

## **Towards the digitalization of the health sector: Case of the SIHATIC project in the context of the covid 19 pandemic**

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### **Abstract:**

The objective of this work is to take stock of the first steps of the digitization of the health sector, in particular, on the "SIHATIC" project. Thus, to understand the contribution of the digital and ICT in improving the management of health sector institutions. And to know if this digitalization can provide solutions to the problems encountered and contribute to the establishment of a more efficient and interactive medicine or it represents only a fad with few positive contributions on medical practice in health institutions? As a result of this work, we can say that Algeria has made the necessary efforts for access to these technologies, and that their benefits in this health sector are no longer to be proven, but the results are not satisfactory enough for multiple reasons.

**Keywords:** Health, Digital, ICT, Digitalization, Integration.

**Jel Classification Codes :** H75, I18.

### **Introduction:**

Digital technology has transformed several fields by changing their work organization and bringing them technological advances. This has been possible by implementing revolutionary digital technologies that save time in space and even in human and material resources. But also, it brings new knowledge while facilitating access to it at any time, reducing costs and enabling better data management with a huge storage capacity that continues to grow. The digital revolution is everywhere

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in the world, all countries are affected; developed or developing countries. All of them are investing in digital technologies, in order to stay in the digital race and enjoy the benefits of the latter, but with different levels.

However, some areas have been at an advantage over others such as education, higher education, scientific research and health. Moreover, this has been planned since 2005 at the World Summit on the Information Society (WSIS)<sup>2</sup> for member countries where Algeria was a stakeholder. Algeria is committed with African and Euro-Mediterranean countries to integrate ICTs in several areas. Therefore, after several years of investments, some results have been visible. In this sense, based on the ITU 2016 report, the Secretary-General of the International Telecommunication Union (ITU)<sup>3</sup>, Mr. Houlin Zhao, said that: Algeria was ranked in 2016 the third "most dynamic" country in the world by the International Telecommunication Union, the highest international telecommunication body and was positioned among those that have carried out « substantial progress" in the development of information and communication technologies.

In this dynamic, the health sector has been able to benefit from several investments, in particular in terms of ICT and digital technologies. Particular attention has been paid to it, in fact, according to the 2018 report of the World Health Organization (WHO) (STATEOF HEALTH in the WHO African Region): "in terms of spending Algeria records the highest per capita health-related expenditure in Africa"<sup>4</sup>. Indeed, according to 2019 statistics from the Ministry of Health, Population and Hospital Reform, our country has 588 hospitals including 15 university hospitals (CHU) with a total capacity of 7653 beds.<sup>5</sup> Concretely, thanks to these investments, the introduction of digital technologies in the health sector has seen a change and modify the experience of the professional and that of the patient for a more adapted and less expensive experience for the latter. But they have also made it possible to simplify and help professionals in the treatment and follow-up of their patients.

Certainly, digital technology contributes to the reduction of healthcare expenses by reducing the operating costs of hospitals. And this, by reducing operational costs, in particular, by digitizing and automating many processes that are carried out manually<sup>6,7,8</sup>. Several examples of the use of digital technologies that have brought a reduction in costs for hospitals and better comfort for patients

<sup>2</sup> **UIT. (2004).** Plan d'action SMSI. UNESCO. 1

<sup>3</sup> **UIT. (2016).** The 2016 edition of the Measuring the Information Society Report .

<sup>4</sup> **Organisation mondiale de la Santé, B. r. (2018).** État de la santé dans la region africaine de l'OMS : analyse de la situation sanitaire, des services et des systèmes de santé dans le contexte des objectifs de développement durable. y

<sup>5</sup> **Website of the Ministry of Health,** Population and Hospital Reform: <https://www.sante.gov.dz>

<sup>6</sup> **Pai, D. R., Rajan, B., & Chakraborty, S. (2021).** Do EHR and HIE deliver on their promise? Analysis of Pennsylvania acute care hospitals. (j. p.-p. In press, Éd.) International Journal of Production Economics.

<sup>7</sup> **Charle-Maach, C., Moreau-Gaudry, A., Sainati, D., Camus, D., Adenot, I., Barthelemy, C.-E., . . . Vercamer, V. (2021).** What value do digital health solutions bring, what are the funding mechanisms and evaluations? (ELSEVIER, Éd.) Therapies, Journal Pre-proof.

<sup>8</sup> **Behera, B. K., Prasad, R., & Shyambhavee. (2022).** Chapter 4 - Health-care information technology and rural community (Vol. 1). Academic Press.

can be mentioned, namely: the autonomous online appointment booking by patients, the digitization of the management of doctors' working hours, the simplification and management of hospital staff guards, storage, processing and archiving of patient data (consultation history, X-rays, MRI, etc.). In this regard, the Minister of Health is committed to the digital transformation of the health sector, through the implementation of digital technologies in the exercise of health. This decision resulted in the initiation of a project called "SIHATIC» (hospital information system adapted to information and communication technologies). Mr. Abdelkader Hadj Miloud, Director of IT Systems at the Ministry of Population Health and Hospital Reform: *"SIHATIC is a project whose main objective is to provide the structures in charge of health with an automated, integrated and global information and communication system to create, update, share and exploit health system information."*<sup>9</sup> Indeed, this project is based on three essential actors namely: the patient, the practitioner and the decision-maker and which aims to improve patient care, especially through their corporation of telemedicine solutions. As well as the generalization of the use of information systems shared between health structures that have expertise and know-how in the various clinical fields and those that do not have them.

In the light of this development, this study tries to make a first assessment of the first steps of the digitization of the health sector, in particular, on the "SIHATIC" project and its use by the various health actors. It is therefore appropriate to ask the following research question: *What is the contribution of digital technology in improving the management of health sector institutions in Algeria?*

### 1-Theoretical framework:

Many authors have been interested in the digitization of the health sector (LANGELIER, 2004)<sup>10</sup>, (Bonnetier, Brotcorne, & Vendramin, 2019)<sup>11</sup>, (Loick, Anne, Audrain, & William, 2017)<sup>12</sup> (Kuhn & Heinz, 2018)<sup>13</sup> (Rantala & Karjaluo, 2016)<sup>14</sup>, (Pirracchio, 2018)<sup>15</sup>, indeed, the major challenges facing the

<sup>9</sup> **Abdelkader, H. M. (2016).** Système d'Information Hospitalier Adapté aux Technologies de l'Information et de la Communication. -SIHATIC. *Découverte et pratiques de eSanté Un défi pour les paramédicaux*.INFPF.

<sup>10</sup> **LANGELIER, R. E. (2004).** Numérisation des dossiers de santé et protection des renseignements personnels : Impératifs techniques, intérêts économiques, considérations politiques et émergence de nouvelles normes. *Lex Electronica*, 9 (3).

<sup>11</sup> **Bonnetier, C., Brotcorne, P., & Vendramin, P. (2019).** Les services d'intérêt général à l'épreuve de la numérisation : études de cas dans les secteurs de la mobilité, de la santé et de l'administration. *Politique scientifique fédérale* (Bruxelles).

<sup>12</sup> **Loick, M., Anne, F., Audrain, P., & William, M. (2017).** The Digitilization of Healthcare: New challenges and opportunities. *canada: Palgrave macmillan*.

<sup>13</sup> **Kuhn, A. K., & Heinz, M. I. (2018).** DIGITIZATION IN THE HEALTH SECTOR IN THE TRADE-OFF BETWEEN TECHNICAL AND LEGISLATIVE POSSIBILITIES AND LEGAL LIMITS ACCORDING TO GERMAN LAW. *Compliance Elliance Journal*, 4(2), 35-50.

<sup>14</sup> **Rantala, K., & Karjaluo, H. (2016).** Value co-creation in health care : insights into the transformation from value creation to value co-creation through digitization. *Proceedings of the 20th International Academic MindTrek. Academic MindTrek*.

health sector are pushing it to find rapid and innovative solutions and digitization is proving to be a source of solutions<sup>16</sup>. Indeed, the number of elderly people and / or suffering from chronic diseases continues to grow in the world, thus posing an important problem of care, especially in the context of the health crisis that we are experiencing. In the face of these challenges, great hopes are placed in digital and digital technologies, as well as in the new care organizations they can produce. These technologies should enable new forms of collaboration, between professionals on the one hand<sup>17</sup>, but also between professionals and patients on the other. Indeed, new forms of collaboration have emerged in the follow-up of patients through internet portals. Offering mobility and allowing individuals to receive, send and even process information related to their health. In concrete terms, digital technologies have disrupted old practices and working methods<sup>18</sup>. Undoubtedly, according to e-health has made it possible to introduce new relationships between health professionals, or even between professionals and patients, by improving the management of chronic diseases, by facilitating home hospitalization or by anticipating the return home after outpatient hospitalization could, in fact, promote the implementation of new methods of organizing care<sup>19, 20</sup>.

Doctors now exchange information with each other or with the patient, but without requiring him to go to health professional individually. We are witnessing the emergence of a new type of patient-centered organization that is emerging with the key to saving time for all, improving the information received by everyone and in fact greater security during care<sup>21</sup>. These advantages provided by digital technologies allow professionals to focus on much more important tasks and also allow for better coordination of professionals from different specialties in the care provided to patients during their journey.

The progress that ICT have made in the global health sector, especially in developed countries, is enormous. This has allowed a greater capacity to share information between all health actors, to make available the examination results of any patient in an electronic file, to define the trajectories of care. Thanks to these

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- <sup>15</sup> **Pirracchio, R. (2018).** Le soin 3/0 ou la e-santé : objets connectés, numérisation des soins, big data, intelligence artificielle. Dans S. -L. Congrès (Éd.), Conférence IDE.
- <sup>16</sup> **Hertling, S., Hertling, D., Loos, F., Martin, D., & Graul, I. (2021).** Digitization in gynecology and obstetrics in times of COVID-19: Results of a national survey. (ELSEVIER, Éd.) Internet Interventions, 26.
- <sup>17</sup> **Whitmore, C., Bird, M., Hugh McGillion, M., Carter, N., Chen, R., Pierazzo, J., & Carroll, S. (2020).** Impact of nurse scientist-led digital health interventions on management of chronic conditions. (ELSIVIER, Éd.) Nursing Outlook, 68(6), 745-762.
- <sup>18</sup> **DUMEZ, H., MINVIELLE, E., & MARRAUD, L. (2015).** États des lieux de l'innovation en santé numérique. i3 Working Papers Series.
- <sup>19</sup> **CLAYERFOUET, M. (2016).** Les technologies numériques au service de la santé. Conseil économique social environnemental pays de loire.
- <sup>20</sup> **Dubreuil, M. (2019).** E-santé : décryptage des pratiques et des enjeux. Observatoire régional de santé Île-de-France.
- <sup>21</sup> **Mougeot, F., Robelet, M., Rambaud, C., Occelli, P., Buchet-Poyau, K., Touzet, S., & Michel, P. (2018).** L'émergence du patient-acteur dans la sécurité des soins en France : une revue narrative de la littérature entre sciences sociales et santé publique. (Cairn, Éd.) Santé Publique.

technologies, the patient has the opportunity to access a large flow of health-related information<sup>22</sup>. The doctor for his part has the opportunity to better inform the patient and provide him with advice adapted to his case and in a very short time. In this respect, the digitalization of the healthcare sector has been developing rapidly in recent years, with a significant and positive impact, to the point where we are even talking about a digital revolution. An evolution made possible by the digitization of this sector, where people and objects are connected and interact with signals and information permanently and in real time. The proliferation of mobile applications and connected objects confirms the growing importance of these digital technologies that are changing the practices of healthcare professionals and potentially have effects on patients' perceptions and attitudes. In another vein, the increasing use of smartphones, tablets and cloud computing would consent to make consultations and transmit data (e.g. images, prescriptions, etc.) anywhere and alert more than ever questions about the availability, integrity, security and protection of medical information<sup>23, 24</sup>. This is all the more delicate as countries do not have the same requirements in terms of regulation and protection of data and information flows<sup>25</sup>.

Similarly, the relationship between doctors and patients, between professionals of different specialties, between patients themselves, between doctors and other caregivers, between doctors and institutions, is impacted, indeed, it has undergone changes induced by the use of digital technologies. Therefore, healthcare workers can only tame these digital tools because they are everywhere, so keeping themselves at a distance only delays the planned change and fueled by the ingenuity of digital solution designers and the arrival of 5G.

The gradual introduction of digital technologies is leading to changes in our society. These technologies aim to extend efficiency in healthcare treatments, improve quality of life, deploy commitment to digital data-driven medicine, empower patients and develop new relationships between patients and healthcare professionals. Concretely, connected health can be used to disseminate, share and connect health information through the two key players in health, namely: patients and healthcare professionals<sup>26, 27</sup>.

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- <sup>22</sup> **Mondal, T., Jayadeva, S. M., Pani, R., Subramanian, M., & Sumana, s. (2021).** E marketing strategy in health care using IoT and Machine Learning. (ELSEVIER, Éd.) E marketing strategy in health care using IoT and Machine Learning.
  - <sup>23</sup> **Sangeethalakshmi , K., Preethi , A., Preethi, U., Pavithra , S., & Shanmuga , P. (2021).** Patient health monitoring system using IoT. (ELSEVIER, Éd.) Materials Today: Proceedings.
  - <sup>24</sup> **Alami, H., Gagnon, M.-P., Fortin, J.-P., & Kouri, R. (2015).** La télémedecine au Québec : état de la situation des considérations légales, juridiques et déontologiques. European Research in Telemedicine, 4(2).
  - <sup>25</sup> **Gonthier Le GUEN, Y. (2020).** La protection des données personnelles en situation de crise sanitaire Exceptionnelle: L'hypothèse du traçage géographique des citoyens à fin de lute épidémique. Colloque virtuel: Droit et coronavirus; Le Droit Face aux circonstances sanitaires Exceptionnelles.
  - <sup>26</sup> **Colloc, J. (2017).** Santé et Big Data : l'Etat et les individus, impuissants face aux pouvoirs des réseaux. (O. é. journal, Éd.) Revue en ligne de géographie politique et de géopolitique . doi:<https://doi.org/10.4000/espacepolitique.3493>

Finally, the use of digital technologies, in particular, the use of connected objects promises a lot of advantages that can remove all obstacles to their use and reduce the limits of use among certain health actors. Indeed, digital tools can promote better coordination of the patient care pathway, by strengthening the dialogue between the different actors of care, thus making it possible to enrich the contributions of digital medicine to health.

The national health system in our country is facing multiple challenges nowadays, one of the main challenges is to respond to the sharp increase in noncommunicable diseases and the new needs of the population in terms of equipment and more qualified human resources which therefore require more and more substantial funding. For this reason, advances linked to the use of digital technologies in the field of health can contribute to the improvement of the situation. Indeed, advances in the digitalization of health should make it possible to meet the challenges of this sector and to meet an increasingly strong demand, due to the increase in the number of people with chronic diseases and the ageing of the population among others.

## **2- Methodology:**

In order to collect the necessary information, we make it possible to make a first assessment on the first steps of the digitization of the health sector, in particular, on the "SIHATIC" project and its use by the various health actors. We conducted a survey of health institutions involved in the SIHATIC project. This allowed us to obtain essential data to measure the impact of digital technology and to take stock of the first experiences of using patient data management software for health care staff and the digitization of these healthcare facilities. Indeed, we wanted to broaden our field of study on all the functionalities of the SIHATIC project, but forced to limit ourselves to the use of patient data management software for health personnel and on the digitization of these health facilities. Because after our field investigations we found that this is the operational part of the project at the time of our survey, being the first stage of the project. In this respect, the methodological approach adopted has followed the usual standards of methods of survey and analysis of results. Indeed, a questionnaire was sent to a sample of health professionals from some public and private health institutions using patient data management software. To this end, we have classified our population into several categories, namely: doctors, paramedical personnel, people who are part of the administration and other people who have a role in our health facilities. However, in view of the situation of the health crisis due to the spread of covid-19, the collection of data was carried out via the internet, remotely affecting health professionals in the wilaya of Oran. To this extent, 53 professionals; 24 men and 29 women, were able to answer this questionnaire in this time of crisis when everyone in the medical profession is on alert. The analysis of the questionnaires was carried out by the Excel software and the analysis of the results was carried out via the

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<sup>27</sup> **Benhamou, A.-C. (2017).** Avantages et risques du développement de la santé connectée et des universités numériques en santé Benefits and risks of the development of connected health and of digital universities for health sciences. Bulletin de l'Académie Nationale de Médecine, 201. doi:[https://doi.org/10.1016/S0001-4079\(19\)30517-5](https://doi.org/10.1016/S0001-4079(19)30517-5)



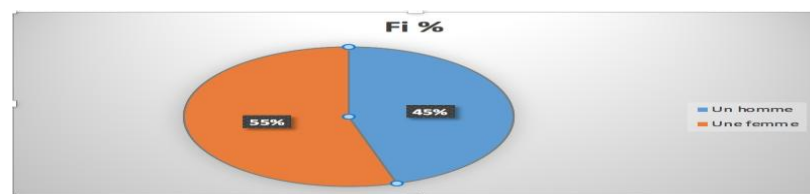
SPSS software we allow to carry out an analysis by flat sorting (uni-varied) and by cross-sorting (bi-varied).

### 3- Results:

#### 3.1. Participants:

Based on the survey results presented in Figure "1», we find that the representation of men and women in the sample is almost equitable. Among the 53 participants in the survey, we observed that 55% of the respondents were female which represents 29 people and the rest represented 24 men. In this sense, the majority of respondents (49.1%) belonged to the age group under 30 years which represents 26 people, 9.4% were between 30 and 39 years old, 24.5% were between 40 and 49 years old, 9.4% that is to say 5 people were between 50 and 59 years old and finally 7.5% of the participants were over 60 years old. Thus, 60.4% of the participants in our survey held the position of doctor, 20.8% were part of the administration, 5.7% were from the paramedical field and 13.2% had other positions.

**Figure N°01: Percentage distribution by sex of participants**



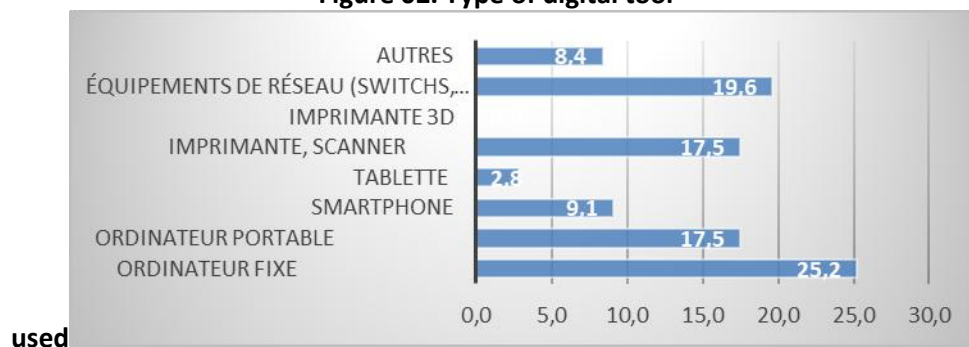
Source: Personal construction of the authors

In addition, the majority of respondents, i.e. 45.3% belong to university hospitals (EHU, CHU), 20.8% belong to private hospitals (clinic), 15.1% work in medical practices, 13.2% to public health hospitals (hospital-polyclinic) and 5.7% of respondents are part of medical analysis laboratories.

#### 3.2. Use of digital technology by healthcare professionals:

##### 3.2.1. Use and use of the digital tool used:

**Figure 02. Type of digital tool**



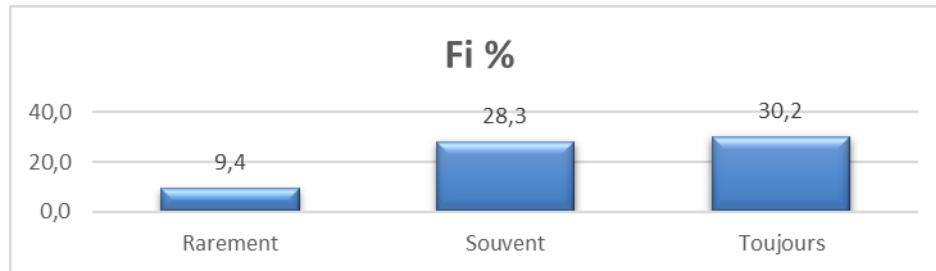
Source: Personal construction of the authors

According to the results of the survey, as shown in Figure "2". 67.9% of respondents said they used the digital tool. Thus, 25.2% of respondents used a desktop computer in their establishment, 17.5% used a laptop, 17.5% used their establishment's printer and scanner, 19.6% used network equipment (switches,

routers, wifi), 9.1% of respondents also used their smartphone, 2.8% used tablets and 8.4% used other equipment in all kinds.

### 3.2.2. Satisfaction with the diversity of the digital tool used and frequency of use:

**Figure 02: Representation of the frequency of use of the digital tool**



**Source:** Personal construction of the authors

The majority of respondents said they were satisfied with the diversity of computer equipment available to them (75%). As a result, 30.2% of respondents i.e. 16 people still use computer equipment at their institution level, 28.3% use it often, 9.4% of the 5 people rarely use it and 17 people did not give answers to this question.

### 3.2.3. Reasons for non-use of the digital tool:

In order to know the reason for the non-use of the digital tool, we asked a question in this sense to the 17 respondents who declared not to use the digital tool. Clearly, these non-users specified that the main reason is that these tools are unavailable at the establishment level to the tune of 61.1%, the second main reason is that these health professionals are not familiar with the computer tool (22.2%). Finally, the third main reason is that these respondents are reluctant to this type of digital solutions in their establishment and prefer the old methods. However, it is important to note that no health professional responded that they did not see the point of using these tools.

### 3.2.4. Use of digital tools during the health crisis in the Health Sector19:

In order to know whether the use of the digital tool has helped to overcome the obstacles caused by the Covid19 health crisis, we surveyed health professionals, to this end, 68.8% of respondents believe that digital tools have overcome some obstacles caused by the pandemic of the Covid19, 6.3% believe that these tools have not really served much purpose, while 25% have rather mixed opinions on the subject.

### 3.2.5. Cross between the judgment on the change of the working method following the use of digital tools and the affirmation that the tool brings added value to the establishment:

After analyzing most of the questions in the questionnaire by flat sorting, we want to further refine our results by performing a cross-sort analysis. We then selected a few questions deemed relevant to the verification of our assumptions. As these are qualitative variables, the appropriate statistical test is the Chi-two or Khi-square ( $\chi^2$ ) test, which consists of testing the statistical significance of a combination of two qualitative variables. Its purpose is to test the independence of two variables



studied in a cross-tabulation, through the test of the null hypothesis (H0) which assumes the absence of a relationship between the two variables.

**Table N° 1 Judgment on the change in the working method following the use of digital tools and the affirmation that the tool brings added value to the establishment**

Crossing		Judgment on the change in the working method following the use of digital tools				Total	
		Not		Yes			
Affirmation that the tool brings added value to the institution	Unanswered	0	0%	0	0%	17	32,1%
	Not	0	0%	3	9,7%	3	5,7%
	Yes	2	40%	22	71%	24	45,3%
	No opinion	3	60%	6	19,4%	9	17%
	Total	5	100%	31	100%	53	100%

Source: Personal construction according to our survey

From this crossing, we notice that 71% of people who have seen their working methods change thanks to the various digital tools and in particular the patient data management software considers, while affirming that this tool brings added value to the establishment. However, only 9.7% disagreed.

**Table2: Test of the khi two relating to the cross-tabulation**

Chi-square test			
	Value	Ddl	Asymptotic (bilateral) significance
Khi-square of Pearson	58,813a	6	0,000
Likelihood ratio	70,295	6	0,000
Number of valid observations	53		

Source: Personal construction according to our survey

By analyzing the  $\chi^2$  test, we reject the H0 hypothesis which assumes that there is an independence between the change in the working method following the use of digital tools and the assertion that the tool brings added value to the establishment. We therefore accept H1 because there is a dependence between these two variables and the asymptotic (bilateral) significance being less than 0.05 (significance threshold) tells us that this dependence is significant.<sup>28</sup>

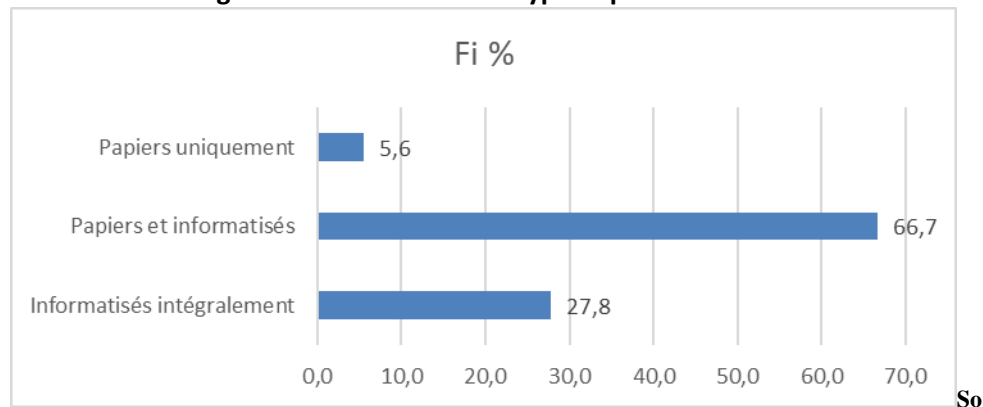
### 3.3. Use of patient data management software by healthcare professionals:

#### 3.3.1. Representation of the type of patient records, difficulties encountered in familiarizing oneself with the software and change in working methods:

<sup>28</sup> Ronald Aylmer Fisher introduced this concept in his book *Statistical Methods For Research Workers* (1925), where he suggests the probability of 0.05 as the threshold for rejecting the null hypothesis.

From the results presented in Figure "3", it is clear that only 27.8% of the health professionals surveyed have fully computerized patient records within their establishment. In contrast, 66.7% of respondents reported having paper and computerized patient records and 5.6% had paper-only records in their institution. However, very few respondent shad no difficulty getting acquainted with their institution's patient data management software (13.9%),5.6% experienced a lot of difficulty and the majority, up to (80.6%) found some difficulty.

**Figure 3: Overview of the type of patient records**



Source: Personal construction of the authors

When asked about the change in working methods following the use of patient data management software, 86.1% said they had changed their working methods, the rest did not see their working methods change.

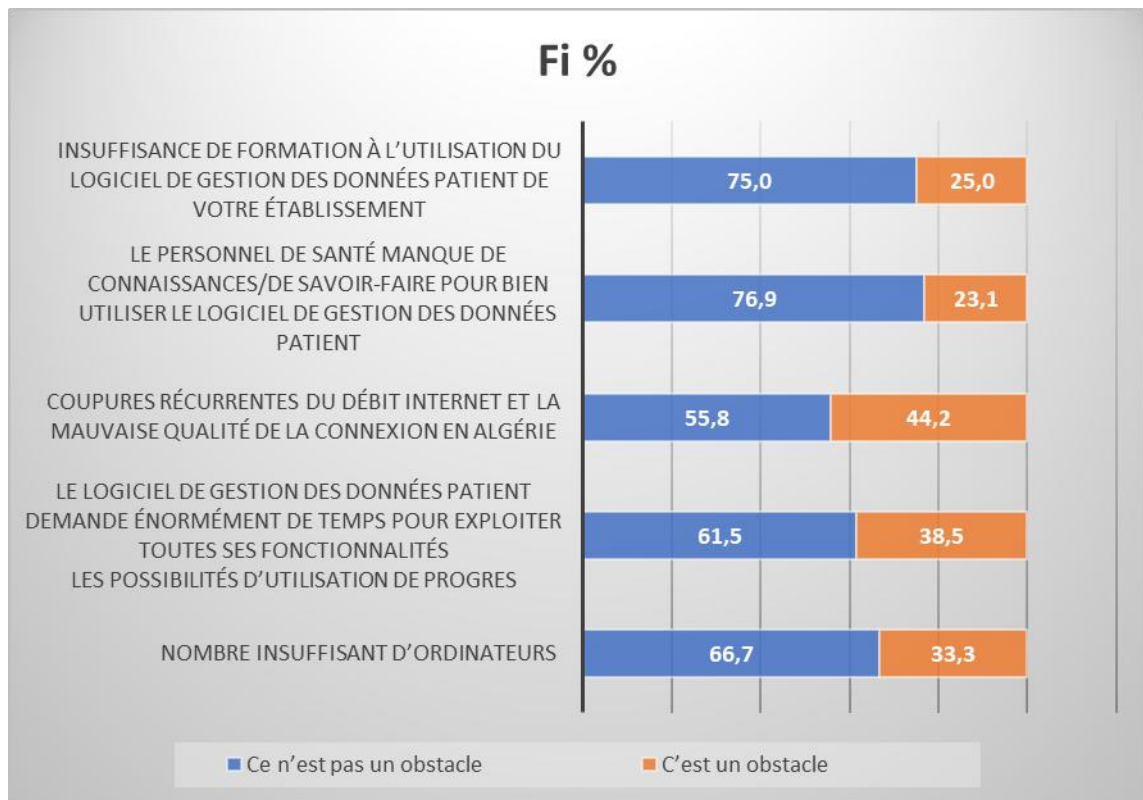
### 3.3.2. Methods of acquiring knowledge and skills for using patient software:

Regarding the acquisition of the skills necessary for the health professionals the use of patient data management software. According to the results of the survey, the majority of people who answered yes to the use of patient data management software were able to acquire the skills and knowledge to use it through mentoring or coaching activities with other colleagues (36.5%), 34.6% were entitled to training sessions (half-day or full days) scheduled by the institution. In addition, only 23.1% i.e. 12 people had to self-train and the rest had to use other methods.

### 3.3.3. Barriers to the use of patient data management software:

We looked at the elements that healthcare professionals considered to be barriers to the use of patient data management software, we found that respondents find that healthcare staff lack the knowledge/know-how to use patient data management software well by 23.1%. Insufficient training in the use of their institution's patient data management software is a 25% barrier. Almost a third of respondents believe that the insufficient number of computers available to them and the enormous time required by this software to exploit all its functionalities are obstacles. However, the most important obstacle is recurrent internet speed cuts and poor connection quality in Algeria, 44.2% of respondents said.

**Figure 4. Barriers to using patient data management software**



Source: Personal construction of the authors

#### 3.3.4. Judgment on the effectiveness of the use of patient data management software:

**Figure 5. Judgment on the effectiveness of the use of patient data management software**

We wanted to know the position of healthcare professionals in relation to three statements that are based on the effectiveness of patient data management software. According to the results obtained, this digital tool brings added value to their establishment, respondents agree with 25%, 8.3% do not agree with this statement and 66.7% of respondents do not agree or disagree. As for the fact that this tool facilitates the work of health personnel and allows better care for patients, 22.2% of respondents agree with this statement, 2.8% do not and 75% of respondents do not agree or disagree. Finally for the statement that states, that through this tool health professionals are better involved in their work, 31.6% of respondents strongly agree with this statement, 10.5% do not agree at all and 52.6% do not agree or disagree with this statement.

#### 3.3.5. Evaluation of the usefulness of patient data management software:

In order to measure the usefulness of the patient data management software, we asked the healthcare professionals surveyed to rate the software on a scale from 1 to 10. The software scored an average score of 7.67 and a median score of 7 with a standard deviation of 1.962.

### 3.3.6. Cross-referencing between the judgment on the change in working method following the use of digital tools and the assertion that through the use of patient data management software health professionals are better involved in their work:

According to the results obtained from the crossing, we note that 61.3% of people who have seen their working methods change thanks to the various digital tools and in particular to the use of patient data management software consider that this allows them to be better involved in their work. Only 6.5% have contradictory opinions and 32.3% do not have an opinion.

**Table 3: Test of the chi two relative to the cross-tabulation**

Chi-square test			
	Value	Ddl	Asymptotic (bilateral) significance
Khi-square of Pearson	61,480a	6	0,000
Likelihood ratio	71,221	6	0,000
Number of valid observations	53		

**Source:** Personal construction according to our survey

By analyzing the  $\chi^2$  test, we reject the H0 hypothesis which assumes that there is an independence between changing the working method following the use of digital tools and improving the involvement of health professionals in their work through the use of data management software. We therefore accept H1 because there is a dependence between these two variables and the asymptotic (bilateral) significance being less than 0.05 (significance threshold) tells us that this dependence is significant<sup>29</sup>.

#### **Conclusion:**

Nowadays the health system is constantly facing many challenges. Indeed, the multiplication of diseases has generated new health needs on the part of the population demanding more and more human resources, adapted equipment and financing. The digitalization of the health sector is therefore a necessity to meet these challenges and to guarantee well-being in all areas of life and activity. In the case of the healthcare sector, we can claim that digital and digital technologies have been able to provide multiple solutions for patients or for healthcare workers. In this perspective, our research work attempted to study the contribution of digital technology in improving the management of healthcare institutions. In this sense, we have seen a fairly significant integration and use of digital technology on the part of the health workforce. Even if the integration of ICTs into the health sector is not fully realized, their use is quite frequent by health professionals. It is a digital transformation that is imposed on the health sector by the administration through

<sup>29</sup> Ronald Aylmer Fisher introduced this concept in his book *Statistical Methods For Research Workers* (1925), where he suggests the probability of 0.05 as the threshold for rejecting the null hypothesis.

the implementation of patient software and the frequent use of digital technologies by health personnel. An organizational and cultural change is taking place and will subsequently allow all health actors to take full advantage of the opportunities offered by digital and digital technologies. This change is well seen by the actors of the health sector because it provides solutions to the problems encountered and it makes an important contribution to the development of a more efficient and interactive medicine. Therefore, we can clearly say that the digitalization of the health sector in Algeria is on track. The contribution of digital and digital technologies in improving the management of healthcare facilities, the benefits of ICT in this sector are well established. Similarly, this has been more than demonstrated in this time of pandemic where different applications and digital tools in terms of e-health have emerged and have helped to slow the spread of this virus and thus facilitate the work of health personnel. However, risks and difficulties do exist in the implementation and development of these technologies at the level of health facilities. This transformation is lagging behind, obstacles such as lack of training, lack of knowledge and know-how on the part of the health workforce must be addressed with the utmost urgency. In this regard, we recommend that actors in the health sector in Algeria make good use of digital tools, in particular, social networks. These make it possible to increase the visibility of healthcare institutions and to gain the trust and respect of patients. Investing in a website or mobile app helps healthcare professionals and patients take on a whole new dimension of better, more interactive medicine. Strengthening the information base on patients and recurrent diseases is useful to facilitate the work of health professionals and contributes to better patient care. Finally, the health sector must consider mutual assistance between the public and private sectors, in particular, in terms of the digitization of patient records and the census of medical specialists practicing in Algeria.

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