# Understanding ICT Behaviors among Health Workers in Sub-Saharan Africa: A Cross-Sectional Study for Laboratory Persons in Uganda

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***Abstract*—**A cross-sectional survey to ascertain the capacity of laboratory persons in using ICTs was conducted in 15 Ugandan districts (July-August 2013). A self-administered questionnaire served as data collection tool, interview guide and observation checklist. 69 questionnaires were filled, 12 interviews conducted, 45 HC observed. SPSS statistics 17.0 and SAS 9.2 software were used for entry and analyses. 69.35% of participants find it difficult to access a computer at work. Of the 30.65% who find it easy to access a computer at work, a significant 21.05% spend 0 hours on a computer daily. 60% of the participants cannot access internet at work. Of the 40% who have internet at work, a significant 20% lack email address but 20% weekly read emails weekly and 48% daily. It is viable/feasible to pilot informatics projects as strategies to build bridges develop skills for e-health landscape in laboratory services with a bigger financial muscle.

***Keywords*—**ICT Behavior, Clinical Laboratory persons, Sub-Saharan Africa, Uganda.

## I. Introduction

A discussion by Ssewanyana [9] opens us to understand that communities in developed and developing countries follow the same pattern for a new ICT to diffuse or spread due to aggregate interest, attention or curiosity. The only difference is in the level and rate of diffusion influenced by the required skills popularity among the communities. For example, the attention given to DHIS2 by laboratory persons in Uganda is very low as compared to similar health initiatives in developed countries. The application of computers and information systems to information management in the pathology or clinical laboratory is crucial to the success of pathologists and laboratorians as emphasized by Pantanowitz [8].

In the same view, the quest to manage vast quantities of information creates new roles for the clinical laboratory. More so, changes in information technologies that manage laboratory information are likely to alter laboratory practices such as utilization of lab services, process control in the laboratory, interpretation of test results, and laboratory economics. These changes impact on the way that clinical laboratories generate diagnostic information and transmit that information to their physician clients as mentioned by McPherson [6]. Indeed, this is demonstrated by Grann [3] in a research database (LABKA) containing millions of lab test results for a clinical information system and is linked to a high-quality individual patient data.

On the other hand, efforts are being made to improve point of care technologies to rapidly diagnose and treat patients to improve triaging, on-site decision making, and, ultimately, economic and medical outcomes as mentioned by Kost [5]. In the future, wireless point-of-care connectivity solutions for managing patient test data hold great promise as state by Kim [4].

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## II. Background

In Uganda, the Laboratory Information Management Systems (LIMS) was established by CPHL in 2006 to collect laboratory information in all districts on a routine basis from 600 Health Centre (HC) IIIs, 177 HC IVs, 64 General Hospitals (GH), 13 Regional Referral Hospitals (RRH) and 2 National Referral Hospitals (NRH). In all the 112 districts of Uganda, there is a District Laboratory Focal Person (DLFP) who is expected to use the data collection tool (Form 105) to submit facility monthly reports to MoH – Resource Centre (MoH-RC) through a web enabled DHIS2 database oparationalised in 2009. Lab data lies at the district offices for over a year until convenient times to hand deliver it in bulk to MoH-RC. Computer skills deficit was among the many factors affecting lab data submission and information about computer and IT skills possessed by laboratory persons in Uganda was insufficient. It was rather outrageous to anticipate the submission of laboratory data when there was uncertainty of computer and IT skills possessed by laboratory persons in Uganda. The prevailing situation affects CPHL's role of coordination and stewardship of lab services in over 1500 facilities. If such a situation goes on and on, it will be difficult to ascertain whether lab facilities are functioning according to national and international standards; the quality of lab services will not be assessed and there will not be adequate planning to sustain lab services that support the delivery of the Uganda National Minimum Health Care Package at all levels.

CPHL conducts in-service trainings to ensure that lab services have an adequate number of skilled staff with the

necessary competency and motivation to deliver quality lab services at all designated levels. However, this did not support the submission of facility monthly lab data on HMIS form 105 to MoH-RC through DHIS2.

A study to investigate the capacity of lab persons in using computers and other related technologies in Uganda was conducted with the aim of ascertaining a better perspective of the baseline computer skills and needs of laboratory persons before implementing an applied informatics project in Uganda. Specifically, the study was meant to determine the proportion of lab persons who have had formal computer training, provide an understanding of the computer experience and ICT communication behavior of lab persons, describe how lab persons access and use computers and other related technologies, anticipate future computer skills needs and technology-related challenges of lab persons, and to explore the computer anxieties of lab persons.

Study findings are being used to align in-service ICT trainings with the skills deficit in order to support timely lab data submission to MoH-RC through DHIS2 database. The findings are also informing and guiding the adoption of ICT initiatives of DHIS2, Digital Library, eLIMS, iHRIS and GIS M&E spatial tool at CPHL.

## III. Methods

Our aim was to enroll laboratory persons who were available during working hours at public health centers III, IV, General Hospitals and Regional Referral Hospitals; offering clinical laboratory services and was willing and capable of providing written informed consent. Between 1st July and 5th August 2013, we conducted a cross-sectional survey to ascertain the capacity of laboratory persons in using computers and other technologies in Uganda. This survey was a continuation of the National Laboratory Supplies Quantification and verification exercise by Central Public Health Laboratories in purposively selected 15 districts and their health centers (HC) to cater for regional variations. From each districts the exercise had selected one HC III, HC IV and a General Hospital or Regional Referral Hospital.

A self administered semi-structured questionnaire was used to collect data among lab persons at their respective work stations. The same questionnaire was used as a guide to key informant and conversational interviews with District Laboratory Focal Persons (DLFP) and as an observation checklist.

A total of 69 questionnaires were filled, 12 interviews were conducted and 45 health centers were observed. The outcome variable was; Attitude of computer usage for laboratory services and was classified as feelings for or against informatics initiatives for lab services which also involved personal rating of computer literacy on a scale of 5. The predictor variables were; Demographic characteristics, Computer experience and communication, ICT accessibility and usage, and anticipated future needs and challenges. Completed data tools were first reviewed in the field by three data collectors to ensure completeness and consistence followed by desk reviews to ensure accuracy of the responses. The data collection tool had an option field of telephone contacts which enabled field and desk reviewers to ensure completeness and consistence for tools where contacts were provided. The reviewed tools were sampled by the researcher and used to develop a coding frame of agreed codes for the responses to the questions that guided data entry. SPSS statistics 17.0 was used for data entry with variable names similar to the questionnaire that allowed legal entries and rejected unknown entries during single data entry by researcher and research assistants. All the data was edited by the researcher and backed up on a laptop and on an external memory drive. Electronic data was later transferred from SPSS statistics 17.0 to SAS 9.2 software for statistical analyses.

## IV. Results

### A. Demographic Characteristics

Sixty-nine (69) laboratory persons, who consented to participate in the study, were found at their respective work places in 15 districts of which 8 districts were from northern Uganda and were affected by the 20 year old war by the Lord's Resistance Army (LRA) lead by Joseph Kony who is currently being wanted by the ICC Courts. Of those who consented, 7 were excluded from analysis because of missing data. Of the 62 analyzed; 6 were Lab Technologists (most senior title), followed by 16 Lab Technicians, 31 Lab Assistants, 1 Phlebotomist (least senior title) and 8 data/other persons in lab service delivery. Table I shows the computer literacy levels of these categories. 61.29% were computer illiterate. They completely lacked skills in basic office applications (word processing, spreadsheets, and power point presentations). For the Lab technologists, only one was illiterate and over two-thirds for Lab technicians and Lab assistants were illiterate. Of the 8 data persons, only two were illiterate. Table II shows that the 38.71% who are computer literate include; 27.42% by persons who have 0-5 years of lab service, 8.06% who have 6-10 year of service, 0% for those with 11-15 years of service and 3.23% for those with more than 15 years in service. Similarly, participants who have served for 5 years and below have the biggest percentage for computer illiterates.

TABLE I
Computer Literacy Levels for the Different Categories of Participants of the Study (0 is for Illiterate and 1 is for literate)

| Table of Years in lab service by Literacy Level | | | |
|---|---|---|---|
| **Lab Years** | **Literacy level** | | |
| | **0** | **1** | **Total** |
| **0-5 years** | 20 | 17 | 37 |
| | 32.26 | 27.42 | 59.68 |
| **6-10 years** | 14 | 5 | 19 |
| | 22.58 | 8.06 | 30.65 |
| **11-15 years** | 1 | 0 | 1 |
| | 1.61 | 0 | 1.61 |
| **>15 years** | 3 | 2 | 5 |
| | 4.84 | 3.23 | 8.06 |
| **Total** | 38 | 24 | 62 |
| | 61.29 | 38.71 | 100 |

TABLE II
COMPUTER LITERACY LEVELS FOR THE DIFFERENT CATEGORIES OF PARTICIPANTS' YEARS OF LABORATORY SERVICES

| Table of Job Title by Computer Literacy level | | | |
|---|---|---|---|
| **Job Title** | **Literacy level** | | |
| | **0** | **1** | **Total** |
| **Lab Technologist** | 1 | 5 | 6 |
| | 1.61 | 8.06 | 9.68 |
| **Lab Technician** | 11 | 5 | 16 |
| | 17.74 | 8.06 | 25.81 |
| **Lab Assistant** | 24 | 7 | 31 |
| | 38.71 | 11.29 | 50 |
| **Phlebotomist** | 0 | 1 | 1 |
| | 0 | 1.61 | 1.61 |
| **Data/Other Person** | 2 | 6 | 8 |
| | 3.23 | 9.68 | 12.9 |
| **Total** | 38 | 24 | 62 |
| | 61.29 | 38.71 | 100 |

### *B. ICT Access and E-mail Behavior among Laboratory Persons*

69.35% of the study participants find it difficult to access a computer at work as shown in Table III. Of the 30.65% who find it easy to access a computer at work, a significant 21.05% spend 0 hours on a computer at work in a day as shown in Table IV. About 60% of the participants cannot access internet at work as shown in Table V. Of the 40% of the participants who can access internet at work, a significant 20% do not have an email address. 4% have read an email only once or twice in their life time; probably during formal computer training. 8% read emails monthly, 20% weekly and 48% daily as shown in Table VI.

TABLE III
HOW EASY OR DIFFICULT FOR STUDY PARTICIPANTS TO ACCESS A COMPUTER AT WORK

| Computer Access at Work | Frequency | Percent |
|---|---|---|
| **Difficult** | 43 | 69.35 |
| **Easy** | 19 | 30.65 |

TABLE IV
THE NUMBER OF HOURS SPENT ON A COMPUTER BY PARTICIPANTS WHO INDICATED THAT THEY FIND IT EASY TO ACCESS A COMPUTER AT WORK

| Out of those that said it is easy to access a computer, how many hours do they spend on a computer? | | |
|---|---|---|
| **Hours spent on a Computer at Work** | **Frequency** | **Percent** |
| **0 hrs** | 4 | 21.05 |
| **0-5 hrs** | 4 | 21.05 |
| **6-10 hrs** | 11 | 57.89 |

TABLE V
WHETHER STUDY PARTICIPANTS CAN ACCESS INTERNET AT WORK

| Internet Access at work | Frequency | Percent |
|---|---|---|
| **No** | 37 | 59.68 |
| **Yes** | 25 | 40.32 |

TABLE VI
HOW OFTEN STUDY PARTICIPANTS READ THEIR EMAILS

| Out of those that access internet, frequency of reading their emails | | |
|---|---|---|
| **Read emails** | **Frequency** | **Percent** |
| **Don't have address** | 5 | 20 |
| **Once/twice** | 1 | 4 |
| **Monthly** | 2 | 8 |
| **Weekly** | 5 | 20 |
| **Daily** | 12 | 48 |

## V. DISCUSSION

Inconsistent with other studies for health workers, [1], [2], [10] we found study participants with most senior job titles (Lab Technologist) to be more computer literate that those with junior titles (Lab technicians, Lab Assistants, Phlebotomist). The study revealed that data/other persons are more computer literate than participants with junior titles. It may be assumed that junior persons have routine manual professional work where systems are not automated bringing about less interest in computers. This category may be a target for informatics projects for automation of work flows and data/other people maybe targets for projects focusing in laboratory information management and senior persons may be targets for informatics strategies and directions for laboratory services.

Studies for doctors such as for Devitt, and Thomas [2], [10] show that the oldest in the profession have the least computer skills and our study shows that the young in the profession have the least computer skills. Assuming that few years in laboratory service is being young in the profession, our study revealed that computer literates have the same pattern as illiterates; where the young in the profession have the biggest percentage for both computer literate and illiterate and the old have the lowest in both as well. We may state that in developing countries such as Uganda, there is the same rate of exposure to informatics technologies by both the young and the old and thus the same pattern of computer literacy.

Consistent with other studies in developing countries such as for Mohammed et al. [7], we also found limited access to computers at work, high computer illiteracy rate, limited access to internet and poor email behavior among health workers. Our study revealed that 61.29% of lab persons are computer illiterate. This could be because lab training colleges do not incorporate ICT in the education curriculum, followed by limited in-service trainings focusing on ICT.

Our study revealed that about 60% find it difficult to access computers at work. Of the 40% who find it easy to access a computer at work, 20% spend 0% hours on the computer in a day. If this is not an indication of too much routine work, it is a revelation that this big percentage has no interest in ICT and probably worried about using ICT in lab services. This category should be the target for in-service trainings aimed at awareness and sensitization about ICT in lab services than even those who are computer illiterate. Where 60% cannot access internet at work, 20% of those who can access do not have emails, 61.29% lack basic computer skills, 60% cant access computers at work, and 20% of those who can access

spend 0% hours on a computer in a day; it may require critical thinking if we intend to implement web enabled interventions in laboratory services without a bigger financial muscle to support required equipment, connectivity, and training as also noted by Wilmer [11]. However, where we have 48% of laboratory persons of those who access internet at work read emails daily combined with 20% who read emails weekly; it is viable and feasible to pilot informatics projects in Uganda as a strategy to build bridges and develop skills for e-health landscape in laboratory services.

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## REFERENCES

[1] Balen, R.M., Jewesson, P.J. (2004). Pharmacist computer skills and needs assessment survey. J Med Internet Res. 6(1): e11.
[2] Devitt, N., Murphy, J. (2004). A survey of the information management and technology training needs of doctors in an acute NHS Trust in the United Kingdom. Health Information and Libraries Journal, 21, 164-172.
[3] Grann, A.,F., Erichsen, R., Neilsen, A.G., Froslev, T., Thomsen, R.W. (2011). Existing data sources for clinical epidemiology: the clinical laboratory information system (LABKA) research database at Aarhus University, Denmark. Clinical Epidemiology; 3: 133-138.
[4] Kim, J. Y., Lewandrowski, K. (2009). Point-of-care testing informatics. Clinics in Laboratory Medicine; 29(3): 449-461.
[5] Kost, G.J. et al. (2009). Point of care testing for disaster: needs assessment, strategic planning and future design. Clinics in Laboratory Medicine; 29(3): 583-605.
[6] McPherson, R. A. (1999). Perspective on the clinical laboratory: New uses for informatics. Journal of Clinical Laboratory Analysis; 13(2): 53-58.
[7] Mohammed, E., Andargie, G., Meseret, S., and Girma, E. (2013). Knowledge and utilization of computers among health workers in Addis Ababa hospitals, Ethiopia: computer literacy in the health sector. BMC Research Notes 6: 106p
[8] Pantanowitz, L., Henricks, W. H., Beckwith, B.A. (2007). Medical laboratory informatics. Clinics in Laboratory Medicine; 27(4): 823-843.
[9] Ssewanyana, J., Busler, M. (2007). Adoption and usage of ICT in developing countries: Case of Ugandan firms. International Journal of Education and Development using Information and Communication Technology (IJEDICT). Vol. 3, Issue 3, pp. 49-59.
[10] Thomas, P., Rutter, P.M. (2008). A computer literacy skills profile of pharmacists residing in two counties of England. Health Info Libr J.; 25(4): 288-94.
[11] Wilmer, M. (2007). How nursing leadership and management interventions could facilitate the effective use of ICT by student nurses. J Nurs Manag. 15(2): 207-13