

Original Paper

# Knowledge and Utilization of Computers Among Health Professionals in a Developing Country: A Cross-Sectional Study

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## Abstract

**Background:** Incorporation of information communication technology in health care has gained wide acceptance in the last two decades. Developing countries are also incorporating information communication technology into the health system including the implementation of electronic medical records in major hospitals and the use of mobile health in rural community-based health interventions. However, the literature on the level of knowledge and utilization of information communication technology by health professionals in those settings is scarce for proper implementation planning.

**Objective:** The objective of this study is to assess knowledge, computer utilization, and associated factors among health professionals in hospitals and health institutions in Ethiopia.

**Methods:** A quantitative cross-sectional study was conducted on 554 health professionals working in 7 hospitals, 19 primary health centers, and 10 private clinics in the Harari region of Ethiopia. Data were collected using a semi-structured, self-administered, and pre-tested questionnaire. Descriptive and logistic regression techniques using SPSS version 16.0 (IBM Corporation) were applied to determine the level of knowledge and identify determinants of utilization of information communication technology.

**Results:** Out of 554 participants, 482 (87.0%) of them responded to the questionnaire. Among them, 90 (18.7%) demonstrated good knowledge of computers while 142 (29.5%) demonstrated good utilization habits. Health professionals who work in the primary health centers were found to have lower knowledge (3.4%) and utilization (18.4%). Age (adjusted odds ratio [AOR]=3.06, 95% CI 0.57-5.37), field of study (AOR=3.08, 95% CI 1.65-5.73), level of education (AOR=2.78, 95% CI 1.43-5.40), and previous computer training participation (AOR=3.65, 95% CI 1.62-8.21) were found to be significantly associated with computer utilization habits of health professionals.

**Conclusions:** Computer knowledge and utilization habits of health professionals, especially those who work in primary health centers, were found to be low. Providing trainings and continuous follow-up are necessary measures to increase the likelihood of the success of implemented eHealth systems in those settings.

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**KEYWORDS**

computer literacy; health professionals; eHealth success; Ethiopia

## Introduction

### Background

The use of information communication technology in health care is not merely about technology but a means to solve the critical data management and clinical communication challenges in health care organizations, especially in developing countries [1]. Given the high burden of disease and the low number of skilled personnel, eHealth is believed to improve health care by strengthening the health system, supporting delivery of care, and improving communication among different health care organizations and professionals [2,3]. Incorporation of information communication technology in developing countries has gained wide acceptance in the last several decades with different success stories in different sectors, especially in the business sector [4]. However, when compared with other sectors, only a limited application of information technology advancements is seen in health care organizations [5,6].

Recently there has been an increase in the implementation of eHealth applications in developing countries that includes telehealth, mobile health applications, electronic medical records, and health information management systems [7]. However, most implementations remain in the pilot phase because of different technical and personnel issues [8]. Most evaluations and case studies from previous implementations in those settings report that infrastructural challenges and the existing skill levels of health professionals are the most common obstacles to the success of implemented eHealth systems [8,9,10]. However, the literature on the level of knowledge and utilization of health professionals and their current exposure in information communication technology use is scarce.

For Ethiopia, with its population of approximately 80 million people, poor health system, and severe shortage of health professionals, incorporation of eHealth to the different sectors of the system is regarded as the only way to achieve the country's goal of universal health coverage by 2020. For that, the government is currently implementing different eHealth initiatives, and the Health Sector Development Plan IV [11] strategy is in progress to transform health services into a cost effective and efficient system. The Ministry of Health of Ethiopia is also drafting a new national eHealth strategy [12] following the recently published World Health Organization guideline [13] on eHealth strategy development. To ensure sustainability, the country is also teaching health informatics professionals [14] who support different eHealth implementation initiatives in the country.

### Statement of the Problem

With the new initiatives in Ethiopia, expanded implementation of eHealth is expected in the coming years, but these systems must be used effectively to meet objectives; this is entirely dependent on health professionals' use of eHealth in their daily tasks. Studies in similar settings show that that lack of basic knowledge of computers and software on the part of health professionals is a main factor in failure of eHealth systems [5,15-18]. Therefore, before costly implementation, it is necessary to know the current knowledge and utilization habits of health professionals so that effective prior planning can take

place. To our knowledge, there is little existing evidence in primary care and hospital contexts in developing countries. This study aims to fill this gap.

### Objectives

The goal of this study is to assess the current levels of knowledge and utilization of computers among health professionals and identify factors affecting utilization. The outcome of this research will help evidence-based planning and implementation of eHealth in Ethiopia and generate additional insight on the topic for further development of health systems in other developing countries.

## Methods

### Overview

Institution-based quantitative cross-sectional research was conducted in 7 hospitals, 19 primary health centers, and 10 private clinics which are on the frontline to implement different eHealth applications in the coming year. All health professionals working at these health institutions were included in the study. There were 621 health professionals working at those institutions; all except those on annual and sick leave were included in the study.

A pre-tested, self-administered questionnaire, adapted from a previous study [19]([Multimedia Appendix 1](#)), was used to collect data on sociodemographic characteristics and computer knowledge and utilization by health professionals. The questionnaire was prepared in English. The data collection was facilitated by eight information technology diploma holders, and supervision was done by the principal investigator.

In this study, health professionals were defined as those employees with at least a diploma certificate in the health professions who are practicing clinical service in the study settings. Computer knowledge was defined as a basic understanding about computers and how to use them. It involves knowing hardware and software, what a computer virus is, and how to manage files and use basic computer applications like a computer network and the Internet. Twenty questions were used to assess computer knowledge. Utilization of computers is a basic skill and involves use of the computer and Internet; managing and storing files; and retrieving, analyzing, and presenting the data on hand. Fifteen questions were used to assess health worker computer utilization habits.

Both knowledge and utilization of computers among health professionals were classified after adopting a cut of value from the Nigerian study in 2004 on the same topic [20]. Those scoring 80% or above on the knowledge test were rated as having good computer knowledge; those scoring below 80% were rated as having poor computer knowledge. Those study subjects who scored 60% or above on the utilization test were rated as having good computer utilization, while those scoring below 60% were rated as having poor computer utilization.

Data were entered using Epi Info then exported to SPSS package version 16 (IBM Corporation) for analysis. Frequencies and cross tabulations were used for the descriptive analysis of the data. Associations between participant's characteristics and

knowledge and utilization of computer were analyzed using binary logistic regression.

### Ethics Statement

The ethical clearance committee of the University of Gondar College of Medicine and Health Sciences through the School of Public Health approved this study. Data were collected after getting permission and clearance from the ethical clearance committee of the Harari Regional Health Bureau. Written consent was obtained from each respondent on a form attached to the questionnaire.

## Results

### Sociodemographic Characteristics

There were 554 public health professionals who participated in this study. Among them, 482 (87.0%) correctly filled out and returned the questionnaire. The median age of respondents was 25 years; 52.0% (251/482) were male. The majority of participants (311/482, 65.0%) were nurses while 20.7% (100/482) were pharmacists and laboratory technicians. Most respondents (364/482, 75.5%) had received at least some kind of basic computer training in the past.

**Table 1.** Sociodemographic characteristics of respondents.

Predictor variables of respondents	n (%)
<b>Age, years</b>	
≤25	174 (36.1)
26-30	118 (24.5)
31-35	71 (14.7)
≥36	119 (24.7)
<b>Sex</b>	
Male	251 (52.1)
Female	231 (47.1)
<b>Profession</b>	
Medical doctor, health officer	51 (10.6)
Pharmacist, lab technician	100 (20.7)
Nurse	311 (64.5)
Other <sup>a</sup>	20 (4.1)
<b>Education</b>	
BSc or Above	126 (26.1)
Diploma	356 (73.9)
<b>Training</b>	
Yes	364 (75.5)
No	118 (24.5)

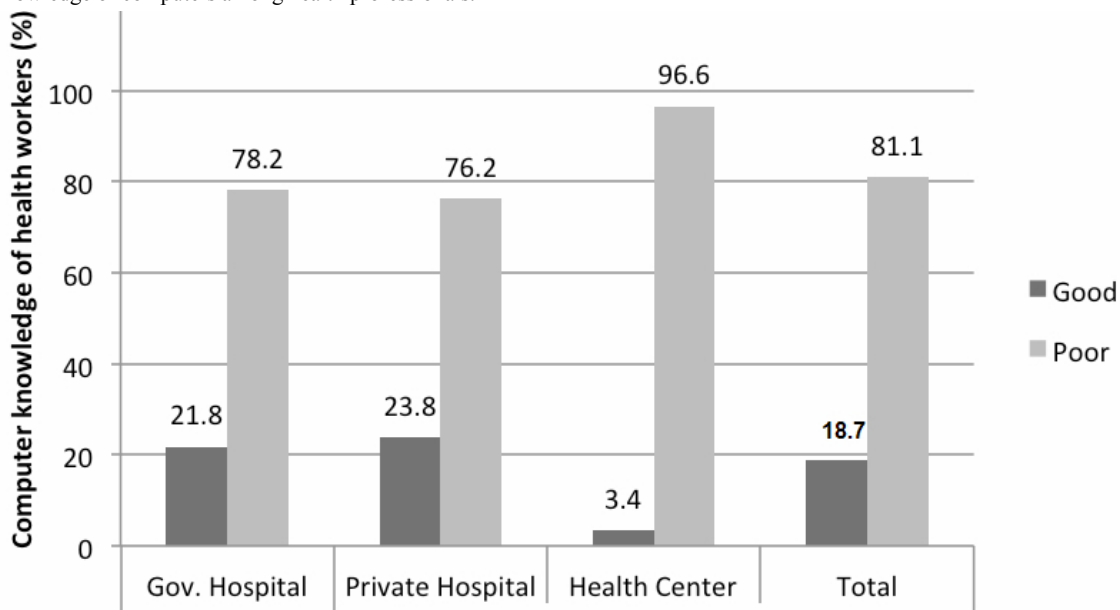
<sup>a</sup>Environmental health, dentistry, physiotherapy, and radiography

### Computer Knowledge

Only 18.7% (90/482) of the respondents demonstrated good knowledge of computers in this study. Of them, few health

professionals working at primary health centers (4/90, 4.4%) showed good computer knowledge compared to those working at government (21/90, 23.3%) and private (24/90, 26.7%) hospitals. The results are displayed in [Figure 1](#).

Figure 1. Knowledge of computers among health professionals.

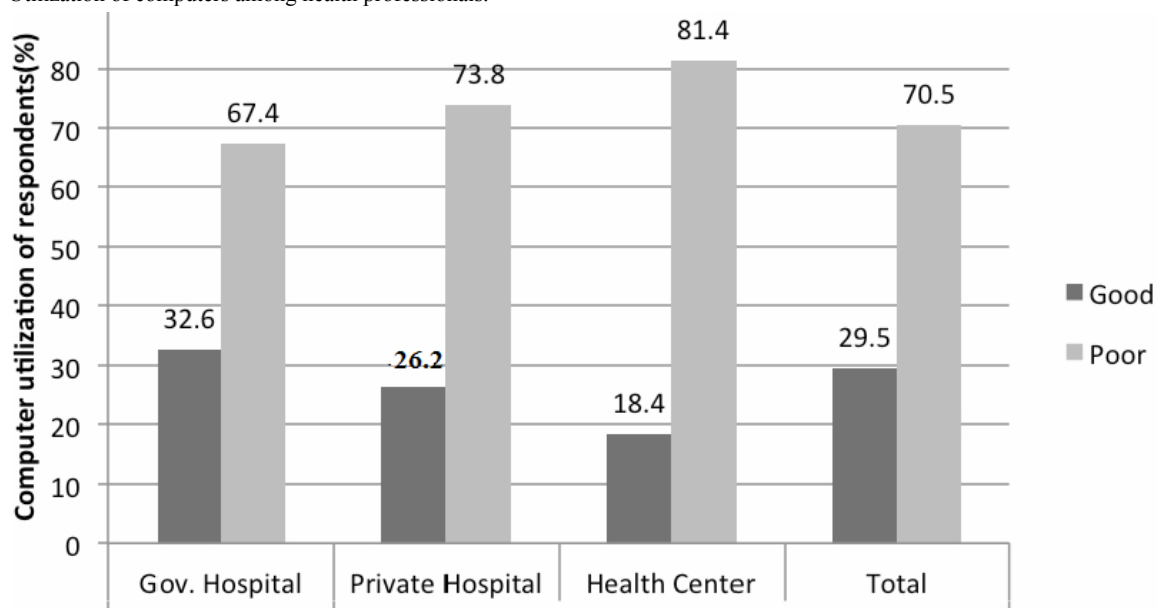


### Computer Utilization

A total of 29.5% of the respondents (142/482) had good utilization of computers. Participants working at government

hospitals showed (115/353, 32.6%) good computer utilization, which was higher than those at private hospitals (11/42, 26.2%) and much higher than those at primary health centers (16/87, 18.4%). The results are shown in Figure 2 with more detail.

Figure 2. Utilization of computers among health professionals.



### Factors Associated With Computer Utilization

With the multivariate logistic regression analysis done on computer utilization as dependent with other hypothesized independent variables, age, field of study, level of education, and computer training were found to be significantly associated with the computer utilization habits of health professionals.

To quantify each relationship, respondents who were younger (age 25-35) were approximately 3 times more likely to use computers than respondents aged 36 years and older (adjusted

odds ratio [AOR]=3.06, 95% CI 0.57-5.37). Additionally, respondents who had previous computer training were 3.65 times more likely to use computers than those who did not have any kind of computer training (AOR=3.65, 95% CI 1.62-8.21). In the professional category, medical laboratory technicians and pharmacists were more likely to use computers than nurses (AOR=3.08, 95% CI 1.65-5.73). Additionally, those with higher levels of education were 2.78 times more likely to use computers than those with lower levels of education (AOR=2.78, 95% CI 1.43-5.40). The results are shown in Table 2.

**Table 2.** Factors associated with computer utilization among health professionals.

Predictor variables	Utilization		COR <sup>a</sup> (95% CI)	AOR (95% CI)
	Good	Poor		
<b>Age</b>				
≤25	54	120	2.36 (1.31-4.25)	1.16 (0.40-3.34)
26-35	46	72	5.36 (1.81-6.21)	3.06 (0.57-5.37) <sup>c</sup>
≥36	19	100	1	1
<b>Sex</b>				
Male	94	157	2.28 (1.51-3.43)	1.05 (1.01-2.69)
Female	48	183	1	1
<b>Marital status</b>				
Never married	75	127	1.87 (1.26-2.79)	1.40 (0.79-2.69)
Married	67	213	1	1
<b>Profession</b>				
Medical doctor, health officer	28	23	4.51 (2.44-8.35)	1.89 (0.77-4.61)
Pharmacist, lab technician	39	61	2.37 (1.46-3.85)	3.08 (1.65-5.73) <sup>c</sup>
Nurse	66	245	1	1
Other <sup>b</sup>	9	11	3.03 (1.26-7.63)	1.30 (0.70-7.50)
<b>Education</b>				
BSc or above	66	60	4.05 (2.63-6.24)	2.78 (1.43-5.40) <sup>c</sup>
Diploma	76	280	1	1
<b>Position</b>				
Institution head	6	4	3.93 (1.08-14.20)	1.97 (0.34-11.24)
Team leader	28	53	1.38 (0.83-2.30)	1.70 (0.85-3.38)
Care provider	108	283	1	1
<b>Training</b>				
Yes	133	231	6.97 (3.42-14.21)	3.65 (1.62-8.21) <sup>c</sup>
No	9	109	1	1
<b>Service year</b>				
6-10	32	49	3.02 (3.27-24.77)	1.51 (1.92-22.02)
11-15	9	45	2.76 (0.86-8.76)	1.28 (0.62-8.40)
≥16	5	69	1	1

<sup>a</sup>Crude odds ratio<sup>b</sup>Environmental health, dentistry, physiotherapy, and radiography<sup>c</sup>Significant at  $P < .05$ .

## Discussion

### Principal Findings

The findings of this study show that computer knowledge and utilization was generally low and was lower for public health professionals who work in the primary health care centers. The results are lower compared to findings in previous studies [2,20,21], which might be attributed to a difference in study

participants between the studies; previous studies only included health professionals working in hospitals while this study also includes health professionals working at the health centers, which have less computer access and information communication technology infrastructure.

The analysis of the determinant factors of computer utilization shows that age, field of study, level of education, and computer training were found to be significantly associated with computer

utilization. Among the factors, stronger association was found with computer training. The result is consistent with previous studies [20-23]. This result implies that providing trainings—not only about the specific eHealth software application which is going to be implemented but also generally about computers—can make a significance difference in system adaptation in health care.

In this study, we found that younger health professionals are more likely to use eHealth systems than older health professionals, which is consistent with other studies [24-27]. This implies that older employees need more assistance to adapt to and use the system.

Additionally, health professionals with advanced levels of education showed significantly better computer utilization than middle-level health professionals. The result is not surprising given the increasing number of computer-based tasks associated with further studies. Finding of this study was inconsistent with studies in India which showed that level of education was not significantly associated with computer utilization [21,22]. This may be due to training differences for health professionals in India and Ethiopia in which the basic computer courses in Ethiopia are more theoretical with few hours of practical lessons.

As skill is a main factor in eHealth success [28], interventions are needed to increase health professionals' knowledge and utilization. The Ministry of Health should provide training to the health professionals so that their knowledge can increase and their anxiety about technology can decrease. In addition, it

is necessary to increase accessibility to computers, especially in primary care health centers, so health professionals can practice using computers in different activities before the main eHealth system is implemented.

In this study, knowledge and utilization habit measurements were self-reported, which might have some response bias. A further study complemented by qualitative approach is recommended to give more insight on how actual computer knowledge and utilization habits contribute to a better adoption of eHealth systems.

### Limitations of the Study

This study did not address the attitude of health workers towards computers, which can influence their computer knowledge and utilization. Additionally, the information collected was self-perceived, which might have reporting bias. Future studies including attitude and actual practical use assessment are recommended. Additionally, the relationship between computer knowledge and use on eHealth success needs further investigation.

### Conclusions

Computer knowledge and utilization habits of health professionals, especially those who work in primary health centers, were found to be low. Providing trainings and continuous follow-up are necessary measures to increase the likelihood of the success of implemented eHealth systems in those settings.

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### Conflicts of Interest

None declared.

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### Multimedia Appendix 1

Questionnaire.

[[PDF File \(Adobe PDF File\), 122KB - humanfactors\\_v2i1e4\\_app1.pdf](#)]

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### References

1. Soar J, Gow J, Caniogo V. Sustainability of health information systems in developing countries: the case of Fiji. *HIM J* 2012;41(3):13-19. [Medline: [23087079](#)]
2. Sukums F, Mensah N, Mpembeni R, Kaltschmidt J, Haefeli WE, Blank A. Health workers' knowledge of and attitudes towards computer applications in rural African health facilities. *Glob Health Action* 2014;7:24534 [[FREE Full text](#)] [Medline: [25361721](#)]
3. Joan Dzenowagis, in collaboration with Gael Kernen. Connecting for health : global vision, local insight. In: Dzenowagis, Joan. , editor. Report for the World Summit on the Information Society. Geneva: World Health Organization; 2005.
4. Kimura K, Omole DW, Williams M. In: Chuhan-Pole P, Angwafo M, editors. Yes, Africa Can: Success Stories from a Dynamic Continent. Washington, DC: World Bank Publications; Jun 2011.
5. Ruxwana NL, Herselman ME, Conradie DP. ICT applications as e-health solutions in rural healthcare in the Eastern Cape Province of South Africa. *HIM J* 2010;39(1):17-26. [Medline: [20335646](#)]
6. Simba DO. Application of ICT in strengthening health information systems in developing countries in the wake of globalisation. *Afr Health Sci* 2004 Dec;4(3):194-198.

7. Vital web consulting. Health Information system in developing countries. Health Information system in developing countries 2009;69 [FREE Full text]
8. Fraser HS, Blaya J. Implementing medical information systems in developing countries, what works and what doesn't. AMIA Annu Symp Proc 2010;2010:232-236 [FREE Full text] [Medline: 21346975]
9. Luna D, Otero C, Marcelo A. Health Informatics in Developing Countries: Systematic Review of Reviews. Contribution of the IMIA Working Group Health Informatics for Development. Yearb Med Inform 2013;8(1):28-33. [Medline: 23974545]
10. Azubuikwe MC, Ehiri JE. Health information systems in developing countries: benefits, problems, and prospects. J R Soc Promot Health 1999 Sep;119(3):180-184. [Medline: 10518358]
11. Ministry of Health. Health Sector Development Program IV of Ethiopia. In: Health Sector Development Program IV of Ethiopia. Addis Ababa: Ministry of Health; 2011:2010.
12. Binyam Tilahun, Atinkut Zeleke, Mengistu Kifle, Fleur Fritz. The Ethiopian national eHealth strategy and its alignment with the health informatics curriculum. Journal of Health Informatics in Africa 2015;2(2):47.
13. World Health Organization and International Telecommunication Union. National eHealth Strategy Toolkit. Publications of the World Health Organization and International Telecommunication Union 2012:5 [FREE Full text]
14. Tilahun B, Zeleke A, Fritz F, Zegeye D. New bachelors degree program in health informatics in Ethiopia: curriculum content and development approaches. Stud Health Technol Inform 2014;205:798-802. [Medline: 25160297]
15. Biruk S, Yilma T, Andualem M, Tilahun B. Health professionals readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study. BMC Med Inform Decis Mak 2014 Dec 12;14(1):115 [FREE Full text] [doi: 10.1186/s12911-014-0115-5] [Medline: 25495757]
16. Vital wave Consulting. Health Information Systems in Developing Countries. vital web consulting Research Paper & Strategic Briefing 2009:69 [FREE Full text]
17. Fraser HS, Biondich P, Moodley D, Choi S, Mamlin BW, Szolovits P. Implementing electronic medical record systems in developing countries. Inform Prim Care 2005;13(2):83-95. [Medline: 15992493]
18. Asangansi OO, Adejoro OF, Makinde O. Computer use among doctors in Africa: Survey of trainees in a Nigerian teaching hospital. Health informatics Dev Ctries., vol. 2, no. 1, pp. 10–2008;2(1):10-14.
19. Cork RD, Detmer WM, Friedman CP. Development and initial validation of an instrument to measure physicians' use of, knowledge about, and attitudes toward computers. J Am Med Inform Assoc 1998;5(2):164-176 [FREE Full text] [Medline: 9524349]
20. Bello IS, Arogundade FA, Sanusi AA, Ezeoma IT, Abioye-Kuteyi EA, Akinsola A. Knowledge and utilization of Information Technology among health care professionals and students in Ile-Ife, Nigeria: a case study of a university teaching hospital. J Med Internet Res 2004 Dec 17;6(4):e45 [FREE Full text] [doi: 10.2196/jmir.6.4.e45] [Medline: 15631969]
21. Mohammed E, Andargie G, Meseret S, Girma E. Knowledge and utilization of computer among health workers in Addis Ababa hospitals, Ethiopia: computer literacy in the health sector. BMC Res Notes 2013;6:106 [FREE Full text] [doi: 10.1186/1756-0500-6-106] [Medline: 23514191]
22. Gour N, Srivastava D. Knowledge of computer among healthcare professionals of India: a key toward e-health. Telemed J E Health 2010 Nov;16(9):957-962. [doi: 10.1089/tmj.2010.0049] [Medline: 21091287]
23. Woreta SA, Kebede Y, Zegeye DT. Knowledge and utilization of information communication technology (ICT) among health science students at the University of Gondar, North Western Ethiopia. BMC Med Inform Decis Mak 2013;13:31 [FREE Full text] [doi: 10.1186/1472-6947-13-31] [Medline: 23452346]
24. Kipturgo MK, Kivuti-Bitok LW, Karani AK, Muiva MM. Attitudes of nursing staff towards computerisation: a case of two hospitals in Nairobi, Kenya. BMC Med Inform Decis Mak 2014;14:35 [FREE Full text] [doi: 10.1186/1472-6947-14-35] [Medline: 24774008]
25. Schumacher P, Morahan-Martin J. Gender, Internet and computer attitudes and experiences. Comput Human Behav 2001 Jan;17(1):95-110. [doi: 10.1016/S0747-5632(00)00032-7]
26. Palm JM, Colombet I, Sicotte C, Degoulet P. Determinants of user satisfaction with a Clinical Information System. AMIA Annu Symp Proc 2006:614-618 [FREE Full text] [Medline: 17238414]
27. Alison Gillwald, Anne Milek & Christoph Stork. Gender Assessment of ICT Access and Usage in Africa. Towards Evidence-based ICT Policy and Regulation 2010;1(5) [FREE Full text]
28. Dias C, Escoval A. Narrowing the Skills Gap for Innovation: An Empirical Study in the Hospital Sector. JMIR Hum Factors 2014 Sep 23;1(1). [doi: 10.2196/humanfactors.3598]

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## Abbreviations

**COR:** crude odds ratio

**AOR:** adjusted odds ratio

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