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Eds: Nicky Mostert, Ghislain Kouematchoua, Ulrich Kemloh

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Koegni eHealth, Innovation for Development e.V. Germany
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www.koegni-ehealth.org
E-mail: info@koegni-ehealth.org

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Editorial to JHIA Vol. 6 (2019) Issue 1

The previous issue of the Journal of Health Informatics in Africa (JHIA) consisted of the proceedings of the HELINA 2019 conference. This issue consists of three papers that were submitted directly to the journal and is thus an open-call issue. All papers in both open-call, as well as conference issues, are double blind peer reviewed before being accepted for publication. One paper in this issue was written in French. This is the particularity of JHIA.

The first paper evaluates the impact of an e-learning program using the Africa Build Portal on the level of knowledge of medical students in a Sub-Saharan African setting. This interventional study indicates that there is potential for e-learning as an effective method of training in Sub-Saharan African countries. The paper also identifies obstacles to e-learning that should be addressed.

The second paper investigates the role of interoperable health information systems in improving health outcomes in the Democratic Republic of Congo though a case study. It is found that the adoption of an interoperability model could improve the use and the quality of data by unifying the health information collected and maintained by many disparate individual organizations.

The paper in French investigates the perception of the use of information and communication technologies by health professionals in the Gabonese Republic within the framework of the eHealth Gabon project. The authors found that health professionals in Gabon generally have an average perception of the usefulness of the electronic patient record and the practice of telemedicine. They also indicate that basic computer literacy – including the use of internet and digital health solutions- are inadequate.

Nicky Mostert and Ghislain Kouematchoua
29.12.2019

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The Evaluation of the Impact of Online Training Program on the Level of Knowledge on medicals students in a Sub-Saharan African setting, using the African Build Portal

Djientcheu VP[1,2,3,4]; Tcheumagam K[1]; Ramirez M[5]; Njajou O[1]; Bello F[4]; Nguifo JE[4]; Kamga Y[2,4]; Essiene A[2,4]; Maoyo V[3,4].

1) ISS /UdM (Institut des Sciences de le Santé/ Université des Montagnes)
2) FMSB /UYI (Faculty of Medicine and Biomedical Siences/ University of Yaoundé I)
3) ABP: Africa Build Portal
4) RAFT: French speaking African Network for Telemedicine
5) UPM: Polytechinical of Madrid.

BACKGROUND: Many initiatives of e-learning have been developed in Sub-Saharan African countries, but limited has been carry up to evaluate the impact of this method of training in our context with his socio-economics particularities. The rational of this study is to evaluate the effect of an e-learning program using the Africa Build Portal on the level of the knowledge on final year medical students.
METHODOLOGY: In this interventional study, the final year medical students of 2 universities in Cameroon (one private and one public) were summited to an on-line program of lectures. After a brief presentation of the lectures program the students were evaluated before (pre-test) and after (post-test) the training. A questioner was filled by each student to express the satisfaction and the obstacles encountered during the training. The training program was elaborated through South-South collaboration (Mali-Cameroon-Ghana) with a support of North (ITM-WHO).
RESULTS: A total of 121 students over 129 were registered; 112 students (92%) followed the online lectures and underwent the whole online procedure (pretest, training, posttest and the questioner filling) were included. The mean age was 25.16 years (range from 22-33years). The sex ratio 1:1. The mean marks of student on pre-test was 43.32/100 compared to mean marks of post-test 69.69/100 ($p = 0.0001^{E}$-21). The significant difference on pretest between the students who in addition followed the face to face presentation (83 students) and the others did not appear on the post- test. The platform was very welcome in general with an average of 7 on a scale of 10. The main obstacles to e-learning were the poor bandwidth internet connection and the overload academic program with less free time. The module on EBM and the methodology of the research were more visited with a total of 12275273 minutes and a mean of 1301.29 min per page because of the direct impact on the ongoing redaction and defense of their thesis.
CONCLUSION: Under certain conditions, e-learning is an effective method of training even in Sub-Saharan African countries. This is a good indicator to promote numeric libraries in that environment. The motivation of the learner is a key point to consider. The parameter to improve is the individual and institutional internet connectivity.

Keywords: e-learning, health education, research, IT

*Corresponding author address: Vincent Djientcheu; mail: Vincent_djientcheu@yahoo.com; Kelly Tcheumagam: keltche@yahoo.fr.
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1 Introduction:

In the higher education sector, especially in the domain of health education and research, there is a need of qualified and specialized personnel to train students and researchers. The offer and the demand in human resources is increasingly unbalanced, quantitatively and qualitatively [1-11].

Since 2002 many initiatives have been developed in the continent in the field of e-learning to cover as possible the deficit. The lead initiatives were the French speaking African Network for Telemedicine (RAFT), the "Université Numérique Francophone Mondiale (UNFM)" and the Pan African Indian project which educated in the continuous medical training [12-19].

Despite the development of these new methods of learning, just very little serious evaluation have been done on the effectiveness or the impact of this method of training on the level of knowledge of the learners in Sub-Saharan Africa where the cultural, economic and social considerations are marked by a limitation for the extend of numeric [20-22].

The purpose of this study is to evaluate the impact of an on-line training program on the level of knowledge of final year medical students, using the Africa Build Portal (ABP). Specifically:

1. After a brief presentation of ABP, each student was submitted to an online pre-test (multiple choice questions) on a topic; an online lecture on the same topic and a post-test (multiple choice questions) on the same topic;
2. The marks obtained by each student before (the pre-test) an after (the post-test) the online training were compared and analyzed.
3. The appreciations and obstacles on the ABP by each student via a questionnaire fill were analyzed.

2 Methods

In this interventional study, an online training program composed of many modules was proposed to final year medical students in Cameroon. The structure of each module is made of a pre-test before the course, the lecture itself, the references and a post-test at the end of course. The lectures can be repeated as needed but the tests can be performed only once.

Two universities where selected for the evaluation: one private and one public institution respectively the institute of health science of "Université des Montagnes" and the faculty of health science of the university of Buea. All the final years' medical students of the selected universities were recruited.

The procedure started by a face to face session with students where the ABP were presented, the demonstration of the registration using a personalized password and user name, and a brief presentation of the contain were performed on May 2014. The students were then invited to go individually to the portal to do the pre-test, to follow the lecture and to do the post-test when they were ready at the end of the lectures. A 3-month period was given to students to achieve the program.

On August 2014, the students were track online and the statistics were performed on the following variables: the pre-test notes, the post-test notes, the activities of students on the ABP, the modules followed by the students, the duration and learning period. A questioner filled by students was used to evaluate their satisfaction through a scale from 0 to 10 and the obstacles encountered.

The analysis was done with Google statistics, ABP statistics, Epi-info 3.5.4, SPSS 20 and Microsoft Excel 2010. Comparisons of variables were done with Chi-Square test, Students test, Mac Neymar test and Mann-Withney test. P value < 0.05 was significant.

3 Results:

121 students over a total of 129 were registered on the platform. 112 students (92%) followed the lectures and the whole process: pre-test, post-test and the filling of the questioner. Because of technical problem, 6 students repeated the pre and post-test for a second time.

The mean age of students was 25.16 ± 1.5 years (range from 22 to 33 years) (table 1). There was 61 females and 61 males with a sex ratio of 1:1.

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The mean mark of the students on pre-test was 43.32 over 100. The mean mark of post-test was 69.69 over 100 (table 2) P= 0.0001^{E}-21. The occasion was given to some students to repeat the pre-test (6 students) and post-test (9 students) (table 3).

The mean mark was respectively 66.88% and 87.20% for second essay pre-test and post-test.

70% of the students followed both the face to face presentation and the on-line lectures but 30% of students followed only the online courses. The difference was significant between the 2 groups during the pretest but the difference was not significant on the post-test (table 4). The ABP was more visited during the weekend (figure 1) and evening with a pic from 3 to 6 PM and 10 PM through midnight (figure 2).

According to the questionnaire, generally the students had a good opinion of the platform (87%), nevertheless 12.5% wanted a download lecture support because of unavailability of internet connection (low bandwidth). The audio/ video support lecture was also difficultly available because of unavailability of connection.

The lectures were judged very pertinent and helpful for the formation with a direct impact on redaction of thesis research (90.1%). The lack of interactivity with the teacher was also the negative aspect of the platform (54.5%). Many students wanted a direct discussion with the platform's teachers.

The test's difficulties (pre and post tests) were judged fair by students (72. %) but 18.8% found the tests very strong.

The platform was very welcome in general with an average of 7.03 ± 0.93 on a scale of 10 (the lowest note was 5 on 10 and the best note 9 on 10). 36.6% of all students gave a note of 7 on 10 to the platform. Of all students 90% were favorable for integration into medical curriculum.

According to the questionnaire, the obstacles to e-learning in this population of students were the unavailability of internet connection, the unstable and low bandwidth quality (79.5%), the lack of time (42.9%), the financial cost (34.8%) and the un-familiarity to new technologies (7.1%).

The lecture on Evidence based medicine and the methodology of research were more visited with a total of 12275273 minutes (mean: 1301.29 min per page) (table 6) compared to logistic regression (total time 3203 min), "planification familiale" (total time 12396), "pre-éclampsie" (1399 min) and others. Inside the site, some lectures were more visited than the others (figure 6).

Table 1. Repartition of students by the age:

Age	Number	Percentage
[22-25[	40	35.7
[25-30[	**70**	**62.5**
[30-35[	2	1.8
Total	112	100

Table 2. Pre-tests marks (first and second essay)

Marks of 1st pretest essay over 100	Number	Percentage (%)	Marks of the 2nd Pretest essay	Number	Percentage (%)	P value
<10	2	1.8				
[10-20[	7	6.3				
[20-30[	17	15.3	< 30	1	16.7	
[30-40[	**27**	**24.3**	[30-40[	1	16.7	
[40-50[	**28**	**25.2**				
[50-60[	18	16.2				**0.2627**
[60-70[	5	4.5	[60-70[	1	16.7	
[70-80[	5	4.5	[70-80[	1	16.7	
>=90	2	1.8	>=80	2	33.3	
Total	111	100%	Total	6	100	

Table 3. Post-tests marks (first and second essay)

Marks of the 1st essay post-test notes over 100	Number	Percentage (%)	Marks of the 2nd essay post-test notes	Number	Percentage (%)	P value
<20	1	1				
[20-30[	1	1				
[30-40[	4	3.9				
[40-50[	8	7.8				
[50-60[	17	16.7	[50-60[	1	11.1	**0.6233**
[60-70[	**29**	**28.4**	[60-70[	1	11.1	
[70-80[	20	19.6	[70-80[	1	11.1	
[80-90[	10	9.8	[80-90[	4	44.4	
>=90	12	11.8	>=90	2	22.2	
Total	102	100	Total	9	100	

Table 4. Comparison of tests notes in relation to face to face presentation:

	Tests	Means	Standard deviation	P Value
Face to face presentation	Pretest of students present	44.91	16.13	
	Pretest of students absent	35.10	13.24	**0.0023**
	Post-test of students present	68.71	15.94	
	Post-test of students absent course	61.55	16.01	**0.0696**

Learners' activity on ABP site:

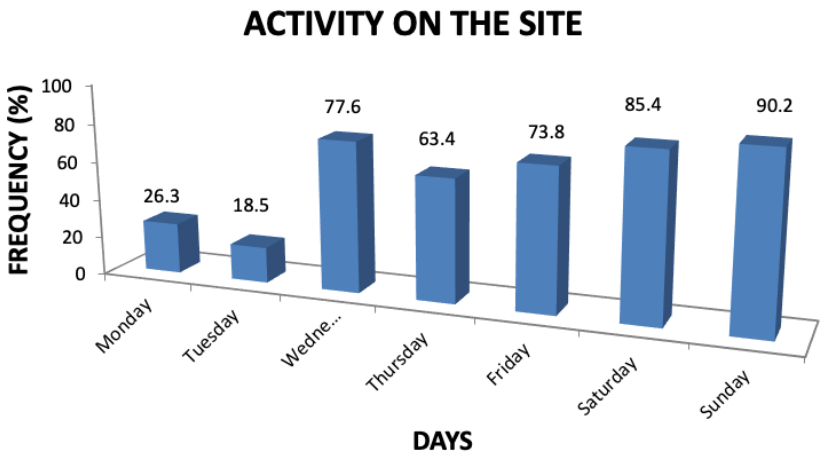

Figure 1. Activities on the site in relation to week days:

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Table 5. Lectures using by the students

Lectures	Sessions	Frequency of use N (%)	Mean time/page (min)	Total time (min)
EBM and methodology of research	Introduction au cours ABP	75 (6.5)	676	50701
	Description du Module 1	50 (4.3)	548.9	27446
	Introduction à EBM	**135 (11.6)**	**1081.8**	**146050**
	Formuler une question de recherche clinique (PICO)	64(5.5)	3405.2	217931
	Les types d'études	**125 (10.7)**	**1825.7**	**228219**
	La recherche bibliographique sur internet	**100 (9.5)**	**1337**	**133708**
	La recherche sur Pubmed	45 (3.9)	1738.5	78249
	Accéder au texte intégral	43 (3.7)	1920.9	82599
	Evaluer la qualité des études	56 (4.8)	638.7	35769
	Gradation de la preuve	41 (3.5)	1451.3	59502
	Résumé Module 1	22 (1.9)	13995	636.13
	Total Module 1	**701 (60.4)**	**1327**	**930238**
	Description Module 2	30 (2.6)	252.6	7578
	Assessing significance and similarity	34 (2.9)	708.7	24095
	Balancing benefit /harm and patient preference	**16 (1.4)**	**586**	**9376**
	Ecrire les recommandations	39 (3.4)	841.9	32836
	Total Module 2	119 (10.2)	620.8	73885
	Description Module 3	30 (2.6)	212.1	6362
	Introduction à la recherche	50 (4.3)	972.7	48637
	Protocole de recherche	28 (2.4)	2402	67265
	Ethique et recherche	51 (4.4)	1018.9	51966
	Gérer les références bibliographiques	16 (1.4)	4533.9	12486
	Total Module 3	195 (16.8)	1010.4	197004
	Vidéo Scientific writing workshop	60 (5.2)	674.5	40470
	Total Cours Pilote	1130 (97.3)	1301.3	12275273

Table 6. Others read lectures on ABP

Lectures	Frequency of use N (%)	Mean time/page (min)	Total time (min)
EBM and methodology of research	1130 (97.3)	1301.3	12275273
Logistic Regression	7(0.60)	457.6	3203
Planification Familiale	5(0.43)	2479.2	12396
Pré-éclampsie/Eclampsie	2(0.17)	699.5	1399
Recherche et expérience e-santé	3 (0.26)	72.7	218
Writing a scientific paper	2 (0.17)	230	460
VIH/SIDA	9 (0.78)	465	4185
Building clinical and research database	3 (0.26)	1135.3	3406
Total others courses	24 (2.7)	3609.6	25267

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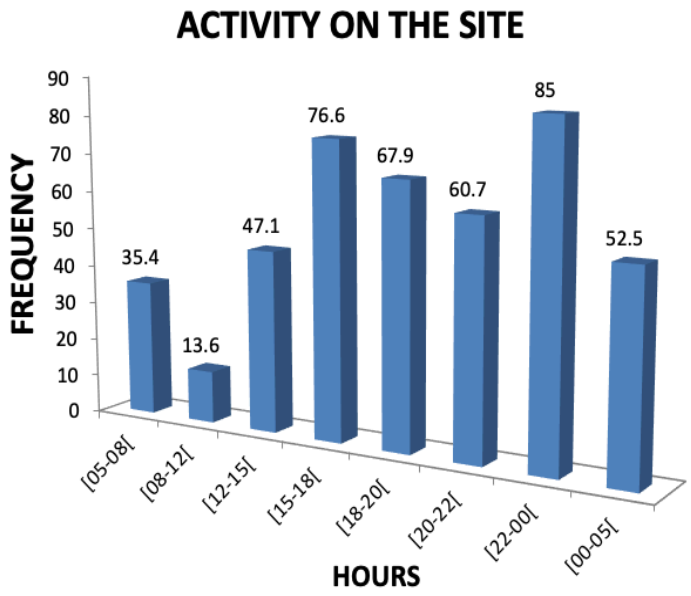

Figure 2. Activities on the site in relation to hours on the day

4 Discussion:

The needs in health education and research are increasing in Cameroon and in Sub-Saharan African countries in general. The number of medical faculties is increasing, both in the public and the private sectors; the number of medical students is increasing; the health cares are becoming complex and specialized but the human resources are not adapted quantitatively and qualitatively. This study showed that, under certain conditions, e-learning appears to be one of the solutions to this inadequacy [2-11]. 92% of registered students followed the lectures and the different steps of the process. The level of individual equipment (laptop, desktop, smartphone) of students is good in general [23].

The motivation of the learner is one of the key points for a successful online training. The motivation of the learners can be an end training certificate, a financial motivation, an honorific distinction, the integration of the program as part of their curricula, a direct application of the program in their ongoing activities or the periodic knowledge checks. In this cohort of students, the motivation was the direct impact of the training on the redaction and the defense of their thesis. This explains the high interest of students for the pilot course on research HIV-AIDS which develops the methodology of research. Then the knowledges were checked by a pre and post-tests. The presentation of the contains in an attractive manner by the responsible of each institution, the expertise of the lecturers and the familiarity of lecturers and trainees were also important elements for the adhesion of the learners. The lecturers were from south and they were elite in their environment. The lecturers were issued from the Faculty of Medicine and Biomedical Sciences of University of Yaoundé I (Cameroon), the Institute for health sciences of the " Université des Montagnes" and the Faculty of Medicine, Pharmacy and Odonto-Stomatology of Bamako [16,17]. The lectures were reviewed by a specialized team from the Institute for Tropical Medicine at Antwerp [16,17]. The lectures were prepared by an international collaboration between Cameroon, Mali and Ghana [16,17].

The structures of the lectures, the good quality of the presentations, the short duration of lectures, the bilingualism of the students may also explain the success of this program. Since Cameroon is bilingual, English was not a barrier.

The advantages of e-learning are the time flexibility and the personalization of the training period, the archiving of lectures and the opportunity of the repetition of the lectures [1,7,20,24-27]. The students who missed the face to face presentation catch up their delay at the post-test. Those who repeated the posttest improved their score.

The limitation of e-learning in our environment is the poor internet connection, the poor band width and the instability of the connection. This issued was partially solved by the use of a special software (Dudal)

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for the emission and the broadcasting even with a low bandwidth (62kbt) [12,13,16,17,19]. The success of this program is an indicator that online training can be recommended in the Sub-Saharan African environment. Virtual or numeric library should be encouraged. The institutions should subscribe for journals, revues and books. The advantage is on space occupation, the maintenance and the flexibility of time for students who can work at home and at any time [1,7,20,25,26]. The lack of time for self-training was also a limitation. The institutions should give more time to students as prone by LMD (Licence-Master-Doctorat) system. Both institutions are in the LMD system.

5 Conclusion:

This study demonstrated that the unbalanced between the offer and the demand in qualified lecturers in the higher education especially in health education and research can be supply effectively by e-learning or distance learning, under certain conditions. The motivation of the learners are capital. The success of this program is an indicator that numeric or virtual library can be emphasized in our environment. The mains obstacles where the poor internet connection, the cost of the connection and the overload academic program.

Acknowledgment and authors' contribution:

We thank the nine partners involved in Africa Build which participate to the elaboration of ABP, the European commission for financing this activity.
Djientcheu VP designed this study, Tcheumagam K collected the data, M Ramirez did Google and ABP statistics, VP Djientcheu and Tcheumagam K wrote the article. The other authors made contributive review and critics of the article.

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Journal of Health Informatics in Africa

The role of interoperable health information systems in improving health outcomes: the case of The Democratic Republic of Congo

Gérard Bisama [a], Dave Potenziani [b], John Liebhardt [b], Claire Viadro [b], Leah McManus [b], Emily Nicholson [b], Amanda BenDor [c], Carl Leitner [c]

[a] IntraHealth International, Kinshasa, Democratic Republic of Congo
[b] IntraHealth International, Chapel Hill NC, USA
[c] PATH, Chapel Hill NC, USA

Background and Purpose:
Many countries intensify their efforts to implement and scale up health information systems to track health service utilization and to support various aspects of health system decision-making. Generally in Low and middle income countries, health data come from different Information systems implemented by different donors and focused on specifics health issues such as: maternal and child health, HIV/AIDS, Human Resources etc…where data that are related each others are represented in different formats, collected by different actors and reported in different way. Actually, some systems offer the capabilities to publish data in international standardized format such as Aggregated Data Exchange, Mobile Care Service Discovery but data exchange is not often taken into account in most implementation plan to build integrated National Health Information System Architecture. To avoid squandering the considerable efforts and resources allocated to implement and to sustain Health Information Systems, the implementation of the data exchange mechanism between systems with a possibility to build master data repository has been identify as one of the solution. Since 2014 when two majors Health Information Systems: District Health Information System 2 and integrated Human Resources Information System has been put in place in the Democratic Republic of Congo, some challenges appears to perform cross data analysis and reporting with health services data as well as financing data. Through this case study, the paper explores if the adoption of an interoperability framework such as openHIE to integrate data from different software and build master data repository could help the Ministry of Public Health of the Democratic Republic of Congo (DRC) to improve the data analysis quality for better decision making on major national health issues.

Methods:
First an interview has been conducted with key stakeholders involved in the implementation of the two main Health Information Systems in DRC: integrated Human Resources Information System (iHRIS) and District Health Information System (DHIS2), to assess their level of knowledge concerning the question of system integration policy and practices. Based on the interview result we found out the respondent mentioned documents and reports where the theme has been discussed but they clearly say that they are not familiar with subject related to the system integration or interoperability. Thus, the document review approach has been chosen to collect data. Two methods have been used to conduct the case study exploring the themes related to the adoption of interoperability to build an integrated Health Information System framework in Democratic Republic of Congo. First, we perform the review of national strategic documents to determine how eHealth, health Information System are understood by policy makers and how important is the system integration in the national Health ICT ecosystem. Secondly, we performed the review of the different narrative reports produce during the implementation and the use of iHRIS and DHIS2 to explored challenges and the opportunities to implement interoperability between them.

Results:
Adoption of an interoperability model such as OpenHIE in the National Health Information Architecture could improve the use and the quality of data produced by iHRIS and DHIS2 by unifying the health information collected and maintained by many disparate individual organizations to support the decision making in the provision of better health services. Four use cases can be used as starting point for the Ministry of the Public Health of the DRC to build an interoperability layer within the National Health Information System architecture.

Conclusions:
The Democratic Republic of Congo, like other low and middle income countries requires strong and adaptive health systems at both the national and subnational levels to pursue the ambitious SDG 3

*Corresponding author address: Email: gerbis2000@yahoo.fr
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targets: Ensure healthy lives and promote well-being for all at all ages. To take advantage of the maximum benefit provides by digital health information systems and technologies, the Democratic Republic of Congo needs to adopt an Interoperability standard such OpenHIE in the National Health Information System framework to unify the health information collected and maintained by many disparate individual organizations to support decision making in the improvement of the quality and the productivity of operations within health care facilities.

Keywords: Interoperability, Health Information System, eHealth, Sustainable Development Goals, iHRIS, DHIS2, OpenHIE.

1 Introduction

In 2015, nations around the world committed to attaining 17 far-reaching Sustainable Development Goals (SDGs) by the year 2030. SDG 3 ("ensure healthy lives and promote well-being for all at all ages") outlines 13 targets, including disease-specific targets as well as broader targets focusing on universal health coverage and health worker recruitment and retention [1]. The World Health Organization (WHO) which defines a health system as "all organizations, people and actions whose primary intent is to promote, restore or maintain health" [2] notes that countries will require strong and adaptive health systems at both the national and subnational levels to pursue these ambitious SDG 3 targets [3].

Accompanying the SDG 3 targets are 26 quantitative indicators (the largest number of indicators for any of the SDGs) and countries' ability to monitor the indicators and thereby assess SDG 3 progress is contingent on access to trustworthy data, including evidence drawn from health information systems [3]. A well-functioning health information system (HIS) "ensures the production, analysis, dissemination, and use of reliable and timely information on health determinants, health systems performance, and health status" and it is one of the cores "building blocks" that helps health systems achieve their goals [2]. However, HIS data must be relevant, complete, and accurate to fairly assess and monitor health systems [4,5].

Recognizing the need for high-quality health sector data, many countries have intensified their efforts to develop, implement, and scale up health information systems to track health service utilization and to support various aspects of health system decision-making [6] . In most LMIC, HIS are still fragmented and not built as integrated components capable of exchanging data within the National Health Information System architecture and, at this critical juncture when countries are setting their sights on SDG 3, there is both an opportunity and a need for users to derive maximum benefit from the actual and potential data that digital health information systems and technologies can provide [7].

A 2009 landscape analysis of health information systems in low- and middle-income countries (LMICs) described a five-stage process in which countries first create and optimize conventional paper-based systems (Stages 1 and 2), next migrate to electronic storage and reporting (Stage 3), implement operational information systems as a source of HIS data (Stage 4), and, finally, achieve a "fully comprehensive and integrated national HIS" (Stage 5) [4]. From the time of the 2009 analysis till now, many LMICs still face challenges to materialize the stage 5.

In the intervening years, however, the pace at which governments and users are transitioning from paper-based data collection to embrace the latest in digital health technologies has accelerated due to the reduced cost of computers, availability of internet access and use of mobile phone [8].

International development donors, multilateral organizations, implementing partners, and others have discussed the possibilities and challenges associated with digital development for nearly a decade. Discussions between these entities has helped distil core principles, lessons, and best practices under nine fundamental Principles for Digital Development that ideally informs the design of technology-enabled development programs, including digital health programs [9]. Most of the principles, including designing with the user, being data-driven, designing for scale, and building for sustainability represent criteria that countries could uses to build or to choose their Electronic HIS.

No matter their level of design sophistication, electronic health information systems are only useful if users are able to access, visualize, analyze, and draw meaningful inferences from the data. However data use has remained a persistent challenge in digital health implementations, especially in environments that have rapidly transitioned from data scarcity to data overload. All too often, digital data remain siloed in a variety of locations and formats or furnish duplicate information [10,11]. When multiple sources of data

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coexist but do not interact, many stakeholders, particularly in LMICs with a short-lived tradition of digital data collection, may find it complex or arduous to extract constructive information.

To avoid squandering the precious, considerable efforts and resources allocated to digital data collection, digital health experts increasingly are highlighting the need for HIS interoperability and related standards. So, the concept of interoperability refers to "exchange of data between two or more health information systems that facilitate decision-makers' ability to simultaneously interpret and make practical use of data from multiple sources" [12]. Standards on the other hand provide a common language and set of expectations that enable interoperability between systems. The growing emphasis on Health Information Exchange (HIE) is evident in initiatives such as the OpenHIE community of practice, which represents a collaborative attempt to foster comprehensive country-driven sharing of health worker and health facility information [13].

Spurred on by SDG 3, many national governments are considering how to govern emerging interoperable HIS through eHealth policies and strategies. However, few researchers and implementers have taken time to examine the specific ways in which countries or sub regions actually are adapting to digital data exchange and cultivating robust policies and systems to better support strategic decision-making for health [14]. To address the health challenges and monitor the health targets and indicators outlined in SDG 3, there is a need to better understand strategies and approaches for developing interoperable systems and using data, guided by an overarching eHealth policy framework.

This study therefore seeks to explore if the adoption of an interoperability framework such as openHIE to integrate data from different software could help the Ministry of Health of the Democratic Republic of Congo (DRC) to improve the data analysis quality for better decision making on major national health issues.

2 Materials and methods

An initial assessment has been conducted through interview among the key persons at The Human Resources directorate and HMIS department of the Ministry of the Public Health (MoPH), such as data managers and technical assistants. The main purpose of the interview was, first, to have their point of view on the opportunity and the benefit of having a fully system integration framework and the country policy concerning this subject. Then, secondly to identify, cases where they may need to combine data coming from the two implemented national wide Information Systems in the health sector to produce report or to perform data analysis form any decision making.

Two data managers of the HR directorate, one technical assistant and one Technical Manager at the HMIS department have been associated to the assessment.

Concerning the question on the opportunity and the benefit of having a fully system integration architecture most of them have mentioned that interoperability could be the solution but they are not very familiar with the subject even though the subject has been mentioned in some national health strategy document.

Concerning the question of the identification of cases of using combined data from different systems to perform analysis, the respondents say that this case is very common during workshop and involved several MoH partners such as International Non-Governmental Organizations. So the good place to have information is to consult the reports of the concerned activities.

Since we could not collect relevant information directly from the MoPH's system users and manager concerning the national strategy to build an integrated Health System framework. Since the main use cases concerning the cross-data analysis from different systems for decision making have been done in workshop sessions by involving different MoH partners such as International Non-Governmental Organizations. Also, the some of the authors of this article are part of Intrahealth International DRC which is one of the partners of the MoH of the DRC through the 'Accès aux Soins de Santé Primaires' (Access to Primary Health Care) project led by the IMA World Health, to implement the iHRIS and DHIS2. Most of them have enough knowledge of the subject and the document review could be the relevant approach to conduct this work due to the limited time and budget.

However, the weakness of this approach is that the documents that we are reviewing do not target specially the problem concerning the integration of systems and the use of transversal data for decision

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making. This approach has required an intensive process of categorization and recoding to explore document for the theme finding. So this could lead to limited interpretation of the fact [16].

Based on the stakeholders interview results, we have used a document review to conduct the case study to explore how the Ministry of Health of DRC understand the adoption of the interoperability within the national health strategy documents to build an integrated HIS framework. This study will be based on the document review of the main strategy document as well as the reports related to the implementation of HIS, and to the identification of some use case when data from different iHRIS, DHIS2 and SYGECPAF have been combined to produce more meaningful information for the decision making.

During the document review:

- First, we first have selected national strategic documents and reviewed them to determine how eHealth, health Information System are understood by policy makers and how is the system integration in the National Health ICT ecosystem.
- Secondly, we reviewed the different narrative reports produce during the implementation and the use of integrated Human Resources Information System (iHRIS) and District Health Information System 2 (DHIS2) in DRC, and we explored through this review the challenges and the opportunities to improve the data use through the interoperability between the two systems. Then we reviewed data use between iHRIS and the proprietary payroll management system: Système de Gestion Centralisée de la Paie des Agents et Fonctionnaires (SYGECPAF), a non-Health Information System established by the Ministry of Finance in 2015, during the payroll analysis activities.
- And finally, we have explored how the implementation and the use the iHRIS and DHIS2 data relates to national eHealth strategy.

All the reviewed documents are listed in the appendix I.

iHRIS, installed in 24 countries thus far, is a widely recognized free and open-source software package used to manage health workforce information [15] The global Capacity and CapacityPlus projects led by IntraHealth International and funded by the United States Agency for International Development (USAID) until 2015, provided the initial impetus for the development of iHRIS[17].

DHIS 2 is the flagship open-source health management information system maturing over 20 years and coordinated by the University of Oslo and currently operational in more than 100 developing countries[18]. iHRIS and DHIS 2 are in varying stages of implementation in the DRC making it an opportune moment to examine enabling factors and barriers to health information exchange between the two systems and, with other Information Systems.

3 Results

3.1 eHealth strategy and interoperability understand by policy makers and stakeholders

The criteria of reviewing documents is based on how important decision makers and implementers understand, and express the need to have information systems that produce and exchange data to support decision making to improve health of the population. As technical and financial partners of the Ministry of Public Health, IntraHealth DRC has been associated to the elaboration and to the review of some of strategic health documents such as: PNDS and PNDRHS. These documents are also used by IntraHealth DRC to build its operational activities plan. As we have a judgment regarding subjects and objects that are representative of the phenomenon or topic, purposive sampling technic also referred to as judgmental sampling has been applied [19] to identify relevant documents related to the implementation of HIS in the DRC.

So we have identify three national strategic documents (Table 1) used by all stakeholders, technical and financial partners and services of the Ministry of Public Health involved in Health Information System implementation activities (IMA World Health, Belgium Technical Cooperation, Japan International Cooperation Agency, Direction SNIS, Direction des Services Généraux et Resources Humaines de la Santé).

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We have started the analysis with the review of the National Health Development plan (PNDS) in which the government diagnose and evaluate the policy designed to improve the health services provided to the population. The thematic framework has consisted to do the annotation of all textual part that contains chosen key concepts with numerical code and them to analyse text part to find what the policy makers understand on the use of key concepts related to HIS in the improvement of the health services.

The key concepts chosen as themes are: information system, data exchange, data use, interoperability, system integration, health data, data transmission, data reporting, mortality, maternal health, infectious disease, family planning, health worker distribution, health workers recruitment, health worker training.

In the PNDS, Health Information System is clearly mentioned as one of the key components of Health System and the problem of data quality, reporting rate, effective use of data for decision making and exchange of data has been recognized as challenges that will affect the actions of government to solve health issues related to mortality, maternal health, infectious disease, family planning and human resources quality and distribution. No clear statement has been made about the standardization of health data and on the need to implement systems that allow exchange of data between them. But the need to access information in acceptable timeframe by others components of the health system has been identify as an important asset to put in place.

In the PAISNIS, the document describes operational plan and actions to successfully implement DHIS2 as the National Health Management Information System (HMIS) for the reporting of aggregated routine health data. The improvement of data collection tools to report and to share health indicators has been recognized as an important action to improve the data quality and the reporting. The harmonization of data format collected from different facility type has been also stated as an action to perform to improve the data quality even though data collection tools refers to paper form called “Canevas SNIS”. However no clear statement have been made about the opportunity to put in place mechanism to allow other services or programs of the MoPH that have already information systems to publish their data in standardized format to facilitate their integration within DHIS2. But it has been recognized that cross analysis of health data, financial data and human resource data allows to get more meaning information within a centralized approach.

In the DRC a proper eHealth Strategy plan (PNDIS) that present a high-level policy statements and “road-maps” in the use of ICT to enhance health services has been released in 2015 with the support of Belgium Technical Cooperation (Now Enabel). The PNDIS describes the national Health ICT ecosystems which “encompasses the people, policies, strategies, processes, information and other ICTs that together make up the socio-technical environment surrounding an ICT embedded” within a health sector in the DRC[20]. However, even though the interoperability has been identified as one of the important mechanism to put in place to ensure optimization of data use and resources saving, no mention has been made concerning the standard or framework to adopt for achieving the interoperability.

Global standardization such as Integrating the Healthcare Enterprise (IHE), the Health Data Collaborative, and the Open Health Information Exchange (OpenHIE), provide reusable architectural framework based on health information standards, facilitates flexible implementation of the national Health architecture, and supports inter- changeability of its components. The international interoperability specifications is part of component to take into account when implementing these global standard [20]

On the otherhandthe PNDIS has not been enough disseminated among the stakeholders and many of them have recognized that they have heard about the document but they have not much used it as reference for their policy and documents for planning.

Table 7: List of Health Strategic Documents Reviewed

No	Document names
1	Plan National de Développement de l'Informatique de la Santé (PNDIS)
2	Programme d’appui à l’implémentation du cadre normatif SNIS (Système National d’Information Sanitaire) et du logiciel DHIS2 En République Démocratique du Congo (PAISNIS).
3	Plan National de Développement Sanitaire 2016 – 2020 : Vers la couverture sanitaire universelle.(PNDS)

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3.2 iHRIS Data use

The population of the DRC is estimated 77.8 million habitants spread over an area of 2,345,409 km2 across 26 provinces [21]. The World Health Organization (WHO) estimates that only six qualified health workers are available for 10,000 populations, as compared to the recommended minimum of 23 per 10,000 populations. Been under this threshold, put the DRC among the countries that face significant challenges in providing skilled birth care for many pregnant women, as well as emergency and specialist care for newborns and young children. This has a direct impact on the number of deaths of women and children [22].

Through the elaboration of the following strategic documents: Plan National de Développement Sanitaire and the Plan National de Développement des Ressources Humaines pour la Santé (PNDRHS), The MoPH recognized the existence of significant gaps in the way that health workers are deployed, distributed, managed, and compensated. Thus, the MoPH set out a roadmap for the decentralized management of Human Resources for Health (HRH) in the DRC. Before 2016, the Ministry of Health was not able to determine with confidence the number of health workers in a specific area, nor plan for the recruitment and training of new health workers.

In the PNDRHS, the MoPH also recognized that timely and complete health workforce data are essential for effective HRH management, So the MoPH began introducing an electronic Human Resources Information System (HRIS) in 2014 with the support from the Accès aux Soins de Santé Primaires (ASSP) project [23].

In late 2014, the MoPH began implementing iHRIS in four of the country's 26 provinces and he was able to conduct a detailed payroll analysis in two of the provinces (Kasaï Central and Kasaï) in partnership with the Ministries of Public Service and the Ministry of Finance. The data manager from Regional and national level were involved in the data entry directly in iHRIS Manage. The data collection generated records for over 11000 verified health workers, 4731 for Kasai and 6713 for Kasai central, over respectively a population of 4,434,801 and 4,365,127. Both provinces also suffer from unequal distribution of scarce health workers, who are disproportionately located in urban areas. Urban health zones have a density ratio of more than 12 qualified health workers per 10,000 populations, while rural health zones have a density ratio of less than eight. To perform the payroll analysis, the data managers extract the list of health workers from iHRIS, match it with list extracted from the SYGECPAF, a payroll management system established by the Ministry of Finance. Both files are exported in excel compatible format and then processed manually the mismatched cases in both sides (iHRIS-SYGECPAF). The matching criterion was based on more than one attributes: names, job category, salary grade, facility and serial number. This operation took time due to the difference of format and terminologies used within the excel files.

Based on the payroll analysis, most registered health workers (57% and 73%, respectively for Kasai and Kasai Central) reported receiving no regular government pay (comprised of salary and/or national bonus), but instead depended on informal incentives or facility-generated funds for compensation

The payroll analysis also found that ghost workers (individuals on payroll who do not exist or show up at work) deplete the country's strained resources. Ghost workers in both two provinces: Kasai Central and Kasai represented 927 (27%) of salaried health workers and 2,142 (42%) of those receiving the national bonus [24].

The payroll analysis performed by extracting data from different sources, allowed the three Ministries to identify ghost workers, remove them from the payroll, and reallocate the freed-up funds to actual health workers who had not previously received government remuneration [25]. This case study shows how the cross analysis of health workers data and financial data collected from different systems and by different actors, provides more meaningful information for decision making.

Through this work, it has been recognized that (Data managers of the MoPH and IT specialist from the Ministry of Finance), the work could be easy only if the two systems could use the same data standard concerning the format of fields (name correctly broken down, job category correspondence) and if the two systems could be able in an automated process to exchange data and generate the list of matched record based on the same terminology.

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3.3 DHIS2 Data use

In the DRC the implementation of DHIS2 has started at the beginning of 2014 when the MoPH has conducted the reform of the cadre that organized the National Information System to produce valid and timely routine health indicator to meet objectives defined in the achievement of the MDGs. The support of donors (World Bank, GAVI, UE) to adopt the electronic platform to report routine health data has contribute also to the adoption of DHIS2 as the National Health Management Information System. DHIS2 has improved the collection of health indicators and their analysis to improve decision making. Even though there are still challenges concerning the completeness (approximately 50%) and promptness of data been collected due to the lack of feedback mechanism, error, incoherence and connectivity to the internet, the overall data quality has been improved with validation rules and threshold set up in the data entry forms.

Basically DHIS2 data manager use to enter data from paper based form (Canevas SNIS) and to extract aggregated data in the form of graph, table and more recently map for decision maker at all levels (District, Regional, and National). Actually the numbers of Country indicators are around 70 based on the last review that reduced them from 218. The collected data are selected based on the need of each programs within the country such as Maternal and child health indicator, Expended Program of Immunization (EPI), Infectious disease, Nutrition, etc…. DHIS2 is still on the beginning implementation status since it supposed to be running in all 26 Direction Provincial de la Santé (DPS).

Actually, many projects need to use data from National HMIS: iHRIS need to synchronize the facility list with DHIS2 to ensure a good reporting and sharing of HRH (Human Resources for Health) indicators and to build the facility and the health worker registry; the WISN Workload Indicators for Staffing Need study required data of health workers activities which are described also as indicator in DHIS2 for different type of facilities and their categories as required to cope with workload [26]; the Integrated HIV/AIDS Program (IHAP)-DRC project thinks also on the way to exchange the data between the TIER.Net System : - an HIV electronic Register [27]; the program specific IHAP/DHIS2 and the national HMIS to generate and shared timely President's Emergency Plan for AIDS Relief (PEPFAR) indicators.

Concerning the data exchange between iHRIS and DHIS2 a semi-automated procedure has been put in place using a script to assure synchronization of the list of facilities in iHRIS, however the three last cases: WISN study, TIER.Net synchronization and the proprietary DHIS2 Synchronization with the National HMIS use the manual processes to import and merge data. That makes the cross-data analysis and use difficult to perform. So, we have four active use cases that can be efficiently solved with the deployment of the interoperability layer to manage the coordination and the exchange of data between HIS in a secured manner.

3.4 Data challenges

Due to the incompleteness and the lack of accuracy of some indicators encoded in DHIS2 during certain periods, sometimes it was necessary to refer back to the field to perform additional data collection or validation using the paper form (Caneva SNIS). This situation is observed during the WISN study where people have gone back to the field to collect primary data on activity performs by clinicians in order to correct some incoherence detected in the data reported within DHIS2. The reference back to the field has also been motivated by the need of investigators to match the terminologies used by clinician on the field and those used in SNIS Caneva for data entry or in the DHIS2 dataset.

Even though action has been taken in general to improve the completeness and the data quality in DHIS2 such as the redefinition of indicator to reduce their number, reinforcement of validation rules in DHIS2 and the setting up of validation meeting at the Health Zone, the cross use of these data with other from different systems causes the problem of terminology matching. There is the need to put in place a system to manage link between data through appropriate coding system and terminology services to allow user to refer to the same data using different label.

At the other hand, the problem of completeness of data was observed also on the use of iHRIS since the system is actually deployed in 3 provinces where health workers data have been verified and validated: - Kasai, Kasai Central and Maniema - over 26 total provinces in DRC. There is a need to perform the scale up of the iHRIS within the all the country and to allow each province through the Direction Provincial de la Santé (DPS) to manage their own data, to plan their activities and build their actions based on real factual data.

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3.5 Interoperability

Actually, the common data exchange case performed within the HIS environment of the DRC is the use of a script to synchronize the list of facilities in iHRIS with the list of the organization units in DHIS2 exported in the excel sheet. However this procedure was not performed by using a standardized data format to ensure that the two systems are able to talk each other dynamically (probably with a new HIS) without any manual intervention but instead based on a clear automated business process through an interoperability standard. In the actual situation, any time that there is a new facility or a new field added as attribute in DHIS2, the excel sheet could be changed and there is a need to share it between the SNIS Directorate and the HR Directorate to update the list in iHRIS.

There is also the case where facility-level data from DHIS 2 on service delivery (such as the number of births and deaths recorded), HIV/AIDs care are being used in combination with iHRIS health worker data to support health workforce intervention and training at national and regional level. Additionally, it has been observed the problem of using different names to call and to enter the same health data within different systems.

We can observe through those cases that the data exchange has become increasingly important to build integrated strategies and actions to target health issues at all level of the health pyramid as the government undergoes a decentralization process transferring health system governance to the provinces.

Other efforts to exchange data between programs and partners resulted to the transfer of some business processes between the programs and the national HMIS to reduce the workload due to the record of the same indicator several times within different systems, for example: Tuberculosis/HIV (TB/HIV) related program and others vertical programs use to enter the same indicators using different names to report to different donors and partners (National and international). Even though some of them use the same base system (p.ex DHIS2 for iHAP and the National HMIS) they are not able to exchange data without manual data processing. Terminology service and use of code systems provided by the interoperability could be used to better coordinate the data exchange and report [28].

3.6 HIS strategic plan

During the review of the national strategy documents related to health information system, it has been clearly recognized that having information systems that produce, allow access and share relevant data to support decision making is very crucial for the country to solve health issues. Based on the importance of the problem an exhaustive analysis of the country Health System has been done and the country eHealth Strategy (PNDIS) has been design with an accent put to the capability of each HIS components to exchange data in optimized way. Some of the interoperability standard such as Health Level-7 (HL7) and Digital Imaging and Communication in Medicine (DICOM) has been clearly cited as the starting point to the HIS integration but any global standardization framework has been proposed. Also, the PNDIS has not been disseminated and used actively by Health Information stakeholder in their operational plan as a reference during the stage of implementation. This can be observed this by the lack of evaluation and revision of the PNDIS comparing to other national strategic document as well as during the initial assessment of this research since all respondents says that they heard about the subject but they find it very technical. However the PNDIS give a clear vision of operational, functional requirement and architecture to build optimized Health Information System to respond to the need of the Country policy. We think that the PNDIS need to be revised to propose an adapted interoperability model based on international standard such as OpenHIE from which we could build the DRC country architecture.

4 Discussion

Robust health systems enable governments and stakeholders to provide patients with quality health care in the right places, at the right times to all of those who are in need [29]. One of the six building blocks of a strong health system is a well-functioning health information system: one that ensures the production, analysis, dissemination and use of reliable and timely data [30]. Interoperable HIS enable faster, more efficient exchange of health data which can support and accelerate progress toward the SDG3. For LMICs countries adoption of data standards and interoperability within the National HIS framework could improve

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the integration of data collection and could allow more comprehensive use of information to support decision to improve health outcomes [29].

As large-scale health information infrastructure, the National Health Information System objective is not only to produce in a unified environment aggregated counts and other summary statistics from HIS components but to unify the health information collected and maintained by many disparate individual organizations that may use unique and incompatible terminology. [31]

By using data from multiple systems, stakeholders can not only monitor progress of health priorities, including reproductive, maternal and child health, communicable, non-communicable and environmental diseases, universal health coverage and access for all to safe, effective, quality and affordable medicines and vaccines; but they can also use integrated data from different sources to respond to health needs on the ground with a broad vision. Also, information produced by different sources can be used by policy-makers thanks to terminology features to shape the environment in which health services are procured and provided to adjust the framework of health Information System strategy to comply with the operational environment.

However it has been observed that the concept of "Interoperability" seems to be just a theoretical concept stated in National Health Strategic documents because the stakeholders still don't clearly understand the immediate benefit of implementing a platform that shares standardized data as the HIS architecture is growing.

Inclusion of fundamentals of Health Information Systems or related topics within the in-service training or health training curriculum could help health professionals and others stakeholders to better understand health care data standards and technical infrastructure as a component of the National Health Information system as well as their benefits in the improvement of the quality and the productivity of operations within health care facilities [32]. DHIS2 and iHRIS as actual key components of HIS framework in the DRC could be used to provide unified environment with standardized coding and terminologies to facilitate the exchange of data between them and also with other systems to implement the four identified use cases:

1. the implementation of Facility registry;
2. The implementation of Health worker registry
3. The implementation of the terminology services to share main health indicators including HRH indicators between iHRIS and DHIS2;
4. The implementation of patient data registry to facilitate patient data exchange across facility, care service analysis and service usage reporting.

The OpenHIE model designed to promote the sharing of health information in countries with a diverse array of health information systems could be adopted [31] Even though OpenHIE architectural blueprint in terms of the requirements of in real world national health ICT ecosystems will most likely involve extensive introduction and removal of ICTs components [20], it provides however guidance on the procedure to follow to build interoperability layer between its software components.

Each use case refers to components that are related each other's and supports a well described health data management process so the OpenHIE architecture [33] could be used since it supports these four use cases.

The adoption of the OpenHIE model can be also integrated in the design of the National Health strategy as well as to allow stakeholder to have a clear guideline during the implementation of the interoperability layer [34].

Three countries could serve as the models to facilitate the integration of OpenHIE within the National HIS architecture: Tanzania, Guinea and Nigeria. Nigeria adopted OpenHIE for the identification of use cases to build the Master Facility List that serves as a repository for the allocation and maintenance of unique identifiers, the standard that will facilitate linking of health facility data sources [35]. In Tanzania, the health sector has endorsed and expended the OpenHIE framework in its evolving Enterprise Architecture to guide the development of the Health Facility Registry (HFR) software which is the Health Information System that manages health facility details over time [36]. And Guinea is actually piloting the test of the interoperability plateform to exchange data between open Logistic Management Information System and DHIS2 under the USAID/Global Health Supply Chain project (GHSC) in a partnership between Chemonics International/Guinea and IntraHealth International.

For the MoH of the DRC, building its Healh information system in an integrated fashion using interoperability will clearly improve its capability to perform cross data analysis for better decision making

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concerning the Human Resources for Health, their deployment, their financing as well as the health care services provided. The following recommendations are suggested to the Ministry of Health of the DRC to do a transition towards an integrated Health Information System that will improve the data use for better decision making:

1. Design a simplified framework interoperability for the exchange of data between iHRIS and DHIS2 based on the openHIE norms and standard;
2. Disseminate this framework to the key stakeholder involved in the implementation of iHRIS, DHIS2;
3. Implement, first the facility registry and the terminology services to share main data between iHRIS and DHIS2;
4. Identify cases for cross analysis of data between DHIS2 and iHRIS, and perform them.
5. Present the result of the cases of cross analysis between iHRIS and DHIS2 to decision makers.

Even if, the interoperability has been chosen as one of the solution, this should note take for granted. There is other approach such as "The functional architecting". Defined as "the activities of a variety of actors involved in configuring and re-configuring the functional roles of independent but related software components", the functional architecting can be used to extend the functionality of DHIS2 to implement other sub-systems features uses to report data in DHIS as the National HMIS. Specifically, the use of tracker that has been experimented for patient management and logistics management can be used as case study [37]. But this goes beyond the scope of our study since the focus is on the interoperability.

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Statement on conflicts of interest

The authors have no conflicts of interest to declare.

Appendix I: Document sources used for the review

No	Document names	Document descriptions
1	Plan National de Développement de l'Informatique de la Santé (PNDIS)	Health National Program for the development of Health Informatics
2	Programme d'appui à l'implémentation du cadre normatif SNIS (Système National d'Information Sanitaire) et du logiciel DHIS2 En République Démocratique du Congo (PAISNIS).	Operational Program for the Implementation of the Health Management information System
3	Plan National de Développement Sanitaire 2016 – 2020 : Vers la couverture sanitaire universelle.(PNDS)	National Health Development plan 2016 - 2020
4	Rapport des travaux d'analyse de paie pour les régions du Kasaï et du Kasaï Central	Payroll analysis report for the Kasaï and Kasaï Central regions
5	Rapport d'étude sur l'utilisation des données pour une meilleure répartition des ressources humaines pour la santé en RDC – 2016	Generating Data to Get the Right Health Worker to the Right Place with the Right Skills at the Right Time in the DRC 2016
6	Rapports d'identification des agents et des fonctionnaires de l'état du secteur de la santé dans	Report of physical identification of the staff of the Ministry of Health in 4

	les regions du Kasaï, Kasaï Central, Nord Ubangi et Maniema	regions: Kasaï, Kasaï Central, Nord Ubangi and Maniema
7	Rapports de retro information DHIS2 dans le Pool ASSP Mweka, Kananga et Tshikapa	DHIS2 usage Feedback reports in the Pools of three main regions: Mweka, Kananga and Tshikapa
8	L'annuaire statistique de la République démocratique du Congo (RDC) pour l'année 2017	Health Statistic reports of the DRC 2017

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Usage des Technologies de l'Information et de la Communication par les professionnels de santé du Gabon: Etude de perception dans le cadre du projet e-Santé Gabon

R. Ondzigue Mbenga[a,*], A.P. Koumamba[a], G. Moukoumbi Lipenguet[a], C.O. Bagayoko[b]

[a] Ministère de la Santé, Projet "Renforcement du Système National d'Information Sanitaire", Gabon
[b]Centre d'expertise et de recherche en télémédecine et e-santé, CERTES, Bamako, Mali

Résumé

Introduction :

Les professionnels de santé de plusieurs pays du monde utilisent de plus en plus les technologies de l'information et de la communication (TIC) dans le cadre de la prise en charge des patients et l'amélioration de la qualité des soins. Cette étude avait pour objectif de faire un état des lieux de l'usage des TIC ainsi que la perception de la e-Santé par les professionnels de santé dans le cadre du projet e-Santé Gabon.

Matériels et méthodes :

Il s'agissait d'une étude descriptive, transversale de type quantitatif. Elle s'est déroulée d'août 2016 à Juin 2017 dans les dix régions sanitaires du Gabon. Un questionnaire (n=447) à une échelle de Likert avec des questions à 5 niveaux (Jamais, Rarement, Parfois, Souvent, Très souvent) et à 6 niveaux (Inutile, Peu utile, Plus ou moins utile, Assez utile, Très utile, Ne s'applique pas) a été utilisé. La méthode d'échantillonnage adoptée était la méthode par convenance. Car, les enquêtés étaient libre de répondre ou pas au questionnaire selon leur consentement. Les données collectées ont été traitées sous Excel puis analysées à l'aide du logiciel statistique EpiInfo 7.

Résultats :

Données socio-démographiques :

Sur les 447 agents enquêtés, 333 étaient du corps médical (professionnels de santé). Seul ces 333 étaient concernés par notre étude. La moyenne d'âge de l'ensemble des enquêtés était 43,48 ans (ET ± 8,89 ans) avec les extrêmes de 20 à 78 ans. Il y avait 39% de femmes et 61% d'hommes.

Perception de l'utilité du dossier électronique patient :

Cent quatre-vingt professionnels de santé sur 333 soit 54,1% ont répondu trouver très utile le dossier électronique patient dans la pratique professionnelle.

Perception de l'utilité de la télé consultation, la télé échographie et la télé cardiologie :

Les professionnels de santé ont trouvé majoritairement la télé cardiologie, la télé échographique très utile soit respectivement 53,2% et 50,2%. Tandis que la télé consultation l'a été à seulement 46,8%.

Formation et usage des TIC en santé :

La majorité des professionnels de santé ont répondus n'avoir jamais reçu de formation à l'utilisation de la télésanté (84,1%), à la téléformation (81,4%), l'utilisation d'Internet (61,0%) et en initiation en Informatique (54,7%). Ils n'utilisent majoritairement jamais la télémédecine (78,7%), la m-Santé (78,1%), la e-Santé (77,5%), l'Internet (61,0%) et l'ordinateur (59,5%) dans la pratique professionnelle.

Conclusion :

Les professionnels de santé ont en général une perception moyenne de l'utilité du dossier électronique patient et de la pratique de la télémédecine. Cependant, ils ont un niveau de formation très insuffisant en informatique de base et n'utilisent presque jamais Internet, la e-Santé, la m-Santé, la télémédecine et l'ordinateur dans le cadre de la pratique professionnelle.

*Corresponding author address: Email: ondzigueraymond@gmail.com
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Mots clés : TIC, perception, e-Santé, télémédecine, m-Santé, télésanté, télé-formation, professionnel de santé, Gabon

1 Introduction

Les Technologies de l'Information et de la Communication (TIC) ont envahi plusieurs secteurs d'activités, et le secteur de la santé n'est pas en reste. Ces technologies sont de plus en plus intégrées dans la pratique médicale et utilisées par les professionnels de santé. L'usage des TIC est de plus en plus multiforme et variée allant des échanges d'expertise entre professionnels de santé par transfert des données, la télé-formation, jusqu'aux actions directes sur le patient. Cette pratique actuellement appelé e-Santé est largement répandue dans plusieurs pays développés et est devenue un enjeu majeur dans le domaine de la santé. Elle permet d'améliorer la qualité des soins offerts aux patients [1] ainsi que leur empowerment. Dans les pays d'Afrique subsaharienne, l'usage des TIC dans la pratique professionnelle par les professionnels de santé reste très insuffisant. La quasi-totalité des prises en charge patients se font encore par contact direct avec le professionnel de santé. Les applications de la e-santé tels que le dossier médical informatisé, la télémédecine (ex : télé cardiologie, télé échographie, téléconsultation, etc.), le système d'aide à la décision médicale, la télé-formation ne sont pas encore largement répandues dans la plupart de ces pays.
Au Gabon, un projet e-Santé a été initié par le gouvernement. Ce projet vise à accélérer le développement des services de santé numériques et à promouvoir les contenus et applications liés à la numérisation des informations de santé. Les professionnels de santé étant les pivots d'un tel projet, il est apparu important de savoir quelles étaient leurs perceptions de l'utiliser des outils et applications de la e-Santé dans le cadre de la réalisation de leurs tâches quotidiennes de prise en charge du patient. Car, Il n'existe pas à ce jour d'études ayant permis de mesurer cette perception des professionnels de santé du Gabon vis-à-vis des outils TIC et applications de la e-Santé. L'objectif était de faire un état des lieux de l'usage des TIC ainsi que la perception de la e-Santé par les professionnels de santé. L'hypothèse qui a soutenu cette étude était que les professionnels de santé n'avaient pas une bonne perception de l'usage des TIC dans la pratique professionnelle ainsi qu'un bon niveau en informatique de base.

2 Méthode et Matériels

Il s'agissait d'une étude descriptive, transversale de type quantitatif. Elle s'est déroulée d'août 2016 à Juin 2017 dans les dix régions sanitaires (Libreville-Owendo, Ouest, Sud-Est, Centre, Centre-Sud, Sud, Centre-Est, Est, Maritime et Nord) du Gabon.
Un questionnaire à l'échelle de Likert avec des questions à 5 niveaux (Jamais, Rarement, Parfois, Souvent, Très souvent) et à 6 niveaux (Inutile, Peu utile, Plus ou moins utile, Assez utile, Très utile, Ne s'applique pas) a été utilisé. Notre population a été définie comme étant l'ensemble des agents en milieu hospitalier acceptant de répondre à notre questionnaire. La méthode d'échantillonnage adoptée était la méthode par convenance. Car, les enquêtés étaient libre de répondre ou pas au questionnaire selon leur consentement. Des tablettes numériques dans lesquelles était embarqué le questionnaire ont été utilisées pour la collecte des données sur le terrain. Les données étaient saisie en mode non connecté. La synchronisation avec la base de données centrale se faisait systématiquement lorsqu'il y avait un point d'accès Internet mobile ou sans fil. Les données collectées ont été exportées de la base de données centrale vers un format Excel pour traitement. Les analyses ont été réalisées à l'aide du logiciel statistique EpiInfo 7.

3 Résultats

3.1 Données socio-démographiques

Quatre cent quarante-sept (447) agents du secteur santé (professionnels de santé et autres professionnels) ont accepté de répondre au questionnaire. Il y avait 202 hommes et 131 femmes. L'âge moyen de l'ensemble des agents enquêtés était 43,48 ans (ET ± 8,89 ans) avec les extrêmes de 20 à 78 ans. Chez les femmes cet âge était de 43,03 ans (ET ± 8,26 ans) et chez les hommes de 43,76 ans (ET ± 9,28 ans). Sur les 447 agents enquêtés, 333 soit 74,5% étaient des professionnels de santé. Seuls ces 333 professionnels de santé étaient concernés par notre étude. Ils ont été sélectionnés à partir de 170 formations sanitaires publiques, parapubliques et privées. Il y avait plus d'infirmiers soit 55,3% de l'ensemble de la population

de l'étude. La répartition des différentes professions est présentée dans le tableau 1.

Tableau 1 : Répartition des enquêtés par profession

Professions	**Effectif**	**%**
Biologiste	12	3,6%
Infirmier	184	55,3%
Médecin généraliste	51	15,3%
Médecin Spécialiste	36	10,8%
Pharmacien	23	6,9%
Sage-femme	27	8,1%
Total	**333**	**100,0%**

Le plus grand nombre d'enquêtés était des régions sanitaires Centre-Sud et Libreville-Owendo avec respectivement 66 et 51 d'enquêtés. La tranche d'âge qui a enregistré le plus d'enquêtés est celle de 40 à 50 ans avec 42,6% de l'ensemble des répondants. La moyenne d'âge était de 43,37 ans avec un Ecart-type entre les âges de 8,94 (Tableau 2).

Tableau 2 : Répartition des enquêtés par région sanitaire et par tranche d'âge

Régions sanitaires	**Tranche Âge**										**TOTAL**
	≤20		**[20 - 30[**		**[30 - 40[**		**[40 - 50[**		**>50**		
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Centre	0	0,0	0	0,0	15	14,3	20	14,1	8	12,7	43
Centre-Est	0	0,0	3	13,6	8	7,6	7	4,9	3	4,8	21
Centre-Sud	1	100,0	3	13,6	26	24,8	28	19,7	8	12,7	66
Est	0	0,0	1	4,5	11	10,5	7	4,9	4	6,3	23
Ouest(Estuaire)	0	0,0	3	13,6	7	6,7	9	6,3	5	7,9	24
Libreville-Owendo	0	0,0	5	22,7	12	11,4	26	18,3	8	12,7	51
Maritime	0	0,0	2	9,1	5	4,8	13	9,2	5	7,9	25
Nord	0	0,0	0	0,0	3	2,9	8	5,6	6	9,5	17
Sud	0	0,0	3	13,6	7	6,7	9	6,3	3	4,8	22
Sud-Est	0	0,0	2	9,1	11	10,5	15	10,6	13	20,6	41
TOTAL	1	100,0	22	100,0	105	100,0	142	100,0	63	100,0	333

3.2 Perception de l'utilité du Dossier Electronique Patient(DEP)

Le Dossier Electronique Patient(DEP) a été trouvé très utile dans la pratique professionnelle par 54,1% de répondants. Parmi ces répondants, il y avait plus d'infirmiers soit 50,6% suivi respectivement des médecins généralistes 18,3% et les spécialistes 15,0%, les sages-femmes 8,3% et les biologistes 4,4%. La majorité des pharmaciens soit 15,4% l'ont par contre trouvé inutile dans leur pratique professionnelle (Tableau 3).

Tableau 3: Répartition des enquêtés selon la perception sur l'utilité du Dossier Electronique Patient (DEP)

Profession	**Inutile**		**Peu Utile**		**Assez Utile**		**Très Utile**		**Total**
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	
Biologiste	2	1,9%	0	0,0%	2	5,6%	8	4,4%	12
Infirmier	68	65,4%	10	76,9%	15	41,7%	91	50,6%	184
Médecin généraliste	8	7,7%	2	15,4%	8	22,2%	33	18,3%	51
Médecin Spécialiste	3	2,9%	0	0,0%	6	16,7%	27	15,0%	36
Pharmacien	16	15,4%	0	0,0%	1	2,8%	6	3,3%	23
Sage-femme	7	6,7%	1	7,7%	4	11,1%	15	8,3%	27
Total	104	100,0%	13	100,0%	36	100,0%	180	100,0%	333

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3.3 Perception de l'utilité de la téléconsultation

Une majorité relative de répondants ont trouvé la téléconsultation très utile soit 46,8%. Les infirmiers étaient ceux qui l'ont le plus trouvé très utile soit 62,2%. Les médecins généralistes et spécialistes l'ont par contre trouvé assez utile soit respectivement 24,0% et 14,6% (Tableau 4).

Tableau 4: Répartition des enquêtés selon la perception sur l'utilité de la téléconsultation

Professions	Inutile		Peu Utile		Assez Utile		Très Utile		Total
	N	%	N	%	N	%	N	%	
Biologiste	1	4,8%	4	6,7%	4	4,2%	3	1,9%	12
Infirmier	10	47,6%	30	50,0%	47	49,0%	97	62,2%	184
Médecin généraliste	5	23,8%	10	16,7%	23	24,0%	13	8,3%	51
Médecin Spécialiste	3	14,3%	8	13,3%	14	14,6%	11	7,1%	36
Pharmacien	1	4,8%	1	1,7%	2	2,1%	19	12,2%	23
Sage-femme	1	4,8%	7	11,7%	6	6,3%	13	8,3%	27
Total	21	100,0%	60	100,0%	96	100,0%	156	100,0%	333

3.4 Perception de l'utilité de la télé échographie

La télé échographie est bien perçue par 50,2% des professionnels de santé. Les infirmiers sont majoritairement ceux qui l'ont trouvé très utile soit 67,1% suivi des pharmaciens 11,4% (Tableau 5).

Tableau 5: Répartition des enquêtés selon la perception sur l'utilité de la télé échographie

Professions	Inutile		Peu Utile		Assez Utile		Très Utile		Total
	N	%	N	%	N	%	N	N(%)	
Biologiste	1	6,7%	4	8,2%	4	3,9%	3	1,8%	12
Infirmier	8	53,3%	16	32,7%	48	47,1%	112	67,1%	184
Médecin généraliste	2	13,3%	14	28,6%	19	18,6%	16	9,6%	51
Médecin Spécialiste	3	20,0%	6	12,2%	19	18,6%	8	4,8%	36
Pharmacien	1	6,7%	2	4,1%	1	1,0%	19	11,4%	23
Sage-femme	0	0,0%	7	14,3%	11	10,8%	9	5,4%	27
Total	15	100,0%	49	100,0%	102	100,0%	167	100,0%	333

3.5 Perception de l'utilité de la télé cardiologie

Les infirmiers ont répondu à plus de moitié soit 63,8% que la télé cardiologie était très utile dans la pratique professionnelle. Tandis que 21,1% de médecins généralistes et 17,9% de médecins spécialistes la trouve assez utile (Tableau 6).

Tableau 6: Répartition des agents selon la perception sur l'utilité de la télé cardiologie

Professions	Inutile		Peu Utile		Assez Utile		Très Utile		Total
	N	%	N	%	N	%	N	%	
Biologiste	1	5,9%	3	6,8%	3	3,2%	5	2,8%	12
Infirmier	8	47,1%	17	38,6%	46	48,4%	113	63,8%	184

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Médecin généraliste	3	17,6%	10	22,7%	20	21,1%	18	10,2%	51
Médecin Spécialiste	3	17,6%	8	18,2%	17	17,9%	8	4,5%	36
Pharmacien	1	5,9%	1	2,3%	2	2,1%	19	10,7%	23
Sage-femme	1	5,9%	5	11,4%	7	7,4%	14	7,9%	27
Total	17	100,0%	44	100,0%	95	100,0%	177	100,0%	333

Nous avons défini la modalité « Très Utile » comme variable pour mesurer la bonne perception de l'utilisation des TIC par les professionnels de santé dans la pratique professionnelle. Le seuil de bonne perception a été arrêté à 50%. En calculant le niveau de perception générale, il ressort que cette perception de l'utilisation des TIC dans la pratique professionnelle est moyenne chez les professionnels de santé soit 51,1% (Tableau 7).

Tableau 7: Niveau de bonne perception de l'Utilisation des TIC par les professionnels de santé

	DEP	Télé Consultation	Télé échographie	Télé cardiologie	Cumul	%
Réponse "Très Utile"	180	156	167	177	680	51,1%
Nombre Enquêtés	333	333	333	333	1332	100,0%

3.6 Formation à l'utilisation d'Internet, l'initiation à l'informatique, l'utilisation de la télésanté et la téléformation

Quatre vingt quatre virgule un pour cent (84,1%) de professionnels de santé ont répondus n'avoir jamais reçu de formation à l'utilisation de la télésanté, la téléformation (81,4%), l'utilisation d'Internet (61,0%) et l'initiation en informatique (54,7%) (Tableau 8).

Tableau 8 : Formation en initiation informatique, télé formation, utilisation d'Internet et de la télésanté

Formations	Jamais		NSP		Parfois		Rarement		Souvent		Très souvent	
	N	%	N	%	N	%	N	%	N	%	N	%
Initiation Informatique	182	54,7%	19	5,7%	38	11,4%	25	7,5%	39	11,7%	30	9,0%
Télé formation	271	81,4%	43	12,9%	6	1,8%	2	0,6%	7	2,1%	4	1,2%
Utilisation Internet	203	61,0%	18	5,4%	30	9,0%	22	6,6%	35	10,5%	25	7,5%
Utilisation Télésanté	280	84,1%	39	11,7%	4	1,2%	5	1,5%	4	1,2%	1	0,3%

Les figures 1, 2, 3 et 4 ci-après présentent la répartition par qualification des professionnels de santé n'ayant jamais reçu de formation en initiation en informatique, à la télé formation, à l'utilisation d'Internet et à la télésanté.

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3.6.1. Formation utilisation Internet

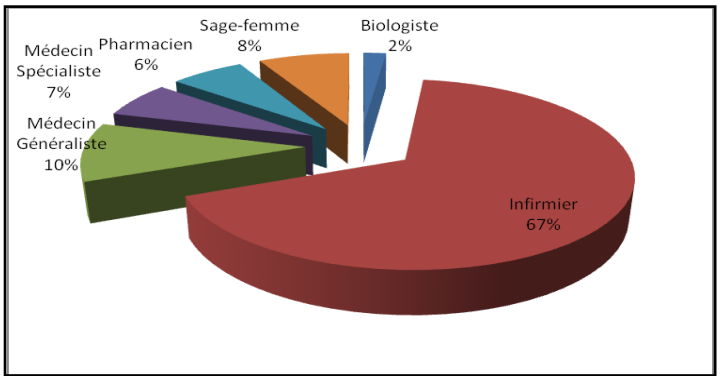

Fig.1. : Enquêtés par qualification n'ayant jamais été formés à l'utilisation d'Internet

3.6.2. Formation Initiation en Informatique

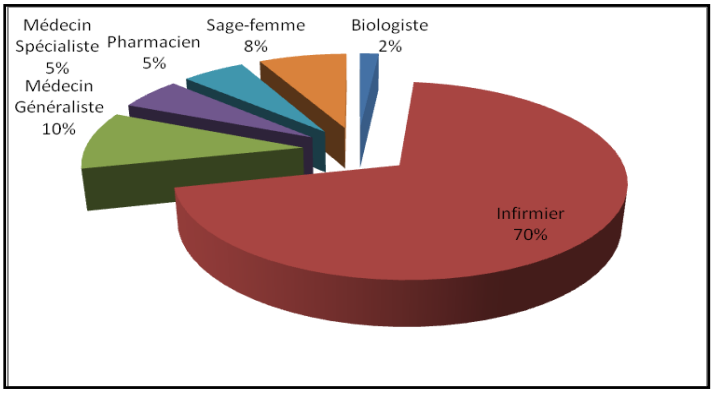

Fig.2. : Enquêtés par qualification n'ayant jamais été formés en initiation en Informatique

3.6.2. Formation en télé formation

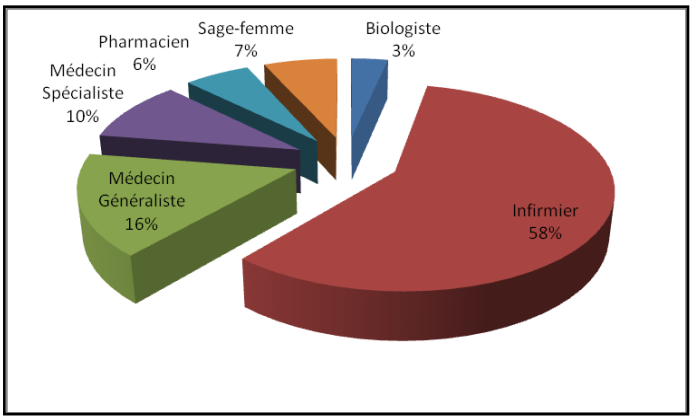

Fig.3. : Enquêtés par qualification n'ayant jamais été formés en télé formation

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3.6.3. Formation en télésanté

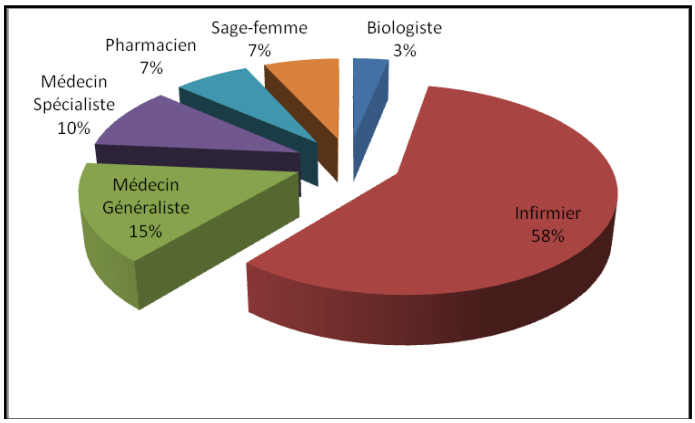

Fig.4. : Enquêtés par qualification n'ayant jamais été formés en télé formation

3.7 Utilisation d'Internet, la e-Santé, la m-Santé, la télémédecine et l'ordinateur dans le cadre de la pratique professionnelle

Les professionnels de santé ont répondu dans leur grande majorité n'avoir jamais utilisé de le cadre de leurs pratiques professionnelles la télémédecine (78,7%), la m-Santé(78,1%), la e-Santé (77,5%), l'Internet (61,0%) et l'ordinateur (59,5%) (Tableau 9).

Tableau 9: Utilisation Internet, e-Santé, m-Santé, télémédecine et ordinateur

Utilisation	Jamais		NSP		Parfois		Rarement		Souvent		Toujours	
	N	%	N	%	N	%	N	%	N	%	N	%
e-Santé	258	77,5%	55	16,5%	5	1,5%	4	1,2%	8	2,4%	3	0,9%
Internet	203	61,0%	16	4,8%	33	9,9%	16	4,8%	39	11,7%	26	7,8%
m-Santé	260	78,1%	57	17,1%	5	1,5%	4	1,2%	3	0,9%	4	1,2%
Ordinateur	198	59,5%	40	12,0%	23	6,9%	6	1,8%	37	11,1%	29	8,7%
Télémédecine	262	78,7%	51	15,3%	6	1,8%	4	1,2%	6	1,8%	4	1,2%

Les figures 5, 6, 7, 8 et 9 ci-après présentent la répartition par qualification des professionnels de santé qui n'ont jamais utilisé la e-Santé, l'Internet, la m-Santé, l'ordinateur et la télémédecine dans la pratique professionnelle.

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3.7.1 Utilisation de la e-Santé

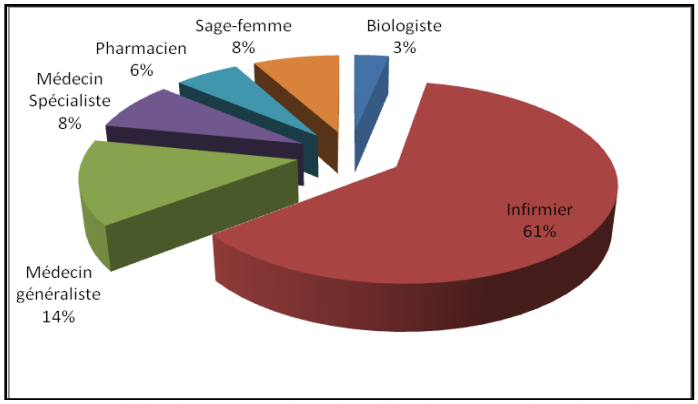

Fig.5. Participants par qualification n'ayant jamais utilisé la e-Santé dans la pratique professionnelle

3.7.2 Utilisation d'Internet

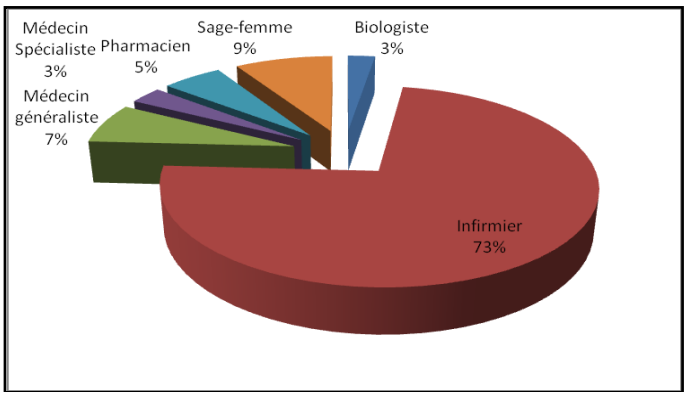

Fig.6. : Participants par qualification n'ayant jamais utilisé Internet dans la pratique professionnelle

3.7.3 Utilisation de la m-Santé

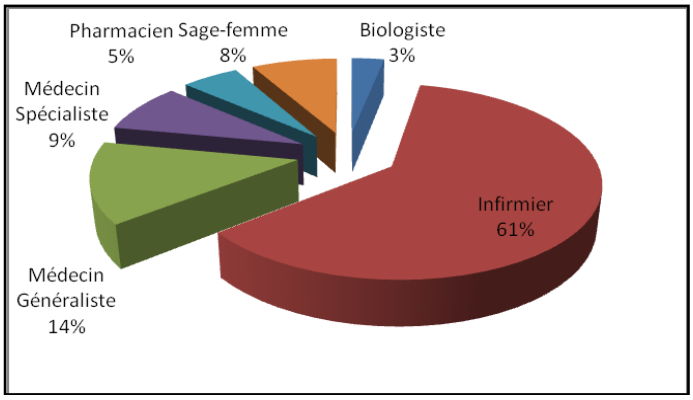

Fig.7. : Participants par qualification n'ayant jamais utilisé la m-Santé dans la pratique professionnelle

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3.7.4 Utilisation de l'ordinateur

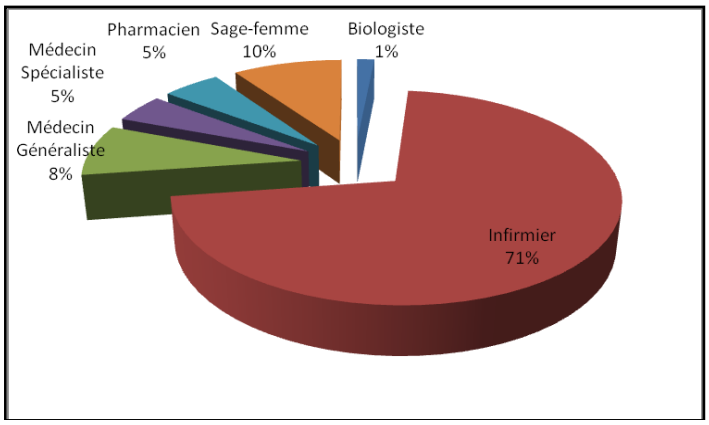

Fig.8. : Participants par qualification n'ayant jamais utilisé l'ordinateur dans la pratique professionnelle

3.7.5 Utilisation de la télémédecine

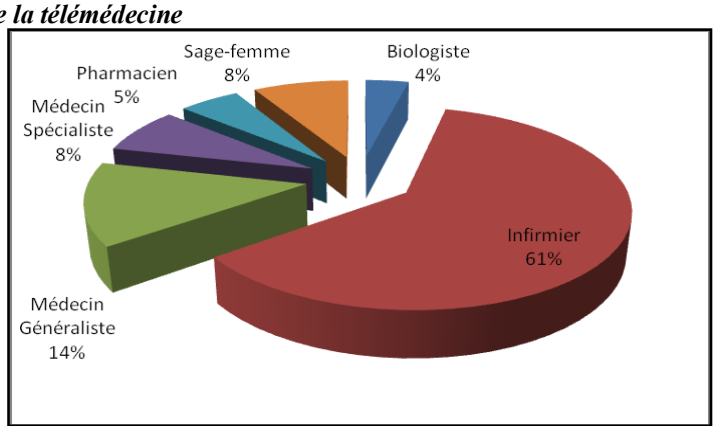

Fig.9. : Participants par qualification n'ayant jamais utilisé la télémédecine dans la pratique professionnelle

4 Discussion

Dans cette étude, nous voulions explorer la perception de l'utilisation des TIC par les professionnels de santé des formations sanitaires de 10 régions sanitaires dans le cadre du projet de mise en place d'un système d'information de santé numérisé au Gabon. Cette étude comporte des limites. Etant données que certains questionnaires ont été renseignés sans grandes explications sur les questions liées au domaine nouveau qu'est la e-Santé. D'autre part, nous n'avons pas exploré les dimensions sociale et organisationnelle de l'implantation des TIC dans les formations sanitaires, ce qui aurait dépassé le cadre de notre étude. Ces aspects devront faire l'objet d'une étude approfondie avant l'implémentation du projet e-Santé Gabon. La perception de l'usage des TIC par les professionnels de santé dans la pratique médicale ainsi que leur niveau de formation en informatique de base sont résumés ci-après.

4.1 Perception de l'utilité du Dossier Electronique Patient(DEP)

Un dossier médical électronique (DME) est un dossier médical informatique tenu par les cliniciens pour chacun de leurs patients. Il contient des renseignements détaillés, tels que les données démographiques, les antécédents médicaux et pharmacologiques, ainsi que l'information diagnostique comme les résultats de laboratoire et d'imagerie [2]. Les professionnels de santé ont majoritairement une très bonne perception de l'utilité de ce dossier dans le cadre de leurs la pratiques médicales. Cette perception est confortée par le résultat d'une étude menée par Boyer et al.[3] où l'opinion générale sur le dossier patient informatisé est

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restée favorable pour plus de 70% des professionnels de santé. Cependant, nous constatons, toujours avec Boyer et al.[3] que « Malgré l'intérêt porté par les professionnels de santé au dossier patient informatisé(DPI), des limites à son utilisation quotidienne persistent». Certains professionnels de santé trouvent l'utilisation du dossier électronique patient(DEP) dans la pratique médicale « Inutile » ou « Peu Utile ». Cela pourrait être lié chez ces professionnels de santé comme l'indiquent [3] à leurs discours à la « perte de temps dans le remplissage du dossier patient informatisé » ou encore à leur prédisposition à la technologie. En effet, ces professionnels de santé peuvent remarquer l'utilité du dossier électronique patient, mais peuvent l'éviter s'ils ne sentent pas à l'aise ou prêt[4] à l'utiliser.

4.2 Perception de l'utilité de la télé consultation, la télé échographie et la télé cardiologie

La télémédecine est une activité professionnelle qui met en œuvre des moyens de télécommunication numérique permettant à des médecins et d'autres membres du corps médical de réaliser à distance des actes médicaux pour des malades [5]. Les actes (télé échographie et télé cardiologie) liés de cette nouvelle forme de pratique médicale sont majoritairement très bien perçus par une majorité des professionnels de santé. Tandis qu'une majorité relative perçoit très bien la télé consultation. La majorité des professionnels de santé ont trouvé à la télémédecine comme le dit Durupt [6] «un atout pour pouvoir faire gagner du temps au patient, notamment dans l'accès plus rapide à un spécialiste ». Cette perception est aussi celles d'un grand nombre de médecins généralistes dans un étude réalisée Diallo[7] où ils reconnaissent que la télémédecine est outil utile dans la pratique de la médecine générale. Ils ajoutent que cette pratique de la médecine pourrait permettre un gain de temps sur les plans financier, temps et confort. Cependant, certains d'entre eux restent septiques à l'utilisation de cette nouvelle pratique médicale comme les médecins de l'étude menée par Durupt et al.[8] qui ont également exprimé leurs réticences vis-à-vis de la télémédecine. Selon Durupt [6], les médecins disent que la télémédecine représente une menace à la préservation du contact physique avec le patient et génèrent une perte d'information essentielle venant de la rencontre face-à-face du patient avec le médecin. Il ajoute [6] que le médecin traitant souhaite clairement conserver son rôle de pivot dans le dispositif de télémédecine. Allant dans le même sens, certains médecins généralistes de l'étude réalisée par Diallo [7] ont déclaré que " la télémédecine pourrait se développer au point que ça viendrait supprimer des postes dans certains hôpitaux locaux car les avis spécialisés seraient pris directement à travers la télémédecine auprès de grands centres hospitaliers". Certains de ces médecins déclarent que "la meilleure chance, pour un patient, c'est surtout quand même la relation de confiance et de face à face qu'il peut avoir avec son médecin".

4.3 Formation à l'utilisation d'Internet, l'initiation à l'informatique, l'utilisation de la télésanté et la téléformation

Les professionnels de santé ont répondu dans leur grande majorité n'avoir jamais reçu de formation sur l'utilisation d'Internet, l'initiation à l'informatique, l'utilisation de la télésanté et la télé formation.

4.4 Utilisation d'Internet, la e-Santé, la m-Santé, la télémédecine et l'ordinateur dans le cadre de la pratique professionnelle

L'usage se définit comme un comportement d'employer la technologie pour accomplir certaines tâches[4]. Les professionnels de santé ont répondu n'avoir jamais fait usage d'Internet, la eSanté, la télémédecine et l'ordinateur dans le cadre de la pratique médicale. D'autres ont même dit que cela ne s'appliquait pas dans le cadre de leurs pratiques médicales. Ces réponses soulèvent le problème de la disposition à la technologie c'est-à-dire la tendance que les gens ont à utiliser les nouvelles technologies pour accomplir leurs missions comme l'indique Bousnina [4]. Elle ajoute que la prédisposition à la technologie comprend quatre dimensions qui sont l'innovation, l'optimisme, l'inconfort et l'insécurité. Elle pense que l'optimisme et l'innovation sont des stimulants de la prédisposition à la technologie qui encouragent le consommateur à utiliser la technologie et à en avoir un avis positif tandis que l'inconfort et l'insécurité sont des inhibiteurs. Ils rendent le consommateur non apte à utiliser la technologie. Les professionnels de santé semblent se situer dans la zone d'inconfort et d'insécurité qui les poussent à ne jamais faire usage des TIC dans la pratique professionnelle. En plus, le manque de formation ainsi que l'attachement des professionnels de santé aux outils traditionnels (ex : registre et dossier patient papier) peuvent aussi être un frein à leur utilisation.

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5 Conclusion

La problématique soulevée par cette étude était la perception que les professionnels de santé avaient de l'usage des TIC dans le cadre du projet de numérisation du système d'information de santé du Gabon. L'enquête établie a permis d'apporter les éléments de réponse. Ainsi, les professionnels de santé ont une perception moyenne de l'utilité du dossier électronique patient et de la pratique de la télémédecine (télé consultation, télé échographie et télé cardiologie). Cependant, ils ont un niveau de formation très insuffisant en informatique de base et n'utilisent presque jamais Internet, la e-Santé, la m-Santé, la télémédecine et l'ordinateur dans le cadre de la pratique professionnelle. Les perceptions négatives de l'usage de TIC dans la pratique professionnelle par certains professionnels de santé ainsi leur niveau de formation nécessiteront l'élaboration et la mise en œuvre d'une stratégie rigoureuse pour les accompagner au changement. Car, les luttes et oppositions de ces acteurs clés sont monnaie courante, et montrent toute la complexité de la gestion du changement organisationnel nécessité par l'informatique[9].

Remerciements
Nous tenons à remercier tous les professionnels de santé qui ont participé à cette étude. Nos remerciements vont également à l'endroit des responsables du projet « renforcement du système national d'information sanitaire » du Gabon, qui ont bien voulu faciliter sa réalisation et à la Banque Mondiale pour l'avoir financé.

Conflits d'intérêt

Les auteurs déclarent n'avoir aucun conflit d'intérêt.

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Annexes

Extrait du questionnaire enquête perception sur la e-Santé

MEDECINE INTERNE

PREMIERE VICE-PRIMATURE

MINISTERE DE LA SANTE, DE LA PREVOYANCE SOCIALE ET DE LA SOLIDARITE NATIONALE

SECRETARIAT GENERAL

PROJET SYSTEME NATIONAL D'INFORMATION SANITAIRE

ONE

CM Thinvoul

No du questionnaire

Projet eGabon, Composante SNIS : Renforcement du Système National d'Information Sanitaire (SNIS) du Gabon

Perception sur la eSanté

DÉFINITION DES CONCEPTS UTILISÉS :

Système d'Information Sanitaire : Un système d'Information Sanitaire (SIS) peut être défini comme un ensemble constitué d'acteurs, de ressources, d'outils et de méthodes qui interagissent à différentes étapes du processus de production de l'information sanitaire à savoir : la collecte des données, l'agrégation, le stockage, le partage et l'analyse des données.

e-Santé / m-santé : Selon l'Organisation Mondiale de la Santé (OMS), la e-santé se définit comme : " les services du numérique au service du bien-être de la personne". D'une façon générale il s'agit de l'utilisation des outils de production, de transmission, de gestion et de partage d'informations numérisées autant pour les pratiques médicales que médico-sociales. Elle inclut la télémédecine. Lorsque ces services sont accessibles via un appareil mobile ou une tablette on parle de ***m-santé***.

OBJECTIF DU PROJET :

Ce projet vise à renforcer le Système d'Information Sanitaire (SNIS) du Gabon dans sa totalité en utilisant les Technologies de l'Information et de la Communication (TIC) et les outils de la e-santé et sur la base des besoins de l'ensemble des acteurs du système de santé, en particulier les structures, les utilisateurs et les consommateurs des services de santé

BUT DU QUESTIONNAIRE :

Recueillir votre opinion et les données sur les structures dans lesquelles vous exercez dans le but de faire un état des lieux le plus complet possible pour la mise en place du SNIS renforcé.

DÉMARCHE À SUIVRE :

1. Lire et **signer** le formulaire de consentement au verso.
2. Pour chacune des questions contenues dans le questionnaire, cochez la réponse correspondant à ce que vous pensez.
3. Se référer aux définitions.

Veuillez remettre le questionnaire et le formulaire de consentement à la personne responsable de l'enquête.

Ce projet est financé par le Gouvernement du Gabon et la Banque Mondiale,

1

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FORMULAIRE DE CONSENTEMENT

NATURE DE LA PARTICIPATION :

- La participation à cette cartographie consiste à répondre à un questionnaire d'une durée approximative de 30 minutes.
- Il est bien entendu que votre participation est tout à fait libre. Vous pourrez à n'importe quel moment mettre un terme à votre participation sans avoir à vous justifier ni à subir de préjudice quelconque.

CONFIDENTIALITÉ ET ANONYMAT :

- Les noms des participants ne paraîtront sur aucun rapport.
- Seules les structures peuvent être citées dans le but strict de la mise en œuvre du projet SNIS.
- Les questionnaires seront identifiés à l'aide d'un code de participation. Ce code de participation pourra être utilisé afin de faire correspondre vos réponses, advenant le cas où vous remplissiez de nouveau un questionnaire dans le cadre de ce projet de recherche.
- Seuls les membres de l'équipe SNIS auront accès à la liste des noms et des codes.
- Au terme de l'étude, les données brutes seront détruites. Seuls les fichiers informatisés, contenant des informations qui ne peuvent être identifiées aux participants, seront conservées aux fins d'analyses ultérieures.
- En aucun cas, les résultats individuels et les opinions des participants ne seront communiqués à qui que ce soit.

Je soussigné(e) MFOULE BERTRAND consens librement à participer à l'enquête du projet SNIS intitulé « Renforcement du Système National d'Information Sanitaire ».

Je soussigné(e) MFOULE BERTRAND consens librement à être contacté(e) de nouveau lors d'une étape ultérieure du projet « Renforcement du Système National d'Information Sanitaire ».

Signature du (de la) participant(e)

11/08/2016
Date

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N° Equipe : _____/

Nom de l'Enquêteur _____/

Nom de l'Enquêté MFOULE BERTRAND /

Date : 11/08/2016

Nom de l'agent de saisie : _____/

Date : ___/____/ 2016

INFORMATIONS SOCIO-DEMOGRAPHIQUES

1. Quel est votre âge ? 40 ans Q1

2. Quel est votre genre ? **Féminin** ☐1 ; **Masculin** ☒2 Q2

3. Êtes-vous ? **Médecin généraliste** ☐1; **Médecin spécialiste** ☐2 **Spécialité** _____ Q3a

Sage-femme ☐3 **Infirmier/ère** ☒4 **Assistant médical** ☐5 Q3b

Autres, précisez SVP : _____ Q3c

4. Dans quelle institution de formation avez-vous obtenu votre diplôme de professionnel de la santé ?

_____ Q4

5. Depuis combien d'années pratiquez-vous dans cette structure ? 3 ans Q5

SNIS, e-SANTE/m-SANTE, EQUIPEMENTS ET APPLICATIONS INFORMATIQUES

6. La collecte des informations sanitaires dans votre structure se fait présentement sur : Q6

☒ Support papier (registres, feuilles de pointage) Q6a

☐ Support électronique (ordinateur) Q6b

☐ Support mobile (téléphone mobile, tablettes) Q6c

7. La remontée des informations sanitaires dans votre structure se fait présentement par : Q7

☐ Voie électronique (mail, clés USB, Téléphone, autres) Q7a

☐ Transport en commun (format papier) Q7b

☒ Déplacement d'un agent pour acheminer à l'échelon supérieur Q7c

8. Dans le cadre de votre pratique professionnelle, utilisez-vous : Q8

	Jamais	Rarement	Parfois	Souvent	Toujours
Q8a Internet	☒1	☐2	☐3	☐4	☐5
Q8a e-santé	☒1	☐2	☐3	☐4	☐5
Q8c m-santé	☒1	☐2	☐3	☐4	☐5
Q8d Télémédecine (formation et ou consultation à distance)	☒1	☐2	☐3	☐4	☐5
Q8e Ordinateur sans connexion d'internet	☒1	☐2	☐3	☐4	☐5

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9. Avez-vous déjà reçu une formation sur Q9

	Jamais	Rarement	Parfois	Souvent	Très souvent
Q9a L'utilisation d'Internet	☒1	☐2	☐3	☐4	☐5
Q9b L'initiation à l'Informatique	☒1	☐2	☐3	☐4	☐5
Q9c L'utilisation de la télésanté	☒1	☐2	☐3	☐4	☐5
Q9e L'utilisation de la téléformation	☒1	☐2	☐3	☐4	☐5

10. Selon vous, l'utilisation des Technologies de l'Information et de la Communication (TIC) (dossier électronique, téléconsultation, formation continue à distance etc.) est :
Q10

	Pas du tout	Un peu d'accord	Assez d'accord	En accord	Complètement d'accord	Ne s'applique pas (NAP)
Q10a Pertinente	☐1	☒2	☐3	☐4	☐5	☐6
Q10b Un moyen efficace d'obtenir de l'information	☐1	☐2	☒3	☐4	☐5	☐6
Q10c Un moyen d'accéder aux connaissances dont vous avez besoin dans votre travail	☐1	☐2	☒3	☐4	☐5	☐6
Q10d Adaptée à votre travail	☐1	☐2	☒3	☐4	☐5	☐6
Q10e Soutenue par des moyens techniques adéquats	☐1	☐2	☒3	☐4	☐5	☐6

11. A quel degré chacun des éléments suivants, associés à l'utilisation de la e-santé /m-santé ou d'un SNIS informatisé vous semble important pour votre pratique Q11

FACTEURS	Pas du tout important	Un peu important	Plus ou moins important	Assez important	Très important
Q11a L'accessibilité directe aux données du patient	☐1	☐2	☐3	☐4	☒5
Q11b L'amélioration de la prise en charge du patient	☐1	☐2	☐3	☐4	☒5
Q11c La possibilité d'avoir une seconde opinion d'un expert à distance	☐1	☐2	☐3	☒4	☐5
Q11d La rapidité d'accès aux ressources spécialisées	☐1	☐2	☐3	☒4	☐5
Q11e L'amélioration de la qualité de la pratique	☐1	☐2	☐3	☐4	☒5
Q11f La meilleure sécurité pour les patients	☐1	☐2	☐3	☐4	☒5
Q11g La continuité des services	☐1	☐2	☐3	☐4	☒5
Q11h L'accessibilité à la formation médicale continue à distance	☐1	☐2	☐3	☒4	☐5
Q11i La facilité de la recherche clinique grâce aux bases de données	☐1	☐2	☐3	☐4	☒5
Q11j L'archivage numérique des informations médicales	☐1	☐2	☐3	☐4	☒5
Q11k La collecte et la remontée des informations sanitaires	☐1	☐2	☐3	☐4	☒5
Q11l La gestion des épidémies / Alerte épidémiologique	☐1	☐2	☐3	☐4	☒5
Q11m La possibilité de promouvoir le centre de santé	☐1	☐2	☐3	☒4	☐5
Q11n La possibilité de partager ses expériences du terrain avec les autres	☐1	☐2	☐3	☐4	☒5

12. Êtes-vous prêts à utiliser les Outils TIC suivants dans le cadre de la mise en place du SNIS ? Q12

	Pas du tout	Besoin de formation initiale	Besoin de mise à jour	Assez prêt	Complètement prêt
Q12a Ordinateurs (Bureau et Portables)	☐1	☒2	☐3	☐4	☐5
Q12b Tablettes	☐1	☒2	☐3	☐4	☐5
Q12c Téléphone portable	☐1	☐2	☐3	☐4	☐5
Q12d Autre (précisez)	☐1	☐2	☐3	☐4	☐5

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13. Choisissez votre degré d'intérêt ou d'aisance avec ces outils *Q13*

	Pas du tout d'intérêt	Peu d'intérêt	Intérêt moyen	Assez d'intérêt	Beaucoup d'intérêt
Q13a Ordinateurs (Bureau et Portables)	☐1	☐2	☐3	☐4	☒5
Q13b Tablettes	☐1	☐2	☐3	☐4	☒5
Q13c Téléphone portable	☐1	☐2	☐3	☐4	☒5
Q13d Autre (précisez)	☐1	☐2	☐3	☐4	☐5

14. Existe-t-il d'autres éléments associés à l'utilisation du SNIS et la e-santé /m-santé qui auraient pu être pratiques ?

Q14

_____

_____

_____

15. Quel (s) type (s) d'applications serait utile pour votre structure *Q15*

APPLICATIONS	Inutile	Peu utile	Plus ou moins utile	Assez utile	Très utile	NAP
Q15a Dossier électronique du patient	☐1	☐2	☐3	☐4	☐5	☐6
Q15b Téléconsultation / Télé-expertise	☐1	☐2	☐3	☐4	☐5	☐6
Q15c Télé-échographie	☐1	☐2	☐3	☐4	☐5	☐6
Q15d Télécardiologie	☐1	☐2	☐3	☐4	☐5	☐6
Q15e Formation médicale continue à distance	☐1	☐2	☐3	☐4	☐5	☐6
Q15f Système d'aide à la décision médicale (pendant la consultation)	☐1	☐2	☐3	☒4	☐5	☐6
Q15g Système d'aide à la formation médicale	☐1	☐2	☐3	☐4	☐5	☐6

16. Autres applications utiles pour vous : *Q16*

_____

_____

_____

17. Selon vous, quelles seraient les 3 conditions les plus importantes qui favoriseraient la mise en place du SNIS et la e-santé/m-santé dans votre structure? *Q17*

1)_____

2)_____

3)_____

18. Selon vous, quelles seraient les 3 conditions les plus importantes qui favoriseraient l'intégration du SNIS et de la e-santé/m-santé au fonctionnement habituel de votre centre/ structure/pratique ? *Q18*

1)_____

2)_____

3)_____

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Autorisation administrative

PREMIERE VICE-PRIMATURE

MINISTERE DE LA SANTE
DE LA PREVOYANCE SOCIALE
ET DE LA SOLIDARITE NATIONALE

SECRETARIAT GENERAL

N° 001512 PVP /MSPSSN/**SG**

REPUBLIQUE GABONAISE
Union- Travail- Justice

ORDRE DE MISSION

Le Secrétaire Général du Ministère de la Santé de la Prévoyance Sociale et de la Solidarité Nationale prescrit aux équipes ci-dessous citées :

Région sanitaire	Composition des équipes
Libreville-Owendo	• MOUSSODOU Christian (fonctionnel) • REZILA OMPOUMA Nina, Chef de mission (technique) • 1 enquêteur de la DRS • 1 chauffeur
	• OMVA MENIE Jean Jacques (fonctionnel) • MEZUI ABESSOLO Rufin, Chef de mission (technique) • 1 enquêteur de la DRS • 1 chauffeur
Ouest (Estuaire)	• MOULOUNGUI MATATOU Wolfgang (fonctionnel) • NSA OYONO Béranger Constantin, Chef de mission (technique) • 1 enquêteur de la DRS • 1 chauffeur
Sud-Est (Haut-Ogooué)	• MOUKOUMBI LIPENGUET Gaétan (fonctionnel) • OMBOUMA Fabien Junior, Chef de mission (technique) • 1 enquêteur de la DRS • 1 chauffeur
Centre (Moyen-Ogooué)	• ASSOUMOU NKA Emmanuel, Chef de mission (fonctionnel) • NDJELI Olive Léa (technique) • 1 enquêteur de la DRS • 1 chauffeur
Centre-Sud (Ngounié)	• TSOKATI Jean Donatien, Chef de mission (fonctionnel) • NZIENGUI BADINGA MOUANDA (technique) • 1 enquêteur de la DRS • 1 chauffeur
Sud (Nyanga)	• KOUMAMBA Aimé Patrice, Chef de mission

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	(fonctionnel) • TSALAMBONGHO Joslyn (technique) • 1 enquêteur de la DRS • 1 chauffeur
Est (Ogooué-Ivindo)	• EFAME Yvon Patrice, Chef de mission (fonctionnel) • OGOULA Aline (technique) • 1 enquêteur de la DRS • 1 chauffeur
Centre-Est (Ogooué-Lolo)	• YOLLA WADA Anicet, Chef de mission (fonctionnel) • DIBA Yves Faustin (technique) • 1 enquêteur de la DRS • 1 chauffeur
Maritime (Ogooué-Maritime)	• TOUNENI Fabrice (fonctionnel) • NGOUSSOU Georges, Chef de mission (technique) • 1 enquêteur de la DRS • 1 chauffeur
Nord (Woleu-Ntem)	• ONDZIGUE MBENGA Raymond, Chef de mission (fonctionnel) • ASSOUA Joël (technique) • 1 enquêteur de la DRS • 1 chauffeur

De se rendre dans : **les différentes régions sanitaires du pays**

Pour y accomplir la mission définie comme suit : **« cartographie, état des lieux des équipements et usages des Technologies de l'Information et de la Communication (TIC) dans l'ensemble des établissements sanitaires publiques, parapubliques et privés»**

Moyen de transport : **Terrestre et aérien**
Date de départ : **25 juillet 2016**
Date de retour : **20 août 2016**

Les frais de transport et de mission sont à la charge de la Banque Mondiale.

Les autorités locales concernées, sont priées d'accorder aide et protection, en cas de besoin, à ces agents.

Fait à Libreville, le 20 JUIL. 2016

Le Secrétaire Général

Léonard ASSONGO

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Postfach 652166
D-22372 Hamburg, Germany
www.koegni-ehealth.org
E-mail: info@koegni-ehealth.org

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