

PUSHING THE BOUNDARIES FOR HIV, HCV & STI TESTING: A CALL FOR ACTION

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STRUCTURE

- 1 Problem: Burden and Need
- 2 Solution: Testing As An Entry Point
- 3 Vision For Poct Strategies

“To turn caring into an action, we need to see a problem, find a solution, and deliver impact.”

BILL GATES

PROBLEM:

BURDEN OF HIV/HCV IN CANADA

- HIV 71,300 (58,600-84,000) HI
 - 11% increase in new HIV infection
- HCV **242,500** living with HCV;
 - 10,000 new cases detected annually
- HIV about 33% are co-infected with HCV
 - HIV 20%-25% vs. HCV 21%-40% unaware of their serostatus?
- About 41-65% infected with HIV, present with advanced infection; cost 55% higher
- About 15%-25% infected with HCV, clear the virus; 75%-85% remain chronically infected;

BURDEN: ESTIMATE PROPORTION OF AT-RISK POPULATIONS UNAWARE OF THEIR SEROSTATUS

	NUMBER	PERCENTAGE
IDUs	2,800	25%
MSMs	6,000	19%
Hetero	7,000	35%
TOTAL	16,900	26%

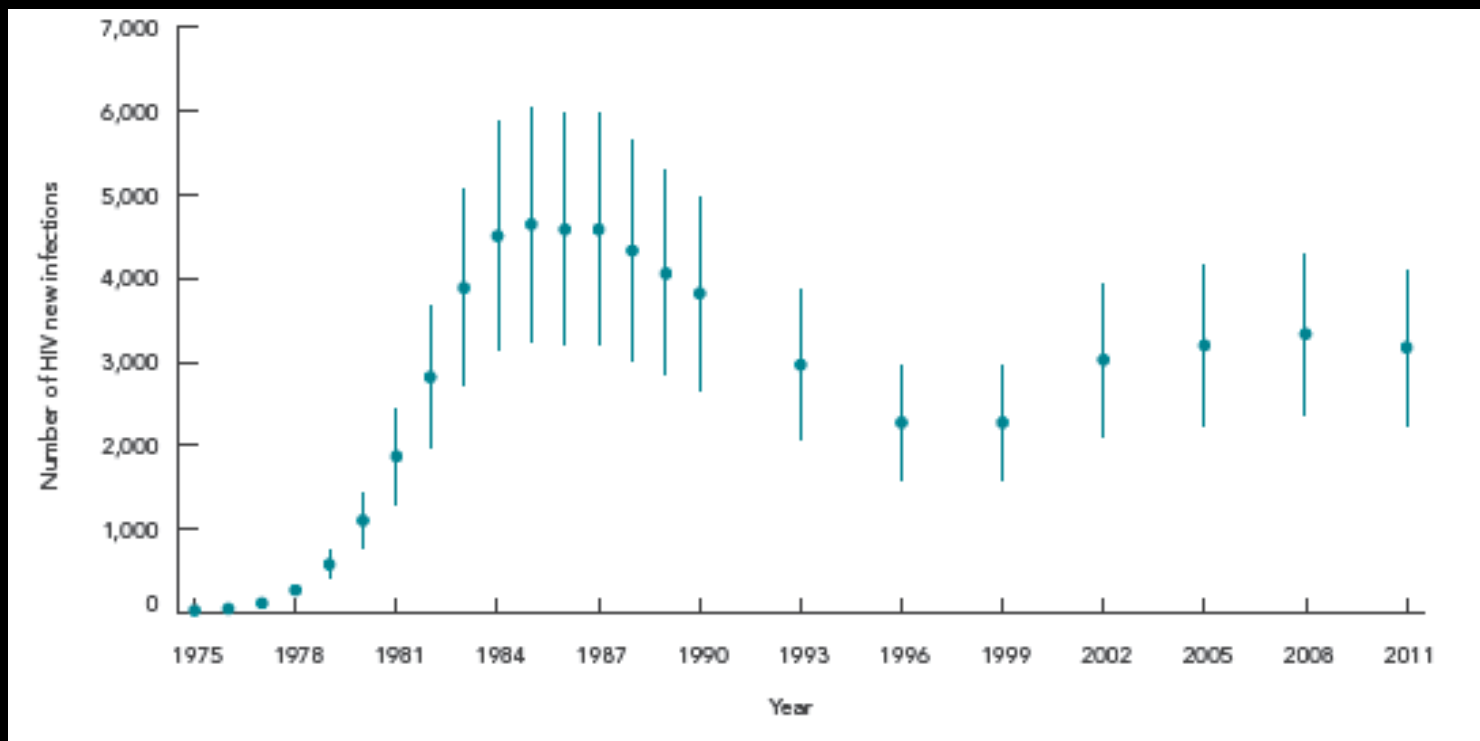
Source:

Data for Canada: Public Health Agency of Canada (2010). HIV/AIDS Epi Updates - July 2010.

Available at: <<http://www.phac-aspc.gc.ca/aids-sida/publication/epi/2010/2-eng.php>>. Accessed on Feb 06th, 2013.

MSMs: men who have sex with men; IDUs: injection drug users

BURDEN: BURDEN: ESTIMATED NUMBER OF INCIDENT HIV INFECTIONS OVER TIME



Source:

Public Health Agency of Canada (2012). Summary: Estimates of HIV Prevalence and Incidence in Canada, 2011. Available at: <http://www.phac-aspc.gc.ca/aids-sida/publication/survreport/estimaf2011-eng.php> . Accessed on Feb 06th, 2013

BURDEN OF STI IN CANADA

- STI: Infectious Syphilis, Chlamydia, Gonorrhea are notifiable steadily on the rise in young Canadians, since 1990 (460% increase; 1800 new cases alone); middle aged and older adults also report cases. Majority are treatable.
- Rates Aboriginals= 3.5 times higher
- Immigrant populations, MSM (outbreaks Syphilis), incarcerated population (HIV HBV HCV).

BURDEN & IMPACT

- STI/HIV Co-infection poses a public health problem increases acquisition and transmission of HIV
- Chronic undiagnosed hepatitis (with/without HIV) fuels transmission- undermining control efforts
- Early treatment for HIV improves patient outcomes reduces community viral load- controls infection
- Effective treatments (DAA) for HCV (clear infection); yet people don't know they are infected and few access it.
- New initiatives for HCV and HIV and perhaps STI are urgently needed to address these many epidemics

LETS EXAMINE HIV TESTING ACROSS PROVINCES

Province or Territory	Anonymous Testing Available (in select locations)	Nominal Testing Available	Non-nominal Testing Available	Rapid Testing Available (in select locations)	Prenatal Testing Policy
Newfoundland and Labrador	No	Yes	Yes	No	Opt-out
Prince Edward Island	No	Yes	Yes	No	Opt-in
New Brunswick	Yes	Yes	Yes	Yes	Opt-out
Nova Scotia	Yes	Yes	Yes	No	Opt-in
Quebec	Yes	Yes	Yes	Yes	Opt-out
Nunavut	No	Yes	Yes	No	Opt-out
Ontario	Yes	Yes	Yes	Yes	Opt-in
Manitoba	Yes	Yes	Yes	Yes	Opt-out
Saskatchewan	Yes	Yes	Yes	Yes	Opt-in
Alberta	Yes	Yes	Yes	Yes	Opt-out
Northwest Territories	No	Yes	Yes	Yes	Opt-out
British Columbia	No	Yes	Yes	Yes	Opt-in
Yukon	No	Yes	Yes	No	Opt-in

Source:

Wertheimer, S. (2011). Women and HIV Testing in Canada: Barriers and Recommendations as Identified by Service Providers: A Summary of Key Research Findings. Ottawa: Canadian AIDS Society

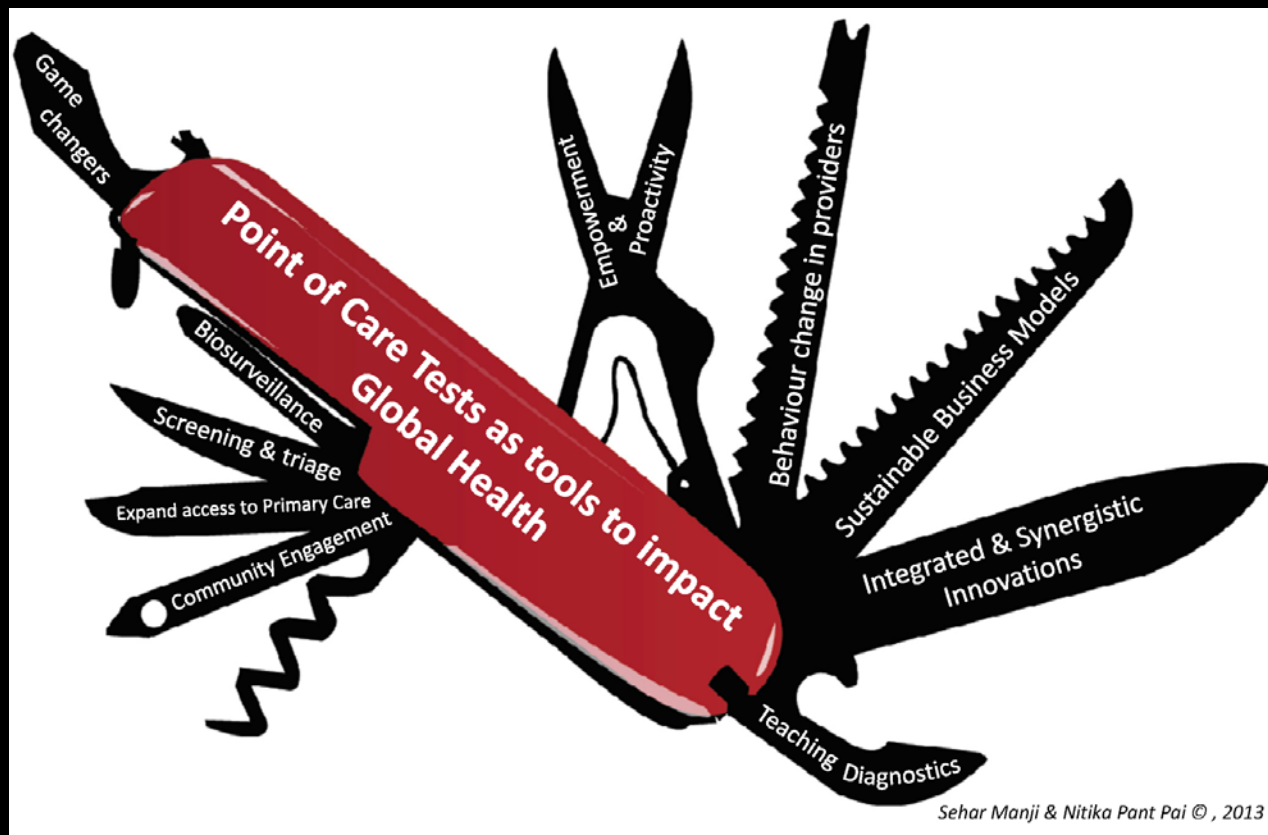
CURRENT REALITY: TYPE OF HIV TESTING

- Rapid tests: remains largely unavailable in most of Canada, with the exception of a few specialized clinics and pilot projects (about 16-20 pilot projects across Canada).
- **Health Canada requires that rapid test kits only be used in settings where pre- and post-test HIV counseling available**
- **INSTI HIV rapid test popular (one vs. 10 FDA approved tests in US)**
- Currently available HIV testing technologies precipitate delays, loose patients, fail to engage patients in their own care
- Delay in Standard laboratory-based (ELISA + confirmatory WB): and result 1-4 weeks depending on location.
- HIV RNA for viral load used for monitoring ART/ HIV p24 Antigen Test: available in select locations

HCV SCREENING PROGRAMS

- Currently, universal screening or risk based screening is not available
- A call for greater Implementation of HCV screening in primary care
- More people screened, linked and engaged in care across the continuum of care

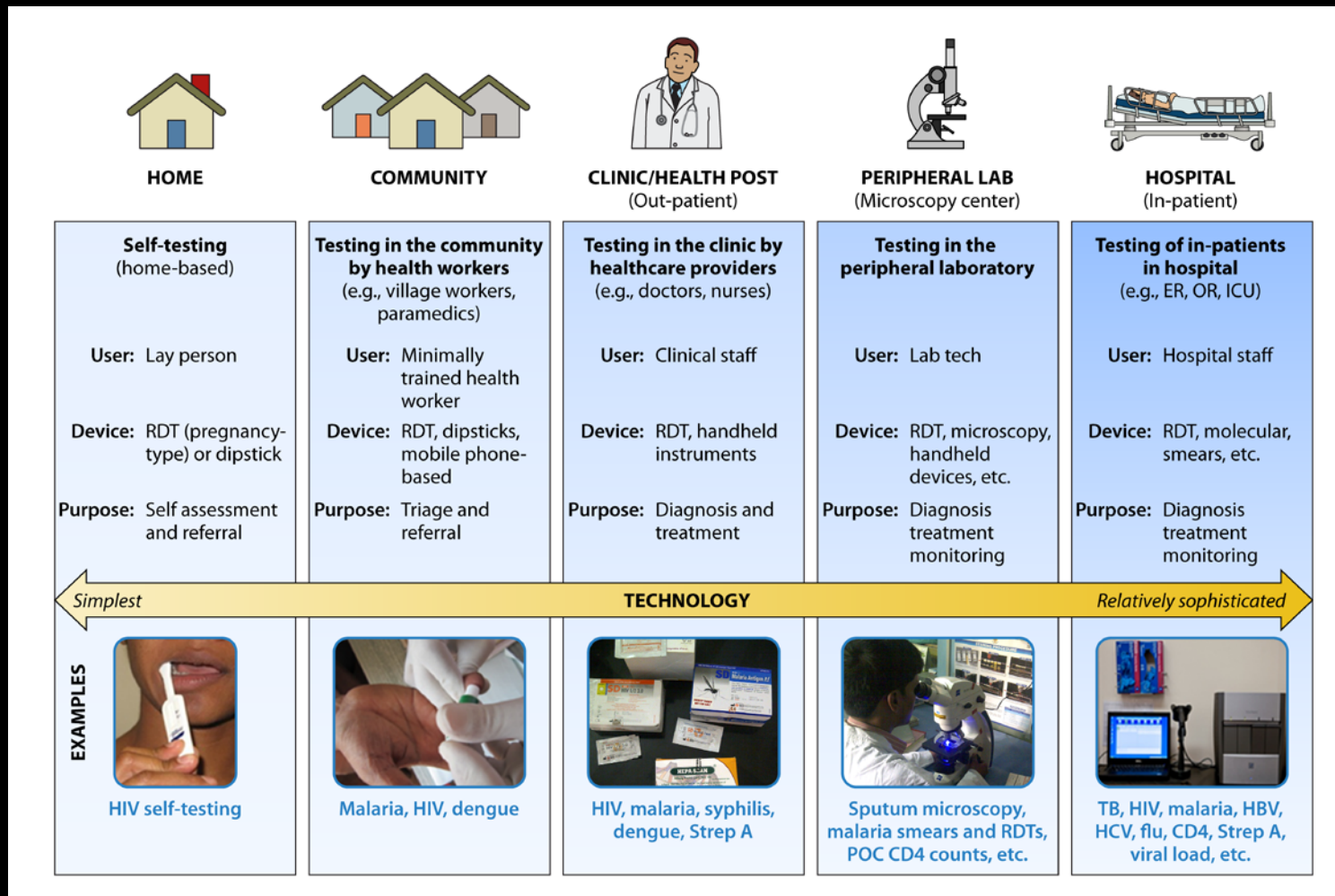
SOLUTION: POINT OF CARE TECHNOLOGIES (POCT)

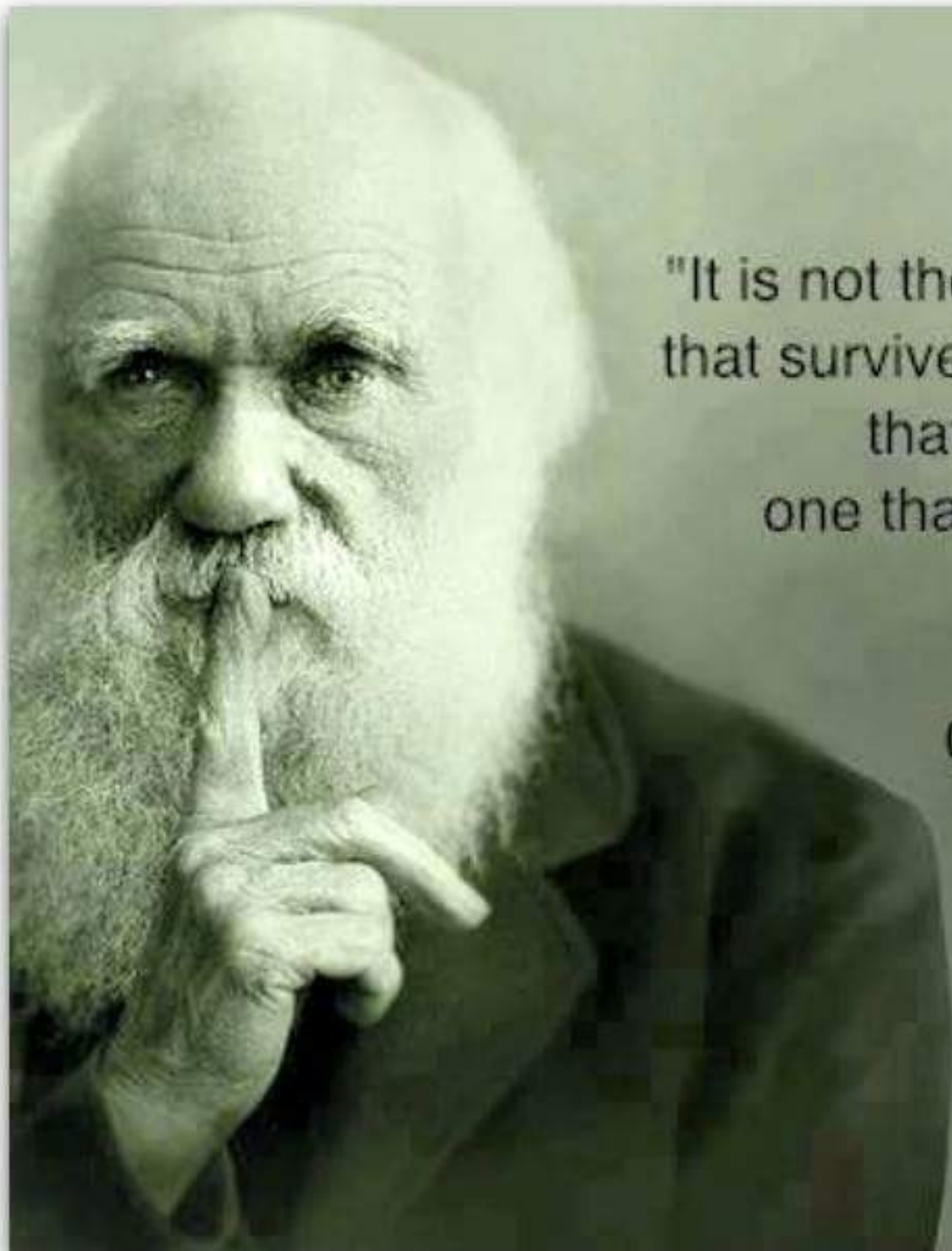


Pant Pai N, Behlim T. Point-of-Care Technologies and their Global Health Applications. *Current Pharmacogenomics and Personalized Medicine*, 2013, 11, 181-186 (**Editorial**)



POCT is a “spectrum” which covers a variety of settings, users, products (i.e. TPPs)





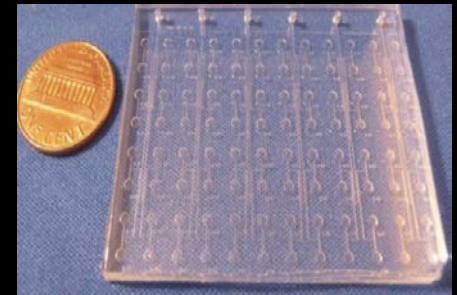
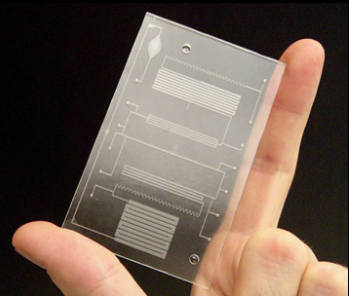
"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change".

Charles Darwin

GOAL-ORIENTED DEFINITION OF POCT

“Testing that will result in a clear, actionable, management decision (e.g. referral, initiation of confirmatory test, start of treatment), within the same clinical encounter (e.g. day).”

ARE THESE POCT'S ACCURATE?
WILL THEY WORK?
WILL THEY BE ACCEPTED?
WILL THEY IMPACT CONTROL OF
INFECTION?



Accuracy of Rapid and Point-of-Care Screening Tests for Hepatitis C

A Systematic Review and Meta-analysis

Sushmita Shivkumar, MSc; Rosanna Peeling, PhD; Yalda Jafari, MSc; Lawrence Joseph, PhD; and Nitika Pant Pai, MD, MPH, PhD

Background: 170 million persons worldwide are infected with hepatitis C, many of whom are undiagnosed. Although rapid diagnostic tests (RDTs) and point-of-care tests (POCTs) provide a time- and cost-saving alternative to conventional laboratory tests, their global uptake partly depends on their performance.

Purpose: To meta-analyze the diagnostic accuracy of POCTs and RDTs to screen for hepatitis C.

Data Sources: MEDLINE, EMBASE, BIOSIS, and Web of Science (1992 to 2012) and bibliographies of included articles.

Study Selection: All studies evaluating the diagnostic accuracy of POCTs and RDTs for hepatitis C in adults (aged ≥ 18 years).

Data Extraction: Two independent reviewers extracted data and critiqued study quality.

Data Synthesis: Of 19 studies reviewed, 18 were meta-analyzed and stratified by specimen type (whole blood, serum, plasma, or oral fluid) or test type (POCT or RDT). Sensitivity was similarly high in POCTs of whole blood (98.9% [95% CI, 94.5% to 99.8%]) and

serum or plasma (98.9% [CI, 96.8% to 99.6%]), followed by RDTs of serum or plasma (98.4% [CI, 88.9% to 99.8%]) and POCTs of oral fluid (97.1% [CI, 94.7% to 98.4%]). Specificity was also high in POCTs of whole blood (99.5% [CI, 97.5% to 99.9%]) and serum or plasma (99.7% [CI, 99.3% to 99.9%]), followed by RDTs of serum or plasma (98.6% [CI, 94.9% to 99.6%]) and POCTs of oral fluid (98.2% [CI, 92.2% to 99.6%]).

Limitation: Lack of data prevented sensitivity analyses of specific tests.

Conclusion: Data suggest that POCTs of blood (serum, plasma, or whole blood) have the highest accuracy, followed by RDTs of serum or plasma and POCTs of oral fluids. Given their accuracy, convenience, and quick turnaround time, RDTs and POCTs may be useful in expanding first-line screening for hepatitis C.

Primary Funding Source: Canadian Institutes of Health Research.

Ann Intern Med. 2012;157:558-566.

For author affiliations, see end of text.

www.annals.org

Rapid Point-of-Care First-Line Screening Tests for Hepatitis B Infection: A Meta-Analysis of Diagnostic Accuracy (1980–2010)

REVIEW

Sushmita Shivkumar, MSc^{1,2}, Rosanna Peeling, PhD³, Yalda Jafari, MSc¹, Lawrence Joseph, PhD² and Nitika Pant Pai, MD, MPH, PhD^{1,4}

OBJECTIVES: Three-hundred fifty million people worldwide are chronically infected with Hepatitis B, with four million acute infections annually. With infection concentrated in hard-to-reach populations and low resource settings, rapid point-of-care (POC) tests offer an efficient screening alternative to laboratory tests. We conducted a meta-analysis to evaluate accuracy of rapid POC tests screening for Hepatitis B.

METHODS: Two reviewers searched four databases, critiqued quality. A hierarchical Bayesian meta-analysis correcting for imperfect reference standards was used. Based on components of the antigen–antibody response, 17 studies were stratified into three subgroups: (i) Hepatitis B surface antigen (HBsAg) tests; (ii) anti-HBsAg tests, and (iii) HBs + eAg tests. Further, we pooled estimates on individual tests with sufficient data.

RESULTS: In subgroup 1, the pooled sensitivity (Sn) was 94.76% (95% credible interval (CrI): 90.08–98.23%) and specificity (Sp) was 99.54% (95% CrI: 99.03–99.95%). The Determine test reported a pooled Sn 98.2% (95% CrI: 94.7, 99.9) and Sp 99.9% (95% CrI: 99.3, 100); in subgroup 2, Sn 93.2% (95% CrI: 85.1, 98.5), Sp 93.1% (95% CrI: 81.9, 99.9); and in subgroup 3, the Binax test showed Sn 95.5% (95% CrI: 88.9, 99.4), Sp 99.8% (95% CrI: 99.3, 100).

CONCLUSIONS: HBsAg tests, including Determine, and the HBs + eAg test, Binax showed high accuracy. Improvements in sensitivity of antibody-based tests will enhance their potential for global first-line screening.

SUPPLEMENTARY MATERIAL is linked to the online version of the paper at <http://www.nature.com/ajg>

Am J Gastroenterol advance online publication, 29 May 2012; doi:10.1038/ajg.2012.141

OPEN ACCESS Freely available online

PLOS ONE

Are *Treponema pallidum* Specific Rapid and Point-of-Care Tests for Syphilis Accurate Enough for Screening in Resource Limited Settings? Evidence from a Meta-Analysis

Yalda Jafari¹, Rosanna W. Peeling², Sushmita Shivkumar¹, Christiane Claessens³, Lawrence Joseph^{1,4}, Nitika Pant Pai^{4*}

1 Department of Epidemiology, Biostatistics and Occupational Health, McGill University, Montréal, Canada, 2 London School of Hygiene and Tropical Medicine, London, United Kingdom, 3 Institut national de santé publique (INSPQ), Montréal, Canada, 4 Division of Clinical Epidemiology, Department of Medicine, McGill University and MUHC, Montréal, Canada

Abstract

Background: Rapid and point-of-care (POC) tests for syphilis are an invaluable screening tool, yet inadequate evaluation of their diagnostic accuracy against best reference standards limits their widespread global uptake. To fill this gap, a systematic review and meta-analysis was conducted to evaluate the sensitivity and specificity of rapid and POC tests in blood and serum samples against *Treponema pallidum* (TP) specific reference standards.

Methods: Five electronic databases (1980–2012) were searched, data was extracted from 33 articles, and Bayesian hierarchical models were fit.

Results: In serum samples, against a TP specific reference standard point estimates with 95% credible intervals (CrI) for the sensitivities of popular tests were: i) Determine, 90.04% (80.45, 95.21), ii) SD Bioline, 87.06% (75.67, 94.50), iii) Visi-Tect, 85.13% (72.83, 92.57), and iv) Syphicheck, 74.48% (56.85, 88.44), while specificities were: i) Syphicheck, 99.14% (96.37, 100), ii) Visi-Tect, 96.45% (91.92, 99.29), iii) SD Bioline, 95.85% (89.89, 99.53), and iv) Determine, 94.15% (89.26, 97.66). In whole blood samples, sensitivities were: i) Determine, 86.32% (77.26, 91.70), ii) SD Bioline, 84.50% (78.81, 92.61), iii) Syphicheck, 74.47% (63.94, 82.13), and iv) Visi-Tect, 74.26% (53.62, 83.68), while specificities were: i) Syphicheck, 99.58% (98.91, 99.96), ii) Visi-Tect, 99.43% (98.22, 99.98), iii) SD Bioline, 97.95% (92.54, 99.33), and iv) Determine, 95.85% (92.42, 97.74).

Conclusions: Rapid and POC treponemal tests reported sensitivity and specificity estimates comparable to laboratory-based treponemal tests. In resource limited settings, where access to screening is limited and where risk of patients lost to follow up is high, the introduction of these tests has already been shown to improve access to screening and treatment to prevent stillbirths and neonatal mortality due to congenital syphilis. Based on the evidence, it is concluded that rapid and POC tests are useful in resource limited settings with poor access to laboratories or screening for syphilis.

Editor: D. William Cameron, University of Ottawa, Canada

Received: January 15, 2012; **Accepted:** December 17, 2012; **Published:** February 26, 2013

February 2013 | Volume 8 | Issue 2 | e54695

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THE LANCET Infectious Diseases

Head-to-head comparison of accuracy of a rapid point-of-care HIV test with oral versus whole-blood specimens: a systematic review and meta-analysis



Nitika Pant Pai, Bhairavi Balram, Sushmita Shivkumar, Jorge Luis Martinez-Cajas, Christiane Claessens, Gilles Lambert, Rosanna W Peeling, Lawrence Joseph

Summary

Background The focus on prevention strategies aimed at curbing the HIV epidemic is growing, and therefore screening for HIV has again taken centre stage. Our aim was to establish whether a convenient, non-invasive, HIV test that uses oral fluid was accurate by comparison with the same test with blood-based specimens.

Methods We did a systematic review and meta-analysis to compare the diagnostic accuracy of a rapid HIV-antibody-based point-of-care test (Oraquick advance rapid HIV-1/2, OraSure Technologies Inc, PA, USA) when used with oral versus blood-based specimens in adults. We searched five databases of published work and databases of five key HIV conferences. Studies we deemed eligible were those focused on adults at risk of HIV; we excluded studies in children, in co-infected populations, with self-reported inferior reference standards, and with incomplete reporting of key data items. We assessed the diagnostic accuracy of testing with oral and blood-based specimens with bivariate regression analysis. We computed positive predictive values (PPVs) in high-prevalence and low-prevalence settings with Bayesian methods.

Findings In a direct head-to-head comparison of studies, we identified a pooled sensitivity about 2% lower in oral

Published Online
January 24, 2012
DOI:10.1016/S1473-3099(11)70368-1

See Online/Correspondence
DOI:10.1016/S1473-3099(12)70000-0

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(N Pant Pai MD,
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Funding Canadian Institutes for Health Research (CIHR KRS 102067).

www.thelancet.com/infection Published online January 24, 2012 DOI:10.1016/S1473-3099(11)70368-1

THREE MAIN HIV TESTING STRATEGIES

1. Facility based

- Routine HIV testing in health care facilities
 - ✓ expands opportunities to screen, increase early diagnoses - Vancouver and Winnipeg

2. Community based outreach out of facility based testing

3. Home based unsupervised or supervised site based self testing

POCT-based pilot projects

CIHR REACH scoping review (Asghari et al.)

- Vancouver (7)
- Quebec (4)
- Ontario (4)
- Alberta (2)
- Manitoba (2)

Panel members will present their experiences

COMMUNITY BASED TESTING APPROACHES

- a. Site based Pharmacy based testing Vancouver Coastal Health (HIV)
- b. Prison based testing Halton Health Deptmt, Ontario
- c. Outreach community clinic SPOT Montreal QC (HIV STI)
- d. Peer based and lay provider based testing at Hassle Free clinic
- e. Outreach settings, bars, bathhouses, mobile vans

**timely referrals, proactive linkage to care and treatment services is key*

COMBINED OR SIMULTANEOUS TESTING FOR HIV HCV STI

- Provincial and regional approaches to testing vary and driven by the needs of their communities and resources in their jurisdictions.
- Combined HIV HCV or HIV HCV STI testing
 - Aimed to increase uptake of testing, increase access, improve numbers with new infection, and link to care.
- Hassle Free clinic Toronto HIV STI
- Gay Zone Ottawa HIV STI

COMBINED OR SIMULTANEOUS TESTING FOR HIV HCV STI

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Open Access

Research

BMJ Open Will a quadruple multiplexed point-of-care screening strategy for HIV-related co-infections be feasible and impact detection of new co-infections in at-risk populations? Results from cross-sectional studies

Nitika Pant Pai,^{1,5} Rachita Dhurat,² Martin Potter,^{3,4} Tarannum Behlim,⁵ Geneviève Landry,⁴ Caroline Vadnais,⁵ Camilla Rodrigues,⁶ Lawrence Joseph,⁷ Anjali Shetty⁶

To cite: Pai NP, Dhurat R, Potter M, *et al.* Will a quadruple multiplexed point-

ABSTRACT

Objectives: Multiplexed point-of-care (POC) devices can rapidly screen for HIV-related co-infections.

Strengths and limitations of this study

A multiplexed point-of-care test-based strategy



FDA approved in home oral HIV self test July 25 2011

Research Article

Will an Unsupervised Self-Testing Strategy Be Feasible to Operationalize in Canada? Results from a Pilot Study in Students of a Large Canadian University

Nitika Pant Pai,^{1,2} Madhavi Bhargava,² Lawrence Joseph,³ Jigyasa Sharma,¹ Sabrina Pillay,² Bhairavi Balram,¹ and Pierre-Paul Tellier⁴

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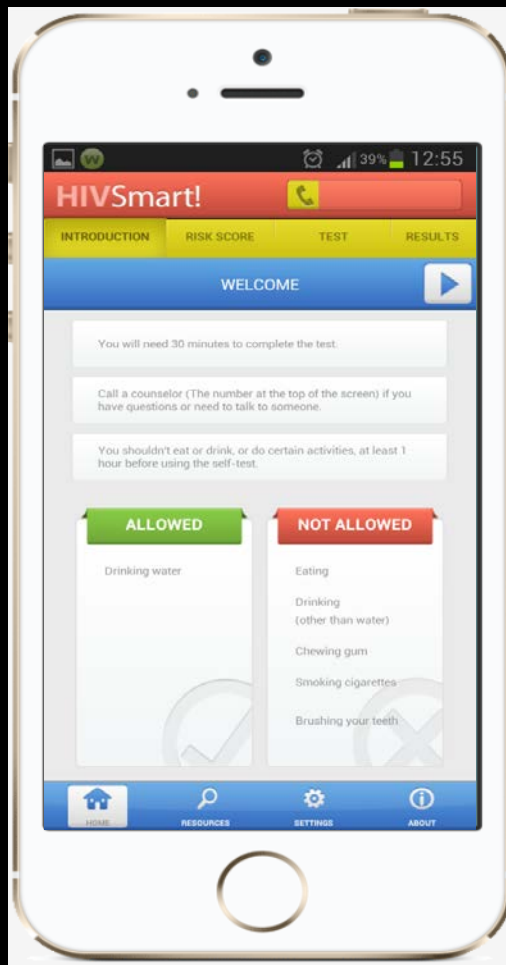
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Background. A convenient, private, and accessible HIV self-testing strategy stands to complement facility-based conventional testing. Over-the-counter oral HIV self-tests are approved and available in the United States, but not yet in Canada. Canadian data on self-testing is nonexistent. We investigated the feasibility of offering an unsupervised self-testing strategy to Canadian students. *Methods.* Between September 2011 and May 2012, we recruited 145 students from a student health clinic of a large Canadian university. Feasibility of operationalization (i.e., self-test conduct, acceptability, convenience, and willingness to pay) was evaluated. Self-test conduct was computed with agreement between the self-test performed by the student and the test repeated by a healthcare professional. Other metrics were measured on a survey. *Results.* Participants were young (median age: 22 years), unmarried (97%), and 47% were out of province or international students. Approximately 52% self-reported a history of unprotected casual sex and sex with multiple partners. Self-test conduct agreement was high (100%), so were acceptability (81%), convenience (99%), and willingness to pay (74%) for self-tests. Concerns included accuracy of self-tests and availability of expedited linkages. *Conclusion.* An unsupervised self-testing strategy was found to be feasible in Canadian students. Findings call for studies in at-risk populations to inform Canadian policy.

INNOVATION

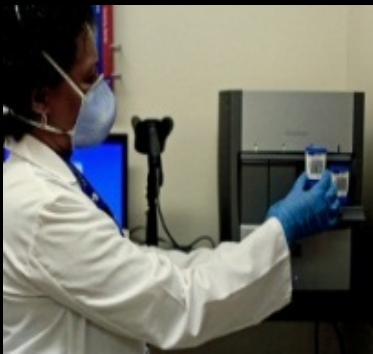
HIV SMART!: A STRATEGY TO SELF TEST



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VISION: DEMOCRATIZE TESTING SERVICES WITH POCT From the clinic to the community



Within regions- from clinics to
communities to homes- individuals

VISION: DEMOCRATIZE HIV/STI POC SCREENING SERVICES ACROSS PROVINCES

- Multi pronged strategy
- Provision of facility based routine HIV HCV testing, community based HIV HCV and STI services and self testing HIV across provinces
 - Easy access to screening services, expedited referrals, enhanced monitoring and retention in care
 - Expanded outreach with point of care services
 - Innovations to support screening strategies

VISION: FOSTER INNOVATION

Innovative optimized strategies, service delivery models that can help integrate POCT use across regions.

ACKNOWLEDGEMENT RESEARCH SUPPORT!



THANK YOU!

CATIE: Laurie, Tim, Christie



“What matters is to live in the present, live now, for every moment is now. It is your thoughts and acts of the moment that create your future. The outline of your future path already exists, for you created its pattern by your past.”

Eckhart Tolle