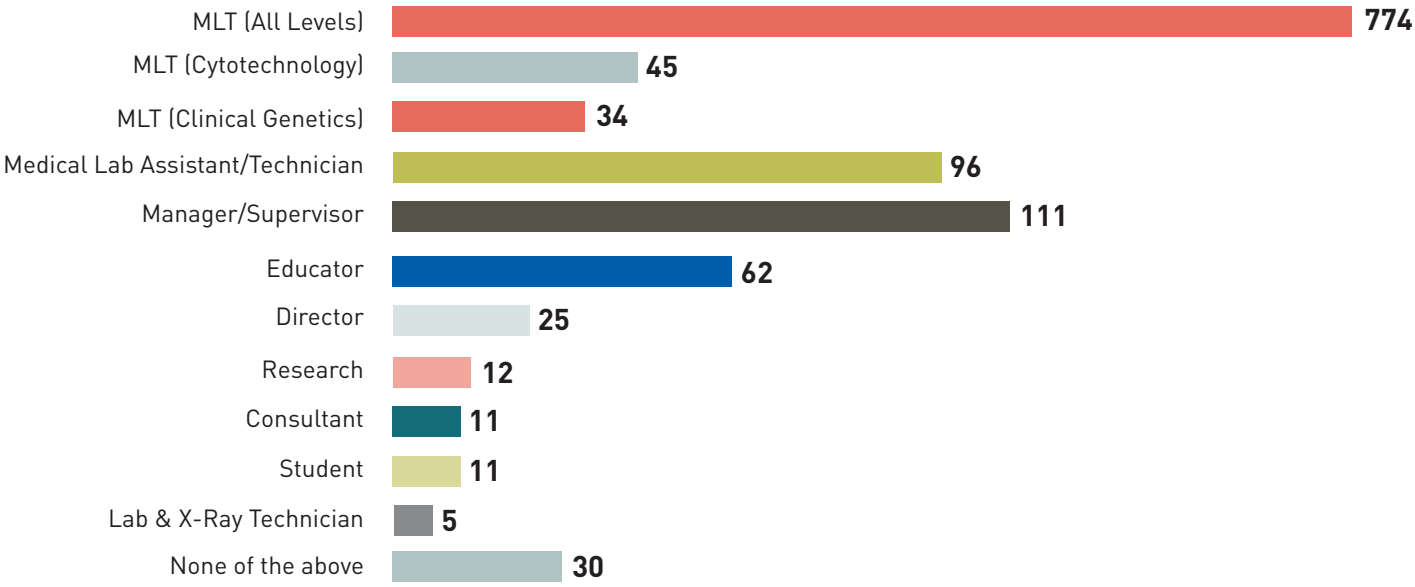
87% *agree/strongly agree*
CSMLS provides me with enough information on the state of my profession

86% *agree/strongly agree*
I feel that CSMLS sufficiently advocates on behalf of my profession

82% *agree/strongly agree*
I am satisified with the goods & services offered

77% *agree/strongly agree*
I get my money's worth with CSMLS membership

Profession



How respondents celebrated National Medical Laboratory Week

10% CREATED A DISPLAY

32% CELEBRATED WITH COLLEAGUES INSIDE THE LAB

9% CELEBRATED WITH COLLEAGUES OUSIDE THE LAB

6% ORGANIZED A LUNCH AND LEARN

4% HOSTED A LAB TOUR

3% GAVE AN INFORMATIONAL PRESENTATION

56%

CELEBRATED OR MARKED **NATIONAL MEDICAL LABORATORY WEEK** IN 2015

OUT AND ABOUT:
Sharing the Lab with Your Community

On May 12, 2015, CSMLS member Joe Costello, MLT, participated in a Career Fair at Montgomery Street Elementary School in Fredericton, New Brunswick. More than 200 children from kindergarten to grade five paraded through the school gym throughout the morning, where Joe's medical laboratory booth was one of 17 different career booths. Joe brought along a display board and a double-headed microscope for the budding scientists to experience a real-life look of a slide of normal peripheral blood. A chorus of "I see it" and "wow" rang throughout the gymnasium all morning long.

Thank you to Joe Costello for taking the opportunity to introduce the medical laboratory science to future laboratory professionals.

Have you been out and about, sharing and teaching others in your community about the medical laboratory? You may want to consider becoming a CSMLS Ambassador. Visit the Volunteer page on the CSMLS website to learn more about the Ambassador Program.

CSMLS LOCAL LAB TOURS

As part of our ongoing advocacy efforts, CSMLS continues its commitment to increase awareness for medical laboratory professionals through lab tours for Members of Parliament (MPs) in their local riding laboratories.

On July 16, 2015, Upper River Valley Hospital in Carleton County, New Brunswick, welcomed MP Mike Allen from the Conservative Party, to its laboratory, along with CSMLS President Tania Toffner. The tour gave Mr. Allen an in-depth look at the important work done in the lab.

The tours continue to be a vital part of CSMLS's advocacy campaign to bring awareness and understanding of the med lab profession directly to our federal decision makers.

Top: CSMLS President Tania Toffner, MP Mike Allen & the staff of Upper River Valley Hospital in Carleton County, NB.
Above left: MP Mike Allen looking through the microscope.
Above right: MP Mike Allen standing next to the prestigious ISO15189 PlusIQMH accreditation.

ELECTION RESULTS

On Friday, May 22, the results of the 2015 Board of Directors election were announced at the CSMLS Annual General Meeting in Montreal, QC.

We are pleased to welcome the newest members of the CSMLS Board of Directors, as voted by the members. The incoming Board members will begin their term in January of 2016.

Director, Ontario
Nancy Bergeron

Director, BC/YK
(re-elect)
Maria Klement

CSMLS Learning Services

Available Online Courses

Are you looking to expand on your education?
Take advantage of our online courses.

INTENSIVE

- Anaerobic Bacteriology Part 1: An Introduction to Anaerobic Bacteriology
- Anaerobic Bacteriology Part 2: Methods and Identification
- Infection Prevention and Control
- Liver: Physiology, Disease and Measurement of Function
- Interpretations in Clinical Chemistry
- NEW Introduction to Ethics and Professionalism for Medical Laboratory Science
- Introduction to Point-of-Care Testing
- Kidney: Physiology, Disease and Measurement of Function
- Laboratory Diagnosis of Malaria
- Laboratory Safety 1: Introduction, Overview, General Occupational Hygiene and Biosafety
- Laboratory Safety 2: Chemical and Physical Reagents
- Laboratory Safety 3: Special Subjects in Laboratory Safety
- Laboratory Safety 4: Management of Occupational Health & Safety in the Laboratory
- Lymphocytes in Disease
- Medical Mycology
- Microanatomy 1
- Microanatomy 2
- Microbiology Refresher 1: Basic Principles of Microbiology
- NEW Microbiology Refresher 2: Microbial Identification and Susceptibility Testing
- Microbiology through the Microscope
- COMING SOON Patient Focused Quality Competence
- COMING SOON Problem-Based Learning in Transfusion Medicine
- Quality Systems for the Clinical Laboratory: Part I (Introduction)
- Quality Systems for the Clinical Laboratory: Part II (Planning/Design)
- Quality Systems for the Clinical Laboratory: Part III (Implementation)
- Training in the Lab: Applying the Science of Adult Learning and Instructional Systems Design (ISD)
- Transfusion Medicine Refresher Course
- Yeasts and Actinomycetes

EXPRESS

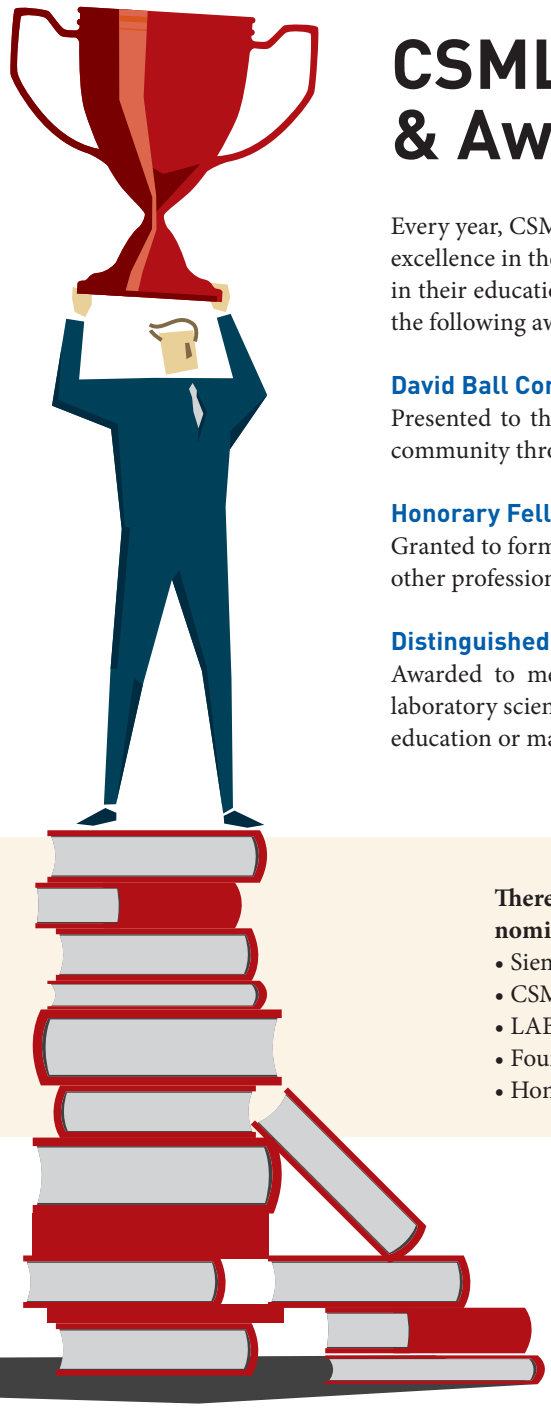
- ABC's of Hemophilia
- ABO Discrepancies: A Systematic Approach to Resolve Serological Problems
- Adverse Effects of Blood Transfusion
- Benign Disorders of Granulocytes
- Benign Disorders of Lymphocytes
- Body Fluids Cerebrospinal Fluid
- Body Fluids: Laboratory Methods
- Body Fluids: Pleural, Pericardial, Peritoneal and Amniotic Fluids
- Body Fluids: Seminal Fluid
- Body Fluids: Synovial Fluid
- Carbohydrates
- Cardiac Markers
- Case Studies: Patients with Platelet Disorders - Series One
- Case Studies: Patients with Platelet Disorders - Series Two
- Clinical Indications of Blood Components
- Clinical Significance of Sodium and Potassium in Blood
- Connective Tissue
- C-Reactive Protein
- Creutzfeldt-Jakob Disease
- Cytokines – The Interleukins
- D-Dimer
- *Enterobacteriaceae*
- *Enterobacteriaceae:* Media & Identification
- Enzymology: Part I
- Enzymology: Part II
- Erythrocyte Sedimentation Rate
- Fastidious Gram Negative Bacilli
- Fibrinolysis
- Fixation Practices
- Genetics for Blood Bankers
- Hematoxylin and Eosin (H&E) Stain
- Hemolytic Anemias
- Hemolytic Disease of the Fetus and Newborn
- Heparin Induced Thrombocytopenia
- Hepatitis A, B, D and E
- Hepatitis C
- Human Immunodeficiency Virus (HIV)
- Human T-Cell Lymphotropic Virus (HTLV)
- Hypercoagulation - Thrombophilia

- Hypochromic Anemias
- Identification and Description of Atypical (Reactive) and Abnormal Leukocyte and Platelet Morphology
- Identification and Description of Erythrocyte Morphology
- Immune System as a Protective System
- Immunology-Antigens
- Improve Your Skills in Identification of Blood Group Alloantibodies
- Introduction to Anaerobes
- Introduction to Erythrocyte Disorders and Normocytic Anemias
- Introduction to Hemostasis
- Introduction to Immunohistochemistry: Principles and Overview
- Introduction to Platelet Structure and Function
- Ischemia Modified Albumin: A New Serum Marker for Myocardial Ischemia
- Laboratory Aspects of Alcoholism
- Laboratory Aspects of Diabetes
- Laboratory Tests for Celiac Disease
- Leukocytes - Measurement of Neutrophil Function
- Lipids
- Liver, Bilirubin and Inherited Disorders of Bilirubin
- Macrocytic Anemias
- Managing Spurious Qualitative Results in Hematology
- Medical Parasitology: Cestodes of the Intestinal Tract
- Medical Parasitology: Nematodes of the Intestinal and Urogenital Tracts
- Medical Parasitology: Trematodes of the Intestinal and Urogenital Tracts
- Metabolic Diseases of the Liver
- Miscellaneous Gram Positive Rods
- Molecular Biology I: Overview of Nucleic Acid Structure and Functions
- Monoclonal Antibodies: Theory and Production
- Monocytes and Macrophages
- Natriuretic Peptides and Heart Disease
- *Neisseria* and *Moraxella*
- Non-Protein Nitrogen
- Organs of the Lymphoid System
- Other Platelet Disorders
- Overview of Common Blood Group Systems
- Pancreatitis, Amylase, Lipase and more
- Paraffin Tissue Processing
- Parasitology: Specimen Collection, Preservation and Methods of Preparation for Fecal Parasites
- Plasma Cell Dyscrasias-Myeloma
- Proteins
- Proteins, Antibodies and Immunoglobulins
- Rheumatoid Arthritis - A Guide to the Clinical and Laboratory Aspects
- Routine and "Not-So-Routine" Methods in Transfusion Science
- Serological Challenges in Pretransfusion Compatibility Testing
- *Staphylococci*
- *Streptococci*
- Theory and Mechanisms of Staining
- Thrombotic Thrombocytopenic Purpura
- *Toxoplasma gondii* and Toxoplasmosis
- Transfusion Related Acute Lung Injury (TRALI)
- Vitamin D
- Why Physicians Order Laboratory Tests: A Laboratory Perspective

FRENCH

- Biologie moléculaire I : vue d'ensemble de la structure et des fonctions d'acide nucléique
- D-dimère
- *Enterobacteriaceae*
- Gestion des résultats qualitatifs fallacieux en hématologie
- Introduction à l'hémostase
- Les aspects de l'alcoolisme en laboratoire
- Les aspects du diabète en laboratoire
- Les protéines
- Liquides organiques : liquide céphalorachidien
- Liquides organiques : méthodes de laboratoire
- Marqueurs cardiaques
- Pourquoi les médecins commandent des analyses de laboratoire
- Protéine C réactive
- *Streptococci*

learn.csmls.org



CSMLS Grants, Scholarships & Awards

Every year, CSMLS offers Grants, Scholarships and Awards to call congratulations to those who have shown excellence in their profession, to help members continue their professional development and to aid students in their education. Do you know of someone who exudes excellence in the field? Nominate them for one of the following awards:

David Ball Community Award

Presented to those who have dedicated time to make a difference and a significant contribution to their community through volunteer service.

Honorary Fellowship Award

Granted to former practising medical laboratory technologists who have gone on to distinguished careers in other professions, not limited to careers in science or medicine.

Distinguished Fellowship Award

Awarded to members who have made significant and sustained contributions to the field of medical laboratory science at the national or international level, in one of the following areas: scientific achievement, education or management/quality management/patient safety.

There are other Grants, Scholarships and Awards available for application and nomination until November 1, 2015:

- Siemens Canada Limited Student Scholarship Award
- CSMLS Student Scholarship
- LABCON Leaders of Tomorrow
- Founders' Fund – International
- Honorary Awards

For more information and to access application and nomination forms visit www.csmls.org under the Members Area tab.

AGM Minutes

The minutes from the 2015 Annual General Meeting are available on the CSMLS website.

CSMLS – THE NATIONAL VOICE OF CANADA'S MEDICAL LABORATORY PROFESSION

As the national voice of Canada's medical laboratory profession, CSMLS represents the needs and concerns of medical laboratory professionals when working with laboratory and health care-related organizations. CSMLS Board of Directors, staff and volunteers attend meetings, conferences and events on behalf of CSMLS members and the entire medical laboratory profession. Here is where your voice was heard recently:

AUGUST

Canadian Network of Agencies for Regulation (CNAR)
TORONTO, ON

SEPTEMBER

International Federation of Biomedical Laboratory Science Chief Delegates Meeting
LISBON, PORTUGAL

Conference Board of Canada - Leaders Roundtable on Immigration
STOCKHOLM, SWEDEN

Saskatchewan Society of Medical Laboratory Technologists Fall Conference
REGINA, SK

Ontario Society of Medical Technologists 2015 Conference and Trade Show
RICHMOND HILL, ON

British Columbia Society of Laboratory Science, Provincial Conference
KELOWNA, BC

Health Action Lobby (HEAL)
TELECONFERENCE

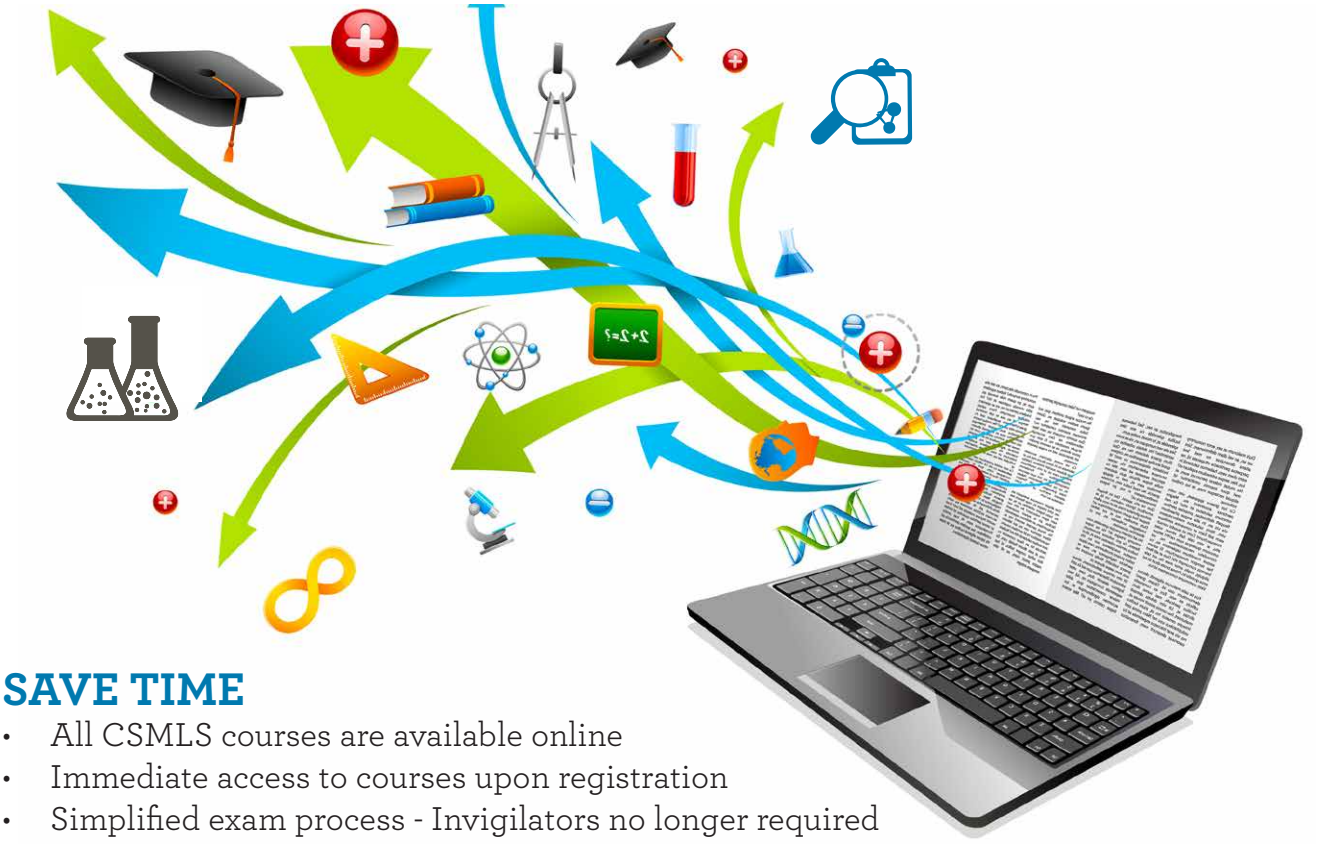
Canadian Association of Allied Health Programs Meeting
TELECONFERENCE

CSMLS SCSLM

Canadian Society for Medical Laboratory Science
Société canadienne de science de laboratoire médical

Save Time and Money with CSMLS Learning Services

Your "one-stop-shop" for professional development with education designed to fit your learning needs!



SAVE TIME

- All CSMLS courses are available online
- Immediate access to courses upon registration
- Simplified exam process - Invigilators no longer required
- Access and print your Certificate of Completion any time
- Easy to search course catalogue

SAVE MONEY

- 10 FREE COURSES available every year to members
- Free courses are changed at the beginning of each year
  (the longer you are a member, the more free courses you have access to!)
- Member pricing for all courses

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