SCIENCE AND COMMUNITY IN THE RESPONSE TO HIV IN WESTERN AFRICA

AIDS 2018 POST-CONFERENCE WORKSHOP

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Point of Care Technologies in PMTCT Programme. How impactful?

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• PMTCT programmes offer a range of services for women of reproductive age living with or at risk of HIV to maintain their health and stop their infants from acquiring HIV.

• PMTCT services should be offered before conception, and throughout pregnancy, labour and breastfeeding.
PMTCT services should include:

- early infant diagnosis at four to six weeks after birth,
- testing at 18 months and/or when breastfeeding ends
- ART initiation as soon as possible for HIV-exposed infants to prevent HIV acquisition.
WHO POCT criteria: ASSURED
Affordable, Sensitive, Specific, User-friendly, Rapid and robust, Equipment-free and Deliverable to end-users

- POC diagnostics are simple to use devices that can be used not only by laboratory staff but also by other health care professionals with basic training
- POCT have become useful in the expansion and provision of PMTCT services for HIV, syphilis, and other diseases such as malaria and bacterial pneumonia rarely covered in PMTCT.
Several efforts have been made toward improving access to POC diagnostic services, including the development of a list of essential in vitro diagnostics by WHO.

This list is required to diagnose common diseases and other global priority infections such as HIV, TB, syphilis, and malaria.
### TABLE 1. Availability POC Tests Relevant for PMTCT in LMICs

<table>
<thead>
<tr>
<th>Type of POC Test</th>
<th>Disease Target</th>
<th>Type of Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV test</td>
<td>HIV</td>
<td>LFIA</td>
</tr>
<tr>
<td>EID</td>
<td>HIV</td>
<td>LFIA</td>
</tr>
<tr>
<td>CD4 count</td>
<td>HIV</td>
<td>NAT Image-based immune</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hematology assay</td>
</tr>
<tr>
<td>Dual HIV/syphilis RDT</td>
<td>HIV</td>
<td>LFIA</td>
</tr>
<tr>
<td>RST</td>
<td>Syphilis</td>
<td>LFIA</td>
</tr>
<tr>
<td>Malaria RDT</td>
<td>Malaria</td>
<td>LFIA</td>
</tr>
<tr>
<td>LAMP</td>
<td>Malaria</td>
<td>NAAT</td>
</tr>
</tbody>
</table>

Abbreviations: EID, early infant diagnosis; LAMP, loop-mediated isothermal amplification; LFIA, lateral flow immunoassay; NAT, nucleic acid testing assay; NAAT, nucleic acid amplification based assay; RST, rapid syphilis test.

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Juliet Katoba, Desmond Kuupiel and Tivani P. Mashamba-Thompson.
Toward Improving Accessibility of Point-of-Care Diagnostic Services for Maternal and Child Health in Low- and Middle-Income Countries  **Point of Care 2019;18: 17–25**
EARLY INFANT DIAGNOSIS (EID)

• Turnaround time and the actual return of test results to providers and parents are critical bottlenecks to early initiation of treatment.

• POC testing potential to overcome the problems associated with the time gap between test and result.

• POC technology makes it possible to test infants on-site and receive the results within hours.

• HIV-positive infants can begin ART immediately which reduces the risk of loss to follow-up
**EID**

WHO in 2015: breakthrough that created the opportunity to increase coverage of EID testing.
- allow same-day test results
- enable the initiation of earlier treatment,
- address some key limitations of conventional EID networks – in particular long turnaround times for tests and high rates of loss to follow up.

WHO prequalification June 2016 of two POCs
- AlereTMq HIV 1/2 Detect3
- Cepheid Xpert®HIV-1 Qual4
EID

• Study if the Alere HIV-1/2 Detect system, would improve retention in care and treatment uptake.

• UNITAID and UNICEF supported a cluster-randomized study in Mozambique, conducted by Mozambique’s National Institute of Health.
EID

• substantial difference in number of test results available at the health facility
• all POC results for infants tested were available at the health facility
• 19% of standard method results failed to be returned, 99.5% POC results were provided to the infant’s caregiver, compared to 65% results returned to the facility.
• Whereas 89.7% of infants POC positive had started treatment within 2 months diagnosis, only 12.8% of those tested by the standard method had started treatment
EID

• Six months after testing, infants in the point-of-care arm were still around two-and-a-half times more likely to be on treatment

• Infants in the standard-of-care arm were still less likely to have started treatment within one month of the result being disclosed

• Also less likely to be retained on ART three months after starting treatment
EID

• UNITAID is investing $63 million in POC for EID and HIV viral load testing in 9 countries in sub-Saharan Africa

• Aim is to increase proportion of infants who are tested, retained in care and initiated on ART.

• UNITAID is working with the Elisabeth Glaser Pediatric AIDS Foundation to test at least 215,000 infants.
HIV/SYPHILIS DUO

- Dual HIV/syphilis rapid diagnostic tests (RDTs) that can detect both HIV and syphilis at the same time during a single clinic visit are also available.
- A cluster-randomized controlled study has shown the potential for dual HIV/syphilis RDT on timely treatment for women who tested positive for syphilis.
- The study also found that the costs for dual testing for HIV/syphilis and treatment for syphilis are high.
- Dual HIV/syphilis testing represents an important opportunity for PMTCT of HIV and syphilis.
POC HIV/Syphilis Tests – Available and Pipeline*

- Standard Diagnostics HIV/Syphilis Duo Rapid Test
- Chembio DPP® HIV-Syphilis Assay
- MedMira Multiplo Rapid TP/HIV Antibody Test
- Biolytical INSTI Combined HIV/Syphilis Test
- Junco Labs mChip Assay*

- CTK Biotech OnSite™ HIV/Syphilis
- Premier Medical First Response® HIV 1+2/syphilis


*Estimated as of May 2018 - timeline may change

--- No market launch date set by company.
CD4

- There is a policy shift toward treating all HIV-infected pregnant women irrespective of CD4 count.
- CD4 count still remains a useful tool for monitoring patient's response to treatment in settings where VL monitoring is limited.
- POCT for CD4 count are available, and studies have demonstrated that POC CD4 testing can overcome challenges associated with laboratory-based CD4 testing.
MALARIA

• WHO recommends a package of interventions for the control of malaria in pregnant women and case management in areas of moderate to high transmission.
• These interventions include early diagnosis with prompt effective antimalarial treatment to prevent progress to severe malaria in malaria-endemic areas.
• The challenge in preventing congenital malaria in Sub-Saharan Africa has been due to a lack of tests, which are adequately sensitive to detect peripheral / placental malaria.
• POCT including molecular techniques for diagnosis of malaria in pregnant women are now well established.
MALARIA

• Malaria RDTs are easy to use, require minimum training, and do not need sophisticated infrastructure, are cost effective.

• Nonetheless, previous studies suggest that accessibility and malaria RDTs use poor in most rural endemic settings.

• A study in Ghana indicated that health care delivery constraints such as weak supply chain, limited quality assurance, and staffing limitations are some of the issues that may affect access to RDTs for malaria in PHC facilities.

• Another study reported in a systematic review found that nurses and nursing assistants were not proficient in execution of RDTs for malaria.
TB HIV Co Infection

- Alere Determine™ TB LAM Ag test point-of-care screen for active TB in HIV positive patients

- Detects the LAM antigen (lipoarabinomannan) in urine samples

- Enables TB screening to rule-in sooner than traditional methods and enabling earlier treatment patient
HEALTH SYSTEMS

- POCT have progressively been rolled out and are currently being used in health care settings and global health programs in LMICs.
- Access to POC diagnostic services will require a strengthened health system for a functional delivery service.
POCT STIs

With respect to STIs, with the exception of screening for syphilis and combined HIV/syphilis and of testing for TV, it is generally the case that RDTs do not perform sufficiently well relative to laboratory-based platforms, in particular NAAT-based platforms.

Must consider what assay/platform characteristics are recommended for STI testing to effectively reach the point of patient care and thus impact PMCT.
POCT STIs
Testing platforms for STI - particularly CT, NG and HPV - that can be used at or near the point of patient care are needed.

GeneXpert provides assays for CT, CT/NG, TV and HPV.

Platforms such as Xpert®, are most appropriate for use at the district hospital or above in resource-limited settings.
## POC STI Tests: Available and Pipeline*

<table>
<thead>
<tr>
<th>Year</th>
<th>Product/Device</th>
<th>Company/Platform</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to 2015</td>
<td>careHPV™ Qiagen HPV</td>
<td>Qiagen</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>OncoE6™ Arbor Vita Corp. HPV</td>
<td>Arbor Vita Corp.</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>GeneXpert® Cepheid CT/NG, TV, HPV</td>
<td>Cepheid</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Solana® Quidel TV</td>
<td>Quidel</td>
<td></td>
</tr>
<tr>
<td>2018 and beyond</td>
<td>Vivalytic Randox/Bosch CT/NG/TV/panel</td>
<td>Randox/Bosch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alere™-i Alere CT/NG</td>
<td>Alere</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Truelab™ PCR Molbio/bigTec CT, NG, TV, HPV</td>
<td>Molbio/bigTec</td>
<td></td>
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<tr>
<td></td>
<td>Diaassess Platform Diassess CT/NG</td>
<td>Diassess Platform</td>
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<tr>
<td></td>
<td>GynTect® Oncognostics/BLINK HPV</td>
<td>Oncognostics/BLINK</td>
<td></td>
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<tr>
<td></td>
<td>NEDxA® GENOMICA HPV - 2019</td>
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<tr>
<td></td>
<td>GeneXpert® Omni CT/NG, HPV</td>
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<tr>
<td></td>
<td>RT CPA Ustar CT</td>
<td>Ustar</td>
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</tbody>
</table>

*Estimated as of May 2018 - timeline and sequence may change.  
---No market launch date set by company.
HEALTH SYSTEMS

Despite the increasing sophistication of novel diagnostic technologies, the impact POCT will be limited unless they can successfully accommodate the weaknesses in healthcare systems in resource-constrained settings, which often affect the successful delivery of diagnostics in-country.

- shortages of human resources
- lack of training for staff
- supply chain challenges
- lack of diagnostic equipment/ equipment breakdowns
- lack of robust quality assurance/ quality control systems
A strengthened health system framework for improving access and sustainability of POC diagnostic services in LMIC

Katoba et al. Point of Care 2019;18: 17–25
HEALTH SYSTEMS

• Available POC tests enable detection, diagnosis, and monitoring of HIV and other infections such as syphilis and malaria aimed for PMTCT in LMICs.
• Accessibility of POCT services, training healthcare workers and efficiency of POCT service delivery are also important.
• A framework for improving access and sustainability of POC diagnostic services in LMICs is required.
Conclusion
When the required technical specifications and preferred operational specifications are married in a single platform/platforms.

Then such POCs will be well positioned to achieve the desired level of uptake and impact on PMTCT in global health.
References

• Diagnostic Brief on Dual HIV/Syphilis Rapid Diagnostic Tests. The International Diagnostics Centre London School of Hygiene and Tropical Medicine. www.idx-dx.org accessed May 2019


• Katoba et al. Toward Improving Accessibility of Point-of-Care Diagnostic Services for Maternal and Child Health in Low-and Middle-Income Countries. Point of Care: March 2019 - Volume 18 - Issue 1 - p 17–25. doi: 10.1097/POC.0000000000000180
References

- Prevention of mother-to-child transmission of HIV. AVERT - Prevention Programming avert.org accessed May 2019


- The Point-of-Care Diagnostic Landscape for Sexually Transmitted Infections (STIs). Maurine M. Murtagh. The Murtagh Group, LLC 31 May 2018.