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# PHASE II: DEVELOPMENT PHASE – LABORATORY STRENGTHENING ASSESSMENT OF *IN VITRO* DIAGNOSTIC DEVICE ACQUISITION PROCESSES WITHIN NHLS

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**ABSTRACT**

**Background:** The National Health Laboratory Services (NHLS), Quality Assurance (QA) department's responsibility is to ensure diagnostic supplies meet required standards. Of particular importance are *in vitro* diagnostic devices (IVD's) such as: reagents, all controls including Quality Controls (QC), equipment and laboratory consumables. Applying the required standards ensures that they are 'fit for purpose'. This process supports and enhances laboratory accreditation as well as strengthening all laboratory systems.

**Objectives:** To assess: (i) the IVD's acquisition processes within the NHLS; (ii) whether a health technology assessment (HTA) framework could be used and (iii) assessing the impact of implementing a health technology assessment unit in supporting accreditation and strengthening laboratory systems.

**Methods:** The researchers planned a strategy meeting to review IVD acquisition processes within the selected organisation. The participants were multidisciplinary technical laboratory personal. The discussions at the HTA strategic workshop focused on Quality Assurance and laboratory accreditation in addressing the requirements of ISO15189:2012, which is important to ensure consistent adherence to accreditation and compliance measures across all the laboratories within the NHLS framework.

**Results:** A workshop entitled: *Health Technology Assessment Strategy* was the first workshop held by the NHLS to stress the challenges faced when acquiring new technologies. The workshop participant's described the present processes of IVD acquisition within the NHLS as incoherent. In particular, they emphasised the lack of clearly defined IVD evaluation and requisition procedures. The examples given were the following: the adoption of technologies on ad-hoc bases with limited consensus from all users, the lack or inadequate selection criteria for performance evaluations, the need to adopt standardised protocols and report templates and the absence of a national database to ensure monitoring and compliance of existing suppliers.

**Conclusions:** The acquisition of IVD's for pathology services is a universal requirement. The NHLS is unique as it provides pathology services to hospitals but is not incorporated as part of the hospital's management system. However the impact of evaluating IVD's is a requirement for developed and developing countries. The establishment of the HTA unit would provide an environment for the coordination and management all IVD requests. This unit would be a single port of entry at the NHLS for all IVD performance evaluations and in addition it would support laboratory accreditation as well as procurement decision making processes within the NHLS.

**KEYWORDS**

health technology assessment, *in vitro* diagnostic devices, laboratory systems

## INTRODUCTION

Medical laboratory services are an essential component of a well-functioning health system and are vital in delivering accessible, equitable and affordable quality healthcare to the population. Reliable laboratory results with minimum turnaround time are crucial to clinical and public health decision-making.[1] Good quality diagnostic tests that are 'fit for purpose' i.e. provide accurate results, are of paramount importance. The choice of which diagnostic test to use, depends on what tests have been approved for use by regulatory authorities in a particular country (if they are regulated at all) and what tests have been purchased for use in the health service. Finally, this choice is dependent on the physician's decision on which of the available tests he or she judges might be useful in clinical decision making.[2]

Given the growing importance of medical laboratories and the emphasis on evidence-based medicine and public health practices, it is imperative that medical laboratories are strengthened to provide critical inputs in making informed decisions. Health Technology Assessment (HTA) is a multidisciplinary process that summarises information about the medical, social economic and ethical issues related to the use of Health Technology (HT) in a systematic, transparent, unbiased, robust manner.[3] To enable the selection of good quality diagnostic tests a clear understanding of HT is required. HT is defined as devices, procedures, correct use of drugs and the organisational support systems within which health care is delivered.[3] The need for the assessment of HT has to be considered against the background of the general reform process as introduced in The South

African Health Products Regulatory Authority (SAPHRA) and as adopted by the South African health sector. The introduction of the Medical and Related Substances Act R. 586[4] in South Africa will, ensure comprehensive Medical Devices (MD) and in vitro diagnostic devices (IVD) regulations. Currently only radiation emitting devices and electro-medical devices need to be registered (Hazardous Substances Act, Act 15 of 1973). Presently there are thousands of MD and IVDs that are not regulated, compromising the safety of patients/users as well as impacting on the quality of health care provided in South Africa.[5] It was against this background that the National Health Council saw an urgent need to regulate medical devices.[6] Lack of regulations poses challenges in relation to amongst other things: possible illegal dumping of waste, recalls, safety issues, post market surveillance, quality issues, maintenance and servicing issues and the sterilisation and disinfection of equipment. Currently, diagnostic medical devices are not regulated in South Africa. There is no regulatory body currently available to monitor the entry, usage and subsequent retirement of these technologies. This has resulted in an influx of unregulated medical devices into the South African market. For example, point of care testing (POCT) devices.

The NHLS is the largest diagnostic pathology service in South Africa and provides health laboratory services to the public sector which provides healthcare for ±80% of the South African population (i.e. 52 million South Africans).

At present, the NHLS has a national network of 268 laboratories throughout South Africa utilising a common laboratory management system and transport network to facilitate diagnostic pathology service delivery. It has a workforce of approximately 7500 employees including pathologists, public health and surveillance personnel, laboratory technologists, technicians, scientists, researchers and support staff. It has an operating budget of around ZAR3.8 billion and an annual expenditure on diagnostic reagents and consumables of ZAR1.2 billion. Its annual expenditure on health technology amounts to ZAR140 million and its current capital investments in health technology are around ZAR177 million.[7] Presently, there are substantial maintenance backlogs as well as multiple vendors and equipment lines, which necessitate different reagents being procured and multiple interfaces being developed within the current laboratory information system (LIS).

The focus on regulation and management of health technology is not just a South African trend. Information from clinically appropriate testing contributes to early detection of disease, its diagnosis, choices of treatment, therapeutic monitoring, reduced adverse events, leading to improved health outcomes and quality of life. The clinical benefit and appropriate use of laboratory screening and diagnostic tests are essential for achieving the goals of health system reform in South Africa.[8] The absence of regulations has aggravated the situation with thousands of health technologies (drugs, devices, surgical and medical procedures or ways of delivering health services) appearing in the South African market. The category of health technologies in particular in vitro diagnostic medical devices which include: reagents, reagent products, calibrator materials or instruments; as well as specimen receptacles intended by the manufacture for the in vitro analysis of specimens derived from the human body.[9] To date, only a fraction of the existing technologies have been evaluated even although further new technologies continue to be implemented without evaluation.[1]

Pathology diagnostic services are constantly bombarded with requests from manufacturers' and /or distributors to purchase these new technologies. These new technologies are intended to replace those current technologies in use, promising effective clinical outcomes and cost efficiencies with increased diagnostic turnaround time. In order to address these challenges, theNHLS Quality Management System (QMS) in compliance with the requirements of the international standard (ISO 15189:2012, Medical laboratories Requirements for quality and competence)[10] reviewed as a continual improvement initiative the technology evaluation and acquisition pathway of these new diagnostic technologies.

## METHOD

### NHLS Health Technology Assessment Strategic Workshop:

The NHLS Health Technology Assessment Strategic Workshop was held on the 1st of June 2012 at Sandringham, with the target group being multidisciplinary technical laboratory personal who were directly and indirectly involved in IVD evaluations of new systems within the NHLS environment. The workshop was attended by the Quality Assurance Department, NHLS provincial representation as well as Occupational Health Safety representatives. The workshop used both formal lectures and group discussions to address the set objectives as outlined in the workshop agenda. The group discussion contributions were noted on flip charts and presented by group leaders. The agenda for the NHLS Health Technology Assessment Strategic Workshop included 3 parts as shown in Figure 1.

Part 1, included current IVD's acquisition processes a theoretical overview as well as the principles of HTA and its benefits. National QA office challenges, gaps and areas to support laboratory accreditation and enable laboratory strengthening were also included.

Part 2, addressed the basic understanding of statistical methods currently used for IVD evaluations, resources required in setting up a HTA unit and its limitations, highlighted challenges faced by laboratories and a way forward to ensure these challenges can be addressed.

Part 3, dealt with Occupational Health and Safety (OHS) role in HTA and the processes to be followed during evaluations of new supplies, challenges faced by suppliers when introducing new products to NHLS were identified. Also addressed, was on how the HTA unit can tackle the NHLS strategy on evaluating new technologies.

## RESULTS

The participants were multidisciplinary technical laboratory personal. The discussions at the HTA strategic workshop focused on Quality Assurance and accreditation in addressing the requirements of ISO15189:2012. A summary of the details of the findings are listed in Table 1 for the respective modules.

## DISCUSSION

According to Phillip Weinfurt[12] evaluating new technologies

| PART 1 | PART 2 | PART 3 |
|---|---|---|
| • Module 1 – Welcome and Introductory process<br>• Module 2 – What is NHLS doing with evaluations of new analyzers, kits and consumables?<br>• Module 3 – Overview of Health Technology Assessment<br>• Module 4 – National QA activities and challenges | • Module 5 – Statistical methods currently available for IVD evaluations<br>• Module 6 – Starting a HTA Unit at NHLS QA<br>• Module 7 – Challenges faced by the NHLS laboratories | • Module 8 – Safety in HTA<br>• Module 9 – Challenges faced by the suppliers when introducing new or modified supplies in the NHLS<br>• Module 10 – NHLS HTA strategy, wayforward |

**Figure 1:** Mapping Phase

poses a significant challenge in light of the complexity and rate of introduction in today's healthcare delivery system. Successful evaluation requires the integration of clinical medicine, science, finance, and market analysis. Little guidance, however, exists for those who must conduct comprehensive technology evaluations. The 3Q Method meets these present day needs. The 3Q Method is organised around 3 key questions dealing with clinical and scientific basis, financial fit; and strategic and expertise fit. Both healthcare providers (e.g., hospitals) and medical industry providers can use this method to evaluate medical devices, information systems and work processes from their own individual perspectives.[12]

The Health Technology Assessment strategy workshop conducted in 2012 was the first workshop held by the NHLS to highlight the challenges in the acquisition of new technologies. The discussion detailing 'What is NHLS doing with evaluations of new analysers, kits and consumables?' illustrated the incoherent processes drawing attention to the lack of clearly defined IVD evaluation and requisition procedures. It also highlighted the adoption of technologies on ad-hoc bases, with limited consensus from all users within the NHLS, the lack or inadequate selection criteria for performance evaluations, the need to adopt standardised protocols and report templates and the absence of a national database to ensure monitoring and compliance of existing suppliers.

The workshop acknowledged that human resources are an integral requirement for the implementation, monitoring and evaluation of new technologies. The human resource skills capacity

**Table 1:** HTA Strategic Workshop Findings

| **What is NHLS doing with evaluations of new analysers, kits and consumables?** |
|---|
| • No clearly defined procedure for IVD requisitions is evident<br>• There are no or limited quantification studies for IVD requisitions<br>• Adoption of technologies is based on individual preferences<br>• No or limited criteria on the selection of which IVD's to conduct laboratory performance evaluation are in place<br>• No standardised protocols or reports are evident<br>• There is duplication of IVD evaluations within different NHLS laboratories<br>• There are also limitations with human resource availability to conduct performance evaluations timeously<br>• Communication of new technologies/updates is limited<br>• There is currently no National database of IVD evaluation reports<br>• No post market surveillance on performance of suppliers is in place<br>• Current processes are in compliance with procurement department/National Treasury, SA however,<br>• Contracts and service level agreements (SLA) are not monitored |
| **National Quality Assurance activities and challenges** |
| • Compliance to ISO 15189, Clause 4.6 External Services and supplies<br>- There is limited/no available criteria for selection of suppliers<br>- The list of selected and approved suppliers for equipment, reagents and consumables is not maintained<br>- There is an absence/limit on monitoring the supplier performance to ensure that purchased services or items meet the stated criteria<br>• Compliance to ISO 1589:2012, Clause 5.5 Examination processes: Selection, verification and validation of examination processes<br>- There is limited or no national record of performance evaluations,<br>- Evaluations records that are available are limited to a specific laboratory in which the evaluation was conducted<br>- There is a disparity in evaluation protocols, no standard guideline limitations on performance evaluations based on clinical setting |

**Statistical methods currently available for IVD evaluations [11]**

| Analytic Validity | Clinical Validity |
|---|---|
| Definition: A laboratory test's ability to measure the analyte (or genotype, in the case of genetic testing) of interest accurately and reliably (i.e., the quality of the measurement).<br>Key measurements:<br>• Accuracy<br>- Analytic sensitivity<br>- Analytic specificity<br>• Precision<br>• Robustness | Definition: A laboratory test's ability to detect and predict the disorder that is associated with an analyte measurement; a test's value to clinical decision making.<br>Key measurements:<br>• Clinical sensitivity<br>• Clinical specificity<br>• Positive predictive value<br>• Negative predictive value |

**Starting a HTA Unit at NHLS QA**

- Funding to set up the unit
- Human Resources
- Infrastructure/laboratory
- Define IVD's to be evaluated
- Define HTA framework: limited to clinical performance evaluations
- Cost minimisation studies (if relevant)
- Develop HTA documentation

**Challenges faced by the NHLS laboratories**

- Human resources
- Clarity with performance evaluation of protocol
- Knowledge of test limitations for considerations
- Availability of laboratory infrastructure, space and capacity
- Samples integrity and stability
- Training, skills capacity and understanding of the evaluation process; detailed training plan prior to commencing the performance evaluation
- Improved communication with relevant stakeholders
- Development and use of database with contact details
- Time constraints
- Expert technical clinical support
- Timing (avoid scheduling performance evaluations during holiday periods)

**Safety in HTA**

The NHLS compliance to "The Occupational Health and Safety Act (OHS Act 85 of 1993)" there following compliance processes are available:

- A risk assessment is nothing more than a careful examination of what, in your workplace, could cause harm to people, so that you can weigh up whether you have taken enough precautions or you should do more to prevent harm. The Occupational Health and Safety Act (OHS Act 85 of 1993) stipulates that all employers must establish what hazards to health or safety of persons are attached to any work performed and establish what precautionary measures should be taken with respect to such work in order to protect the persons, and he/she shall provide the means to apply such measures.
- RISK ASSESSMENT PROCEDURE
  Step 1 – look for the hazards
  Step 2 – decide who might be harmed and how
  Step 3 – evaluate the risks and decide whether the existing precautions are adequate or whether more should be done
  Step 4 – record your findings
  Step 5 – review your assessment and revise if necessary

ISO 15189:2012

- Clause 4.14.6 – Risk management
- Clause 5.2 – Accommodation and environmental conditions

**Challenges faced by the suppliers when introducing new or modified supplies in the NHLS**

- There is no single point of entry to conduct a performance evaluation
- Reports are not standardised and sometimes not acceptable throughout the organisation
- Limited communication between the NHLS/laboratory/supplier is problematic
- Clarity with reference to current processes is vague

| NHLS HTA strategy, way forward |
|---|
| • Designate human resources and infrastructure |
| • Define HTA policy and procedures relevant to scope of practice at NHLS |
| • Staff training on HTA |
| • Benchmark visits HTA/diagnostic pathology organisations against technology assessment |
| • Develop an electronic database to monitor all new technologies evaluations |
| • Develop a communication portal to publish current performance evaluations |
| • Review implementation within QMS framework with regular monitoring and evaluation processes |

and technical expertise are essential in conducting a robust performance evaluation. Furthermore, these resources would provide the communication portal's necessary to record and circulate all new technology updates within the organisation. It would be the responsibility of these key staff members to ensure that the national database is updated and maintained.

To address compliance to ISO 15189:2012 clause 4.6 and clause 5.5 the organisation will develop documented procedures for all new technology evaluations and acquisitions. In particular, acquisition procedures shall be guided by the South African National Treasury, Public Finance Management Act[13] (PFMA) requirements. The procedure should determine the processes needed for HTA and ensure their application throughout the organisation. It should also determine the sequence and interaction of these processes; determine criteria and methods needed to ensure that both the operation and control of these processes are effective. Finally, it should monitor and evaluate these processes and where required implement actions necessary to achieve planned results and continual improvement of these processes.[10]

The Cochrane Review in 2013 by Leeflang et al[14] illustrates that finding good evidence regarding the performance of diagnostic tests and interpreting their value for practice is more challenging and less straightforward than for intervention. Furthermore, a highly accurate test does n necessarily improve patient's outcome.[14] Although the workshop identified the statistical methods currently available for IVD evaluations demonstrated. Analytical validity and clinical validity were not necessary standardised within the organisation. Therefore, there is a need to address ISO 15189:2012 requirements for selection, verification and validation of examination procedures. These should stipulate that the validation shall be as extensive as is necessary and confirm, through the provisions of objective evidence in the form of performance characteristics that the specific requirements for the intended use of the examination has be fulfilled.[10]

Furthermore, at the NHLS the risk assessment procedure is available as a resource to be used during a performance evaluation. The NHLS compliance to 'The Occupational Health and Safety Act (OHS Act 85 of 1993)' as well as ISO 15189:2012 clause 4.14.6 and 5.2 are positive attributes for the organisation to address the health and safety of laboratory personnel within the OHS frame-work. The current supplier challenges emphasises the need for all new technologies to have a single portal of entry into the NHLS environment and also stresses the need for an active register to monitor performance evaluations.

Research by Ruffano et al. (2014) illustrates that ideally, new tests should only be introduced into clinical practice if the evidence indicates that they have a better chance of improving patient health over the existing tests.[15] It is therefore important for health care purchasers and providers to assess the importance and role of new diagnostic technology in the diagnostic pathway. It is vital to have a process that can identify those technologies that require a detailed formal assessment, such as technology assessments or evidence-based summary reports.[16]

Finally, the use of HTA principles would hopefully yield reliable results to manage evaluations of new IVDs used for diagnostic laboratory services in supporting accreditation and strengthening laboratory decision making processes.

## STUDY LIMITATIONS

The aim of this workshop was to review the current practices within the NHLS and develop an equitable framework for new technology evaluations and acquisitions. The workshop addressed areas relevant to clinical performance for IVD's but did not review the current cost analysis processes within the organisation. The participants: multidisciplinary technical laboratory personal and laboratory quality experts focused on accreditation and laboratory strengthening, with limited discussion on cost effectiveness,[17] which poses an all important question. Is new technology an efficient use of resources?

## CONCLUSION

The first phase of this study was to map out the current practices within the organisation with the intention of applying the results of its findings in solving specific problems currently being experienced at the NHLS.

Although the workshop was limited to the NHLS; the acquisition of IVD's for pathology services is a universal requirement. The NHLS is unique as it provides a pathology service to the hospital but is not incorporated as part of the hospital management system. However, the impact of evaluating IVD's is a requirement for developed and developing countries.

The establishment of an HTA unit would provide an environment to coordinate and manage all IVD requests. This unit would be the single port of entry at the NHLS for all IVD performance evaluations and would additionally support laboratory accreditation as well as the decision making processes within the NHLS environment.

## CONFLICT OF INTERESTS

The author has no conflict of interest to report.

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