



## Guidance Note on Product Selection, Site Upgrades, and Sample Transportation

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***Purpose:** The purpose of this guidance document is to present a clear and condensed set of information on POC EID products, and provide some suggestions and considerations related to site upgrades and sample transportation between spokes and hubs.*

### 1. Side-by-Side Analysis of POC EID Products

Appendix 1 provides a table of information on the three products that are currently eligible for procurement with Global Fund funding. The table contains the characteristics and implementation considerations for each product. We understand that there are many factors to consider when selecting a product, and emphasize that there is no “right” or “wrong” answer in deciding which platform should be used in your context.

### 2. Other Product Selection Considerations

**Sample transport using whole blood vs DBS:** Please note that DBS is not the most suitable specimen for decentralized testing at primary health centers due to the additional time, expertise and equipment needed to process DBS samples. It is a more time-consuming process than transporting and testing whole blood. Allowing the blood to dry for DBS preparation takes several hours, usually overnight, thus delaying specimen transport for testing. Once the DBS reaches the testing lab, the sample needs to be reheated, thus requiring additional processing time, as well as requiring a power demanding heating device. The quality of the DBS preparation has also been documented to be extremely variable and often leading to the specimen to be rejected by the lab if not collected properly. The collection of blood onto the DBS card is not very intuitive and also requires a relatively high volume of blood as compared to what is required to perform the POC tests. Considering the population we service, the smaller the blood volume collected, the better it is. Thus, DBS might make sense for conventional EID, where stability of whole blood conflicts with transportation time for long distances, but in the context of POC EID, whole blood should be prioritized. Transportation of whole blood is possible using sealable EDTA-treated capillary tubes, which in addition to ease sample collection, have a greater potential to improve turnaround times to results, one of the core objective of the project and POC EID implementation in general. EDTA-blood is stable for 24h prior of testing if kept at ambient temperature, and up to 3 days if kept and transported at 4C.

**Optimizing existing GeneXpert platforms currently being used for TB:** In most countries, a significant number of existing GeneXpert platforms used for TB are not being used to their full capacity, and there is opportunity to optimize the machines by incorporating EID. Our project would provide the cartridges, training, support/supervision needed to ensure that the machine is optimized. In most cases EID would only send 1-2 additional tests per/day, it should not overtake the machine or be an added burden to testing staff. Thus, project team should consider this option when possible. However, it is to note that the Xpert HIV-1 cartridges contain a chemical compound (which is not present in the MTB/RIF cartridges) which is very difficult to dispose. Thus only sites with regular access to high temperature incinerator facilities should consider this.

**Biosafety and Safe disposal of cartridges:** GeneXpert cartridges contain guanidinium thiocyanate, a harmful chemical if release in drainage system and which requires high temperature incineration (TBC). Facilities using this product need access to an incinerator on-site, or regular waste transportation to an incinerator. For Alere Q cartridges, this chemical is not used, thus waste disposal using a simple burner is suitable. Further review of the appropriate disposal of GTC is on-going and updated guidance should be released soon.

**In-facility location of instrument: Lab vs consultation room:** Placement of the instrument in the consultation room is preferred whenever possible except if there is a lab on-site with an existing GeneXpert that meets all requirement to allow EID testing.

### 3. Site Upgrades

Before determining what upgrades are needed to a facility, the platform selection must already be determined. A facility upgrade could be something as simple as purchasing a table or fridge—it does not necessarily mean making serious infrastructural upgrades to the site. The upgrades should be strictly limited to the objective of ensuring that POC EID platforms and cartridges have the proper operation space (room with a table), electricity, storage space, temperature requirements. The upgrades will be possible only at testing sites (i.e. sites where the POC EID platform is to be installed) and not for spokes.

### 4. Sample Transportation for Hub-and-Spoke Networks

In order to facilitate the transport of EID samples to testing sites and the return of results to spoke sites, a sample transportation plan will need to be in place. This plan will vary by country based on the strength of the existing sample transport systems.

Some suggestions include:

- **Start by assessing the strength of existing sample transport systems at your sites.** Is it possible to build off of the existing system? Or is a completely new system needed? Frequency of existing sample transport system if any in place will most likely not be regular enough to achieve the project objective of reducing considerably turnaround time. Thus, try to think of various option to allow swift transportation of specimen and results. REMEMBER, the distances between your spokes and their hubs should not be too big to allow the transportation system to be efficient. As a guide, facilities more

than 60 minutes' drive away from their hub risk not to be served frequently enough or may involve associated costs outside of what your budget allows.

- **Produce a map of where your hubs and spokes are located.** This will help to give you a visual sense of the distances between facilities, and help you to design an optimal transportation route.
- **Start to think about how sample transport will be documented and monitored.** Some type of Transport Logbook for the specimen will be needed, to ensure that specimens have been picked up and delivered as scheduled. For those paying riders, you might also choose to use a Fuel Logbook to justify how much fuel was used on the route (and cross check with distances between spokes and hub to avoid misuse of fuel).
- **Regular communication between hubs and spokes regarding sample pick up and return of results will be important-** airtime may need to be budgeted to allow for regular communication.
- **Frequency of sample transport an important consideration.** Depending on the frequency of infants tested, different transport models can be considered. For facilities with less frequent testing, perhaps an "on-call" transport option would be optimal (using air-time, hubs and spokes communicate to know when pick-up is required). For facilities with more frequent testing, a systematic routine pick-up might be more suitable. EDTA-blood samples need to be tested within 24 hours if kept at room temperature, or within 3 days if kept in a cool box at 4 degrees Celsius. The sample transport system must accommodate these timelines to ensure the quality of the sample.

Whatever model is chosen, it will be important to consider existing structures, expected demand of each of the spoke sites, and budget implications.

- Some countries will pay one motorcycle driver to cover sample pickup and result drop off for all of the spokes from one hub. Using this system, several models are possible:
  - The driver can be given airtime to communicate daily with each spoke to learn whether they will require sample pick-up for that day.
  - The driver might also have his routine and regular run amongst the spokes sites if volumes allowed (every day or alternative day).
  - A mix of the two options above
- Leverage existing Riders for Health sample transport that is already in place
- Local courier
- Hand-carried and transported using public transportation
- Community health workers are provided with transport stipend, transport logbooks are use public transportation or personal transport to bring samples to the hubs.

## Appendix 1: Side-by-Side Analysis of POC EID Products

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	Cepheid GeneXpert Xpert® HIV-1 Qual Assay (EID)	Alere Q HIV-1/2 Detect (EID)	Diagnostics for the Real World (DRW) Samba II HIV-1 Qual (EID)
<b>Cartridge shelf life:</b>	Currently 12 months from manufacture.	Currently 9 months from manufacture, working towards longer shelf life	Currently 9 months from manufacture, guaranteeing 6 month from delivery.
<b>Max throughput:</b>	20 tests/day	8 tests/day	4 test/day using one Assay module. Possibility to add up another assays module control by the same tablet.
<b>Routine maintenance:</b>	Daily and monthly cleaning procedures are crucial	Nothing specific	TBD
<b>Storage temperature:</b>	Shipping at 2-8C, storage at 2-28C. Manufacturers have agreed to ship from point of origin to country ports cold chain.	Shipping and storage 4-30C	2-37C for long term storage, -10C to 55C shipping stability (up to 1 month)
<b>Environment for running of tests:</b>	15-30C	10-40C	10-38C; Rel. humidity: ≤80% @ ≤31°C, decreasing linearly to 50% RH @ 40°C (can't be used in very hot and very humid environment)
<b>Power requirements:</b>	Requires good and stable power supply, thus would need an external gel battery with each platform	Comes with a built in battery, thus stable power at the testing facility is not required	Requires good and stable power supply, thus we would need to purchase an external gel battery with each platform
<b>Portable?</b>	No. However, a highly-portable, battery-operated version called the Omni is expected to be released in Q3 2017.	Yes. (7.8 kg) This means it could be "shared" between multiple sites	No because of power requirement.
<b>Polyvalent capacity (i.e.: Can the platform conduct other assay types?):</b>	Yes, there is potential to use this platform for TB and other viral testing. One consideration here is if there are currently underutilized platforms that are being used for TB, there is potential to add EID to optimize these existing platforms	Currently only HIV-1/2. HIV viral load is in development with planned accelerated WHO PQ submission in Q4 2017. Other viral testing, including filovirus testing (e.g. Ebola) in development.	Currently HIV qualitative and HIV viral load semi-quantitative. Dev. stage: Chlamydia and gonorrhoea Duplex test, Flu A/B Duplex test
<b>Tests for:</b>	HIV 1 only	HIV 1 and HIV-2	HIV 1 only
<b>Type of sample:</b>	DBS or 100µl of whole blood EDTA (capillary or venous). Note that testing with DBS will require extra time, a warmer, and extra steps to prepare the sample for testing. Due to the power requirements the warmer requires, it is unlikely to be able to be placed at a decentralized facility.	25µl of Whole blood EDTA (capillary or venous)	100µl of Whole blood (capillary or venous)
<b>Time to result:</b>	92 minutes per test. Up to 4 individual tests can be run concurrently.	52 minutes per test, to be run one test at a time	120 minutes per test, to be run one test at a time on each Assay module
<b>Waste management:</b>	Cartridges contain guanidinium thiocyanate, a harmful chemical if release in drainage system and which requires high temperature incineration (TBC). Facilities using this product need access to an incinerator on-site, or regular waste transportation to an incinerator.	TBD, most likely a simple burner is ok.	MSDS not available yet. TBD

	<b>Cepheid GeneXpert Xpert® HIV-1 Qual Assay (EID)</b>	<b>Alere Q HIV-1/2 Detect (EID)</b>	<b>Diagnostics for the Real World (DRW) Samba II HIV-1 Qual (EID)</b>
<b>Pricing:*</b>	<p>GeneXpert-IV platform: \$USD 17,500 incl. laptop, (includes a 2-year warranty)  Cartridge: \$USD 17.95  Cost of gel battery (required): \$2,500 - \$4,000  Service and Maintenance:</p> <ul style="list-style-type: none"> <li>• Two-year warranty included in the purchase price</li> <li>• \$2,900 per year to extend the warranty beyond 2 years, if purchased with the instrument; or</li> <li>• \$6,840 to extend the warranty for 3 additional years, for a total of 5 years, if purchased with instrument; or</li> <li>• \$7,900 to extend the warranty for 3 additional years, for a total of 5 years, if purchased after the instrument is installed.</li> </ul>	<p>Platform: \$USD 25,000, includes battery, modem and printer (includes 1-year warranty)  Cartridge: \$25.00  Service and Maintenance:</p> <ul style="list-style-type: none"> <li>• One-year warranty included in the purchase price</li> <li>• \$2,500 per year to extend the warranty beyond 1 year, if purchased with the instrument.</li> <li>• \$9,000 to extend the warranty for 4 additional years, for a total of 5 years, if purchased with instrument</li> </ul>	<p>Platform: Assay Module= \$26,750 including tablet, security system, printer &amp; paper (includes 1-year warranty)  Cartridges; \$37.40 + 10-15% distribution margin  Heel prick capillary blood collection kits with EDTA transport microtube included in the cartridge kit.  Cost of battery and charger-inverter: TBD  Service and Maintenance:</p> <ul style="list-style-type: none"> <li>• One-year warranty included in the purchase price</li> <li>• \$3,250 to extend the warranty for 1 additional year (2 years total)</li> <li>• \$6,500 to extend the warranty for 2 additional years (3 years total)</li> </ul>
<b>Recommended testing setting:</b>	More suitable for larger, more centralized facilities with increased HR capacity, higher testing volumes, good electricity grid, or possibility to install alternative power backup system, and access to incinerator (TBC)	More suitable for decentralized settings (battery pack, lower throughput)	More suitable for larger, more centralized facilities with increased HR capacity, not too high volumes, but good electricity grid, or possibility to install alternative power
<b>Stringent Regulatory Authority (SRA) approval:</b>	<p>Cepheid Xpert® HIV-1 Qual Assay (EID):</p> <ul style="list-style-type: none"> <li>• WHO Prequalified (<a href="http://www.who.int/diagnostics_laboratory/evaluations/pg-list/hiv-vrl/160613PQPublicReport_0259-0700-00_XpertQualHIV_v2.pdf?ua=1">http://www.who.int/diagnostics_laboratory/evaluations/pg-list/hiv-vrl/160613PQPublicReport_0259-0700-00_XpertQualHIV_v2.pdf?ua=1</a>)</li> <li>• CE-IVD Mark (<a href="http://ir.cepheid.com/releasedetail.cfm?releaseid=906875">http://ir.cepheid.com/releasedetail.cfm?releaseid=906875</a>)</li> </ul>	<p>Alere™ q HIV-1/2 Detect (EID):</p> <ul style="list-style-type: none"> <li>• WHO Prequalified (<a href="http://www.who.int/diagnostics_laboratory/evaluations/pg-list/hiv-vrl/160902_amended_public_report_0226_032_00_alere_hiv_detect_v3.pdf?ua=1">http://www.who.int/diagnostics_laboratory/evaluations/pg-list/hiv-vrl/160902_amended_public_report_0226_032_00_alere_hiv_detect_v3.pdf?ua=1</a>)</li> <li>• CE-IVD Mark (<a href="http://news.alere.com/~media/Files/A/Alere-Newsroom-V2/press-release/Alere_q_Detect_CE_IVD_Mark_3_2_2015_FINAL4.pdf">http://news.alere.com/~media/Files/A/Alere-Newsroom-V2/press-release/Alere_q_Detect_CE_IVD_Mark_3_2_2015_FINAL4.pdf</a>)</li> </ul>	<p>Samba II HIV-1 Qual (EID):</p> <ul style="list-style-type: none"> <li>• CE-IVD Mark</li> </ul>