

**VANCOUVER ISLAND HEALTH AUTHORITY
MEDICAL MICROBIOLOGY SERVICES REVIEW
FEBRUARY 9 – 11, 2011
FINAL REPORT**

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Executive Summary

The Vancouver Island Health Authority (VIHA) engaged Drs Gregson, Henwick and Swaine to review VIHA Medical Microbiology services during the period of February 8 – 10, 2011. The scope of the review included services provided by VIHA Medical Microbiology laboratories for the Royal Jubilee Hospital, Victoria General Hospital, Nanaimo District General Hospital and Campbell River Hospital. Other Medical Microbiology laboratories/services provided by VIHA or third parties were out of scope as was analysis of the VIHA 2010 business case for consolidation of Medical Microbiology services.

In addition to material provided by VIHA the review consisted of on-site tours/meetings/interviews at the involved facilities involving both laboratory staff and physicians, including the Medical Advisory Committees of NDGH and CRH.

The reviewers appreciate the time taken by all staff to meet and thank all stakeholders for their input.

VIHA Medical Microbiology services are currently substantially provided in a distributed manner.

Attributes of the current service delivery model include:

- Regional service from the perspective of policy/procedure/information standardization
- Ability of all sites to consult with Medical Microbiologists/technologists in Victoria

Potential for service enhancement exists, including:

- Establishment and monitoring of quality metrics/Key Performance Indicators (KPI) on a regular periodic basis, including:
 - Setting of key performance indicator targets to assess performance
 - Regular reporting of performance to stakeholders
- Engagement of sites outside Victoria, including
 - Regular meetings of Microbiology staff from all sites
 - Increased 1:1 meetings/communication between Victoria staff and staff at other sites
- Development of a program to maintain competency for testing for low frequency tests/tests were confirmatory investigation is referred offsite

Several service delivery models were identified as potential options. Irrespective of the option selected, it is crucial for VIHA to:

- Establish KPI for Medical Microbiology services
 - This would be done in collaboration with stakeholders, facilitating engagement
- Implement routine monitoring and reporting of KPI prior to any change in the service delivery model

- Develop and implement alternate service delivery model in a manner that ensures KPI are maintained or enhanced

Alternate service delivery models include:

1. Enhanced status quo – maintaining three Medical Microbiology laboratories with KPI established and monitored
2. Consolidation to two Medical Microbiology laboratories, one north and one south of the Malahat Pass
3. Consolidation to a single Medical Microbiology laboratory with STAT testing retained at other sites as required
4. Phased approach with #2 being an initial and transitional step to #3

Acknowledging that it was out of the review scope, consideration could also be given to:

1. Integration of the Comox Medical Microbiology laboratory at some future juncture
2. Collaboration with private laboratory providers, particularly from a logistics perspective

Background

Prior to arrival for the on-site assessment the reviewers were provided with background material by VIHA, including;

- Presentation to Nanaimo Regional General Hospital Physician meeting regarding Medical Microbiology services – August 24, 2010
- Presentation to Campbell River Hospital Physician meeting regarding Medical Microbiology services – August 9, 2010
- Presentation to Nanaimo Regional General Hospital Medical Advisory Meeting – Laboratory Initiatives – September 13, 2010
- Framework for External Review of Service Delivery for Microbiology in VIHA
- Information from Dr Aref Tabarsi, Laboratory Director, Campbell River Hospital, including;
 - Correspondence regarding potential changes to the VIHA Medical Microbiology service delivery model
 - References and correspondence regarding service delivery models for Medical Microbiology

In addition to the material provided the reviewers, either as a group or singly, engaged in teleconferences with VIHA administration and Dr Aref Tabarsi.

The schedule for the on-site assessment was:

- February 8, 2011
 - Meeting with VIHA COO, Catherine McKay and CMO, Dr Richard Crow
 - Meeting with VIHA Laboratory Director and Medical Microbiology staff
 - Tour of Royal Jubilee and Victoria General laboratories
 - Meeting with LMAC – Nanaimo
- February 9, 2011
 - Tour of Nanaimo laboratory
 - Meeting with Nanaimo Laboratory Medical staff
 - Meeting with Nanaimo Microbiology Laboratory staff
- February 9/11
 - Meeting with Nanaimo Hospital Medical staff
 - Meeting with LMAC – Campbell River
- February 10/11
 - Meeting with Campbell River Pathologist
 - Tour of Campbell River laboratory
 - Meeting with Campbell River Microbiology Laboratory staff
 - Meeting with Campbell River Hospital Medical staff

Subsequently the reviewers met via teleconference with:

- VIHA administration – April 26, 2011

Since the on-site review the Diagnostic Accreditation Program (DAP) of British Columbia has issued standards for laboratory practice. Included are standards for Quality and Medical Microbiology. These standards will not be referenced during the report. It

is acknowledged that these standards were not available to the reviewers or VIHA at the time of the on-site review or obviously to VIHA prior to the review. It is important to note however that the report was completed in draft prior to the standards being issued and they did not materially change the report recommendations.

Subsequent to initial presentation of the review finding to VIHA stakeholders, additional questions were received. These questions are addressed in Appendix 2.

Review Findings

The reviewers were provided with a series of questions to address which will be used as the framework for outlining the findings.

Questions:

- 1. What is your assessment of the current status of the structure of medical microbiology services in VIHA?*
- 2. What is your assessment regarding having one microbiology laboratory servicing the entire island (an area of more than 500 by 75 km) in South Island or in another location in VIHA? Transport media and transport should be specifically considered. Consideration of any model needs to be within existing resources.*
- 3. What other best practice models could be considered keeping in mind budgetary/quality considerations?*
- 4. What are the benefits/challenges to the recommended structure from all perspectives (quality of care, cost, other)?*
- 5. What indicators would be used to evaluate/inform this structure once implemented?*

What is your assessment of the current status of the structure of medical microbiology services in VIHA?

VIHA provides a regional Medical Microbiology service from the perspective of standardization of policies and procedures. A single regional Laboratory Information System, Cerner PathNet, facilitates delivery of the service. Standardization of practice is a positive attribute of the current system.

The service is provided in a distributed manner via 3 microbiology laboratories in the in-scope facilities. The Victoria laboratory provides reference testing and in particular molecular testing is performed only in Victoria. All sites have the ability to consult with Medical Microbiologists/technologists in Victoria.

Although there was information provided to the reviewers with respect to turnaround time the data was limited with respect to time frame and the involved tests. The reviewers were supplied with some blood culture TAT data during their review. The involved period was not specified on the more detailed of the documents, however the volumes approximate those provided for the month of January 2011. The Reviewers supposition is that the supplied data describe roughly one month of blood cultures.

Analysis of the information/data is outlined in Appendix 1

The data provided is not sufficient to determine if the perceived delays in TAT are statistically significant. However, the results are consistent with expectations of a positive relationship between the measured TAT and both the geographic distance and time related to current pre-analytical processes (including courier runs). The “InLab to Verify” TAT parameter was not included in the table as this measure is subject to bias [from a variable subset of patients with extended incubation times] due to variations in patient mix and clinical practice between sites.

The analysis indicates that there is a disparity in the level of service currently provided to VIHA facilities. To facilitate evaluation of the appropriateness of service VIHA should develop performance indicators/targets on a regional basis.

A key finding of the review is that Key Performance Indicators (KPI) for assessing service delivery are not monitored/reported on a regular basis nor are there defined targets. This includes sites for which microbiology is currently referred offsite.

The lack of current KPI was evident during the review with stakeholders relying on ad hoc reports or anecdote.

From the perspective of the laboratories outside Victoria there is a lack of engagement and a feeling that there is a lack of attention of VIHA to their needs. Microbiology meetings are not occurring on a regular basis that leads to a sense of disengagement with respect to procedure development and implementation. Consultation with Medical Microbiology staff is available, however visibility/recognition in non-Victoria sites is a challenge. There is an over reliance on e-mail as the often sole means of communication. The historic staffing challenges in Victoria that have contributed to this issue are acknowledged, however the perception is well established and widely held.

What is your assessment regarding having one microbiology laboratory servicing the entire island (an area of more than 500 by 75 km) in South Island or in another location in VIHA? Transport media and transport should be specifically considered. Consideration of any model needs to be within existing resources.

There are a number of options for service delivery, including:

1. Enhanced Status Quo
2. Two microbiology laboratories, one north and one south of the Malahat Pass
3. A single microbiology laboratory with STAT assays retained as required at specific sites.
4. Phased approach for integration with #2 being an initial and transitional step towards #3
5. *The integration of Comox due to its proximity to Campbell River should be considered.*

6. *Collaboration with the Private Laboratories should be considered (at least from a logistics perspective)*

It is acknowledged that options 5 and 6 were outside the original review scope.

There are several issues that should be addressed in any of the scenarios including:

- Establishment and monitoring/reporting of key performance indicators, including TAT and quality parameters is recommended and should occur prior to any change in service delivery.
- Establishment of indicator targets, and in particular have TAT assessment on a site specific basis (order to result verification, or as close as possible, to reflect end user experience)
 - These targets and indicators should include hospitals currently without microbiology laboratories.
 - Contingent on the future service delivery model, TAT for monitored tests may be impacted, however a key determinant will be development of appropriate pre-analytical logistical support.
- Enhanced engagement of stakeholders at all sites including
 - Development of indicator targets
 - Regular review of indicator results
 - Regular meetings with Microbiology Laboratory and facility medical staff

Ultimately, all laboratory services have to meet the requirements of the clinical services they support. To ensure this occurs testing should be done in an appropriate time interval from the perspective of the complete testing cycle; the time from when a test is requested to the time the result is available for clinical interpretation. To facilitate this the turnaround time from request to result delivery/availability is the metric that should have an agreed target and testing assessed against this target. A key element of cycle turnaround time is the pre analytic phase, frequently constituting a considerable portion of the total testing time. In view of this pre analytical issues, particularly the logistics of specimen transportation and integrity, are fundamental for success of any laboratory system.

Definition of acceptable TAT targets should be established via a collaborative approach within VIHA if stakeholder buy-in across the region is to be achieved.

With respect to potential consolidation the following have to be addressed:

1. Developing/instituting a program to maintain competency for test(s) remaining on site (such as STAT Gram stain)
2. Pre-analytical phase
 - Logistics/courier with a schedule/frequency to maintain or achieve the designated TAT indicator
 - Metrics and monitoring to ensure specimen integrity
3. Analytical phase

- Reference laboratory resources included but not limited to staff, space and equipment to maintain or enhance TAT targets.
 - Hours of operation and staffing of the microbiology laboratory(s) would need to be optimized to reach targets set for quality.
4. Post analytical phase
 - Maintenance of the current integrated laboratory information system and connectivity to clinical system(s) to maintain or enhance TAT
 5. With respect to all phases – appropriate contingency plans to address potential issues of service disruption, including but not limited to:
 - Inclement weather impacting specimen transportation
 - Disruption of service in the reference laboratory
 - LIS/HIS downtime
 6. Communication/engagement plan for impacted sites
 7. Trial period to demonstrate effectiveness and a phase in of the new service delivery model.
 8. Assessment of logistics can in part be done using laboratories currently referring microbiology off-site.
 9. Assessment of any test consolidation and capacity would require a separate evaluation.

Acknowledging the current perception regarding support of all VIHA Medical Microbiology laboratories, a comprehensive communication plan involving engagement of stakeholders prior to and in support of developing alternative service delivery models is important for success. This involvement will facilitate implementation of any changes to the current distributed model.

What other best practice models could be considered keeping in mind budgetary/quality considerations

Two key elements for any laboratory service delivery model are the “what” and the “how” of service delivery. Establishing KPI in collaboration with stakeholders defines the “what”; providing laboratories with the flexibility in “how”.

Establishing, monitoring, reporting key performance indicators within a quality cycle that specifically addresses identifying and remediation of deficiencies addresses the fundamentals of ensuring a clinically appropriate service is delivered.

Without these key elements, health care workers will continue to use anecdotes and innuendo with regards to service delivered by any service model (single site versus other options). The number and location of microbiology laboratories should be determined by the ability to meet quality targets (including turnaround time) and logistical/reporting issues.

What are the benefits/challenges to the recommended structure from all perspectives (quality of care, cost, other)?

1. Establishing performance indicators facilitates
 - Greater stakeholder engagement
 - Process improvement; trends/issues identified and remediated prior to sentinel event occurrence
2. Leaving an independent Microbiology service in place (Comox) during a consolidation process reduces cost savings and results in a differential delivery of service to patients in one location (perceived or real) on Vancouver Island.
3. Quality targets need to be set and met prior to any consolidation to ensure costs associated with provision of direct patient care are not increased.
4. Moving to a single Microbiology Laboratory has the potential for reduced testing costs but there will be an offset related transport costs required to meet quality targets (dependent on the location of the laboratory).
5. The impact of consolidation of microbiology services on the hospital/care delivery “outside” the laboratory has to be determined.

Challenges include:

- Ensuring logistics do not negatively impact TAT and specimen integrity
- Ensuring that a centralized microbiology laboratory operation meets the requirements of all sites, not just the facility within which it is located.
- There is an offset to potential efficiencies in labour/resource utilization related to logistics and other issues in referral of testing
- Ensuring appropriate contingency planning for a consolidated service delivery model
- Ensuring competency of STAT tests remaining on site – Gram stain
- Engaging the staff north of the Malahat as active partners in VIHA.

What indicators would be used to evaluate/inform this structure once implemented?

The following are required to ensure the appropriateness of any service delivery model:

- Critical issue is to establish, monitor and report key indicators prior to, during and following changes to service
- Key indicators should include but not be limited to:
 - Transport times from collection to laboratory receipt.
 - Turn-around time for key specimens for selected medically significant results such as:
 - Positive blood cultures: preliminary and final reports
 - Positive intra-operative specimens; preliminary and final reports
 - Positive MRSA screening results.
 - Gram stains on Critical Specimens
 - A specimen integrity indicator of some type for specimens during any consolidation process.

- Dual processing of specimens at two sites to ensure concordance or results.
- Monitoring of positivity rates and changes associated with consolidation.

Recommendations

There are three categories of recommendations;

1. Defining service requirements
2. Engagement
3. Provision of Service

Defining service requirements – separating facts from beliefs:

- What is going to be supported needs to be defined;
 - The current and future locations, and planned level of acute and complex patient care north of the Malahat needs to be defined to determine Microbiology services needed for these locations.
- The establishment of time for results and quality targets (metrics) need to be defined in collaboration with stakeholders.
- These metrics should be applied to the current system to determine current gaps in service delivery. This information should be distributed to laboratory staff with transparent reporting to the users of the service (including and not limited to the various MAC's within VIHA) and administration.
- Future business cases for changes in service delivery should include costs/benefits associated with meeting established targets.
- The frequency and duration of Malahat highway closures needs to be determined and disseminated to VIHA medical/laboratory staff.

Engagement:

- Any change in service delivery should meet the targets established by stakeholder review.
- Engagement of staff north of the Malahat to collaborate in developing and moving to any new microbiology service delivery model is imperative.
- Laboratory staff north of the Malahat should be actively engaged in the development and implementation of new policies and procedures.
- Use of Emails as a means of consulting the medical microbiologist for clinical issues should be minimized.

Provision of service:

- The logistics of transport and diagnostic service delivery (space, hours of operation, staffing levels, equipment) needs to be defined and communicated to the stakeholders prior to any further movement of specimens/testing.
- The scope of “STAT” testing to remain outside of Microbiology laboratories in any consolidated model needs to be determined.
- The methods of provision and cost of required “STAT” testing in a consolidated service delivery model needs to be defined.

- The effectiveness of maintaining STAT microbiology testing expertise at sites currently without a microbiology laboratory can serve as a basis for assessment and identifying options.
- The medical microbiology consultant group in VIHA needs to have a physical presence north of the Malahat.
- An effective method of tele/videoconferencing with remote technical/medical staff needs to be developed for two-way communication with regards to VIHA Microbiology policies and procedures.

Appendix 1

The following table extracts the TAT from blood “Draw” to “In Lab” with the latter being a recorded event within the laboratory site performing blood cultures. Data were provided for blood cultures collected at 15 sites [and cultured at 3 sites], however only the 7 sites providing at least 100 blood cultures were included in the analysis to avoid fluctuations seen with small sample sizes. Yearly data would permit meaningful analysis of current TAT for the remaining 8 smaller sites. Data provided were “Average” and “95th Percentile” for this TAT measure. The table also lists the “delay” in this TAT measure associated with blood cultures referred in from non-testing sites versus blood cultures collected within the facilities performing on-site testing.

Table 1: Blood Culture “Draw to In-Testing-Lab” Turnaround Times

Draw Site	No. of Blood Cultures	Average 'Draw to InLab' TAT	95th %-ile 'Draw to InLab' TAT	Average “Delay”	95th %-ile “Delay”
RJH	782	0:59	2:42	****	****
VGH*	559	3:43	8:02	2:44	5:20
SPH*	144	4:17	9:45	3:18	7:03
CDH*	308	10:02	21:04	9:03	18:22
NRGH	689	0:36	1:22	****	****
WCGH**	128	14:02	24:38	13:26	23:16
CRH	161	1:09	4:30	****	****

Appendix 2

Following initial presentation to VIHA stakeholders further questions were submitted to the reviewers. This section addresses those specific questions.

- 1. How best does VIHA keep up with new developments (including implementing new and potentially expensive technologies: automation/robotics, smart incubators, MALDI-TOF, multiplex PCR, flow cytometry etc.) in microbiology? I ask this question in the context of operating on one, two or three sites. Is it practical to consider implementing such new enhancements on more than one site In VIHA? If so, under what circumstances?*

The assessment of individual testing procedures/policies was beyond the scope of the assessment; this includes both current and potentially future specific tests or technologies.

It is recommended that VIHA develop principles to be used in future business cases that allow assessment of whether a consolidated or distributed service delivery model is the preferred option. These principles would both facilitate decision-making and allow the process to be transparent to stakeholders.

The same principles could be used to assess potential changes to the current service delivery model with respect to existing tests.

Overall the tests/technologies outlined in the question would be deemed to be more complex than some of the other tests discussed during the review that are being considered for remaining onsite. Given the spectrum of testing currently performed and anticipated testing/technologies development of principles to guide decision-making should be a priority, if this has not already occurred (assessment of business cases was deemed to be out of scope for the review)

- 2. How important is on-site medical supervision of diagnostic testing? How does on-site supervision by a general pathologist compare with on-site supervision by a team of medical microbiologists in terms of medical quality?*

The importance of timely access to appropriate medical support for the Microbiology laboratory is acknowledged and supported. During the onsite portion of the review it was indicated that support for Microbiology laboratories outside of Victoria is currently being provided, predominantly remotely, via a variety of channels.

Given the varying scope and complexity of testing in different Microbiology laboratories the frequency and nature of onsite or remote support may vary between laboratories. Contingent on the changes to the current service delivery model, requirements for support should be developed by VIHA.

With respect to the prerequisites of individuals providing support the competencies necessary for such support have to be defined by VIHA; this definition will enable identification of the necessary qualifications.

3. *Given your experience, how important is having microbiology labs open 24 hours each day to patient care*

Hours of operation should be determined by service requirements, testing volumes, along with cost effectiveness. The extent to which this results in 24/7 operations varies between laboratories. What is important is that the service requirements are determined in collaboration with stakeholders and the delivery model optimizes resource utilization. An additional factor is providing a consistent level of service across the region.

One reviewer's personal experience with 24/7 microbiology services has been that of a laboratory with numerous technologists working during the day shift, a small number of technologists on evenings, and a lone microbiology technologist on graveyard shift. The overnight staffing was valuable for handling on-site STAT requests, but had little if any effect on overall TAT. The RJH microbiology laboratory may be of sufficient size currently to offer 24/7 microbiology technologist coverage; potentially, this could be instituted on a trial basis to determine the effects of offering 24-hour service.

Another reviewer's personnel experience has been with 24/7 microbiology services with substantial distribution of staffing levels between 2 or 3 shifts. Fundamental in implementing this service delivery model was assessment and redesign of processes to "smooth" management of processing and testing volumes. This redesign did facilitate management of referred in specimens/testing as well as testing capacity. Within VIHA, potential changes to service delivery should be predicated on first establishing performance targets followed by establishing what model(s) could meet the targets, including changes to current hours of operation.