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# Scientific Feature

## Evaluation of Plastic Blood Culture Bottle Transportation and Smudge Plate Growth

## Safety Perspective: Not my Job?

## CSMLS Code of Ethics

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## IN FOCUS



## PERSPECTIVES



## SCIENTIFIC FEATURE



## SOCIETY NEWS






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# Does this crystal ball come with a manual?

Christine Nielsen
CHIEF EXECUTIVE OFFICER

I have been on the road a fair bit this year speaking with members of the laboratory community about the future of our profession. During these presentations, I often joke that my crystal ball is sometimes a little fuzzy. Prognosticating is a nuanced art and one I haven't quite mastered yet. When I look to the future, I find more questions than I do answers. Though the questions make for delightful discussion!

Trying to predict the future of health care is fantastically challenging. Those who do this kind of thing for a living freely admit they have to hold a number of variables equal when making projections. Otherwise, there are just too many variables to account for. The reason a lot of predictions end up being inaccurate is because those variables change unexpectedly.

In our industry, technology is constantly driving change affecting what we do and how we do it. In the future, will we all be working in molecular genetics as it makes everything else we do extinct? Just like the paperless society we were promised – maybe not.

Another piece of the health care puzzle that makes for challenging forecasts is people. The patients that we serve are human beings, which makes them unpredictable almost by definition. Changes to lifestyle, diet and exercise all impact the health care they will need. Changes in expectations around one's role as a patient has fuelled the direct-to-consumer trends we see in for-profit diagnostic services like 23andMe and the rise of patient portals to directly access diagnostic results.

Case in point, according to Statistics Canada data, the number of children born to women over the age of 40 exceeded the number of children born to teenaged mothers for the first time in Canadian history in 2012. For context, according to a recent *Maclean's* article, in 1974, the older age group gave birth to 10 times fewer children than their teenaged counterparts. Big changes are afoot.

In hindsight you might think this should have been an anticipated trend, but consider the changes that led us to this point. Later marriages, changing attitudes toward contraception use, changing attitudes toward women's careers, demand for higher education, improvements in assistive reproductive therapy (ART) – the list goes on and on.

The impact on health care is not inconsequential. Differences in prenatal screening and postnatal care for the two demographics would be considerably different. Not to mention the increased demand for ART, which are now being covered or subsidized by provincial health coverage in several jurisdictions.

We are changing the equation with the choices we make. The health care we will require, or demand, will be different than the health care we are delivering today. So how can we, as a profession, prepare for a future we cannot predict? I do love these questions...

I think the answer lies in planning and constantly revisiting those plans. If we can only see so far into the horizon, we better be checking our compass repeatedly.

This is true of the Society as well. We need to stay relevant to the members we serve; meaning we need to anticipate their needs, even as they are changing. The plan we have in place to best serve our members will quickly become outdated. This is why we will be heading into strategic planning in early 2017. When that plan is developed, we will look forward again to see when it should be validated and when it should be replaced. The days of long-term, inflexible plans are gone, if they ever truly existed.

It is with this nimble approach that the CSMLS Board of Directors will set, and continue to set, the best course for the Society. Our crystal ball may be fuzzy and short on definitive answers but questions will continue to drive us forward as we strive to best serve our members.

Chris Hirtle
2016 CSMLS PRESIDENT

# Fostering our Future

This year at our professional development conference, LABCON2016 held in PEI, we honoured two members of our Society, recognizing their lifelong commitments to the profession. We honoured Bill Younger with a Distinguished Fellowship Award and Mary Golba-Bylhouwer with an Honorary Fellowship Award. You can learn more about them and their inspiring careers on page 36.

In Bill's Distinguished Fellowship Award acceptance speech, he highlighted an idea that really struck a chord with me. He spoke to the young professionals in the room, expressing his desire for them to become engaged in the profession early in their careers. In a few powerful words he pointed out, "Don't wait, don't hesitate and get involved in your profession." I believe the sentiment in this statement will resonate with many of you and not just the young professionals. Many of us feel we are not old enough, don't have enough experience, or our lives are just too busy and stressful to take on another commitment. Truly in many cases there is no ideal or perfect moment to start and no need to wait to achieve a certain status in your career. Ordinary people do extraordinary things every day. They don't wait until everything is just right because it will never be perfect. With each step you take, you grow stronger, more skilled, more self-confident, and more successful.

There were many young professionals at the conference who were attending as part of the Leaders of Tomorrow Grant. CSMLS offers these grants to help new MLT grads, MLT students and CSMLS certified MLAs attend LABCON. This is a valuable experience for these young professionals but also valuable for the veterans in the room. We all must realize that these novices are the future of this profession. The profession we have all strived so hard to move forward will now be passed on to this generation.

Although there were only a small group of these highly engaged young professionals at the conference, there are many more contributing at your workplaces. They are your students on clinical rotation and new hires entering your labs. They are your co-workers and colleagues.

What we need to do is start recognizing their passion and engagement for their chosen profession. We should celebrate the fact that they are eager and willing to learn from us and help guide them to a successful and long career.

You may not consider yourself a mentor in the formal sense, but every interaction you have with a new professional shapes their thoughts and opinions about this professional community. Let's make them positive ones.

If you are wondering how you can continue shaping the future of this profession with constructive interactions with new professionals, here are a few of the many programs worth mentioning:

- Mentorship Program
- Leaders of Tomorrow Grant
- Ambassador Program

Information about all of these programs and others are available on the website, csmls.org, as well in this issue of the *CJMLS*. Let's work together to create an engaged workforce in the future.

*You may not consider yourself a mentor in the formal sense, but every interaction you have with a new professional shapes their thoughts and opinions about this professional community.*

# 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.

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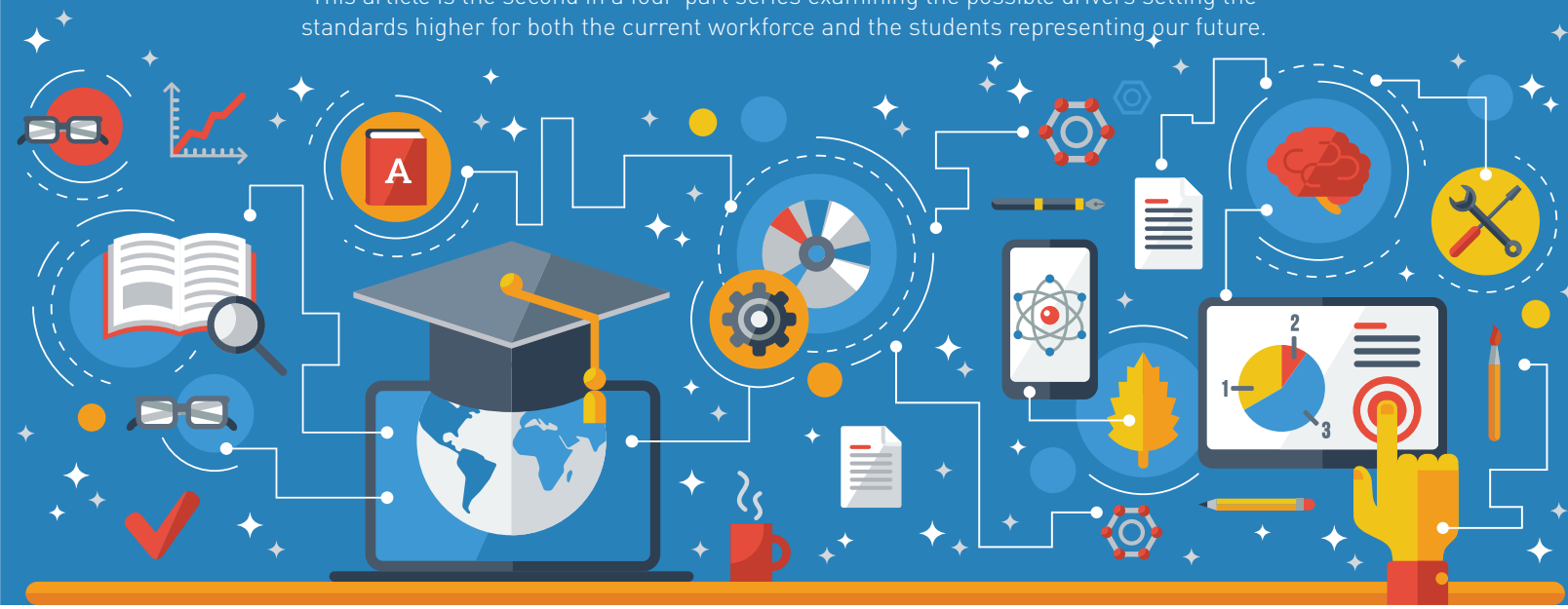
PART 2 OF 4

# CLIMATE CHANGE

## Drivers of higher professional standards in Canada

This article is the second in a four-part series examining the possible drivers setting the standards higher for both the current workforce and the students representing our future.



## Part 2: Changes for the Education System

Canada has experienced a significant economic revolution since the Second World War, spurred by large ideological shifts in concepts such as globalization, prosperity, technology, health science, and cultural openness. Examining the workforce change from the 1950s to present day, our transformation can be viewed through the movement of manual labour positions (e.g., historical forms of millwork and farming) to new employment areas requiring sophisticated education in realms of science, digital technologies, creative content, advanced manufacturing and resource extraction[1]. The number of students attending university has risen in the last 35 years to 30%[2]. Occupations requiring college education or apprenticeship training are the most prevalent group in today's workforce, accounting for approximately one-third of those able to work[3].

With this change grew a divide between academic availability (programs and seats) and job market characteristics. The risk being that "[educational] institutions may be the most important public institutions in Canada to ensure a vibrant and robust quality of life and economy," as described in a report published by the Higher Education Quality Council of Ontario (HEQCO)[4]. In all provinces, it was found that post-secondary education positively correlated with labour market success, individual earnings, citizen engagement, and contributions to the economy. The mismatch, however, can be highlighted in the Parliamentary Budget Officer's estimates that the proportion of over-qualified working university graduates (aged 25 to 34) has been on an upward trend since the early 1990s, reaching 40% in 2014. The rate of over-qualification for recent college graduates remains roughly equivalent to the mid-1990s at 34% in 2014, a consistently high value[5].

The divide has been driven by a multitude of well-intended but misdirected priorities from parents, students and governments with minimal involvement or direction from the Canadian business community[6]. HEQCO President Harvey Weingarten explains that "… trying to make all institutions to be all things to all people… offers less real choice to students, threatens rather than strengthens the unique contributions and qualities of each of our institutions and is simply not affordable for either students or taxpayers."[7] By understanding and prioritizing driving influencers of demand and supply, academic institutions can start to realign themselves and strengthen the bridge.

Let us take a moment to consider the upcoming themes as opportunity for disruptive innovation, "a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors."[8] In plain language, disruptive innovation respectfully acknowledges the status quo in the academic setting but strives for the creation of something different through incremental change. It seeks to design a product/service according to the consumer's perspective (e.g., students and employment market) versus the providers (e.g., parents and government). "By its very nature, disruptive innovation provokes organizational, professional, and cultural controversy,"[9] but it can drive greater resource and fiscal efficiency while satiating consumers. The academic health centre's mission of education, clinical care and research is "ripe for disruption" according to experts, as it is threatened by decreasing revenues and increasing expenses[10]. The same can be argued for the academic arena considering the reduction of public funding to approximately half of post-secondary education institutions' operating budgets today, a decrease of more than 90% since the 1960s[11].

The divide has been driven by a multitude of well-intended but misdirected priorities from parents, students and governments with minimal involvement or direction from the Canadian business community.

If we consider the landscape for medical laboratory science programs (MLSP; Medical Laboratory Technologists and Medical Laboratory Assistants/Technicians) the impact has affected the trajectory of the education system behind the profession, with some of the greatest pressure from information and generation–specific characteristic (students and parents). The effect of employers and governments as drivers on the academic system and profession will be discussed later in this series of articles.

## Information Drivers

The creation, acquisition and evaluation of MLSP content by educational institutions has increased in depth and breadth. It showcases the strength of the programs across time as well as the increased expectations of students for entry into the workforce.

**Creation:** Health science curricula are targeted to meet current competency requirements of given professions. Achieving the balance between concrete information and the plasticity of new knowledge is vital for academic institutions to maintain relevancy. This tightrope is difficult to walk given the velocity of discoveries and the security required to ensure evidence-based syllabi. Nonetheless, the system is in constant motion and does not wait for institutions to catch up. For example, based on new evidence or guidelines, more than 20% of core information guiding clinical practice will change within one year. Academic medicine is experiencing a doubling of medical information almost every five years[12] and laboratory technology is changing at a rapid speed[13]. The creation and integration of new knowledge within MLSPs has transformed from on-the-job training to a breadth and depth that requires higher education as noted around the world[14]. Traditional program information is trending into new territories for future competence evaluation (formal or informal). From the Norwegian perspective, biomedical laboratory scientists study all of the medical laboratory specialties, but it is expected that there will be a greater demand for individuals with a

THE PROPORTION OF OVER-QUALIFIED WORKING **UNIVERSITY** GRADUATES REACHED

**40%** IN 2014

**60.6%**

OF 26 FRESHMEN IN 2006 EXPECTED TO EARN AT LEAST A "B" AVERAGE IN COLLEGE, COMPARED TO **26.7%** IN 1967

PUBLIC FUNDING TO APPROX. HALF OF POST-SECONDARY EDUCATION INSTITUTIONS' OPERATING BUDGETS HAS DECREASED MORE THAN

**90%**

SINCE THE 1960s

specialized background in gene technology, bioinformatics, and the ability to guide and train other health personnel and users for point-of-care devices and self-monitoring[15]. Medical laboratory science programs in Canada have walked the same path and are likely to follow a similar trajectory of continued complexity and novelty within academic curricula.

**Acquisition:** In MLSPs, there is a level of consistency due to biology fundamentals and routine laboratory testing which creates an ease in exposing students to didactic and clinical learning for specific competencies (application of rote memorization). However, teaching to a delimited set of tasks only, it is possible to "risk obsolescence" as new technologies are integrated[16] (e.g., MALDI-TOF mass spectrometry) which is a concept of particular importance to the technology-driven laboratory profession. The potential risk can be demonstrated in 36% of students not demonstrating any significant improvement in learning over four years of U.S. college (various programs) on key measures of critical thinking, complex reasoning and writing[17]. If we teach students adaptive expertise (higher level learning), the ability to both efficiently use past knowledge and experiences to innovatively create new knowledge and ideas in response to novel problems[18], we can prepare students for greater success in the current climate. Such education models are more prevalent in medicine and nursing, as these professions deal more with direct patient care. However, the application of adaptive expertise training in MLSPs can be seen. As a simple example, laboratory information systems differ across the nation; however, there is a routine and mandatory set of overarching processes to entering information. If we teach to the process logic rather than where the "button" is located, we can enable students to learn more complex adaptive skills. Such mechanisms of teaching can be applied to highly dynamic and complex environments such as the hospital setting during clinical placements. "The key is that how we teach students is probably as, if not more, important than what we teach."[19]

To a certain extent, programs must be naturally integrating this concept into practice due to the maintained relevance of MLSPs and accreditation continuation. As the profession transforms further into informational leaders taking a more visible role (as discussed in Part 1 of this series), the way in which students acquire knowledge through reformed teaching models will continue to drive the profession forward.

**Evaluation:** There is a general trend in Canada[20] and the United States since the late 1980s for an increase in the number of high grades, referred to as "grade inflation". Only 1.3% of entering freshmen in a 2006 report were obtaining a C average in high school compared with 8.6% in 1966. Moreover, upon college entry, 60.6% of 26 freshmen in 2006 stated that they expect to earn at least a B average in college compared to only 26.7% in 1967. Demographic considerations such as older students entering college for the first time, parental income steadily increasing among entering freshmen, the increased interest in biological and health science on the rise (mainly women)[21] are generally accounted for in such statistics. Although medical laboratory science program data was not identifiable, it is likely that a similar involuntary trend has existed given the consistency across diverse programs (an area for potential research). Grade inflation does not propel a profession forward though. In fact, it can hamper or mask true growth instead. Nonetheless, it facilitates the importance of evaluation for knowledge, skills, ability and judgement of students and should open discussion from local, provincial and national competency representatives.

## Generational Drivers

The impact of parental values and expectations coupled with defining generational characteristics have resulted in a student transformation which demands higher quality experience from academic institutions while altering their personal investments from previous generations. Parental investment, emotional and fiscal, has also brought forth an additional dynamism as they are providing greater support for their school-aged children than ever before.

**Student Characteristics:** Students have changed as proven through research and reflections of generational characteristic

**42%**

OF CANADIANS UNDER 30 YEARS OLD STILL LIVE IN THEIR PARENTS' HOME.

A **15%** INCREASE SINCE 1981.

FROM 1990 TO 2014, THE NATIONAL AVERAGE TUITION FEE HAS SEEN AN INFLATION-ADJUSTED INCREASE OF MORE THAN

**155%**

models.[22] Millennial students are better informed, have greater access to immediate information, feel deserving and expect more from others in producing quality experiences. In relation to the academic setting, these new student characteristics promote greater dependence on the education system than in previous years. These students want to be "emotionally supported" during their undergraduate education (as partially demonstrated by the rise of mental health and support initiatives in academic settings) and no longer accept the academic institution as defining the standard but rather feel that they should.[23] However, their demands foster deeper relationships and knowledge acquisition that promote academic achievements and heighten standards. Graduates who reported having at least one professor who made them excited about learning, cared about them and provided mentorship as they pursued their goals, had more than double the chance of having a positive personal life and feeling engaged in their work. The current student who also thirsts for and thrives on experiential or deep learning such as term-long projects, research experience in a lab, experiencing mentored internships or community-based projects is twice as likely to be engaged in work. MLSPs are shifting to new education models that foster such requirements. In response, the driver produces students with hard skill acquisition but also important, greater soft skills[24] acquisition, the more valued trait required by employers.[25]

**Parental Characteristics:** As Generation X sees their children go through higher education programs, the work ethic and values they have are superimposed on their child's experience in school. Gen Xers want structure and direction but are sceptical. They see work as a difficult challenge and as a result are expecting the same experience for their children. With a leadership style of asking "why" and valuing entrepreneurial interactions, they want to ensure their children succeed in a manner that is unprecedented in previous generations. In fact, parental expectations for children are a viable predictor of post-secondary aspirations in children.[26] The extent and form of parental involvement is strongly influenced by family social class, maternal level of education, material deprivation, maternal psycho-social health and single parent status.

Also, the higher the level of academic attainment by students, the more parents get involved.[27] Given the rise of students entering MLSPs with prior degrees, it can be speculated that parents are greatly involved in the academic settings more and more, in line with general trends. In addition, there is an increase in parents providing funding and accommodations (pre, peri and post-schooling), increasing their investment in their children's education outcome.[28] As an example, 42% of Canadians under 30 years old still live in their parents' home and is projected to continue rising, which is a substantial increase from 15% in 1981. From 1990 to 2014, the national average tuition fee has seen an inflation-adjusted increase of more than 155%.[29] All characteristics combined result in parental expectations and pressure that academic programs provide value and future prosperity for their students to repay for their sacrifices.

## Conclusion

The education by MLSPs today is increasingly superior to times before, as key information and generational drivers contribute to shape the pathway forward, in addition to employer and government expectations. Supported by educators and administration, educational redesign using futurist models must continue with an understanding of the changing professional identity and needs of the health care system. An alignment between these realms is imperative moving forward.

LAURA ZYCHLA
Researcher, CSMLS

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# 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 STUDENT PERSPECTIVE

# LABCON2016: Opportunity to Learn

When I reflect on my three-day experience at LABCON2016 in Charlottetown earlier this year, the first things that come to mind aren't necessarily how delicious the lobster tasted on the east coast or how refreshing an ocean breeze can feel. Rather, as a second year medical laboratory science student attending LABCON for the very first time, what I recall most vividly is how LABCON was nothing short of a transformational learning experience.

Every day was packed with interesting and informative plenary and educational sessions. These provided me with new knowledge of the latest research and innovations in medical laboratory science and an understanding of the critical issues and challenges facing the future of the medical laboratory community and profession. One of my favourite sessions, *From Bench to Business*, allowed me to hear the ways people's careers evolved to combine medical laboratory science and business in ways that I would never have thought were possible. Sessions and debates on legal and ethical issues, such as whether or not individuals should be able to order their own lab tests, challenged me to think critically about the implications of laboratory medicine. If there was anything I disliked about LABCON, it was that since the sessions were held simultaneously I did not have the opportunity to attend more of them!

In the evening, social events including *Dine Around with the Board of Directors* and the *President's Dinner* provided me with the opportunity to not only network with other medical laboratory professionals in a relaxed environment, but allowed me to focus on making meaningful connections with people from every corner of the country. Although it felt a little intimidating to approach others at first, I was grateful for how many opportunities there were to meet new people and how welcoming everyone – particularly the Canadian Society for Medical Laboratory Science (CSMLS) board of directors, staff, and volunteers – made me feel during the events. Listening to other's stories about their careers, the projects that they were undertaking, and their passion for volunteering abroad in countries like Haiti, left me with a sense of admiration and awe. I also appreciated the chance to visit the exhibitors' displays and explore new and innovative technology and instruments.

I sincerely thank the CSMLS for awarding me with the Leaders of Tomorrow Grant to attend LABCON2016. As a student, the value of LABCON lies not only in being able to learn from the speakers and connect with others across the country, but also in providing me with the belief that I, too, have the capacity to make a meaningful contribution to the profession, just like many others whom I had the pleasure of meeting during the conference. My experience at LABCON2016 has empowered and inspired me early on in my career to strive to become an active, engaged and responsible member of the medical laboratory community.

LABCON has taught me not only to recognize the critical work that medical laboratory professionals do, but also to realize how much more work there is that needs to be done – with respect to mental health, interprofessional collaboration, advocacy for the profession and many other areas – and how important it is for young professionals like myself to get involved early on. I highly encourage everyone, especially students and new medical laboratory professionals, to attend LABCON. As a student embarking on the beginning of her career, I certainly do not know what my future holds, but LABCON2016 left me with a sense of wonder and enthusiasm about a future that I have never been so excited to live out. ■

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A VENDOR PERSPECTIVE

# Managing Pathology Projects For Success

**A successful project is a masterpiece of co-ordinated effort. It is about mastering paradox and managing trade-offs using a particular mindset, skillset and attitude.**

We are all good at discovering, in hindsight, why projects go wrong. Organizations that have experienced failure usually react by establishing tighter controls and procedures that require closer adherence to standards and stricter financial guidelines.

In prior decades, emergent tests and technologies proliferated, while costs were not a major factor. The focus was on assay quality and market share. Now, the focus is government-driven cost containment while clients demand service. Laboratory clients and payers are obsessed with the transactional cost of the service without assessing the true cost-benefit-value of laboratory diagnostics. Real savings come from standardization, automation and systemization using convergence technologies.

Service delivery hubs and outsourcing relationships use technology to enable system-to- system transfer of data, using the Internet, the "cloud" and expert decision tools. These changes are complex with a demand for results. How can we deliver?

Project management is an art, an attitude and a *modus operandi*. It is a one-time activity, with a well-defined set of results. Interdependent tasks require a co-ordinated approach. The complexities and multidisciplinary aspects of projects require that many parts be put together to meet the prime objectives. They are:

- **Quality:** meeting customer expectations
- **Time:** meeting schedule requirements
- **Cost:** use of time and cost of people, capital and overhead

A project is comprised of people and material resources predicated on four key assumptions:

| | |
|---|---|
| **REALITY** | Project planning reflects the realities of the tasks and the participants. |
| **TEAMWORK** | No individual can be successful without support from other participants. |
| **OWNERSHIP** | Plans are not successful, people are! |
| **ADAPTABILITY** | The plan establishes visible relationships between activities. |

**Eight Steps to Project Management are:**

| Step | What (input/output) | How |
|---|---|---|
| 1. Develop Project Charter | Everyone is focused on the same outcome | • Identify stakeholders/requirements<br>• Determine project scope<br>• Set goals<br>• Determine success criteria<br>• Identify key assumptions, constraints, barriers |
| 2. Select Players | The right players are selected, at the right time, performing the right activities | • Identify functions, place right players with the right skills and attitudes<br>• Prepare the project structure |
| 3. Identify Actions Required | All tasks and activities are completed on time and each participant knows their role | • Identify all actions<br>• Develop team mandate, goals, deliverables<br>• Develop Gantt/Milestone charts |
| 4. Identify Critical Supplier Relationships | Transactions are successfully managed amongst the parties | • Identify critical steps or activities<br>• Identify suppliers |
| 5. Develop Performance Indicators | Activities are completed successfully and monitored in real time | • Set performance indicators<br>• Use tracking system |
| 6. Develop Monitoring and Feedback Loops | All relevant groups get accurate information when needed | • Use:<br>- formal/informal communications<br>- a project review format<br>- a System Change Review process |
| 7. Manage Risk | Unexpected problems are minimized | • Identify areas of significant risk<br>• Develop preventative/contingent scenarios |
| 8. Develop Performance Management Strategy | Successful individual and team performance is assured | • Garner staff assignments<br>• Provide feedback on project performance |

The selection of a Project Manager (PM) is a crucial element to success. The PM must be experienced, dedicated and calm, competent at defining the scope of work and the timing while acting as a clearinghouse for issues. Key skills include persuasion, systems thinking, flexibility, ability to deal with organizational politics, presenting and obtaining trade-offs, rigorous planning and review. The PM focuses on results, is intolerant of delays and is able to communicate at all levels in the organization.

The role of paradox is important. Tom Peters, business writer and author of *In Search of Excellence*, sees Project Management as:

- Seeing the big picture and the small detail;
- Holding autocrat/delegator roles dependent on the circumstances;
- Handling complexity while keeping the rules simple; and
- Providing inspirational leadership one moment and detailed management planning the next.

## Conclusion

Project Management and a supportive and competent PM allows for more flexibility enabling organizations to deliver complex projects on time and on budget that meet client expectations and specifications. This is not only possible, it is realistic and achievable. The acquisition or development of these skill sets within an organization allows personal opportunity for growth and partnership. J

*This article was submitted by In-Common Laboratories. In-Common Laboratories was established in 1967 by the Laboratory and Medical Directors at three Ontario hospitals, as requested by the Ministry of Health and Long-Term Care. The concept was and still is, hospital laboratories working together or 'in common' to share resources, rather than every hospital performing all medical lab tests ordered and incurring substantial expenses. In-Common Laboratories (ICL) is a not-for-profit Canadian corporation governed by a Board, operating independently of any hospital or government agency. The value rests in the single-sourcing of any lab test, enabling both clients and suppliers to use resources wisely.*

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A SAFETY PERSPECTIVE

# Not My Job?

Safety officers often complain that there are very good policies and procedures in place, but they are not being followed; laboratory staff are not wearing some of the required personal protective equipment and staff may not be respecting the contaminated/uncontaminated rules. In some cases, safety rules have been "relaxed" for the more administrative tasks.

Legislation in all provinces holds the employer responsible for ensuring a healthy and safe work environment. Some employers believe they can delegate this responsibility to a committee or to an individual or department, thereby effectively limiting organizational responsibility. Over the past several years, numerous court cases have proven otherwise; the organization cannot effectively absolve itself of its legal responsibilities by delegating them to someone else. Safety officers are generally in advisory positions. They are technical experts who can assist an organization by interpreting legislation and providing training and advice. They generally do not control major budgets to ensure that safe work procedures could be followed, that safety equipment is purchased and that training can be provided. Managers make the budgetary decisions. Managers also determine what rules and policies they enforce. Permitting safety hazards to exist (whether physical hazards or unsafe work procedures) is a management decision. Remaining silent on safety issues implies acceptance of the status quo.

The job of a laboratory supervisor or manager is very complex and demanding. It includes managing tight budgets, dealing with multiple personality types in staff, ensuring quality control for laboratory results, meeting sometimes unrealistic deadlines and timeframes in which to complete work, keeping

up to date with technical, administrative and management issues, and ensuring the health and safety of all staff. Safety officers and committees can assist the manager by providing information and advice, but ultimately the manager is accountable for setting and enforcing rules. A good rule of thumb is if you're not prepared to enforce a rule (with disciplinary action), get rid of the rule. There is no value in giving conflicting messages to employees (with "real" enforced rules and "lip service" unenforced rules). Managers are sometimes reluctant to enforce safety rules. Employees often believe that the risk is not high enough to warrant specific precautions and will argue the issue with management. Managers are sometimes relieved when staff don't demand the latest or more effective protective equipment, as it helps them to keep within their budget. Some managers themselves are sometimes not convinced of the value of certain safety precautions or rules, and do not want to "police" employees on practices they don't believe are critical. Some managers also don't want to babysit employees when they believe that safety precautions are common sense and the employees should be trying to protect themselves. All of these reasons (and probably many more) factor into the enforcement of decisions. The repercussions of not enforcing safety rules are many and serious.

- Unenforced rules are quickly assumed to be unimportant by most workers and encourage widespread disregard for the rules.
- Those following the rules are sometimes seen in a negative light by those who don't ("goody two-shoes").
- Supervisors, managers and senior executives can be held morally and criminally negligent should an incident occur which could have been prevented.
- Laboratory workers who do not follow safety rules may cause injury or illness to themselves or to co-workers.

If supervisors and managers do not heed their moral and legal responsibilities for safety, the workplace becomes a more dangerous environment. Supervisors and managers should assess their own behaviours related to health and safety, ensure that they understand and support the safe working procedures and safety rules, ensure they communicate and train staff to work safely, and visibly enforce safety rules.

All laboratory workers are responsible for following safety rules and safe work practices, wearing the appropriate protective equipment, reporting all safety hazards and incidents to supervisors and co-operating in creating and maintaining a safe work environment. Peer pressure to work safely is sometimes an even stronger motivator to improve safety behaviour.

The accountability to ensure a healthy and safe work environment rests with the employer, but all levels of workers and management have roles and responsibilities, making this a total team effort.

Managers make the budgetary decisions. Managers also determine what rules and policies they enforce. Permitting safety hazards to exist (whether physical hazards or unsafe work procedures) is a management decision.

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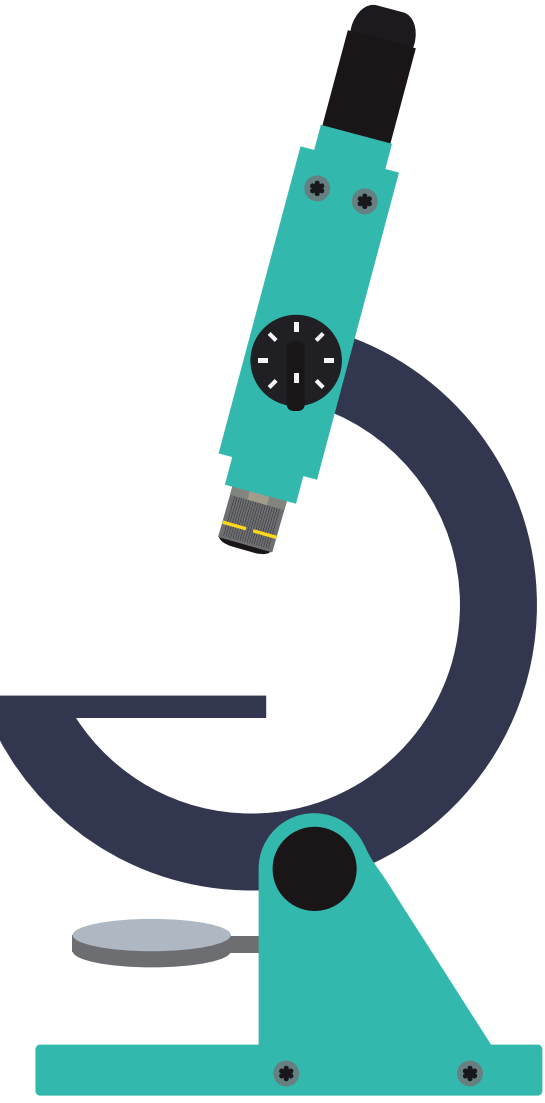
AN EDUCATOR'S PERSPECTIVE

# Should we Grant Individuals Direct Access to Laboratory Testing?



In some countries, citizens are allowed to order diagnostic tests from a laboratory without needing a doctor's requisition. This practice is currently not available in Canada, where physicians, and increasingly other health professionals, such as pharmacists, are necessary for access to diagnostic testing. However, there is already a precedent for offering testing outside of the formal health care system via at-home testing kits ordered online, and private companies offering genetic testing that have existed for some time. Is this all leading to a reality where people can order their own tests directly from the laboratory in Canada?

Recently at LABCON2016, we tackled this topic in a debate format. Valentin "Tino" Villatoro argued that, yes, we should allow direct access to laboratory test ordering. Amanda VanSpronsen argued against this. In a series of rebuttals, we outlined our best cases, and allowed the audience to choose the winner. In a twist, there was no definitive winner – the audience was torn, and it's clear that this debate is going to persist in the laboratory medicine profession, as perhaps it should.

Given the interest that this topic has generated both before and after our debate, we were invited to continue the discussion. Through a series of conversations below, we share our experience and reflections along with reactions from attendees of LABCON2016.

## The Elevator Speech

**Valentin Villatoro:** I think that direct access to laboratory testing provides us with a unique opportunity to help shift the focus of care from a physician-centred approach to a patient-centred model. I see a trend of increasing demand for access to information from an increasingly health-literate public, suggesting they want to be proactive and engaged when it comes to their health. There is also mounting evidence that shows that engaged patients have improved health outcomes and a better quality of life. There are also issues with the current model, which relies on passive patients, jumping through multiple hoops for care.

It's extremely inefficient to make people wait in multiple waiting rooms for a requisition from their doctor, have testing done at the lab, and follow-up appointments for their results. Many results are delayed, or not followed-up at all, and patients are often left wondering what it was all for. Physician ordering habits have also shown that there is a lot of room for improvement in the area of laboratory utilization. I believe that the growing population of chronically ill, such as diabetic patients, stand to gain the most from access to testing as it allows them to self-manage their illness, which has benefits for many. There is also a suggestion that doctor-patient relationships can be strengthened when patients are armed with knowledge about their own bodies, and consult their health care provider regarding their results. Everyone has the right to the pursuit of healthiness and this is a step in that direction.

**Amanda VanSpronsen:** I want to clearly illustrate that using diagnostic tests to inform medical decisions is so complex that even the experts make mistakes. I worry that it is a task unsuitable, even dangerous, for the layperson. Testing itself can cause harm - there is uncertainty in our numbers, reference ranges overlap and change, there are analytical limitations, and both the choice and timing of tests has to be correct - all of these factors contribute to false negatives,

false positives, or results that are otherwise meaningless or misleading. False negatives can lead to a false sense of security, and false positives cause anxiety and stress, and usually obligate a person to act, sometimes making a change in how they live or starting a medication.

Medications don't work well in people who don't need it, but they still cause side effects! The harms can get much worse than that – just look at the diagnostic cascade some men unnecessarily go down because of unreliable prostate cancer screening with frequent adverse effects. There are also social, financial and ethical factors to consider. Who would pay for this? What are the ramifications on patient privacy? How do we make this a fair and accessible system? How do we prevent private industry and other dubiously credentialed individuals from exploiting it? It would be opening a huge can of worms and I ultimately argued that any potential benefit was not worth certain risks.

## Interpretation

**Villatoro:** From my perspective, the most difficult argument to counter is the thought of the average lay-person ordering and interpreting their own lab tests. It's difficult for us lab professionals to wrap our heads around how this would work, as we can all probably think of someone in our lives who would probably abuse this, or be ill-equipped to handle this responsibility.

**VanSpronsen:** I think that we could also head down a slippery slope of starting to expect this from our patients, which isn't fair, especially when someone is ill and vulnerable.

**Villatoro:** However, I think we need to realize that health literacy amongst the general public is improving, and fueling the demand for more information. We need to give the public more credit.

**VanSpronsen:** Do we, really? I think it's important to recognize our perspective as lab professionals. We have a level of health literacy that is quite high, which might make it tough to appreciate what the public does and doesn't know, or is and isn't capable of, or what type of misinformation or deceptive advertising they may be susceptible to. This also might blur the distinction between passing trends and actual good ideas!

**Villatoro:** I think there is reason to believe that people want to inform themselves about their health and how to make healthy life choices, and access to lab testing is an extension of that. I don't think direct access to testing would be for everyone, but there's a substantial population of patients that would benefit from this type of access, and the health care system stands to gain from this as well.

**VanSpronsen:** I don't know – laboratory results are tremendously nuanced – it's tough to come up with many examples where a single test or a standardized panel is interpretable outside a lot of other factors. However, I think that the best example you gave was with diabetes. I'll concede that there might be benefit there, particularly since the lab can offer something much more reliable, and less painful, than point-of-care.

## Public Profile (#Exposure)

**VanSpronsen:** During the debate, you (Tino) gave us a really compelling vision of what laboratory services could look like under a model of direct access – you painted a picture of a close collaboration with the patient, heightened public profile, and a chance for the laboratory to seize control over ordering guidelines. As a laboratory professional myself, who is passionate about our profession, that "dream" really spoke to me. I found myself really getting caught up in that.

**Villatoro:** Knowing that this debate was going to be presented to mainly a lab audience, I felt that I really had to make this point clear. Increasing direct access to laboratory testing is an opportunity to raise our public profile because we would be interacting directly with the public. We might even expand our scope of practice. The expertise found in the lab spans such a wide range – MLAs, MLTs, lab scientists, pathologists, clinical chemists – these could all be used to a greater scope.

**VanSpronsen:** We need to be cautious. I fear that the conditions where this idealized

scenario would be the most likely outcome are incredibly stringent, and if we don't get it right, it could lead to even bigger problems.

**Villatoro:** Like what?

**VanSpronsen:** The opposite! Decreased profile of the lab, less respect for our profession. Even though we probably don't want to admit it, we simply do not have a good handle on the relationship between our testing results and clinical meaning in far too many cases, particularly in people who are otherwise well. There is more and more research demonstrating that more tests aren't better, and "routine" or annual wellness testing as a blanket recommendation is faulty. If people start ordering tests for themselves, only to find them of little value, there could be a backlash, and we in the lab would just look foolishly opportunistic. As one example, private companies in the United States are pushing low-value tests such as the ESR or Chloride on an unwitting public. Laboratory services in Canada are already highly privatized in many jurisdictions and I'm concerned about how easy a system of direct access would be to take advantage of, encouraging a lot of unnecessary or meaningless testing.

**Villatoro:** I agree that private interests would need to be carefully managed. I hope that our system is different enough that we can start from a better place with more oversight and higher assurances of quality. However, with the responsibility of ordering their own lab tests, I believe that individuals would want to be well informed. The laboratory can be the source of high quality information, providing support for test result interpretation beyond a number and a reference range. We can publish ordering guidelines, describe the utility of tests in certain conditions, list sources of interference, highlight the risks of testing, and factors that affect test results, etc.

**VanSpronsen:** There's still so much work to do in order to make our information more understandable and valuable for health practitioners, let alone patients. Why can't we be that source of information without allowing direct patient access?

**Villatoro:** Well, one reason is that the current physician-centred model rests this responsibility on doctors, whose time and resources are already stretched thin.

## Funding: Show Me the Money

**Villatoro:** The fact that we have a publically funded system is a very important point to make, as this type of access to testing is currently paid for by individuals in jurisdictions where it is allowed. I wanted to propose a model that could work within the context of a publicly funded health care system, and came across the "personal budget" approach used in the UK for adult social care. People enrolled in this program are told up-front how much money is available for them, and get to decide how much control they want over how it's spent. More research needs to be done, but I've read that initial testing of this approach has shown improved delivery of services, improved satisfaction, and most importantly, lower costs.

**VanSpronsen:** The choices people need to make there are very different. In this personal budgeting example, individuals are allocating their dollars toward social needs, like housing, which is radically different than deciding how to prioritize your dollars with laboratory testing. I think ultimately the public will have to foot the bill for this testing, and the follow-up testing that will naturally come with it. As well, who is going to pay for all of the confirmatory testing when people go to their doctor with results that are inappropriate or otherwise meaningless because they were ordered without justification, or at the wrong time?

**Villatoro:** This points to the need for careful oversight. This shouldn't be a free-for-all. There is also the potential for cost-savings. Reducing initial and follow-up appointments, especially for chronically ill patients, and better-utilizing other health care providers would free up physician resources to do what they do best: care for the acutely ill. With the lab guiding what tests are ordered and in what frequency, we can finally reign-in inappropriate lab testing by cutting out the middle-man and putting emphasis on evidence-based, value-added testing.

**VanSpronsen:** Here's an issue that we agree on – improving laboratory utilization. However, I think this is urgent – something that we need to focus on right now. Overall, a better use of our time and energy is funding research into the impacts of all testing processes on all relevant clinical outcomes, and building this into the day-to-day of how we work. The bonus of keeping it within the traditional ordering model is that we avoid potential harms that I've already outlined.

**Villatoro:** It's definitely work that should start now, but will flourish within a system of improved access to lab testing. This change could spur innovation in technology to help us better understand the complex nature of testing and diagnosis, and powerful computers and new apps are needed to handle the vast amount of information we can glean not only from lab testing, but wearables such as heart rate and activity monitors.

**VanSpronsen:** Let's just not lose sight of the fact that it takes more than having a laboratory result in order to make meaningful change in our lives. Lots of other types of support are needed, especially if sustained lifestyle changes are necessary. Reading a number on a screen probably isn't going to help someone change their diet, but a whole team of dedicated health providers might, so we need to be careful not to overstate any potential benefits.

## Crowdsourcing

**VanSpronsen:** It was interesting to see which part of my arguments hit home the

strongest. In one of my rebuttals I voiced my concerns about accessibility. I am concerned that people with low socioeconomic status, newcomers to our country, or other marginalized groups will not be able to equitably access a system of direct ordering, nor will they have access to the same resources needed in order to understand what they need, why they need it, and what it means. This sentiment resonated with more people than I expected, and it also came across in some of the questions from the floor, such as "what if you don't have a family doctor to talk about your laboratory results with?" or "what if you don't have access to the internet?"

**Villatoro:** One person approached me after the debate and told me that I had unexpectedly swayed her to my side. She said that she had been a lab tech for many years and remembered the talk that revolved around point of care testing (POCT) when she was a new graduate. She said that the lab really missed the boat on POCT, and now, years later, we're still struggling to regain control and oversight. She drew parallels to our debate, and felt that the laboratory really needed to lead the way in allowing direct access to testing in a responsible, evidence-based approach. In the debate, I brought up how other health professions are expanding their scope of practice, and even performing limited POCT, like pharmacists performing "flu screens" with influenza testing kits. Basically, if we don't take the lead, someone else will.

**VanSpronsen:** People who weren't there probably don't know that we polled the audience both before and after the debate. Let's talk about that!

**Villatoro:** One thing that surprised me with our poll prior to the debate was that no one was on the fence. Everyone was either "for" or "against", on different points of the spectrum. I didn't anticipate that, though there was definitely more people opposed to the idea.

**VanSpronsen:** The audience was split, but weighted in my favour. It started at 66% against a system of direct access, and ended up at 64% still against, but with 5% on the fence.

**Villatoro:** (laughs) Hey, doesn't that mean that I won? I pulled some people away from their "against" position! Though, what was most satisfying for me was to hear people say afterwards: "I already had an idea that I was for/against, but you guys made me think of arguments I hadn't even thought of." We both wanted to be thought-provoking, to have people leave the room unsure of where they stood, but eager to discuss the debate with their friends and colleagues.

**VanSpronsen:** A couple of the audience members mentioned that they voted against me because I stood for the status quo, and they think that something substantial needs to change. I think that many in our profession have a sense that the current way of doing business hasn't overtly led to what we've all hoped for: a vibrant profession that is well integrated and valued in the health care team. This desire for change needs to be carefully managed. One of the points that I brought up in the debate was that allowing direct access could increase the distance of both the patient and the laboratory from the health care team.

**Villatoro:** We'll have to agree to disagree on that point. I think that the drive to form health care teams, with the patient at the centre, is finally starting to be realized. Much like a patient going to the physiotherapist doesn't mean that the patient is set adrift, it shouldn't mean that going to the laboratory on their own creates disconnection either. Teams aren't static – they are dynamic and flexible, and there is so much more technology to support that type of model. Care customization and treating people like individuals rather than averages is being increasingly recognized as the way forward for health care, and I think that offering direct access could be a catalyst for this.

## Final Thoughts

**VanSpronsen:** If direct ordering by the public does come to pass, I do hope that we in the lab really put in the time to comprehensively explore what our role should be and how we can act in a way that minimizes harm to the patient. I think that one of the general themes regardless of how you feel is that there needs to be more laboratory oversight of how, what and why tests are ordered, and an increased focus on how we can improve information interpretation and integration for the entire health care team, including the patient.

**Villatoro:** While I see a lot of benefits to direct access, I hope it doesn't happen tomorrow. There's a lot of ground to cover before we can make this something that is viable, fair and safe. I think it's vital that we are having conversations now and continue to have conversations about how we can capitalize on the expertise that we have at all levels in the laboratory.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LAB CON 2017

# SCIENTIFIC SECTION

## Evaluation of Plastic Blood Culture Bottle Transportation and Smudge Plate Growth pg.24-29

# Evaluation of Plastic Blood Culture Bottle Transportation and Smudge Plate Growth

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Peterborough Regional Health Centre

## ABSTRACT

Blood cultures are collected for the diagnosis of bacteremia. Glass bottles were previously used at the Peterborough Regional Health Centre, however, plastic bottles have now been validated. The transport of plastic bottles through the pneumatic tube system and the preparation of smudge plates need to be evaluated. Simulated blood cultures were created using plastic bottles inoculated with common blood culture isolates (n=10). A standardized amount of each isolate was inoculated into five bottles: one set was walked to the laboratory (reference method), another set transported through the pneumatic tube system (test method), and one additional uninoculated bottle for a sterility control. The growths of reference and test bottles in the BD BACTEC™ Blood Culture System were examined. With each positive blood culture bottle, smudge (test method) and regular culture (reference method) plates were prepared, and growths were used to perform identifications on the Vitek Mass Spectrometer. From the data, it was determined that the differences in growth between the transportation methods were not significant (p=0.0595). In addition, most test isolates gave acceptable confidences (>98.0 %) after two hours of growth, determining that the pneumatic tube system and smudge plates are acceptable for an earlier identification of blood culture pathogens.
*Keywords: bacteremia, validation studies, microbiology*

## INTRODUCTION

Bacteremia is defined as the presence of bacteria in the blood, which can originate from the respiratory system, urinary tract, abdomen and central venous catheters[1]. Sepsis results from the body responding to severe infection, such as bacteremia. Between 2008 and 2009, sepsis accounted for 10.9% of hospital deaths in Canadian hospitals, typically affecting older adults and young children[2]. Blood cultures are the gold standard in identifying pathogens involved in bacteremia. These specimens are collected whenever patients have localized infections or possible endocarditis, experience fever or chills, or demonstrate leukocytosis[1]. Blood cultures were previously collected using glass bottles and walked to the laboratory at the Peterborough Regional Health Centre (PRHC). However, new plastic bottles have been validated for use in the BD BACTEC 9120/9240 Blood Culture System and now need to be validated for transport through the hospital's pneumatic tube system (PTS) (test method) to determine whether the growth times are significantly different compared to blood culture bottles walked to the laboratory (reference method). In addition, the use of smudge plates for the earlier presumptive identification of blood culture pathogens must be investigated. Smudge plates are prepared on growth media using a concentrated amount of organism, in order to obtain an adequate inoculum for an early identification. Smudge plates are made by centrifuging 3.0 mL of a blood culture in a serum separator tube. The sediment is streaked in three directions to obtain a confluent lawn of growth. From smudge plate growths, positive identifications of organisms can be made on the Vitek Mass Spectrometer (MS). The use of 2 and 4 hour smudge plate growths (test method) will be evaluated against the current blood culture specimen workup procedure at PRHC of 4 and 24 hour plate cultures (reference method)[3]. The aim of this study are to implement the pneumatic tube system in

Table 1
**Test Isolates and Growth Conditions**

| Isolate | ATCC Strain | Growth Characteristics | Media | Incubation Conditions |
|---|---|---|---|---|
| *Escherichia coli* | 35218 | Non-fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Haemophilus influenzae* | 10211 | Fastidious Facultative Anaerobe | Chocolate Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Staphylococcus aureus* | 25923 | Non-fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Candida albicans* | 14053 | Non-fastidious Strict Aerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Pseudomonas aeruginosa* | 27853 | Non-fastidious Strict Aerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Streptococcus pyogenes* | 12384 | Non-fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Klebsiella pneumoniae* | 700603 | Non-fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Streptococcus pneumoniae* | 49619 | Fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Enterococcus faecalis* | 29212 | Non-fastidious Facultative Anaerobe | Columbia Blood Agar | 37°C in $O_2$ with 5-10% $CO_2$ for 12-24 hours |
| *Bacteroides fragilis* | 25285 | Strict Anaerobe | Brucella Agar | 37°C in Anaerobic Pouch for 48 hours |

the transport of blood culture bottles, and the 2 hour smudge plate growth into the blood culture specimen workup procedure at the PRHC microbiology laboratory in order to yield earlier presumptive identifications of blood culture pathogens.

## MATERIALS AND METHODS

### Microorganism Subculture

Test isolates (n=10) were sub cultured to growth media according to Table 1 prior to seeding into blood culture bottles.

## PREPARATION OF BLOOD CULTURE BOTTLES AND VENIPUNCTURE

After the appropriate plate media incubation length (as shown in Table 1), isolates were seeded into BD BACTEC Plus plastic blood culture bottles (BD Diagnostics, Franklin Lakes, NJ). Prior to seeding, reference, test, and sterility control blood cultures were ordered through the MEDITECH Laboratory Information System under the patient name "TEST, MIC". The transportation method for each bottle was included in the comment section of each order. Specimen numbers were obtained, and labels were printed and attached to the appropriate blood culture bottle. After tests were ordered, informed consent was given and venipuncture was performed on healthy adults by a medical laboratory assistant. For each organism tested, five plastic blood culture bottles were collected: one set (aerobic and anaerobic bottle) for transport by the reference method, one set for transport by the test method, and one additional bottle (either aerobic or anaerobic) for the sterility control.

## INOCULATION OF ISOLATES INTO SUPPLEMENTED BLOOD CULTURE BOTTLES

After the collection of blood cultures, suspensions of the appropriate organism were made using a 12 to 24 hour growth from facultative anaerobes and strict aerobes or a 48 hour growth from strict anaerobes. Suspensions of isolates were prepared in test tubes labelled:

A, 1, 2, and 3. Two (2) mL of 0.85 % saline (Hardy Diagnostics, Santa Maria, CA) was added to each test tube using a disposable pipette. A suspension equal to a 1.0 (± 0.10) McFarland standard was created in tube A using the Vitek Densicheck (bioMérieux, Marcy-l'Étoile, France). A 1:100 dilution was performed by transferring 20 µL from test tube A into test tube 1. Test tube 1 was recapped and vortexed (Fisher Scientific, Hampton, NH) to mix. This dilution was repeated in subsequent test tubes in order to create a final suspension containing approximately $3x10^2$ CFU/mL in tube 3. The tops of the plastic blood culture bottles were then disinfected using 70 % alcohol wipes. Using a sterile 1.0 mL syringe (BD Diagnostics), 0.1 mL of test tube 3 was inoculated into each blood culture bottle, excluding the sterility control. A growth plate was also inoculated for each test organism for the detection of pure growth using 0.1 mL of tube 3 on media in accordance with Table 1 and streaked for quantification using a 1.0 µL calibrated loop (COPAN, Murrieta, CA).

## TRANSPORTATION OF BLOOD CULTURE BOTTLES

All blood culture bottles were placed into a blood culture bottle rack and walked down to the either PTS station that was the furthest for the blower unit (Mental Health or Breast Assessment)[4]. The blower carries the pneumatic tube within the tubes via a vacuum, and sections of the pneumatic tube system are separated based on the blower used. On arrival at the PTS station, the test blood culture bottles were packaged into plastic and leak-proof bags for transport. Code 160 was inputted for transport to the laboratory. Reference and sterility control bottles were transported to the laboratory by walking. Upon receipt into the lab, the specimen and blood culture bottle integrity was examined for any breakage. All of the blood culture bottles were immediately loaded into the BD BACTEC 9120/9240 Blood Culture System (BD Diagnostics) for incubation, as typical protocol in the PRHC receiving section of the laboratory.

## PREPARATION OF REGULAR CULTURE AND SMUDGE PLATES

After a positive blood culture bottle was detected, it was unloaded from the BD BACTEC 9120/9240 Blood Culture System and growth plots were printed. From each positive blood culture bottle, a smear for Gram stain was prepared. The smears were methanol fixed for one minute and Gram stained using the automatic Previ Color Gram (bioMérieux). All slides were examined microscopically for monobacterial culture.

All positive blood culture bottles were inoculated onto media for regular culture. For facultative anaerobes and strict aerobes, Chocolate agar was inoculated using a drop from blood culture bottles and streaked for isolation. Smudge plates for culture were also prepared on Chocolate agar for all facultative anaerobes and strict aerobes by aspirating and transferring 3.0 mL of blood from a well-mixed blood culture using a 3.0 mL sterile syringe (BD Diagnostics) to a serum separator tube (BD Diagnostics). The serum separator tubes were centrifuged (Silencer, Novi, MI) using a horizontal head rotor for five minutes at 1610*g*. After specimens were centrifuged, almost all serum was aspirated and discarded, leaving about three to four drops. Sediment present in the sample was gently re-suspended using a vortex (Fisher Scientific). One drop of sediment was cross-streaked as shown in Figure 1 to form a lawn measuring 2x2 cm in size. Both regular culture and smudge plates were incubated in oxygen with 5-10 % additional carbon dioxide. Finally, the anaerobic isolate was inoculated onto Brucella agar using a drop from the blood culture bottle and streaked for isolation. Anaerobic isolates were incubated in a BD GasPak EZ Anaerobe Container System (BD Diagnostics).

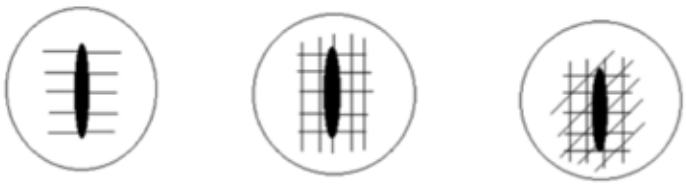

Figure 1. Streaking patterns for smudge plate. After the application of one drop from the serum separator tube, the inoculum is first streaked horizontally, vertically, and then diagonally using a sterile inoculation loop.

## IDENTIFICATIONS ON VITEK MASS SPECTROMETER

From the growth of facultative anaerobes and strict aerobes, identifications on the Vitek MS (bioMérieux) were performed. Identifications were performed on 2 and 4 hour growths from smudge plates, and 4 and 24 hour growths from regular culture. Identifications were also performed on 24 hour and 48 hour growths from anaerobic organisms. When inoculating organisms onto Vitek MS slides (bioMérieux), a quality control strain of *E. coli* (ATCC 8739) was inoculated onto the centre spot of each

Table 2

**Test Organisms Time of Growth to Detection**

| Test Isolate | ATCC Strain | Aerobic or Anaerobic Bottle | Growth Time to Detection in Reference Bottles (hours) | Growth Time to Detection in Test Bottles (hours) |
|---|---|---|---|---|
| *Haemophilus influenzae* (first run) | 10211 | Aerobic | 18.38 | 17.01 |
| *Haemophilus influenzae* (first run) | 10211 | Anaerobic | 19.89 | 20.24 |
| *Haemophilus influenzae* (second run) | 10211 | Aerobic | 14.52 | 16.18 |
| *Haemophilus influenzae* (second run) | 10211 | Anaerobic | 15.18 | 15.52 |
| *Staphylococcus aureus* | 25923 | Aerobic | 13.01 | 14.51 |
| *Staphylococcus aureus* | 25923 | Anaerobic | 14.84 | 15.51 |
| *Candida albicans* | 14053 | Aerobic | 28.82 | 33.48 |
| *Pseudomonas aeruginosa* | 27853 | Aerobic | 15.85 | 15.34 |
| *Streptococcus pyogenes* | 12384 | Aerobic | 14.88 | 14.52 |
| *Streptococcus pyogenes* | 12384 | Anaerobic | 13.02 | 13.52 |
| *Klebsiella pneumoniae* | 700603 | Aerobic | 10.52 | 11.19 |
| *Klebsiella pneumoniae* | 700603 | Anaerobic | 10.52 | 10.85 |
| *Streptococcus pneumoniae* | 49619 | Aerobic | 12.04 | 11.20 |
| *Streptococcus pneumoniae* | 49619 | Anaerobic | 12.70 | 12.37 |
| *Enterococcus faecalis* | 29212 | Aerobic | 11.35 | 11.68 |
| *Enterococcus faecalis* | 29212 | Anaerobic | 11.85 | 12.18 |
| *Bacteroides fragilis* | 25285 | Anaerobic | 23.21 | 24.24 |

acquisition group. Test organisms were then inoculated on consecutive spots using wooden applicator sticks and specimens were left to dry. For yeast or mucoid organisms (*C. albicans* and *K. pneumoniae*), 0.5 µL of Vitek MS formic acid (bioMérieux) was pipetted to appropriate spots. After the formic acid had dried, 1.0 µL of Vitek MS matrix solution (bioMérieux) was pipetted to each spot and left to dry. Slides were inserted into the Vitek MS (bioMérieux) for identification. Identifications with confidences >98.0 % were considered an acceptable identification. Results of the growth control plate, Gram stain, and Vitek MS identification (with confidence %) were recorded. All negative blood culture bottles were discarded following five days of incubation.

## RESULTS

### Organism Time of Growth to Detection

The growth times of all test isolates, excluding *E. coli* (ATCC 35218), were recorded in Table 2. The data on the growth time to detection for *E. coli* was not collected. Two runs of *H. influenzae* (ATCC 10211) were performed due to missing identification results on the Vitek MS.

From this data, a dependent sample analysis was performed using a paired-samples t-test ($\alpha$=0.05) to determine whether the growths from the test bottles were longer than the reference bottles. A p-value of less than 0.05 would indicate a significant difference in the growth

times. In performing the paired-sample t-test using the differences of the growth times from the acquired data, it was determined that the difference between the test and reference bottle growth times is not significant (p=0.0595). Therefore, it cannot be claimed with 95% confidence that the PTS transportation method increased the growth times compared to bottles walked to the laboratory.

## ORGANISM GROWTH PATTERNS

All facultative anaerobes grew in both aerobic and anaerobic bottles. The two strict aerobes (*C. albicans* ATCC 14053 and *P. aeruginosa* ATCC 27853) only grew in aerobic bottles. The strict anaerobe, *B. fragilis* (ATCC 25285), only grew in anaerobic blood culture bottles. No growth was observed in the sterility control bottles, and no contamination was observed in both reference and test bottles.

## IDENTIFICATIONS ON THE VITEK MASS SPECTROMETER

Overall, identifications and confidence levels on the Vitek MS were acceptable for both regular culture and smudge plates. The majority of test organisms (*E. coli* ATCC 35218, *H. influenzae* ATCC 10211, *S. aureus* ATCC 25923, *S. pyogenes* ATCC 12384, *K. pneumoniae* ATCC 700603, *S. pneumoniae* ATCC 49619, and *E. faecalis* ATCC 29212) had acceptable growth and confidence levels (>98.0 %) for both aerobic and anaerobic smudge plates (2 and 4 hours) and regular culture (4 and 24 hours). However, *C. albicans* (ATCC 14053) exhibited slower growth compared to other test organisms as an acceptable identification was only obtained after 24 hour incubation. In addition, the growth control plate for *C. albicans* initially had no growth observed after five days of incubation. This control plate was repeated in following weeks, demonstrating the presence of isolated pure colonies, resembling yeast under wet mount. Finally, *B. fragilis* (ATCC 25285) obtained acceptable identifications after 24 and 48 hour incubation. Throughout the identification of test isolates, some identifications obtained no results, while others had improved confidence levels after refiring a spot. Overall, two identification results obtained the correct genus and species with confidences less than 98.0 %. From *S. pneumoniae* (ATCC 49619), a confidence of 90.7 % was obtained from the anaerobic 2 hour smudge plate of the test bottle and a confidence of 89.7 % was obtained from the anaerobic 4 hour regular culture of the reference bottle.

As previously mentioned, due to missing data for the growth of *H. influenzae* (ATCC 10211) from the Vitek MS, the test organism was repeated. From the first trial, a low discrimination identification was obtained from the aerobic two hour smudge plate growth of the test bottle: *Prevotella disiens* (24.0 %), *Helicobacter pylori* (25.7 %), *Campylobacter fetus* spp. fetus (24.4 %), and *Staphylococcus capitis* (25.7 %). While the majority of identifications in the second trial of *H. influenza* were acceptable, the aerobic 24 hour growth from the reference bottle received a low discrimination identification of *Edwardsiella tarda* (49.7 %) and *Corynebacterium auris* (50.3 %).

## DISCUSSION

**Organism Time of Growth to Detection**

While the statistical testing performed on the test isolates time of growth to detection indicated no significant difference between transportation methods, this testing does not demonstrate a true representation of all the test isolates, as time of growth to detection data is lacking for *E. coli*. However, with the acquired data, it cannot be said with 95 % confidence that the PTS increases the growth times of blood culture isolates.

## IDENTIFICATIONS ON THE VITEK MASS SPECTROMETER

Most test isolates (n=8) in this study obtained positive identifications with acceptable confidence levels in smudge plate and regular culture growths. Therefore, it can be determined that smudge plate preparation is effective in identifying most clinically significant blood culture pathogens after 2 hours. Even the anaerobic isolate, *B. fragilis* (ATCC 25285), was able to obtain an earlier acceptable identification with only 24 hour incubation. However, some organisms present in the study obtained questionable results. To begin with, *C. albicans* ATCC 14053 only grew in the 24 hour regular culture due to the organism's slow growth in culture[5]. This slow growth characteristic could also explain the initial no growth result on the organism's growth plate after five days of incubation. In addition, random error could explain the one questionable control result as the suspension could have been inadequately vortexed and yielded a dilute inoculum. Results that lacked or obtained low discrimination identifications could be explained by inadequate or excessive amounts of organism present on the Vitek MS slide, uneven spreading of the test isolate, uneven spreading of the matrix solution[6], differences in technique, and inattention to detail.

## CLINICAL SIGNIFICANCE OF STUDY

The transportation of plastic blood culture bottles through the pneumatic tube system demonstrates many benefits for patients. Healthcare professionals who collect blood cultures from suspected septic patients, such as phlebotomists or medical laboratory assistants, often need to immediately attend to other patients.

Therefore, blood culture bottles sent through the PTS reduce turnaround time.

Recently, benefits of smudge plates have been reviewed and show clear benefits towards the faster identification of blood culture pathogens. In a study performed by Chen, Porter, Mubareka, Kotowich, and Simor[7], 85.8 % of test isolates from smudge plate growth were correctly identified by genus and species using the Vitek MS. After two hours, 77 % of all isolates were positively identified, including 91.7 % of *Enterobacteriaceae*, and all *P. aeruginosa* isolates. While most clinically significant microorganisms can be identified after two hours, smudge plates demonstrate other benefits, such as lack of labor intensive preparation since they only require approximately ten minutes to be made. For this reason, the specimen preparation method is easy to incorporate into a laboratory's workflow. The use of the smudge plates also demonstrates benefits to healthcare staff. Earlier information towards the pathogen's identity is important to pharmacists in regards to antibiotic stewardship. While antibiotic therapy might begin with the administration of broad spectrum antibiotics whenever a patient demonstrates signs of sepsis, knowledge of the organism's Gram stain aids in narrowing treatment. However, with the knowledge of the identity of the organism, antibiotic treatment can be altered in order to administer more effective antibiotics[8].

## CONCLUSIONS

Overall, both hypotheses testing the transportation of plastic blood culture bottles in the pneumatic tube system and the 2 hour smudge plate growth were supported by the acquired data. The results obtained from the paired-samples t-test demonstrated no significant difference between transportation methods. In addition, the pneumatic tube system provides the benefit of faster turnaround time for patients' results, and improved workload for healthcare professionals. The results obtained for identifications from two-hour smudge plate growth on the Vitek MS mostly yielded acceptable identifications and provided comparable results to the reference method. Therefore, both methods should be implemented in the procedure for blood culture specimen workup in the clinical microbiology laboratory as they provide many benefits compared to reference methods.

## NOTES

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**Potential conflicts of interests:** No reported conflicts.

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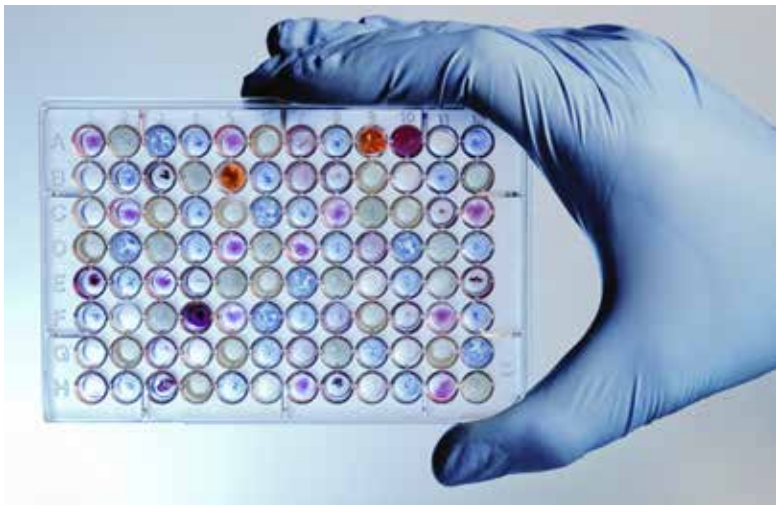
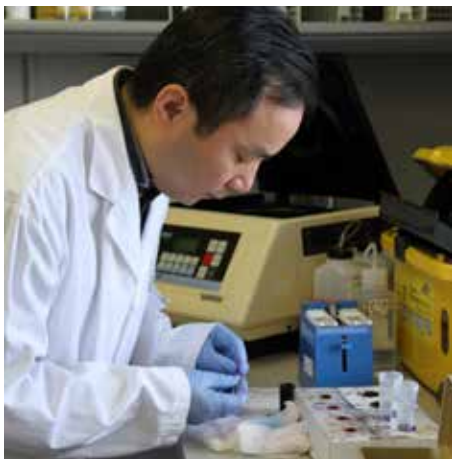
# SOCIETY NEWS





# Election Process for Vice-President

A new election process will be introduced in late 2016, the result of a bylaw change in 2014 to meet requirements of the *Canada Not-for-profit Corporations Act*. The change ensures that candidates for the Presidential offices have prior experience serving on the CSMLS Board before moving into these leadership positions. It allows the Board to choose from amongst themselves who is the best to lead the strategic plan and issues suspected in the immediate future.

During the last business meeting of the year, nominations for Vice-President will be put forward to the Board of Directors either by self-nomination or peers. The Board will then vote by secure paper ballot. A candidate needs a majority vote to be successful. A motion will be made to accept the successful candidate for Vice-President, with progression one year later to the Presidential term.

## CSMLS Code of Ethics

CSMLS has developed a Code of Ethics in consultation with its members. The Code serves to define and expand the inherent ethical concepts contained in the CSMLS Code of Professional Conduct, to document expectations of ethical behaviour for all medical laboratory professionals and to provide a framework during professional personal self-evaluation.

There are several ways to explore and learn about the Code of Ethics.

- Download the Code of Ethics and the supporting documents.
- Further your comprehension and apply the principles in real-life situations by taking the free course, *The Science of Morals: Understanding the CSMLS Code of Ethics*.
- Share your opinion and how to deal with an ethical dilemma by participating in the discussion forum.
- Order the Code of Ethics poster (free for members).

Access through the CSMLS website under the About Us tab.

# Election Results

On Saturday June 18, the results of the 2016 Board of Directors election were announced at the CSMLS Annual General Meeting in Charlottetown, PE.

We are pleased to welcome the newly elected members of the CSMLS Board of Directors, as voted by the members. The incoming Board members will begin their term in January of 2017.

**Joël Rivero** (re-elected)
Director, Alberta &
Northwest Territories

**Greg Dobbin** (re-elected)
Director, Atlantic

**Danielle McLennan**
Bilingual Director

# Update on Accreditation

In January 2016, CMA Conjoint Accreditation Services announced that it would take steps to divest itself of responsibility for assessing and accrediting Canadian health education programs within the next 24 months.

CSMLS immediately began consultations with regulatory bodies, through the Professional Standards Council and the Canadian Alliance of Medical Laboratory Professionals Regulators (CAMLPR), with meetings in February, June and July.

A group of nine organizations representing health professions, CSMLS included, commissioned research to review best practices involved in accreditation. CSMLS independently commissioned research into existing self-accreditation frameworks and potential third-party accreditation services that could assume the work of CMA. Both reports were presented to the CSMLS Board of Directors in June 2016.

The CSMLS Board decided to strike a taskforce to provide a set of recommendations on the processes and policies associated with the design and implementation of a new accreditation model for Medical Laboratory Science in Canada. The taskforce met twice in-person and once via teleconference in the late summer. The results of these consultations will be presented to the Board in September.

Progress continues to be made in finding a solution, but at this time no decisions have been made about how a new accreditation model would be governed, structured or resourced. The CSMLS remains committed to working with the larger laboratory community to find a suitable replacement to CMA accreditation. We will continue to provide updates on this issue and we encourage you to visit the CSMLS website for the most up-to-date information.

## 2016 AGM Minutes

The minutes from the 2016 Annual General Meeting held in Charlottetown, PE on June 18th are available on the CSMLS website under the Membership tab.
**www.csmls.org**

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## Become a member of the CSMLS Nominating Committee

We are looking for volunteers interested in serving on the CSMLS Nominating Committee.

This committee is essential in recruiting members to stand for election to the Board of Directors.

Representatives are needed for the following positions for the 2017-2019 term:

- **Manitoba & Saskatchewan**
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### To apply:

**Submit a letter of application to:**
Tania Toffner, Chair 2016 Nominating Committee
33 Wellington St. North, Hamilton, ON L8R 1M7

**Or email:**
Lisa Low, Executive Assistant (lisal@csmls.org)

*Must be a member in good standing to apply.*

**Application Deadline: October 21, 2016**

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# LABCON2016: EXPAND YOUR HORIZONS

From June 17-19, medical laboratory professionals from across the country gathered together in the spirit of professional development in Charlottetown, PE for LABCON2016. The sense of community was strong with nearly 350 delegates gathering for three days of remarkable speakers, limitless networking, interactive exhibits and exciting socials. With more than 50 exhibitors, attendees were also encouraged to browse the latest and greatest in technology from some of the industry's largest vendors.

The event kicked off on Thursday, June 16 with half-day and full-day workshops offering in-depth, intensive learning on topics such as pre-briefing, pediatric phlebotomy, management and communication skills (using Lego!) and even a hands-on transfusion medicine wet workshop inviting participants to "Capture" the antibody.

LABCON2016 also featured a new Managers' Intensive Program. This full-day program was designed for those who manage others in the laboratory setting. Nearly 40 delegates benefited from sessions led by industry experts on performance management, lab costing, quality management, and leadership.

*Save the date!*

LABCON2017 – Banff, AB

**May 26-28, 2017**

The Banff Centre, Banff, AB

Friday morning marked the official opening of the conference with remarks from President Chris Hirtle and CEO Christine Nielsen. They started off three days of learning with plenary speakers and sessions.

Following sessions on Friday, delegates had dedicated time to meet with the vendors during our Exhibitor's Reception. This casual event allowed for some genuine discussions and exploration of new technology. Delegates had the chance to have island memories captured in the on-site photo booth. (Photos can be viewed online at labcon.csmls.org).

LABCON was filled with many notable sessions, including those on quality assurance, MALDI-TOF, international volunteering, From Bench to Business (showing potential career paths for laboratory professionals outside the lab), Lean Six Sigma, plasma utilization, HCV Monitoring and incredible insight into the virtual laboratory created by Red River College.

After a full day of learning on Saturday, delegates were able to unwind with some tasty appetizers and a steak and lobster meal at the President's Dinner. The evening featured amazing live entertainment, a beautiful view and, later in the evening, a DJ and dance party.

On Sunday, the conference closed with keynote speaker, Dr. Richard Heinzl, founder of Doctors Without Borders Canada. His presentation, *Opportunities of a Borderless World,* explained how thinking outside the box and not accepting "no" as an answer can have a considerable positive impact on our lives. He reminded us that the world is much broader than we realize and that even as individuals we can make a difference.

*CSMLS would like to thank everyone who came to experience and support LABCON2016, including our sponsors and exhibitors. Each year we strive to create an educational, informational and entertaining program for everyone. We are already planning for LABCON2017 in Banff, AB.*

*Hope to see you there!*


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# CSMLS Recognizes 2016 Award Recipients

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. During LABCON2016 we recognized the recipients of the following awards:

**Distinguished Fellowship Award** is the highest level of recognition bestowed to a member. It is granted to members who have made significant contributions to the profession and this year, we recognized **Bill Younger.** Bill's career in medical laboratory science spans more than 40 years. In that time, he held positions as a bench tech, chief technologist, educator, volunteer in Malaysia and even a stint in the wine industry in Australia. In 1990, Bill was the CSMLS President. He is never one to fear change or challenge and has used his education and experience to teach, inspire and lead generations of medical laboratory professionals.

**Honorary Fellowship Award** is given to a CSMLS member for their outstanding contribution to the Society. This year, the award was granted to **Mary Golba-Bylhouwer**. Mary is a former practising medical laboratory technologist and became an educator of the Medical Laboratory Technologist program at Mohawk College in Hamilton, Ontario. She was also instrumental in establishing and maintaining a bridging program creating successful graduates that went on to fulfilling careers.

**LABCON Leaders of Tomorrow**

Every year, CSMLS offers an award to bring new graduates and young professionals to LABCON. We understand the importance of networking and learning opportunities early in a career. At LABCON2016, we had the pleasure of welcoming our 2016 Leaders of Tomorrow recipients; **Deanna Danskin, Jean-Paul Nadeau, Judy Tran, Ryan Wilson and Jennifer O'Neill.**

## Grants, Scholarships and Awards: Apply Now

There are several awards available for application and nomination until November 1, 2016:

Siemens Canada Limited Student Scholarship Award
CSMLS Student Scholarship
LABCON Leaders of Tomorrow
David Ball Award
Founders' Fund – International
Honorary Awards
Honorary Fellowship Award
Distinguished Fellowship Award

For more information on all of the CSMLS Grants, Scholarships and Awards and to access the application and nomination forms, visit **www.csmls.org** under the Membership tab.

# CSMLS Ambassador Program

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Our Ambassadors go out into their local communities and deliver presentations about medical laboratory sciences and the professionals who work in the lab. The presentation is based on real experience, combined with materials provided by the CSMLS.

We are always looking for enthusiastic members who are comfortable sourcing and delivering presentations to the public.

Ambassadors receive online orientation, training and support while earning Professional Enhancement Program (PEP) hours for the presentations they deliver.

***If this sounds like a fit with your personality, we'd like to hear from you.***

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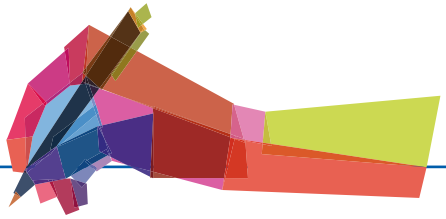
go.csmls.org/ambassador



## Competency Based Item Writing Training

CSMLS certification examinations are competency-based exams that focus on the candidate's ability to apply knowledge in the laboratory, not simply what they memorized. The exams are designed to identify laboratory technologist and assistant candidates that have met the minimal practice requirements necessary in order to provide safe, effective and ethical patient care in a variety of work environments at entry level.

Test development is important for every educator. As students progress, it becomes important to move away from strictly recall (memory) items and into application and critical thinking.

Programs that provide students with carefully designed tests written in the same format as CSMLS certification exams are able to better prepare students for the CSMLS exam process. Currently the CSMLS is providing professional development Item Writing sessions for MLT/MLA program educators. For more information please contact Lorna Zilic at lornaz@csmls.org.

### PROFESSIONAL DEVELOPMENT OPPORTUNITY FOR MLT/MLA PROGRAM EDUCATORS

November 24-25, 2016 | 9am – 4pm
CSMLS Office in Hamilton, ON
Lunch and refreshments are provided

*If interested, contact Lorna Zilic at lornaz@csmls.org*

## POSITION STATEMENTS

Our members rely on the CSMLS as their national professional society for insight and guidance on industry issues. In response, the Society regularly creates or revises position statements. They are created by the Board of Directors as an outward statement on behalf of the Society on industry trends, health and safety concerns, patient safety or environmental issues.

This year, we've released the following position statements:

**REVISED**
Point of Care Testing

**NEW!**
Medical Laboratory Professional Recruitment and Retention Strategies in Rural and Remote Communities

**NEW!**
Social Media Use by Laboratory Professionals

Position Statements can be viewed and downloaded at csmls.org under the About Us tab.

# 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:

## JULY

Canadian Association of Pathologists (CAP – ACP) Council Meeting
*VANCOUVER, BC*

Canadian Alliance of Medical Laboratory Professional Regulators (CAMLPR)
*TORONTO, ON*

Canadian Leadership Council on Laboratory Medicine (CLCLM) Executive & Member Meeting
*VANCOUVER, BC*

## AUGUST

International Federation of Biomedical Laboratory Science (IFBLS) Conference, Meeting
*TOKYO, JAPAN*

## SEPTEMBER

Health Action Lobby (HEAL)
*TELECONFERENCE*

National Patient Safety Consortium
*OTTAWA, ON*

Canadian Standards Association TC Z252
*TORONTO, ON*

Vancouver Roadshow, Vancouver General Hospital
*VANCOUVER, BC*

Foreign Credential Recognition Working Group, Government of Canada
*OTTAWA, ON*

British Columbia Society of Laboratory Science (BCSLS) Congress 2016
*HARRISON HOT SPRINGS, BC*

Coalition For Public Health In the 21st Century
*TELECONFERENCE*

College of Medical Laboratory Technologists of Ontario (CMLTO) Council
*TORONTO, ON*

CSMLS SCSLM

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


# Stay connected to your profession

renew today!

## New supports available

- Code of Ethics for medical laboratory professionals
- Mental Health Toolkit (to provide members/organizations the means to identify, monitor, and implement change)

## Save Money

- 10 **free** courses each year (members only)
- Discounts for professional development courses and events
- Savings with Discount Partners

## Experience Peace of Mind

- Professional Liability Insurance
  *(CSMLS coverage provides Legal Defence and Professional Liability Insurance)*

## Enrich your career

- National job postings
- Labour market data
- Career tips and information

## Support your profession

- Advocacy focused on the government and general public

## Connect to the Industry

- Bi-weekly eNEWS
- Quarterly *CJMLS* publication
- Access to laboratory standards

csmls.org