CENTRE
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جامعة محمد الخامس بالرباط
Université Mohammed V de Rabat

In partnership with

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Ministère de la Santé et de la Protection Sociale

الضمان الإجتماعي
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CNSS

DIGITALIZATION AND SHARING OF HEALTH DATA IN MOROCCO

Realities, opportunities and challenges

WHITE PAPER

March 2024

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صاحب الجلالة الملك محمد السادس نصره الله

“*(...) The new government is responsible for setting priorities and developing projects during its mandate, in addition to raising the necessary means to finance these projects, within the overall framework for implementing the development model. The government is also expected to complete the implementation of the major projects started, especially that of achieving universal access to social protection, which I care deeply about. In this regard, the main challenge is to achieve a real overhaul of the health system, in accordance with the best standards, making sure the public and private sectors complement each other.*”

Excerpt from the speech addressed by HM the King to Parliament on the occasion of the opening of the 1st session of the 1st legislative year of the 11th legislature, Friday, October 8, 2021.

Morocco initiated a radical, multidimensional reform of its health system to achieve full coverage of the entire population. Such ambitious reforms require significant, carefully targeted investment in the health system, including investment in the health information system. An effective, comprehensive health information system is critical to support decision-making at every stage, from policy through service delivery to monitoring and evaluation, and at every level of service.

WHO encourages multistakeholder dialogue as a way of reaching a consensus and a shared vision for health system reforms. Health system digitalization is essential to support the reform Morocco is undertaking; decentralizing the health system and developing health service autonomy will require digital support to ensure more efficiency and accountability. At the same time, digitalization needs to be carefully planned and implemented to maximize its benefits and address potential challenges.

This second white paper confirms and strengthens the roadmap for Morocco's digital healthcare transformation, initiated by King Mohammed VI in 2008. This reform positions Morocco as a digital health leader in the Eastern Mediterranean Region, recognizing the importance of technology. It includes input from national stakeholders, identifies key opportunities and challenges, and proposes a path forward. It aligns with WHO's Global Digital Health Strategy, which underscores the importance of international cooperation in harnessing digital technologies for health. This involves working with countries to develop evidence-based plans, invest in reliable digital tools, and ensure long-term sustainability and impact.

The potential of digital technology for healthcare cannot be overstated. It is revolutionizing the healthcare landscape, offering a multitude of benefits to both patients and providers. It empowers patients to consult with healthcare providers remotely, thereby reducing travel time and enhancing accessibility, particularly for those in rural or underserved areas. It also facilitates patient access to their medical records, appointment scheduling, and secure communication with healthcare providers. This not only streamlines patient information management and reduces paperwork but also enhances care coordination. Moreover, it aids in identifying trends, patterns and areas for improvement in patient care, and equips patients with reliable information about their health conditions and treatments.

Ensuring universal access to digital health technologies, including broadband internet and devices, presents a significant challenge. Some patients may lack the digital literacy skills required to use digital health tools effectively, while some healthcare providers may resist adopting new technologies or changing their workflows. Patients may also hesitate to use digital health tools due to privacy concerns or lack of trust. Overcoming these challenges requires the integration of digital health into national planning, policies, governance and infrastructure, underpinned by sustained and sustainable financial commitments. Dedicated investment is crucial to fully realizing the potential of digital health.

The rapid advancement of digital health technologies has raised critical ethical considerations. As these technologies become increasingly integrated into healthcare delivery systems, addressing potential ethical challenges and ensuring they are used responsibly and equitably is critical. Ensuring the confidentiality, integrity and availability of patient data is paramount. It is essential to obtain informed consent from patients and be transparent about how their data is collected, used and shared. Preventing and mitigating data breaches is also critical for healthcare organizations and national systems implementing digital health.

The ambitious reform Morocco is undertaking, and in particular its approach to digital health, is a model that may offer lessons to other countries. On behalf of WHO, I welcome Morocco's ambitious digital transformation agenda and role in driving digital health progress in the Eastern Mediterranean Region and Africa. WHO remains committed to supporting Morocco in this ambitious digital reform.

Dre Hanan Balkhy

Regional Director for the Eastern Mediterranean
World Health Organisation

Preface

وزارة الصحة والحماية الاجتماعية
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Ministère de la Santé et de la Protection Sociale

Under the directives of His Majesty King Mohammed VI, may God assist him, Morocco has embarked on an ambitious digital reform of its health system, aiming for excellence in quality and management through key projects such as the renovation of the National Health Information System (NHIS), the emergence of telemedicine and the introduction of the "Shared Medical Record" (SMR) which are at the forefront of this revolution. The latter, Shared Medical Record (SMR) by facilitating the secure exchange of medical information, optimizes patient care and symbolizes the pivot of our approach towards sector-specific efficiency and innovation. To realize this shift towards a digital and patient-centric healthcare system a reality, synergy between all stakeholders is essential.

This White Paper, the result of collaboration with the Ministry of Health and Social Protection and the National Social Security Fund, depicts our shared ambition for a renewed and competitive health system in the digital age. The successful transformation of the health sector in Morocco requires an enabling framework that brings together all stakeholders around a holistic, transversal and inclusive national strategy, with particular attention paid to international experiences and local specifics.

We extend our thanks to the e-health innovation center and the project team for their commitment and invite you to discover this White Paper, a reflection of our collective desire to reinvent the Moroccan health system and to confirm our role as a leader in the digital revolution of the health sector.

Pr. Khalid Ait Taleb
Minister of Health and Social Protection

In line with the enlightened vision of His Majesty King Mohammed VI, may God assist him, to expand social protection and in response to the significant broadening of our base of beneficiaries of the Compulsory Health Insurance (AMO), now extended from 7.5 million to 23.2 million, including non-salaried workers and former beneficiaries of the Non-contributory Basic Coverage Scheme (RAMED), the digitalization of our services and the dematerialization of our processes have become imperative.

It is with this perspective that the National Social Security Fund (CNSS) has undertaken ambitious actions laying the foundations for a major digital transformation capable of helping us control costs, cope with the huge influx of activity that has evolved in such a short time, and maintain a quality of service towards our insured and affiliates.

This digital transformation will also allow us, through data, to generate value for the ecosystem beyond business boundaries. The collection and management of this data will help combat fraud, strengthen epidemiological and preventive analyses, and optimize expenditures. The implementation of the electronic care sheet symbolizes our firm commitment to the digital transformation of the sector. This emblematic project, among other initiatives, demonstrates our desire to place the citizen at the heart of our actions, in an integrated and efficiency-oriented approach.

This White Paper comes at a time when it seems particularly gratifying to introduce this innovative reflection on the digitalization and sharing of health data in Morocco, an essential step in the evolution of our compulsory health insurance system.

Through our support for the elaboration of this White Paper, we share our deep conviction about the potential of digitalization and data to optimize the processes of AMO, transforming the CNSS from an administrative establishment into a true social insurer/provider and thereby enhancing the overall efficiency of our health system.

Mr. Hassan Boubrik
Director General of the National Social Security Fund

الضمان الإجتماعي
CNSS
the duty to protect you

WE ARE TRANSFORMING TO

DAMANCOM
MACNSS
TAAWIDATY
HEALTHCARE PROVIDER PORTAL
FISHERMEN SAILORS

SERVE YOU BETTER

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Under the High Instructions of His Majesty King Mohammed VI, may God assist Him, Morocco is engaging in an innovative approach to digitalization and health data sharing, aiming to revolutionize our health system. This White Paper embodies this commitment, marking a decisive step in the national effort towards integrated and accessible digital health system.

The elaboration of this document is the result of a multidisciplinary collaboration, bringing together the knowledge and skills of numerous experts, health professionals and policy makers. It explores the opportunities and challenges related to the digitalization of the healthcare sector, highlighting the importance of a national strategy for efficient and secure data sharing to improve patient care and optimize resource management.

The White Paper addresses crucial topics such as the current situation of health data sharing in Morocco, the impact of digitalization on the accessibility and quality of care, as well as the challenges and solutions for a successful implementation of digital health. It also highlights the essential role of digitalization in responding to health crises, demonstrating the need for a more resilient and adaptive health system.

Furthermore, this document offers reflections on harmonizing digital health practices with international standards, thus promoting a better integration of Morocco into the global health network. It emphasizes the need for effective governance of health data, rigorous privacy protection, and a solid ethical framework to guide the use of digital technologies in the health sector.

In conclusion, this White Paper provides a solid foundation for policymakers, health professionals, and stakeholders, guiding them towards the realization of a high-performing and equitable digital health system. It represents an ambitious vision for the future of health in Morocco, a future where technology and innovation continually serve to improve the quality of care and access to top-level health services for all Moroccans.

Pr. Anass Doukkali

President of the e-Health Innovation Center

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CENTRE
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Our missions

Accelerator for e-health dynamics in Morocco (e-health Advocacy)

Provider of expertise and advice for different institutional stakeholders and care providers

Trainer for healthcare professionals and developers of digital solutions

Incubator for innovative e-health projects

Promoter of multidisciplinarity and teamwork

Catalyst for funding research and innovation in e-health (Fund Raising))

www.cies.ma

Summary

List of acronyms

ADD	Digital Development Agency
Africa CDC	Africa Centres for Disease Control and Prevention
AMO	Compulsory health insurance
ANAM	National Health Insurance Agency
Babyl	Rwanda's Digital Healthcare Provider
CEDEAO	Economic Community of West African States
CHU	University Hospital Center
CIeS	e-Health Innovation Center
CINE	Electronic National Identity Card
CNDP	National Commission for the Control of the Protection of Personal Data
CNOM	National Council of Order of Physicians
CNSS	National Social Security Fund
DGSN	General Directorate of Information System Security
DGSSI	Directorate-General for Information Systems Security
DHIS2	District Health Information Software 2
SMR	Shared Medical Record
DPI	Electronic Health Record
e-Nabiz	Turkish Ministry of Health Application
ENISA	European Network and Information Security Agency
e-Santé	E-Health or Digital Health
ESB	(Enterprise Service Bus (for interoperability between different IT systems
FIPS	Federal Information Processing Standard
GAFAM	Google, Amazon, Apple, Meta and Microsoft
GISRE	National Interoperability Platform
HDS	Health Data Hosting Providers
HIMSS	Healthcare Information and Management Systems Society
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level 7, a messaging standard that defines the structure and content of messages exchanged between systems
IA	Artificial intelligence
INPE	National Identifier of Healthcare Professionals and Establishments
INS	National Health Identifier (potentially related to medical records management
IoT	Internet of Things
ISO	ISO International Organization

MFA	Multi-Factor Authentication
MSPS	Ministry of Health and Social Protection
NIST	National Institute of Standards and Technology
NMD	New Development Model
OAuth	Open Authorization
OMS	World Health Organization
WAHO	West African Health Organization
openHIE	Open Health Information Exchange
openHIM	Open Health Information Mediator
OpenMRS	Open Source Medical Records
PIPC	Persons Unable to Pay Dues (AMO TADAMON Context)
PPP	Public-Private Partnership
PS	Care Providers or Health Professionals
RAMED	Medical Assistance Scheme for the Economically Deprived
RGPD	General Data Protection Regulation
RNP	National Population Register
SAML	Security Assertion Markup Language
SDSI	Information Systems Master Plan
SIH	Hospital Information System
LIS	Laboratory Information System
SNOMED	Systematized Nomenclature of Medicine Clinical Terms
TIC	Information and Communication Technologies
UNESCO	United Nations Educational, Scientific and Cultural Organization
WARDS	West African Regional Disease Surveillance Capacity Strengthening
WSA	World Summit Award

White Paper Project Team

SUPERVISORY AND COORDINATION

Pr. Anass Doukkali, Former Minister of Health, Coordinator

Anass Doukkali is a research professor at the Faculty of Medicine and Pharmacy of Rabat and a project manager at Mohammed V University for the development of e-health. He is the President and Co-Founder of the e-Health Innovation Center (CIeS) and President of the International eHealth Forum. He served as Minister of Health and served as Director General of ANAPEC. He has held several elected positions at the local, national and international levels.

Mr. Hicham El Achgar, IT6 Director, Digital Transformation Expert

Graduate of ENSIAS and founder of IT6 Morocco, Hicham El Achgar is a specialist in information systems management and governance. He has carried out a dozen audit missions and master plans for information systems in the public sector. He is vice-president and co-founder of CIeS. He is also the founder of the Higher Institute of Engineering Sciences (ISSI) which specialises in the field of digital transformation.

WORK TEAM

Mr. Saïd Hayar, Project Coordinator, Health IS Expert

Backed by more than 20 years of experience in managing IT projects as a project management contractor (MOE) and project owner (MOA), on projects involving the digitalization and deployment of digital services across various sectors: public administration, health, and health insurance.

Mr. Mustapha Zghoumi, Digital Health Expert, Canada

An expert in clinical computerization and speaker in digital health, Mustapha Zghoumi has amassed over thirty years of experience. Holding an MBA in health project management and certified as a PMP, he has completed several certifications in digital health and telemedicine. He has led several large-scale projects related to the shared health record of Quebec/Canada.

Mr. Naoufal Rahali, Expert Digital Transition, CEO Talent Access

Naoufal Rahali has twenty years of experience in the service sector, with expertise developed in Morocco and the EMEA region. He has led several projects in the health sector, particularly in project ownership assistance for Health Information System (HIS) projects and in supporting the certification of health data processing.

Dr. Franck Lauryens, CEO, Healthcare 360, France

Health organization engineer and former member of the French National Authority for Health (HAS), Franck Lauryens is a hospital director in France. He teaches at Sciences Po Paris on health systems, public health, and e-health. A graduate in artificial intelligence in health, he founded the consulting firm Healthcare 360, which supports the transformation of health systems in Europe and on the African continent in organizational, human, and digital aspects.

Part 1

Emergence and methodology

Why this new white paper on digitalization and health data sharing in Morocco?

Background to the emergence of this white paper

The recent digitalization initiatives in the health sector in Morocco, led by the Ministry of Health and Social Protection (MSPS), the National Social Security Fund (CNSS), the Digital Development Agency (ADD) as well as several private health actors, have prompted us to reflect on the crucial issue of health data sharing that stems from it. This question is all the more important as the collection and use of personal data is hotly debated in several countries.

When it comes to the field of health data, the sensitivity is all the more marked as it is information that is traditionally considered confidential due to medical confidentiality. Convinced that the sharing of health data represents a real opportunity for all players in the health ecosystem, we wanted to contribute to the collective reflection, no longer on the opportunity or not of this sharing, but rather on the "how" to implement it.

This work is part of the initiatives of the Centre for Innovation in e-Health (CIeS) of the Mohammed V University of Rabat to promote digital health in Morocco. It is an extension of the first White Paper on e-health in Morocco, published in April 2022.

We wanted to provide a comprehensive roadmap, allowing an in-depth understanding of the issue of digitalization and sharing of health data, strategic orientations, recommendations and practical advice to implement them effectively, with a strong conviction about the crucial issues of this document and the importance of the expected outcome.

Our Goals

With this work, we seek to provide key insights into the challenges associated with the exchange and sharing of health data in Morocco, particularly focusing on the following four aspects:

ACCESSIBILITY **USE** **PROTECTION** **GOVERNANCE**

Without being exhaustive, through this white paper we aim to:

- Provide relevant and up-to-date information on the digital maturity reality of our healthcare professionals and care facilities, and their capacity to digitize and share health data;
- Identify the barriers and challenges to this digitalization and sharing in Morocco; • Grasp the opportunities and challenges of integrating available public or private solutions;
- Conduct studies and analyses targeting best practices in terms of content, architecture, and implementation and deployment strategies;
- Understand the on-the-ground reality of all stakeholders (users and professionals) regarding their needs for medical information;
- Present strategic perspectives based on the identified expectations and challenges, involving all stakeholders;
- Produce recommendations for policymakers;
- Develop a roadmap that facilitates rapid and effective implementation.

Methodology

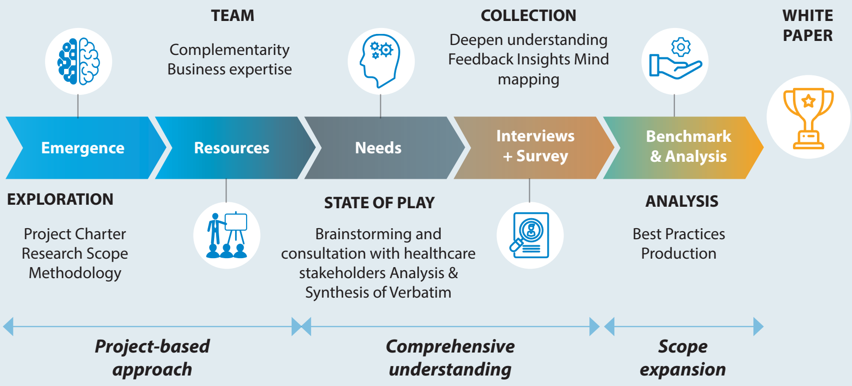
The working approach

To successfully carry out this work, we have opted for a comprehensive approach, to cover all the issues and problems related to the sharing of health data, in light of ongoing and upcoming initiatives and projects in Morocco. Our work approach was organized around three complementary aspects:

1. A project-mode approach, where we adopted a methodical approach to ensure efficient management of the process;
2. A 360-degree deep understanding, where we thoroughly explored all aspects related to the digitalization and sharing of health data to have a complete view of the situation;
3. The expansion of the scope of investigation, which allowed us to embrace a broader perspective in order to consider all relevant elements.

The diagrams below trace the process of producing this white paper.

PROCESS



Emergence

EXPLORATION

Project Charter
Research Scope
Methodology

Resources

TEAM

Complementarity
Business expertise

Needs

STATE OF PLAY

Brainstorming and consultation with healthcare stakeholders Analysis & Synthesis of Verbatim

Interviews + Survey

COLLECTION

Deepen understanding
Feedback Insights Mind mapping

Benchmark & Analysis

ANALYSIS

Best Practices
Production

WHITE PAPER

Project-based approach — ***Comprehensive understanding*** — ***Scope expansion***

STUDY SCOPE

EFR

- Comprehensive understanding
- Strategic directions
- New framework law on the national health system
- Project for the generalization of social protection

GEOGRAPHICAL SCOPE

- Morocco
- Canada
- France
- Spain
- Turkey
- Jordan
- Rwanda
- Senegal

THEMES

- National context
- Inventory by sector/speciality
- International / Africa Benchmark
- Use Cases
- Analysis of feedback from healthcare professionals
- Interviews with stakeholder
- Digital surveys
- Recommendations of the task force

TOOLS & SOLUTIONS

- Data analysis
- Interviews and field visits
- Conferences and seminars

IS SOLUTIONS

- Hospital Information System
- RIS, LIMS, Pharmacy Systems
- AI in the medical sector (radiology, anatomy)
- Interoperability platforms
- IoT and Telemedicine

METHODOLOGY AND PROCESS

A work process organized around several highlights between November 2022 and December 2023.

- **Technological intelligence Aggregate data collection and analysis**
- **Literature review on the basis of some 20 international documents**
- **Review of reports of different firms**
- **Preparation of interview guides and survey questionnaires adapted to each actor**
- **Organization of interviews/ categories of actors**
- **Identification of use cases (university hospitals, private clinics, startups, etc.)**
- **Opinion polls/ categories of actors (Users & Pro)**
- **Analysis and use of interview and survey results**
- **Realization of an international benchmark based on about 100 references**
- **Organization of working sessions**
- **Writing (first draft)**
- **Conducting a presentation meeting in the presence of all the actors**
- **Production (final version)**
- **Official presentation ceremony of the White Paper**

Part 2

Sharing health data issue around the world

The Shared Medical Record (SMR) as the main tool for sharing health data: an international comparative study

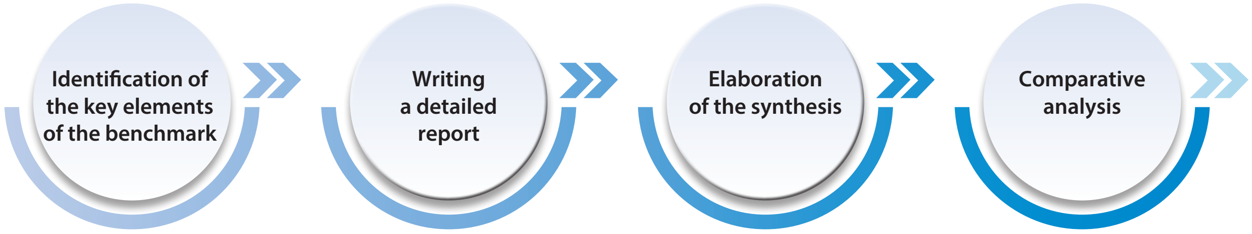
Over the past two decades, several countries have adopted digital health strategies that include the implementation of a shared health record. In our study, an initial literal analysis of the experiences from about a dozen countries helped us define the following criteria for selecting countries to study:

- The project was considered as a lever for transforming the health system;
- The sustainability of the project;
- Clearly identified governance;
- The technological maturity of the solution, including the adoption of market standards.

However, due to time constraints and the availability of information, our study focused on certain countries selected for the relevance of their experiences: Canada, Spain (Autonomous Region of Andalusia), France, Jordan, and Turkey.

Approach

We began to gather information through an extensive literature search on each case. Our approach was deployed in four distinct stages:



More than 100 scientific articles, webographies, management reports and institutional documents were consulted and studied. For each experiment examined, we sought to identify:

1. the organization of the health system;
2. the main objectives of the project;
3. the governance adopted;
4. the main components of the project in all its dimensions;
5. maturity and level of deployment;
6. the benefits and advantages generated;
7. the challenges and difficulties encountered;
8. Success factors of the project.

In the following, we present the synthesis of our analysis, providing a perspective focused on the elements of success and failure of the five experiments, with the aim of drawing lessons for the establishment of a shared medical record in Morocco.

Summary

The following is a summary of the highlights of the benchmark for the five cases studied, focusing on the relevant aspects to the implementation of a SMR.

Project Objectives

- Accelerate the transformation of health practice and foster a patient-centred service offering;
- Ensure the flow of information in support of the continuum of care, particularly in family medicine;
- Establish an integrated network of health services;
- Obtain structured, homogeneous and comparable information;
- Make information available to health professionals;
- Avoid fragmentation of medical data;
- Have immediate access to patients' medical information during hospitalization, initial consultation or emergency;
- Facilitate the follow-up of patients, especially those with chronic diseases;
- Avoid drug interactions; • Overcoming the difficulties in measuring the effectiveness of health policies and investments;
- Have a system to support decision-makers; • Compensate for significant waste in the management of medication prescriptions, laboratory analyses and medical imaging examinations;
- Share medical information and provide clinical decision support.

Type of Governance

- A multidisciplinary team under the responsibility of the Ministry of Health;
- A special secretariat under the responsibility of the Minister of Health, with the necessary resources and funds;
- A non-profit PPP (public-private partnership) company;
- Subcontracting to a private company;
- An agency dedicated to digital health.

Project Components

- An interoperable service-oriented architecture based on a predefined framework;
- Information systems developed separately and interoperable via ESB technology;
- A single information system for the entire health system;
- An information system based on modules that can be interoperable via ESB technology.

Maturity and degree of deployment

- Multi-year projects, ranging from 5 to 10 years;
- Take the time to complete the testing and break-in phase;
- Choice of pilot sites to be considered from the beginning of the project and to be representative;
- Provide training and technical support for use before, during and after the deployment phase;
- Establish incentives for the adoption of digital health by primary care physicians;
- Implement training programs on digital health.

Benefits & Advantages

- Fewer duplicate diagnostic tests;
- Better use of hospital and emergency care;
- Effective coordination of care teams;
- Strengthening the application of standardized protocols at the national level;
- More effective work of health professionals;
- Reduced support costs for a centralized database management system replacing many local databases;
- Easy appointment scheduling for patients
- Creation of new jobs in the health sector.

Challenges and dificulties

- Missed deadlines caused by the complexity of the project;
- Over-budget due to project scope revision;
- Late buy-in by some stakeholders;
- Disparity of information systems within the hospitals and other health facilities involved in the project, complicating the integration and harmonization of these systems with the SMR;
- Legal aspect of managing consent and ownership of the shared medical record;
- Difficulty in recruiting expert resources during the different phases of the project with the lack of local skills for digital health;
- Management of healthcare professionals' expectations;
- Fear of control by healthcare professionals following the implementation of performance indicators related to the use of the SMR;
- Adaptation of the solution to the context of the national health system;
- Lack of Arabic language support;
- The complexity of a SMR's architecture complicates and slows down the learning curve;
- Risk of work overload for healthcare professionals during the ramp-up phase;
- Management of the change from paper medical record to electronic medical record;
- Management of the identity of patients and healthcare professionals who will use the SMR;
- Quality assurance of electronic medical records;
- Confidentiality and data protection of electronic medical records.

Key Success Factors

- The governance of the SMR project must be based on:
  - – SMART objectives[1];
  - – recognized organizational leadership;
  - – a single point of contact;
  - – representativeness of all health sector stakeholder;
  - – political buy-in for the support of the project, ensuring continuity at the level of the management team;
  - – the introduction of legislation to support implementation;
  - – a stable and sustainable core management team;
  - – Implementation of audit mechanisms during the project phases.
- Involve health professionals in the development of the system in order to create useful tools for medical practice;
- Launch of an accelerated training program for healthcare professionals before, during and after the deployment of the SMR project through the following actions:
  - – organise systematic workshops and training courses;
  - – provide an advisory and support service to users.
- Launch of a promotion and communication program regarding the SMR and its use.
- Launch a SMR adoption program for primary care physicians in offices with financial incentives to accelerate its use.
- Consider the SMR project as an investment project.
- Emphasis on the computerization of primary care.
- Compliance with market standards and collaboration with institutions specialized in the field: SNOMED, HL7 International, HIMSS, Regenstrief Institute, WHO...
- Standardization of health data.
- Phased implementation process spread over several years.

Our analysis of the different experiences (carried out using the Digital Health Assessment Tool[2]) highlights the importance of governance, interoperability and continuous evaluation to guide the successful implementation of an effective SMR in Morocco.
In terms of potential delays in deployments, we noted that they are often associated with the complexity of national projects and health systems.

A few points to note:
- **Good governance has a positive impact on maturity, degree of deployment as well as benefits and advantages;**
- **All the countries surveyed started with clearly defined objectives;**
- **Apart from the case of Jordan (open source solution), the components of the SMR are almost similar.**

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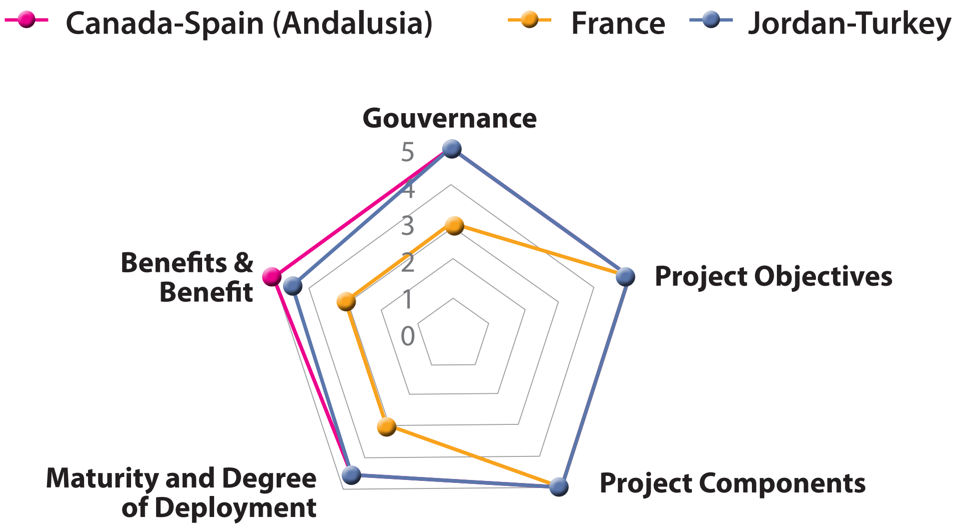
[1] SMART: Specific, Measurable, Achievable, Realistic and Time-bound.

[2] World Bank : https://elibrary.worldbank.org/doi/abs/10.1596/36547

COMPARATIVE CASE ANALYSIS

COMPARATIVE DIAGRAM OF CASES STUDIED



Focus on Africa

This focus aims to identify the current trend of digital health in Africa, highlighting cases relevant to the Moroccan context.

In fact, the WHO Africa zone presents a disparate and fragmented picture of digital health solutions ranging from specific sharing solutions to targeted health programs with service-oriented architectures, based on open source solutions: openHIE and openHIM and supported by a network of 1,267 startups.

In recent years, WHO has stepped up its efforts to encourage the adoption of digital health strategies in African countries, seeing this as a lever for the scaling up of universal coverage and the strengthening of national health systems. But despite these strengths, only 12 countries (Cape Verde, Ivory Coast, Ethiopia, Ghana, Kenya, Mauritius, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, Rwanda) have been able to effectively implement their digital health strategies.

The challenges identified by the WHO are multiple: lack of leadership in digital health, limited multisectoral approaches, inconsistent standards and interoperability frameworks, gaps in the regulation of data protection and system security, limited financial resources as well as insufficient participation of health professionals.

At the regional level, the lack of data-sharing mechanisms hinders the development of best practices in the region[3].

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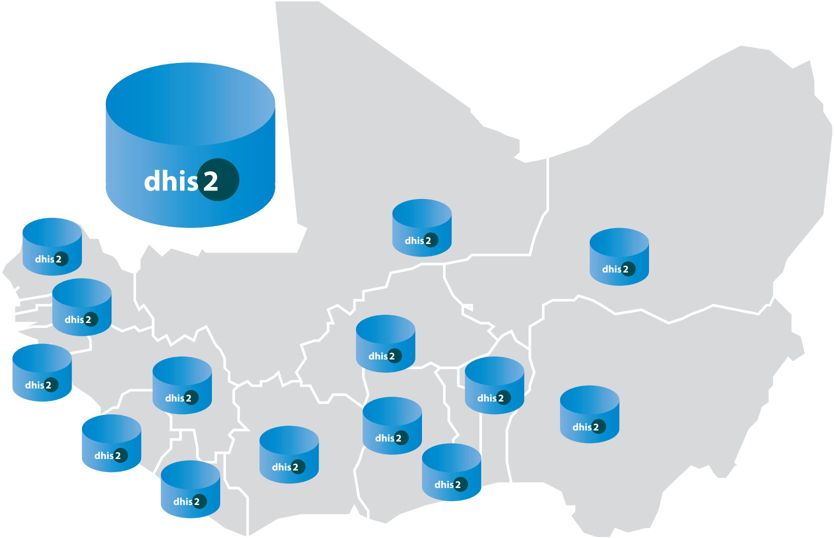
[3] WHO, Regional Committee for Africa, Seventy-first session, Virtual meeting, 24–26 August 2021.

Case of the West African Health Organization

Isolated health data sharing initiatives for targeted projects that require data collection on infectious diseases such as Malaria, Ebola, Covid-19 and the Maternal and Child Health programme have been accompanied by the implementation of two open source solutions, OpenMRS and DHIS2. These two platforms have been deployed in all West African countries and adopted by the West African Health Organization (WAHO).



The WAHO DHIS2 platform (one instance per country and one WAHO instance).

The DHIS2 platform adopted by WAHO[4] is presented as a data warehouse of essential health indicators, harmonizing the health data of the 15 ECOWAS Member States. It is of crucial importance for WAHO as it allows the monitoring of health indicators through temporal comparisons between different member countries. Currently focused on aggregate data on diseases with epidemic potential, the creation of this data warehouse is part of the West Africa Disease Surveillance and Capacity Building (WARDS) project. Ultimately, the goal is to extend this platform to routine disease surveillance.

Case of Africa CDC

As part of its strategy deployed at the beginning of 2023, Africa CDC is integrating three major initiatives related to the sharing of digitized health data:

- the digitization of primary health care with the aim of producing quality health data;
- Health Connekt Africa, which will connect 100,000 health facilities and 1 million health professionals, including primary health care delivery points and community health professionals across Africa by 2030;
- Integrated Disease Surveillance in Africa: Africa CDC will provide advice and technical assistance to Member States to strengthen laboratory capacity, comprehensive data collection, analysis and reporting systems, thereby aiming at rapid and accurate detection of outbreaks, reduction of the burden of infectious diseases and promotion of overall public health.

The case of Rwanda

Rwanda stands out when it comes to the deployment of its SMR. It has implemented a shared medical record based on the Canadian experience since 2013.

Faced with the complexity of the organization of the health system, mainly in rural areas, the Rwandan government has adopted an innovative approach based on mobile health technology to improve access to primary care. In partnership with startup Babyl, the Ministry of Health has implemented a mobile infrastructure expanding access to primary care nationwide, as shown in the map below.

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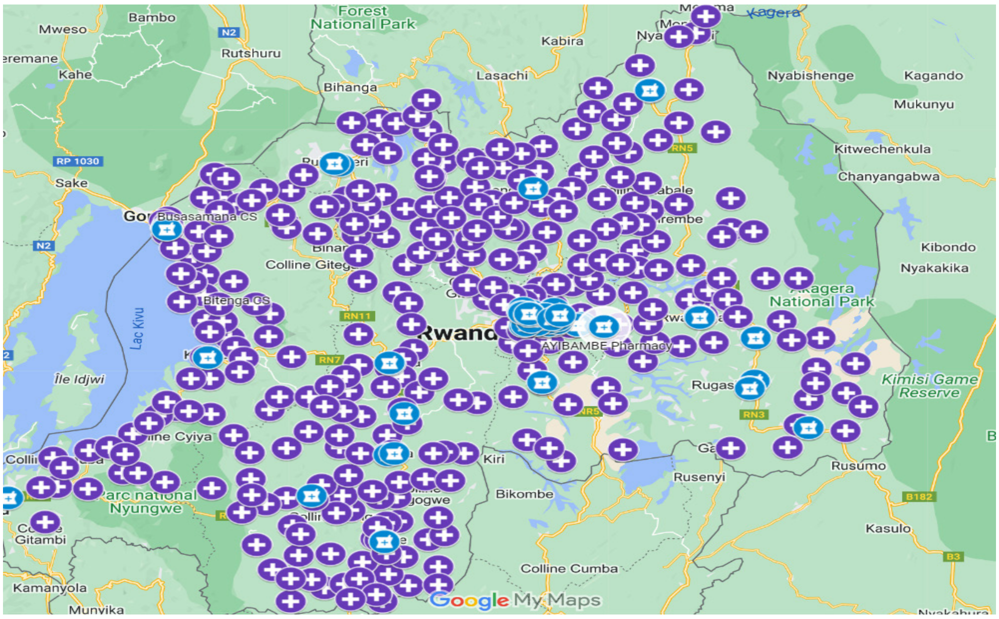
[4] https://dhis2.org/fr/waho-uses-dhis2/



The scope of the deployment of the m-health Babyl app[5]

The Babyl solution has revolutionized access to healthcare in Rwanda by allowing citizens to consult with healthcare professionals over the phone, avoiding long journeys and waits. With more than 2.5 million citizens subscribing, 2.9 million consultations carried out and 418 connected points of care, this initiative demonstrates the effectiveness of telemedicine to improve the accessibility and effectiveness of healthcare in the country.

The case of Senegal

Senegal has developed and validated a Digital Health Strategy 2018-2023[6] at an estimated cost of US$46 million for the first phase which spans three years for the following seven projects:

1. implementation of the "shared medical record" (SMR);
2. development of telehealth;
3. development of a HIS;
4. Implementation of the Health Geographic Information System;
5. Establishment of an integrated information system for the management and control of medicines and essential products;
6. Support for the digitalization of community health;
7. Support for the coordination, governance and management of the six projects.

Architecture adopted in several African countries

Several other countries, including Liberia, Gabon, Cameroon, Nigeria, Sierra Leone, South Africa and Kenya, have followed Rwanda's lead in adopting the OpenHIE platform, as shown in the figure below:

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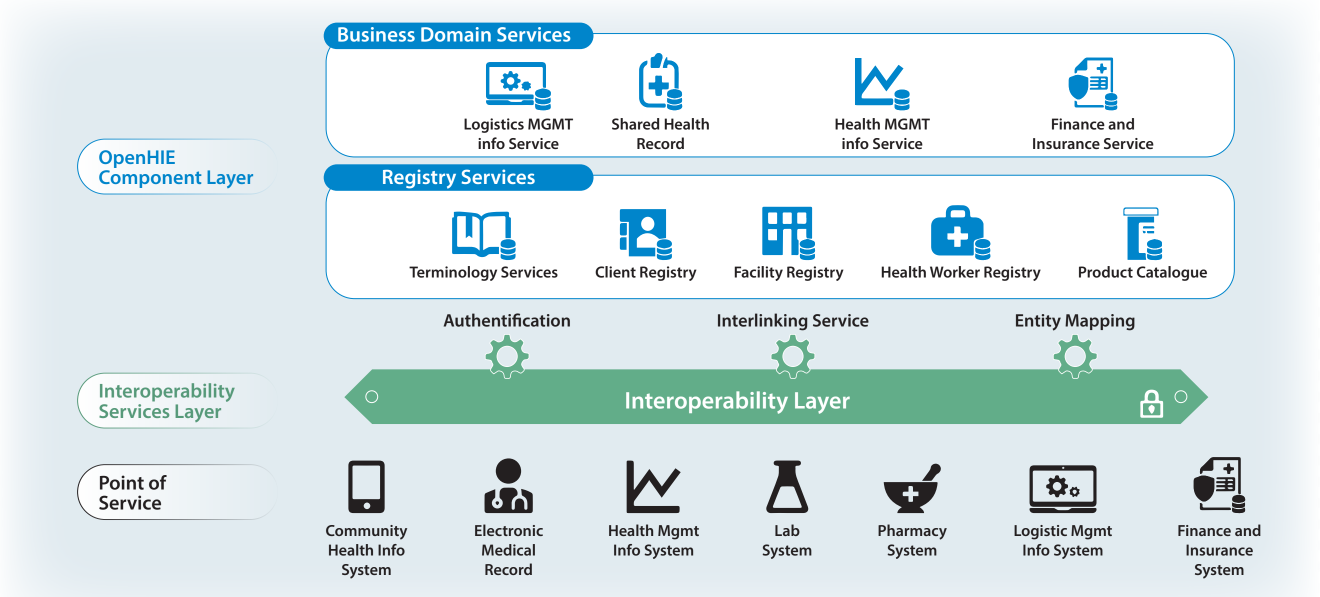
[5] https://www.babyl.rw/facilities/

[6] Senegal's Digital Health Strategic Plan (DHSP) 2018-2023.



OpenHIE 2021-09-29, CC By 4.0

openHIE Interoperability Framewor

The architecture of the **OpenHIE**[7] framework is formed by software components, all interacting/interopering to ensure that health data from various point-of-care systems is brought together in an exchange of health information. To do so, the exchange normalizes the context in which health information is created across multiple dimensions, including:

- Who received health services?
- Who provided the services?
- Where were the services received?
- What special care and services were received?
- What products may have been involved in the treatment?
- Who has financial responsibility?

The Case of the Startup Ecosystem in Africa[8]

Digital health startups and the investments that come with them are experiencing significant growth in Africa, with a fundraising of US$3.14 billion in the first six months of 2022, recording an increase of +140% compared to 2021. Notably, 83% of these fundraisers went to startups based in English-speaking countries such as Egypt, Kenya, South Africa, and Nigeria. Currently, there are 1,267 digital health startups operating across the continent, playing a critical role in healthcare delivery and distribution, 60% of which were established in the last five years.

Sharing health data during crises and natural disasters

The importance of managing social and health information in the event of natural disasters and/or emergencies is important in decision-making for a resilient health system, capable of overcoming the different challenges faced by public authorities in order to make health care accessible as quickly as possible. The availability of historical and shared information for citizens in the affected regions facilitates the intervention of health professionals.

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[7] https://ohie.org/

[8] Report 'Digital Health Trends' from the consulting firm Digital Health Partnerships (https://www.dhp.global/)

A 2021 World Bank report, Frontline: *Preparing Healthcare Systems for Shocks from Disasters to Pandemics*[9], calls for different actions to better prepare health systems to respond to a range of shocks, from seasonal increases in health needs to pandemics, climate change, and disasters. This report places great emphasis on digital health in its many aspects, particularly telehealth, mHealth and the shared patient record.

Regarding the issue of health data sharing, there was increased interest in it after the earthquake in southeastern Turkey on February 6, 2023. Local residents have been left without essential services such as electricity, gas and water, forcing them to take refuge in overcrowded shelters such as school sports halls. This precarious situation, especially for the elderly and those with chronic diseases, underscores the importance of effective health data sharing in the event of a crisis or natural disaster.

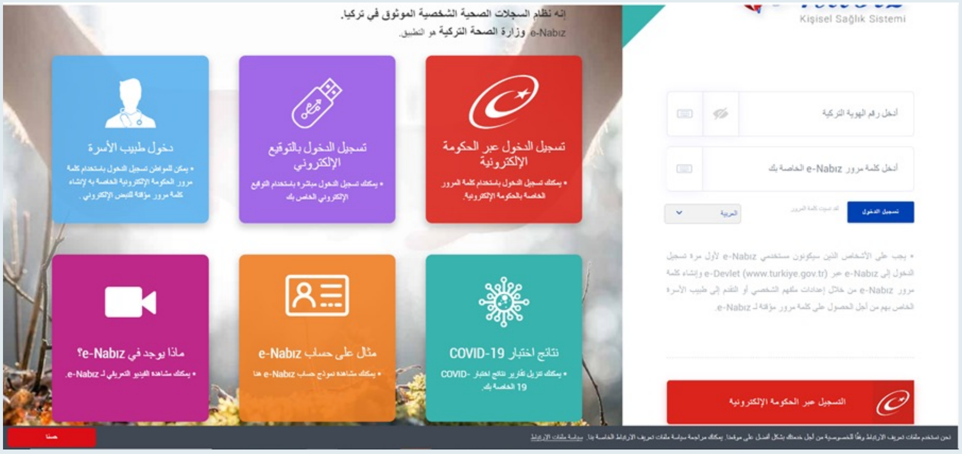
It should be noted that despite the regional chaos, the **e-Nabiz** health platform has proven to be very convenient for doctors and other health professionals working in the affected region. It has enabled healthcare professionals and citizens to access health data from various healthcare facilities via the internet and mobile devices.

e-Pulse

It is a personal health records management system that centralizes all health information, regardless of where the examinations and treatments are performed. It provides authorized physicians with access to their patients' medical histories within defined timeframes and limits, improving the quality and timeliness of diagnoses and treatments. In addition, the platform facilitates communication between patients and doctors.

e-Nabız was launched in Turkey in 2015 and has 71 million users. The app provides access to all examination records, from lab results and X-ray images to prescriptions, medication information and diagnostics.

e-Nabız received the award for "Best Health App" at the WSA (World Summit Award) in 2016. Thanks to e-Nabız, more than 879,000 organ donors are registered in Turkey. It has even gone beyond the borders of Turkey thanks to medical tourism, supporting different languages: Turkish, Arabic, English, French, German and Russian.



إنه نظام السجلات الصحية الشخصية الموثوق في تركيا.
e-Nabız وزارة الصحة التركية هو التطبيق.

تسجيل الدخول عبر الحكومة الإلكترونية
- يمكنك تسجيل الدخول باستخدام كلمة المرور الخاصة بالحكومة الإلكترونية.

تسجيل الدخول بالتوقيع الإلكتروني
- يمكنك تسجيل الدخول مباشرة باستخدام التوقيع الإلكتروني الخاص بك

دخول طبيب الأسرة
- يمكن للمواطن تسجيل الدخول باستخدام كلمة مرور الحكومة الإلكترونية الخاصة به لإنشاء كلمة مرور مؤقتة للنبض الإلكتروني.

نتائج اختبار COVID-19
- يمكنك تنزيل تقرير نتائج اختبار COVID-19 الخاصة بك

مثال على حساب e-Nabız
- يمكنك مشاهدة نموذج حساب e-Nabız هنا

ماذا يوجد في e-Nabız؟
- يمكنك مشاهدة الفيديو التعريفي لـ e-Nabız.

Kişisel Sağlık Sistemi

أدخل رقم الهوية التركية

أدخل كلمة مرور e-Nabız الخاصة بك

- يجب على الأشخاص الذين سيكونون مستخدمي e-Nabız لأول مرة تسجيل الدخول إلى e-Nabız عبر e-Devlet (www.turkiye.gov.tr) وإنشاء كلمة مرور e-Nabız من خلال إعدادات ملفهم الشخصي أو التقدم إلى طبيب الأسرة الخاص بهم من أجل الحصول على كلمة مرور مؤقتة لـ e-Nabız.

نحن نستخدم ملفات تعريف الارتباط وفقًا للخصوصية من أجل خدمتك بشكل أفضل على موقعنا. يمكنك مراجعة سياسة ملفات تعريف الارتباط الخاصة بنا. سياسة ملفات الارتباط

Overall, programmes such as e-Nabiz are essential to strengthen countries' preparedness and response to natural disasters. They maintain a continuous connection between healthcare professionals and patients, even after a disaster. The establishment of such programmes is particularly beneficial for countries that frequently face natural disasters, offering a solution to overcome major disruptions in health services and facilitating access to medical care.

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[9] World Bank : https://www.worldbank.org/en/news/feature/2021/04/13/frontline-preparing-healthcare-systems-for-shocks

Part 3

Morocco and its digital shift in health

Digitalization and sharing of health data in Moroccan public strategies

The recent evolution of the health system in Morocco, inspired by the High Royal Directions, demonstrates a significant acceleration in digitalization and the exchange of health data. These advancements, focused on implementing cutting-edge technologies and optimizing care processes, illustrate Morocco's commitment to modernizing its health infrastructure and improving access to care for all.

The speech delivered by His Majesty King Mohammed VI on July 29, 2020, was a pivotal moment, highlighting the need for extended social coverage and announcing ambitious projects such as the generalization of mandatory health insurance (AMO) and family allowances.

Recent initiatives, such as the shared medical record (SMR) project led by the MSPS and the electronic care sheet from the CNSS, mark significant steps towards achieving these goals. These actions, in addition to enhancing the security and confidentiality of health data, facilitate better coordination of care and a quicker response to the health needs of the population.

Morocco's e-health roadmap

The Health Plan 2025 was a major milestone in the digitalization and exchange of health data aimed at modernizing the country's health infrastructure. The plan envisioned key initiatives such as the establishment of an integrated National Health Information System and the development of a SMR. Emphasis was also placed on telemedicine, the implementation of the MSPS's IT master plan for digitalizing business, administrative, and financial processes in hospitals.

Although requiring regulatory adjustments, Morocco's e-health roadmap aimed for a significant digital transformation of the health system.

Telemedicine, encouraged by a regulatory framework established since 2015, represents a key solution for addressing healthcare access challenges.

The Royal Initiative for the deployment of mobile medical units in forty rural provinces illustrates a tangible advancement in the implementation of telemedicine[10]. These units, equipped with state-of-the-art biomedical equipment, enable in-person consultations and specialized teleconsultations, marking a significant step towards reducing medical deserts and improving access to healthcare. This system will facilitate the efficient collection and sharing of medical information.

The Ministry of Health's Information Systems Master Plan (SDSI)

The MSPS's strategic vision for the 2019-2022 period was explicitly unveiled through the SDSI, with a massive investment aimed at digitizing medical information and promoting its sharing, placing the patient at the center, with the ultimate goal of ensuring continuity and optimization of care.

A fundamental element of this ambitious strategy is the **IT infrastructure.** As a crucial pillar, this robust infrastructure is ready to support all future initiatives and innovations, ensuring the sustainability of the systems.

Cybersecurity is treated with utmost seriousness. Given the constant digital threats, preserving medical data is crucial. This level of security enhances trust in the system while protecting the integrity of medical data. Introducing a new dimension, a **sovereign cloud** has been set up. This initiative focuses on setting up secure digital storage fully controlled by the government, ensuring the sovereignty of medical data.

Subsequently, the **Hospital Information System** is integrated into this approach. It ensures a smooth orchestration of medical information and harmonization of processes at the core of hospitals.

At the pinnacle of this strategy, the Shared Medical Record is introduced. It centralizes medical information, making it available to all relevant professionals, thus guaranteeing continuity of care.

Accompanying this pyramidal vision, change management and "continuous training" are the essential pillars to support medical staff during this digital transformation, ensuring that they have the right skills for this new era.

The project of the generalization of social protection

The Royal speech delivered on July 29, 2020, by His Majesty King Mohammed VI on the occasion of the 21st anniversary of the Throne Day, marked a significant turning point in Morocco's social policy, particularly by announcing the generalization of social coverage. This ambitious project, scheduled to be deployed over five years starting from January 2021, aims to extend social coverage to all Moroccans, beginning with the generalization of mandatory health insurance (AMO) and family allowances, as well as retirement and unemployment compensation.

The implementation of this project required a profound restructuring and the accelerated digitalization of processes within the National Social Security Fund (CNSS). This digital transformation was highlighted by the online registration of over two million non-salaried workers, of which 330,000 have already started to declare their families to benefit from AMO.

Digitalization plays a key role in this initiative, particularly with the CNSS's launch of the Electronic Health Care sheet (FSE).

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[10] https://www.mapnews.ma/fr/activites-royales/sm-le-roi-pr%C3%A9side-la-c%C3%A9r%C3%A9monie-de-signature-dunecon-ventionrelative-au-1

The New Development Model (NDM) and the digitalization of health

The new development model[11] emphasizes the importance of digital technology as a lever for change. Indeed, digitalization is seen as a crucial means to improve the efficiency of public services, including healthcare. Through this digitalization, Morocco can not only enhance access and the quality of care but also ensure better resource management and a more effective response to the health needs of the population.

The framework law on the national health system in Morocco

Framework Law No. 06-22[12] relating to the national health system in Morocco has been a major advancement in accelerating the exchange of health data projects. This law is the legislative expression of a structural reform project, based on four fundamental pillars:

- **First of all, it aims to establish good governance by strengthening the regulation of actors' actions, at all levels:**
  - **at the strategic level, this implies the establishment of a High Authority for Health, an Agency for Medicines and Health Products and an Agency for Blood and Blood derivatives;**
  - **At the central level, this involves reviewing the missions, functions and organisation of the central administration;**
  - **At the territorial level, this implies the creation of territorial health groups.**
- **Secondly, it emphasizes the development of human resources, in particular through a new law on the public health service.**
- **The third pillar seeks to modernise the health offerings to meet citizens' expectations by facilitating access to medical services, improving their quality and ensuring a fair distribution of hospital services throughout the country.**
- **Finally, the fourth pillar focuses on the digitalisation of the health system, with the implementation of an integrated IT system to gather, process and exploit key information relating to the health system.**

By establishing a robust legal framework and defining precise guidelines, this law contributes significantly to the digital transformation of the Moroccan health system. It provides for the creation of an integrated national health information system, which is essential for the collection, processing and secure exchange of health data.

By revising the governance of the health system, the framework law promotes better use of health data, including the standardization of procedures, the guarantee of data quality and security, as well as their accessibility for informed decisions.

This framework law also contributes to strengthening the trust of citizens and health professionals in the data exchange system, by establishing a legal framework for their protection. It emphasizes the importance of the integration and interoperability of health information systems, which are fundamental for an efficient and secure exchange of data between different levels of care and the various actors of the health system. Thus, Framework Law No. 06-22 marks a decisive step towards a more modern, integrated, patient-centred healthcare system, where technology and data exchange play a central role.

The National Electronic Identity Card (CINE) for access to health services

The tripartite agreement signed between the Ministry of Health and Social Protection (MSPS), the General Directorate of National Security (DGSN) and the National Commission for the Control of the Protection of Personal Data (CNDP)[13] marks a significant step in accelerating health data exchange projects in Morocco. This agreement aims to utilize the digital identity of the national card to simplify and enhance access to health services.

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[11] https://www.csmd.ma/documents/Rapport_General

[12] http://www.sgg.gov.ma/BO/FR/2873/2023/BO_7178_fr.pdf

[13] https://www.mapnews.ma/fr/actualites/social/la-convention-sur-l%E2%80%99exploitation-de-l%E2%80%99identit%C3% A9-num%C3%A9rique-de-la-cnie-va-contribuer

It is part of the health system reform to support the generalization of social protection and health coverage, particularly in terms of the digitalization of health facilities. The agreement will enable the control and verification of patient identities, thereby securing the integrated medical information system adopted by the MSPS at care facilities. It will prevent the misuse of someone else's identity in medical records or for obtaining certain medications that require identity verification. Moreover, it will offer the possibility to include certain health data on the electronic chip of the national identity card, such as the patient identifier and the social protection identifier.

The dematerialization of the CNSS care sheet

The CNSS's project to dematerialize AMO pathways is positioned as a transformative initiative in the Moroccan health landscape. With a focus on technology and digitalisation, this project aims not only to improve the efficiency and quality of care but also to lay the foundations for a more integrated and connected healthcare system that can meet the needs of a growing and increasingly connected population.

The objective of the dematerialization of AMO processes is twofold: on the one hand, to improve the quality of service to customers and, on the other hand, to control the costs associated with the processing of AMO files. Through this initiative, the CNSS aims to reduce the need for customers to travel to its branches, while speeding up and improving reimbursement conditions. These improvements have a significant impact not only on client satisfaction but also on accessibility to care.

For healthcare professionals (doctors, pharmacists, laboratory technicians, radiologists, paramedics, etc.), dematerialization promises a more efficient working environment, with functionalities adapted to each specialty, thus helping in the prescription, diagnosis and management of drug interactions. Automatic recognition of prescriptions and interoperability with existing software aim to simplify the process, avoiding redundancy of entries.

For the insured and their dependents, the impact is also significant. In addition to direct improvements to care pathways and reimbursement processes, a mobile application will offer insured the ability to manage their medical records, track their reimbursements and be notified in real time of the different stages of their care pathway. This level of digital engagement is critical to ensuring better care management and increased transparency for patients.

The project also takes into consideration potential connectivity issues and envisions hybrid processes that allow for the continuity of care even in the absence of an Internet connection.

The approach adopted by the CNSS, which is transforming from a mere AMO file-processing entity into a true health insurer, underscores the importance of data for preventing, anticipating, and managing health risks.

Data sharing between different health stakeholders

PS ↔ CNSS

CNSS/PS ↔ ASSURES

PS ↔ PS

Medical Data/ History
Administrative Data

Medical Data
Therapeutic Conduct

Competent authorities in the field of health

PS: Healthcare Providers or Healthcare Professionals

Benefits of leveraging digitized health data

1

Optimization of patient care management

- Access to the patient's medical history and prescriptions.
- Exchange between health professionals.
- Accompaniment and monitoring of the behaviour of HCPs.

2

Medical prevention

Use of big data and artificial intelligence techniques to identify risk factors and implement appropriate prevention tools.

3

Ecosystem catalyst

- Detection of epidemiological and public health risks (information to the competent authorities).
- Data sharing* (universities/research centres, etc.).

4

Fight against fraud

Using data analytics to detect and anticipate fraudulent behavior.

*** Subject to prerequisites**

The development of the digital prescription should make it easier to obtain dematerialized information that could feed the SMR and thus improve the quality of the data collected.

The roll-out should be phased in over several phases. It will all start with the launch of a pilot in a region primarily targeting doctors and officials. After this initial phase, the project will be extended to other regions, including radiology centres, CNSS polyclinics and haemodialysis centres. In a later stage, the roll-out will concern laboratories and will be completed with the integration of clinics and oncology centers.

The framework agreement for the deployment of the Shared Medical Record and the Electronic Care Sheet between the MSPS, the CNSS and the ADD.

The agreement signed by the MSPS, the CNSS and the ADD at the beginning of 2024[14] aims to facilitate the compatibility of the SMR and the FSE through the implementation of a unified interface. The purpose of this interface is to ensure the harmonization of the two solutions, while ensuring their integration with the information systems of healthcare institutions and medical practices.

Aligned with the law on the health system, the agreement supports the digitalization of the sector and establishes a partnership framework to simplify medical monitoring and care reimbursement procedures. The agreement contributes to the project of modernizing the National Health Information System, strengthening the governance of the sector. The solutions deployed aim to improve access to health data, providing a seamless experience for patients and healthcare professionals.

Other Data Sharing and Exchange Initiatives

Our field exploration led us to meet various actors who have launched relevant and innovative projects at the heart of this dynamic of digitalization and sharing of health data. Although our exploration is not exhaustive, given that other experiments could also be of significant importance, we would like to present some of these projects below.

The Laboratory Information System (LIS) of the Ibn Sina University Hospital in Rabat

The importance of the exchange of health data, particularly highlighted in the project to duplicate the Laboratory Information System (LIS) of the Central Virology Laboratory (LCV) of the Ibn Sina University Hospital, is crucial. In times of crisis, such as the one caused by the Covid-19 pandemic, the effectiveness and speed of communication of health test results is vital. Not only do they directly influence treatment decisions and public health measures, but they also

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[14] https://www.mapexpress.ma/actualite/societe-et-regions/signature-rabat-dune-convention-cadre-deploiement-du-dossier-medicalsharing-paper-care-electronic/

have a profound impact on the management of the pandemic at the regional and national level. Previously, methods of communicating results – often by telephone or on paper – had become not only obsolete but also impractical in the face of the high volume of samples received. This lack of effectiveness in data sharing could hinder the timely and accurate follow-up of cases, thus delaying isolation or treatment measures and potentially increasing transmission of the virus.

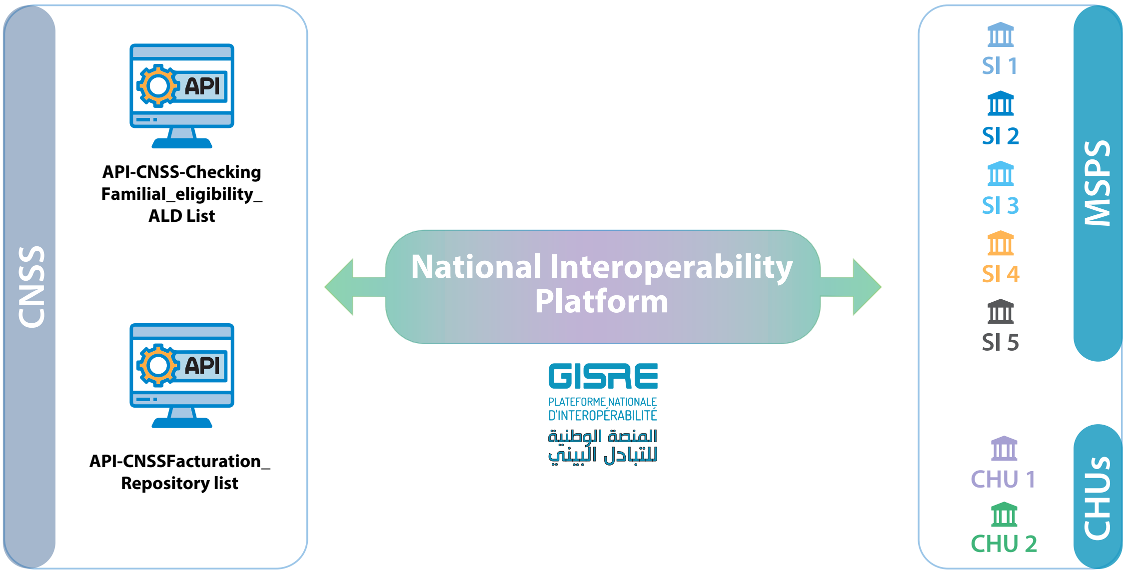
The introduction of a specific LIS for Covid-19 has radically changed this dynamic. By enabling immediate visualization and validation of results, this system has contributed to faster and more effective patient management, as well as better management of transmission and follow-up of contact cases. In addition, features such as mass sample validation and real-time statistics have optimized the lab's response capabilities, in a context where every minute counts.

This case illustrates the strategic importance of health data sharing, not only for the individual care of patients, but also for the development of public health strategies and the response to health emergencies.

TADAMON AMO: ADD's interoperability platform

The MSPS uses the ADD's GISRE[15] interoperability platform for data exchange with the CNSS, the managing body of the new TADAMON AMO scheme, which replaces the medical assistance scheme (RAMED).

In this context, the MSPS, through its hospitals and the CNSS, exchanges more than 120 data related to the patient and his medical file. Around 20,000,000 transactions relating to these exchanges passed through this national interoperability platform between December 2022 and August 2023.



This exchange of data between the CNSS and the hospitals makes it possible to simplify the treatments relating to the management of patients eligible for the TADAMON AMO and the billing of care.

As such, the GISRE platform can contribute to the exchange of patient data between the HIS managers and the MSPS central IS platform to retrieve a patient's care history and medical data and update in real time the patient data stored at the new MSPS IS platform.

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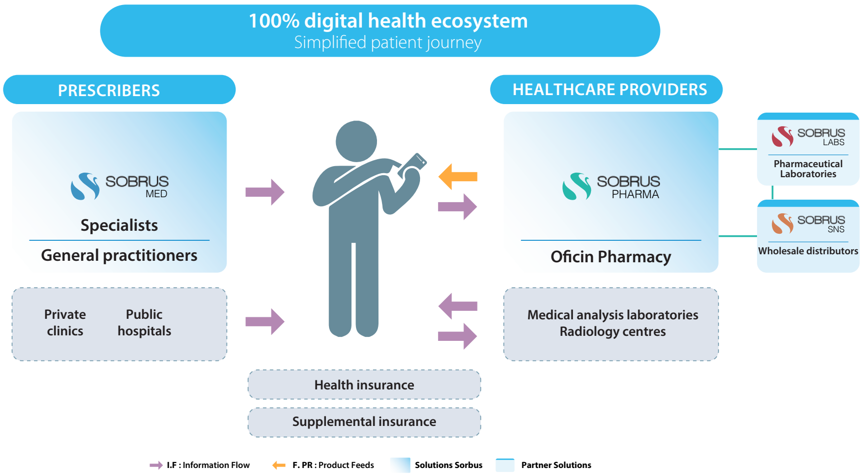
[15] https://gisre.gov.ma/

Digitization of the patient journey with the Sobrus solution



Sobrus represents a relevant example of the use of health data exchange in the Moroccan context. Faced with challenges such as digital accessibility, system interoperability and data protection, Sobrus has developed a solution focused on the centralization and digitization of health data. This initiative aims to reduce errors typically associated with traditional data management systems, thereby optimizing ordering and inventory tracking in pharmacies.

The Sobrus system, by unifying procedures following MSPS guidelines, ensures consistent execution nationwide. It offers a unified repository for secondary effects of medicines and unified inventory management, covering a wide range of players, including pharmacies, wholesalers and pharmaceutical companies. This comprehensive system enables an integral data exchange platform.

Nabady, a Moroccan medical network

Nabady is a 100% Moroccan platform launched in 2023, which aims to bring together all health actors on a single platform.

Nabady offers a range of advanced features to facilitate healthcare management, including online appointment scheduling, comprehensive electronic medical record management, teleconsultation with healthcare professionals, electronic delivery of prescriptions, as well as other innovative tools.

Nabady's goal is to simplify the patient journey and simplify the medical and administrative tasks of healthcare professionals that come with it.

Part 4

Health Data Sharing in Morocco: Realities, Opportunities and Challenges

Analysis and Lessons from Interviews and Surveys

Interviews with key stakeholders in the health ecosystem, along with three online surveys conducted among healthcare institutions, health professionals, and patients, are fundamental components of this white paper. They aim to provide a precise vision of the situation of health data sharing in Morocco, while offering a basis of factual strategic information.

A. Interviews

The interviews were conducted based on an interview guide with a target group of actors holding high responsibility and decision-making positions. This group consists of institutional representatives, public authorities, regulators, healthcare institutions, insurance and funding bodies, industrial players, professional associations, learned societies, universities, and training and research institutions.

General Observation

The general observation is that the framework law on the health system is the cornerstone of a fundamental transformation of the health sector in Morocco. This legislation provides the necessary regulatory and organizational framework to support a series of crucial initiatives aimed at modernizing and improving our country's health system. Among these initiatives, the generalization of medical coverage is of paramount importance. In parallel, the implementation of the electronic care sheet is a significant advancement that will simplify the management of medical records. The deployment of Hospital Information Systems (HIS) on a national scale is a major step towards the complete digitalization of the health sector and will enable effective management of health data, ensure more precise medical monitoring, and facilitate the sharing of his information between care institutions.

Finally, the generalization of the use of digital technology in Moroccan society is a positive trend. This means that these digital technologies are increasingly accessible to a wide range of citizens, which promotes the adoption and use of digital health solutions in the country.

Overall, these initiatives and developments demonstrate Morocco's commitment to modernizing its health system and providing better quality care to its population.

However, it is important to highlight certain delays and significant gaps, particularly regarding the limitation of information sharing among different national data producers, the absence of monitoring, reporting, planning, and real-time decision-making, as well as access to complete and reliable information.

1. How do key health stakeholders in Morocco perceive the issue of health data exchange and sharing?

All interviewed stakeholders share the same view on the positive contribution of health data exchange and sharing. This sharing represents a crucial pillar in improving the healthcare system in the country. It offers numerous benefits, notably by streamlining and enhancing patient care pathways.

By organizing the healthcare system around the patient, it promotes more coherent and personalized care.

> *"An internal patient pathway, from admission to discharge, can be streamlined through digitalization, thus improving the patient experience."*

Another significant advantage is the availability of medical information, which enhances the quality of care by facilitating access to patients' medical histories. This helps avoid redundant medical examinations and inappropriate treatments, which can significantly reduce healthcare costs.

> *"Making data available digitally improves the patient experience and safety, puts stakeholders at the same level of information, improves the economics of care, helps with planning, and supports teaching and research."*

Furthermore, the sharing of health data creates valuable data pools for medical research. This data can be used to monitor the progression of certain diseases and detect health risks more rapidly, which is particularly crucial in the context of epidemic prevention and public health improvement.

For healthcare professionals and insurers, the exchange and sharing of health data can only be conducted through a shared and secure patient record, capable of surpassing the current use of unsecured consumer communication tools.

According to the majority of interviewed stakeholders, Moroccan citizens are favorable to the adoption of digital technologies. However, the determining factors remain the environment, the regulatory framework, the level of digital maturity, and especially the adherence of healthcare professionals

2. What is the current situation of health data digitization and sharing in Morocco?

General observation reveals the implementation of numerous initiatives in recent years aimed at promoting digital health. However, without a coordinated overall approach by the state, these efforts often remain fragmented. Additionally, the absence of a well-defined patient pathway leads to interruptions and inconsistencies in care.

Regional infrastructure remains insufficient, leaving some areas not fully covered by communication networks.

The lack of coordination and collaboration among different health sector players also represents a major challenge, leading to duplications and gaps in health data management. Furthermore, the absence of a unique patient identifier further complicates care coordination.

Regarding the health information system, the current situation reveals an inadequately computerized system, characterized by difficulties in data collection and exploitation. These data are often scattered across various applications and information systems, sometimes redundant. Despite efforts by the MSPS, there is a significant delay in the implementation of Hospital Information Systems (HIS). This considerably hampers the digitization and sharing of data.

Moreover, the lack of computer equipment in private medical practices limits the effective participation of private healthcare professionals in the sharing of medical data. His problem is exacerbated by the reluctance of some to engage in data-sharing networks.

“Medical practices are only partially equipped with IT tools, which are mainly used for internal management.”

Furthermore, due to their limited familiarity with digital tools, many healthcare professionals continue to prefer using paper. Their age also seems to influence the adoption of these tools, with younger practitioners generally more inclined than older ones to use them.

It is also essential to note that there is a limited supply of national software solutions, which encourages the importation of foreign solutions that must be adapted to the local context, sometimes requiring substantial modifications with significant investments.

Other barriers to the digitization of health have adapted been mentioned, including the high rate of illiteracy, particularly among rural populations and women.

For healthcare professionals in the private sector, the situation is heterogeneous. Interviews with officials from some foundations and large groups have revealed the implementation of information systems that are more or less compliant with interoperability standards and integrated with other information systems such as those of laboratories and medical imaging.

Thus, many health data are already digitized, including radiology and imaging data, various examination data, and medical records, among others. However, it should be noted that these data remain local and are not shared. But this situation is not widespread across all private clinics. Although some facilities are beginning to implement a “basic start” of a shared medical record, their information systems are primarily oriented towards managing appointments and billing medical procedures.

Furthermore, it should be noted that computer software is not perfectly adapted to the digital maturity of health institutions, and the telecommunications infrastructure and data centers in Morocco currently do not allow for the availability of data at reasonable costs.

For the information technology professionals we met, despite conducting numerous studies, there is a notable gap between strategic thinking and the implementation of concrete operational actions.

For them, several challenges remain. Among these, we can mention the poor connectivity in rural areas, limited integration of information systems, lack of interoperability and usable data sources, suboptimal management of public hospitals, inadequate training of healthcare professionals, the absence of a unique patient identifier, and the constant threat of cybercrime. These potential obstacles represent real barriers to the development of digitization and data sharing.

“ The system assigns a patient index (IPP) that identifies them by the combination of their National ID (CIN), name, and first name... This index can be inaccurate if the patient does not have their CIN.”

Regarding the use of health data, there is observed restricted use in hospitals and various health services, whether public or private. This use is often done through specific, offline, and compartmentalized software, and used mainly to manage logistics.

The current legal framework struggles to adapt to the rapid technological evolution in the field of digital health, which can lead to legal uncertainties and gaps in data protection.

> *"The current legal framework is slow to keep pace with technological developments, in particular because of certain legal requirements in terms of archiving that force healthcare players to move at two speeds."*

For actors involved in health education and research, the use of health data remains limited due to the decentralization of data at the local level and the challenges of effectively collecting population-representative data.

3. What are the challenges and benefits of digitalization and health data sharing in Morocco?

Challenges and positive impacts

The importance of health data sharing is clearly recognized by various stakeholders :

- From a public health perspective, it offers the opportunity to better understand the epidemiological transition and the challenge of an aging population, thanks to improved monitoring and management of chronic diseases, thus facilitating their prevention and care.
- From a professional perspective, it facilitates access to patients' medical history, particularly in emergency situations, resulting in better quality and safer care, informed decision-making, and reduced medical errors.
- From the patient's perspective, it allows the healthcare system to be centered around their needs and preferences, offering more personalized care that will help build their trust in health services.
- At the territorial level, the shared medical record is a crucial pillar for the development of e-health, particularly for telemedicine and remote consultations.
- In medical research, it fosters the emergence of new knowledge and innovative treatment solutions, paving the way for the discovery of more effective and economical treatments and the early detection of health risks and epidemics.
- Economically, it significantly reduces the cost of care. By avoiding duplication of exams and tests, it generates substantial savings.
- By encouraging preventive medicine, it helps to preserve the population's health, thus reducing the pressure on the financial resources of health insurance. This includes reducing administrative costs, improving professional productivity, and reducing costs related to medical errors.
- Moreover, it supports the health industry by creating new commercial opportunities. The development of data-sharing technologies stimulates economic growth, thus fostering innovation and job creation.

Key Success Factors

At the end of our interviews, we identified several prerequisites and key factors for the success of a digitized and shared medical record in Morocco, which we summarized at four levels of maturity:

- **Technological maturity**, by the generalization of health information systems nationwide, ensuring completeness, reliability, and real-time access to data. This initiative must encompass care facilities and health professionals in the private sector to ensure comprehensive coverage, and by implementing interoperability of health information systems for seamless data exchange. A crucial aspect of this approach is to establish a unique identifier for patients (which will help ensure data uniqueness and enhance coordination). Finally, it is recommended to involve all stakeholders from the design phase of any national information system project. This collaborative approach is essential to drive widespread adoption and minimize interoperability risks.
- **Societal and cultural maturity,** which involves two crucial aspects. On one hand, practitioners need to be encouraged to adopt health information systems, as many currently see them as a burden in the absence of appropriate incentives. On the other hand, it is necessary to enhance the technical mastery of healthcare staff on technological platforms and their interpersonal skills to enable effective communication with patients through these interfaces.

Similarly, a cultural shift among Moroccan citizens is needed to encourage them to play an active role in the datasharing process, which cannot occur without their consent.

- **Legal maturity**, through the establishment of a robust legal and regulatory framework, which must define the rules, standards, rights, and responsibilities of all parties involved, ensure the protection of health data, enable secure and seamless sharing, and anticipate potential risks. For this, close collaboration between legislators, health professionals, cybersecurity experts, and patient rights advocates is essential. Solid legal maturity will strengthen the trust of stakeholders and facilitate the widespread adoption of health data sharing.
- **Economic maturity**, the implementation of health data sharing systems requires considerable investment. In addition to initial expenditures, their maintenance and regular updating must be ensured. These recurring costs must be borne by health facilities and professionals, necessitating adequate budgetary planning. Therefore, it is crucial to establish sustainable economic models for both health establishments and professionals as well as technology service providers, which could include financial incentives.

4. What are the risks, and what regulation and governance for this data sharing process?

Risk & Safety

All interviewees unanimously recognize the importance of protecting personal data. They emphasize that this protection should be guaranteed through close partnership with the CNDP (National Commission for the Control of the Protection of Personal Data). The identified risks are varied, including the use of unsecured messaging for exchanging confidential patient data, breaches of confidentiality, unauthorized access, quality defects or errors in transmission and handling that could endanger patients' health, incomplete, unreliable, or erroneous information that could affect the quality of data, inappropriate use, storage outside Morocco, unauthorized exploitation by technology giants (GAFAM), and illegal commercialization.

To minimize these risks and establish trust, various stakeholders agree on the need to establish robust mechanisms for information and health data security, starting with ensuring all care providers comply with the provisions of Law 09-08 on the protection of personal data and the application of Law 05-20 on cybersecurity. These mechanisms would include data encryption, access authorization management, the use of electronic signatures, and the national health identifier for patient authentication. Other essential elements mentioned include the need to preserve national sovereignty concerning digital solutions, networks, and data hosting to ensure the security and sustainability of information systems.

Regulation and governance

To promote the sharing of health data while minimizing risks and enhancing security, regulatory and management issues in this area have been extensively discussed by the majority of interviewed stakeholders. They unanimously advocate for an evolution of the legislative and regulatory framework regarding the protection of personal data, taking into account the respect for medical secrecy and patient medical data privacy (in accordance with directives from CNOM, the code of ethics, CNDP, Law 09-08, the penal code, etc.), while capitalizing on the existing national framework for information system security (referring to DGSSI and Law 05-20, for example).

In an environment characterized by a diversity of solutions for the shared medical record (SMR), data exchange requires standardization of rules. In this regard, the creation of a specific regulatory mechanism is necessary to standardize the solutions offered by SMR publishers through, among other things, specifications, usage guidelines, and patient protection measures.

Regarding the implementation of a device such as the shared medical record, the majority of interviewees recommend that the responsibility should fall to the MSPS, in collaboration with various actors, particularly those from the private sector, to ensure inclusive governance.

5. What are the main perspectives and expectations of the various parties?

Perspectives and Ongoing projects

Given these observations, it is clear that various actors in the ecosystem are fully aware of the issues related to health data sharing. However, it is now imperative to move from reflection to action. This was emphasized during our interviews with different stakeholders, assessing ongoing projects and their prospects.

Regarding public authorities, it is worth noting the efforts made by the MSPS to implement an HIS in the 12 health regions of the Kingdom, ensuring interoperability with existing HIS in university hospitals and the outpatient system. Moreover, the SMR is clearly integrated into the ministry's reflections and strategies. Interoperability is also at the heart of the concerns of the Digital Development Agency (ADD), which has set up a dedicated platform and continues to explore this area.

For managing bodies, particularly the CNSS, the main challenge lies in the dematerialization of exchanges with actors in its ecosystem. As the main manager of AMO and aggregator of medical data, the CNSS plays a crucial role in processing, sharing, and multidisciplinary exploitation of health data. It already holds information regarding medical procedures and medications consumed by the insured. This consumption data constitutes a solid base on which any initiative to implement a SMR must rely.

However, it is essential that this reflection goes beyond the public sector to actively include the private sector.

Expectations and recommendations

Following the interviews, participants were asked to express their expectations and make recommendations to promote the sharing of health data. The main expectation, widely shared, concerns the implementation as soon as possible of a national and interoperable SMR, accompanied by a national patient identifier.

> ***"With the advent of the national population register (RNP), it is the identifier assigned at birth that will serve as the identifier for the SMR."***

This SMR should place the patient at the heart of the system by facilitating access to all their medical information in a centralized manner. However, before realizing this initiative, it is imperative to bridge the digital divide and overcome cultural barriers. Additionally, it is important that the use of the SMR does not translate into increased administrative burden for healthcare professionals. Therefore, it is essential to involve them, particularly those from the private sector, in the design of the system.

> *“A public-private partnership with broad consultation is the best configuration to manage the various issues related to data exchange.”*

> *“User involvement is also a key factor for success.”*

> *“Professionals are more likely to adopt new tools when they allow them to perform their activities more easily and in less time (e.g., quick access to patient history).”*

Regarding the security and integrity of data and exchanges, the priorities highlighted are mainly the strengthening of legislation to make it more suited to the protection of health data. This includes the precise definition of the responsibility of healthcare professionals and the promotion of compliance in data processing and exchange by actors, particularly healthcare professionals. Moreover, the need for a national solution for hosting health data is clearly emphasized to ensure data security and sovereignty.

It is also essential to clearly identify the intended uses for health data and to precisely define which data should be shared.

Regarding governance, it is recommended to establish a clear framework, with the management of the system by a public actor, notably the MSPS.

> *“The implementation of a shared national medical record must be led by an actor who can unite all stakeholders.”*

To promote the adoption of health data sharing practices, support for healthcare professionals through incentives for equipment is highly desired.

> *“A change strategy and organizational measures remain key to fostering the adoption of change…”*

Finally, to harmonize practices regarding the electronic health record (EHR) in health institutions and among healthcare professionals, the establishment of a specification aimed at standardizing the solutions of EHR publishers is expected.

> *“The SMR cannot be designed without taking into account electronic health records (EHR)... HIS and EHR are prerequisites for any exchange and sharing process.”*

B. Digital Surveys

a. Profile of survey participants

As part of our comprehensive study on health data exchange, we conducted a field survey across Morocco during the first half of 2023 involving various key stakeholders in the data-sharing process. Their participation was crucial for a deep understanding of the challenges and opportunities associated with this process. The respondents who contributed to this survey include the following profiles:

Health facility staff

- Number of participants: 3,435
- Profile: medical and administrative staff.
- Type of health facility:
  - public hospitals (15%);
  - primary health care facilities (35%);
  - private clinics (10%);
  - pharmacies (15%);
  - analytical laboratories and radiology centres (5%);
  - others (delegations, directorates, agencies) (20%)

Private Practitioners

- Number of participants: 1,033. • Profile: Physicians providing health services in private practices and outpatient clinics
- Specific distribution:
  - medical specialists (50%);
  - general practitioners (34%);
  - dentists (16%);
  - age: 60% of private doctors are over 55 years old;
  - gender: 70% are men, 30% are women.

Citizens

- Number of participants: 1,345.
- Profile: individuals from diverse regions and socio-economic backgrounds, representing a cross-section of the population and their interaction with the health system.
- Additional demographic information:
  - gender: 67% are men, 33% are women;
  - level of education: 67% have a baccalaureate + 5 and above;
  - sector of employment: 68% work in the public sector.

b. Key findings of the survey

The participants' responses gave us a better understanding of the current situation and the challenges for the digitalization and sharing of health data.

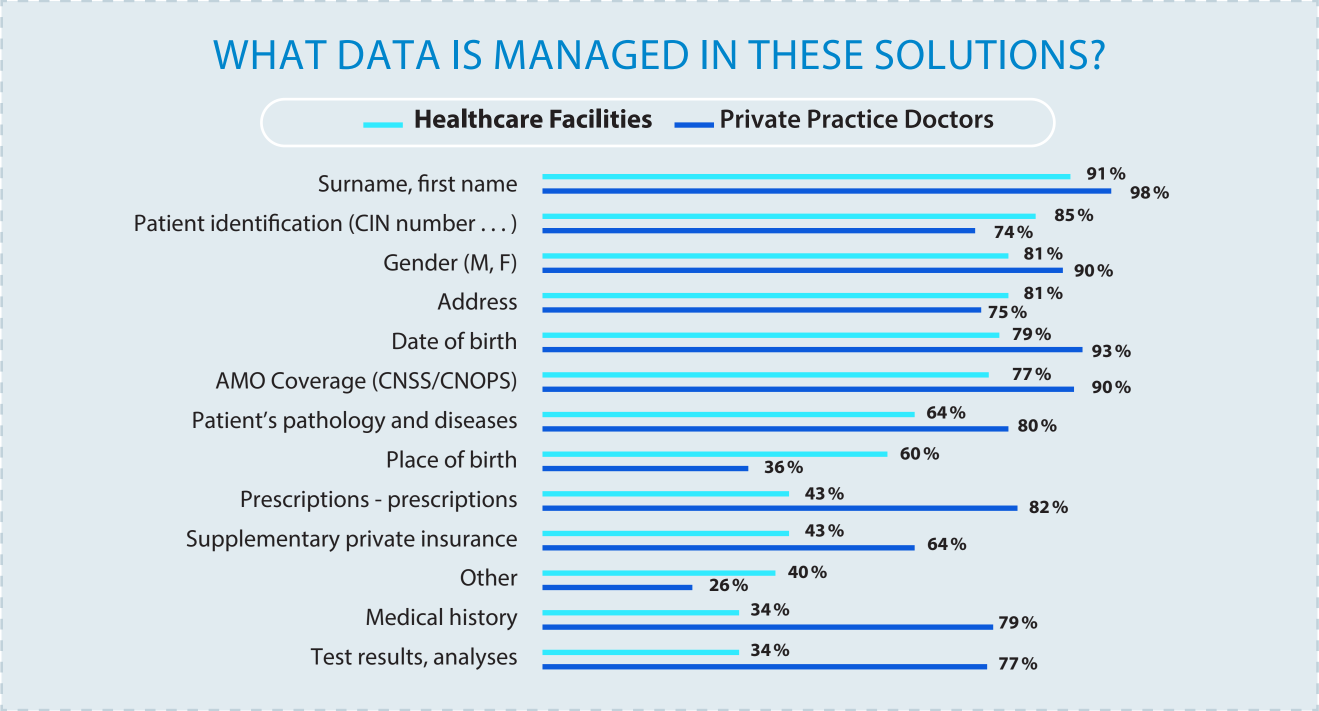
1. Status of Computerization of Patient Records

- Overall, 70% of facilities do not have electronic patient records. This includes the entire ecosystem, namely: public hospital, primary health care facility, private clinic, radiology center and analytical laboratory, pharmacy and other agencies and delegations. This gives an idea of the path to be taken for a complete digitized patient journey.
- More than 80% of the public hospitals surveyed are equipped with an EHR. On the other hand, only half of private clinics say they have implemented such a system. This disparity between the public and private sectors could reflect variations in access to resources or in the priorities given to digitalisation.

- One-third of pharmacies, or 33%, confirm that they have an EHR, revealing the specific challenges the pharmaceutical industry faces in terms of data management.
- 75% of radiology centers and analytical laboratories report having adopted these systems, highlighting a relatively high integration of digitalization into diagnostic services.
- Half of the private doctors surveyed indicated that they do not use electronic patient records (EHR).
- More than 60% of medical specialists have an EHR, while only 30% of general practitioners report having one. This difference highlights the gaps in the adoption of information technology between different medical specializations.

These data highlight the disparities in the implementation of patient record digitalization among different actors in the health ecosystem in Morocco.

2. *Health data produced and exchanged*



WHAT DATA IS MANAGED IN THESE SOLUTIONS?

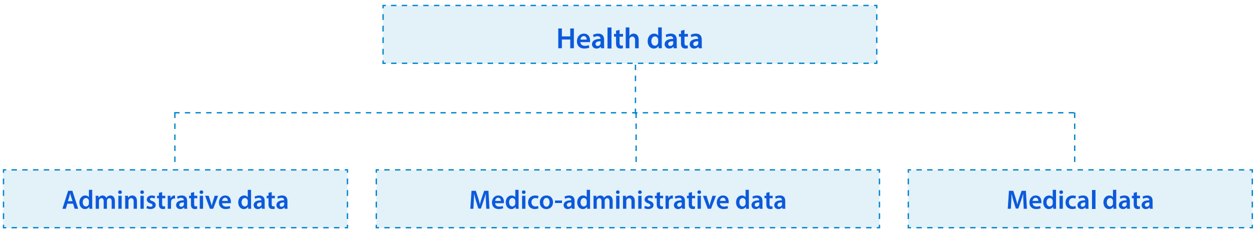
- Patient names and surnames are almost universally managed, with 98% of private practice doctors and 91% of healthcare facilities handling this information. The same goes for dates of birth, managed by 93% of private practice doctors and about 79% of healthcare facilities.
- The patient identifier is a critical piece of data but is only collected when provided by the patient. Approximately 85% of facilities and 74% of private practice doctors request it.
- Information related to AMO (CNSS/CNOPS) coverage is also widely used. These data are important in the administrative management processes of patient care.
- Private supplementalry insurance data are more frequently managed by private practice doctors (64%) than by healthcare facilities (43%).

In summary, private practice doctors and healthcare facilities manage a wide variety of patient data, with particularly high management of identification and health insurance coverage information.

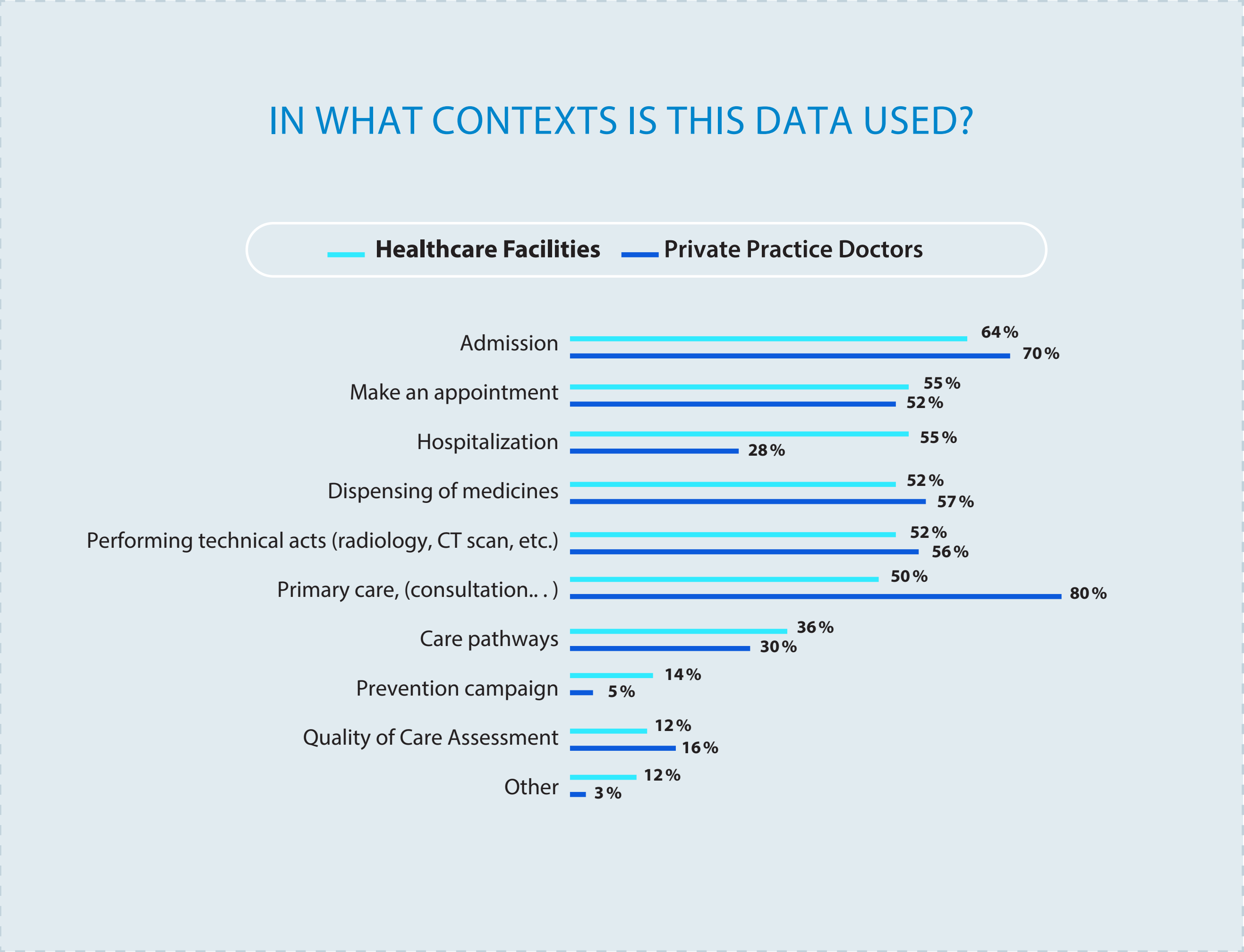
Beyond the standard data mentioned, healthcare professionals aspire to collect additional information specific to their fields of activity. Public hospitals are particularly interested in data related to monitoring, protocols, complications, adverse events, and information about treating physicians. Similarly, information on hospitalizations, admissions, billing, collections, as well as vaccines, blood groups, and patient contacts are considered valuable.

Pharmacies note a need to manage contact and credit information for some patients, while radiology centers and medical diagnostic labs emphasize billing and clinical details. Moreover, information such as personal and family medical histories, national health identifiers, and evaluations of treatments received are also deemed important. This reflects a trend toward a more integrated and personalized approach in healthcare management.

In general, the data managed by the surveyed healthcare facilities and professionals can be categorized into three broad categories:



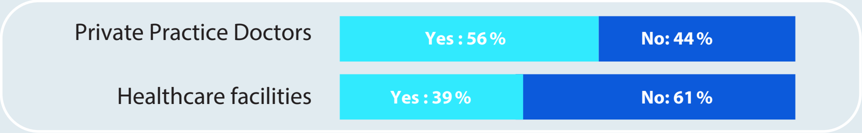
3. *Context of use of health data*



In summary, health data are used at various levels. They are involved in admissions and hospitalizations in healthcare facilities, in scheduling appointments and consultations with private practice doctors, and in the dispensing of medications. Similarly, they are utilized in performing technical acts such as radiology and scans. Although to a more limited extent, they are also used for prevention and quality of care assessment.

4. *Accessibility of patient data*

IS PATIENT DATA ACCESSIBLE WHEN NEEDED?



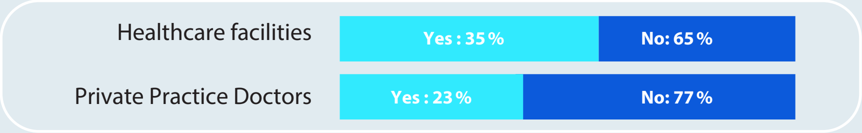
Another critical aspect of the study focused on the availability of patient data when needed for healthcare. Data accessibility is fundamental to ensuring continuity and quality of care, and the results reveal notable variations:

- The majority of private practice doctors (56%) report having access to patient data when needed. However, a significant portion (44%) indicates the opposite, raising concerns about the ability to effectively meet patient needs in the absence of these essential pieces of information.
- Access to data poses an even greater problem in healthcare facilities, where only 39% confirm having access to patient data when needed. Overall, about 50% of healthcare professionals

Overall, about 50% of healthcare professionals report that patient data are not accessible when needed. This revelation highlights a major issue in the field of health information exchange and underscores the imperative to improve information systems for more effective management of patient data.

5. *Practices of exchanging health data in digital format*

EXCHANGING HEALTH DATA IN DIGITAL FORMAT
WITH OTHER ACTORS

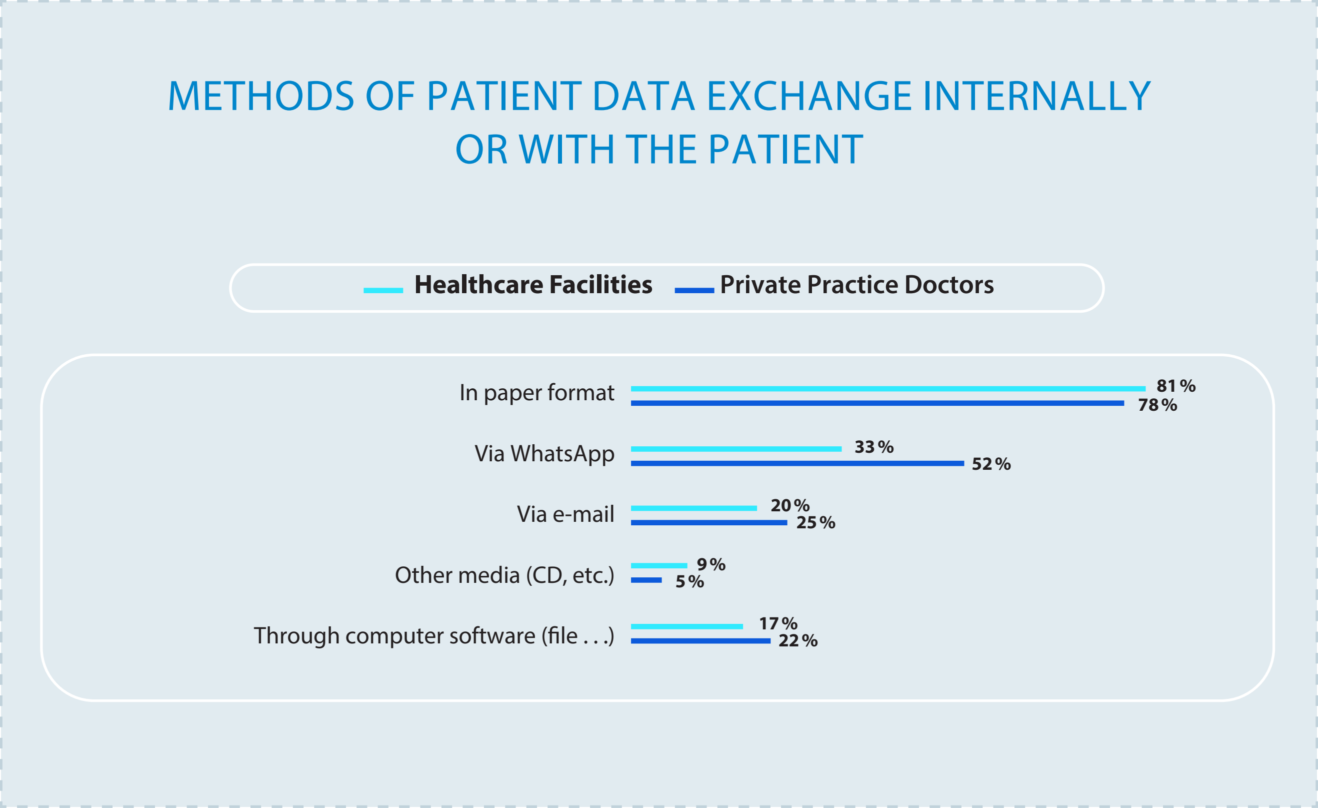


One of the pillars of a modern and integrated health system is the ability to exchange health data efficiently between different actors

- Among the healthcare facilities surveyed, only 35% report that they exchange health data in digital format with other actors. This means that the majority, or 65%, do not participate in this exchange, suggesting significant barriers to interoperability or the adoption of compatible systems
- The exchange of health data is even less common among private practice doctors, with only 23% confirming that they engage in this exchange, highlighting potential challenges related to technological infrastructure, training, or issues of data privacy and security.

Overall, the exchange of health data in digital format is not widespread in Morocco. This observation reveals the need to facilitate communication and collaboration among various health professionals and to improve the exchange of health data in digital format. Establishing common standards, training healthcare professionals, and investing in suitable technologies could help overcome current obstacles.

6. *Methods of Patient Data Exchange*



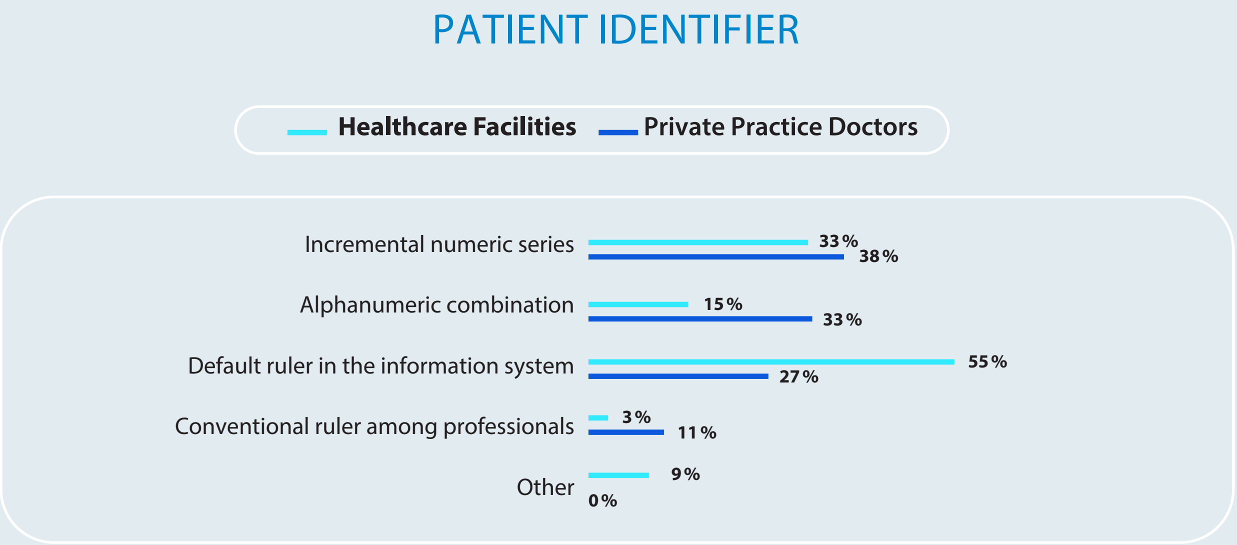
METHODS OF PATIENT DATA EXCHANGE INTERNALLY OR WITH THE PATIENT

An essential component of healthcare management is the method used to exchange information between healthcare professionals or with patients. The survey highlighted the predominant means of data exchange:

- **Internally and with patients**, our survey results highlight the predominance of paper format in information exchanges, with 78% of private practice doctors and 81% of healthcare facilities still using it. This traditional exchange method raises questions about the security, efficiency, and accessibility of data.
- **Regarding the use of messaging apps**, WhatsApp is used by 52% of private practice doctors and 33% of healthcare facilities as a means of exchanging information. Although convenient, this method raises concerns about privacy and compliance with health data regulations. Email, on the other hand, is used by 25% of private practice doctors and 20% of healthcare facilities, while other media like CDs are used by 5%.
- Concerning the use of software dedicated to the exchange of health data, it is reported by 22% of private practice doctors and 17% of healthcare facilities, indicating a gradual adoption of more secure and integrated digital solutions.

Generally, paper format and WhatsApp remain the most common exchange methods among health professionals, highlighting the need for a transition to secure digital solutions compliant with data protection standards. This transition is a major challenge for the modernization of the Moroccan health system and for protecting the confidentiality of patient data.

7. *Patient Identification in the Healthcare System*



Regarding patient identification, a key element in management and continuity of care:

- 33% of healthcare facilities and 38% of private practice doctors use an incremental numeric series to identify their patients;
- 15% of healthcare facilities and 33% of private practice doctors use a more complex, potentially more secure approach with a combination of letters and numbers for patient identification;
- More than half of healthcare facilities (55%) use the method predefined by their information system, a practice that simplifies data integration and can vary depending on the solution used;
- 11% of private practice doctors and 3% in healthcare facilities use conventional rules established among them for patient identification;
- Finally, other less common methods, including various non-standardized approaches, have also been reported.

Patient identification remains characterized by a wide variety of practices. Establishing unified and nationally recognized standards could play an essential role in improving care coordination, the accuracy of medical records, and the security of health data exchanges. This standardization process would help establish a common basis for patient identification, thus enhancing the quality and consistency of medical information within the health system.

8. *Right of Access to the Shared Medical Record*

The goal is to identify stakeholders who can have access (both contributing and consulting) to a shared medical record in Morocco. The findings are as follows:

- Doctors: They are unanimously considered to have the right of access and contribution to the record, reflecting their central role in patient monitoring
- Pharmacists, medical laboratories, and radiologists: They are widely recognized for their essential contribution to the medical record, contributing to therapeutic monitoring;
- Nurses and paramedical staff: Their access to the record is generally accepted, with their role in daily care and record maintenance considered important.

- **Administrative staff**: Although their access is more limited, their role in updating administrative information is recognized as important.
- **Patients**: There is a consensus for unlimited patient access to their medical records, although they are less involved in updating them.
- **Healthcare managers and technicians**: Their access and role in updating the records vary according to opinions, suggesting diversity in practices and policies within health establishments.

These results highlight the complexity of managing access to medical records and underscore the need for in-depth reflection on privacy, data security, and information governance policies.

9. Citizens' feedback on health data sharing

Although citizens instinctively regard health data as personal and confidential items they own, they also naturally associate them with the concept of sharing.

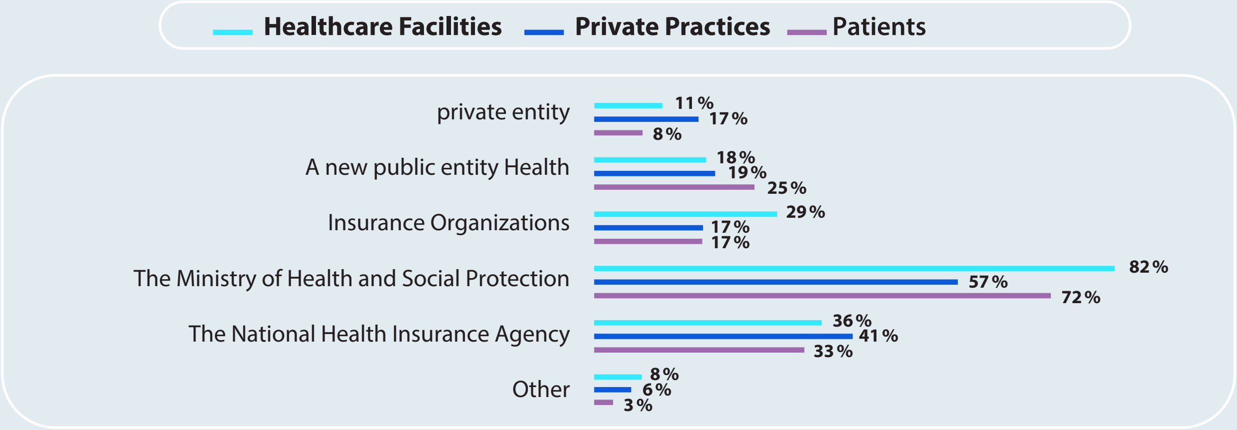
When describing health data, respondents envision sharing both in their personal interest and for the benefit of the health system. This sharing is deliberately done with healthcare professionals, health institutions, and entities like health insurance funds.

For citizens, the issue of health data sharing is not controversial as they recognize its beneficial role in the patient journey. However, their concerns focus on how this sharing is executed. They demand ethical and responsible use, fearing that their health data could be exploited for commercial purposes. Their main worry is about the individual use of their data and the judgments that could result from it. Participants unanimously acknowledge the ubiquity of health data, noting that it appears in examination results and reports, on prescriptions, and even on doctors' computers (when they have one). Perceived as sensitive elements, health data raise concerns among some participants, particularly when digitized, fearing potential hacking. Our survey gathered information on citizens' experiences and preferences regarding health data sharing:

- **Sharing data in clinical contexts**: A large majority of citizens, 64%, choose to share their health data during hospitalizations and consultations. This reflects a recognition of the crucial value of these data in continuity of care.
- **Access to medical histories**: 70% of citizens report difficulties accessing their analysis and radiology histories, highlighting gaps in access to essential health information.
- **Data ownership**: Nearly all respondents, 87%, express a desire to be recognized as the legitimate owners of their health data and aspire to exercise control over its use and sharing. This strong sentiment underscores the need for a more transparent system focused on patient needs.
- **Sharing preferences**: Nearly all participants, 94%, favor sharing their information with their treating physicians. Additionally, half of them (50%) express a desire to share their data with their health insurance, while less than 30% are willing to share it with administrative authorities or private actors.

These feedbacks clearly show among citizens the desire for a more inclusive health system that promotes transparency and respects confidentiality. They also highlight the need for health information systems that not only secure data but also make it easily accessible to patients and authorized healthcare professionals.

10. *Governance of the National Medical Record: Perspectives and Preferences*



ACTORS RESPONSIBLE FOR THE IMPLEMENTATION AND OPERATION OF A NATIONAL MEDICAL RECORD

The setting up of a national medical record requires reliable and competent management. Through our survey, we have gathered opinions from various health sector stakeholders on the entity they perceive as most capable of assuming this responsibility.

- The Ministry of Health and Social Protection is widely endorsed, with 72% of patients and 82% of healthcare facilities supporting this option, affirming its leadership role in managing public health initiatives.
- Health insurance organizations receive approval from 29% of healthcare facilities, reflecting their daily role in processing health data.
- The proposal for a new public entity is supported by 25% of patients who express an interest in an institution entirely dedicated to the governance of health data.
- The involvement of private entities is only favorably considered by a minority of patients (8%) and healthcare facilities (11%), revealing some reluctance to privatize the management of health data.
- These results highlight a strong consensus in favor of public governance of the national medical record, while also opening the discussion on the opportunity to create a specialized digital health agency focused on innovation and digital specialization.
- Private entities receive limited support, indicating potential concerns about the privatization of the management of sensitive health data.
- Other mentioned actors show a preference for a more diverse and potentially innovative approach, even though these options only receive minority support.

The strong preference for management by public entities, particularly the health ministry and potentially a digital health agency, underscores the desire for transparent and secure governance of health data.

The introduction of a digital health agency could combine the authority of the ministry with specialized expertise in health technology, thus offering an optimal solution.

Lessons learned from interviews and surveys

• A conducive context for the digitisation and sharing of health data

the framework law 06-22, concerning the national health system, lays the foundations for a major reform, setting out strategic orientations that will guide the modernization of the sector and dedicating a chapter to the digitalization of the health system.

Among current initiatives, five previously mentioned initiatives stand out: the generalization of medical coverage, aiming to ensure access to care for the entire population; the electronic care sheet, which digitizes exchanges between the CNSS and various health professionals and facilities, will simplify the collection of certain medical and medico-administrative data related to patient care consumption and could form the base data for a shared medical record; the deployment of hospital information systems (HIS) nationwide, covering all levels of care and including EHRs; the development of telemedicine, which will produce new modes of exchange between patients and health professionals; the project of a national health identifier that will secure access to health data.

Moreover, public actors' awareness of the importance of interoperability for dematerializing exchanges and sharing data has been reinforced. In this context, the Digital Development Agency (ADD) has set up a public interoperability platform to facilitate exchanges between administrations.

Similarly, the various actors we have met, as well as feedback from our field surveys, show keen interest in the implementation of the SMR and clearly recognize its potential benefits. This unanimity creates a favorable climate for its adoption and reveals its potential for transformation in the field of health.

Finally, the generalization of digital technology within Moroccan society is an essential element. Digital technology is now integrated into daily life, offering opportunities for innovation and connectivity, and thus contributing to the improvement of the health system as a whole.

• Shortcomings and challenges that hinder health data sharing

The implementation of widespread health data sharing in our country is likely to face several challenges and shortcomings. Firstly, despite notable efforts by the Ministry of Health, national strategic orientations struggle to materialize, particularly concerning the generalization of HIS, especially for EHRs.

Likewise, although a few public and private initiatives have been launched for the digitalization and sharing of health data, they remain insufficient and do not cover the entire territory. The digital maturity of health sector actors is uneven, both among health professionals and citizens, resulting in a digital divide.

Moreover, digital medical records are almost non-existent among health professionals, especially in the private sector, except in radiology centers, medical diagnostic labs, and some specialist doctors who are better equipped. Public hospitals have better equipment, but the centralization of personal medical data is lacking.

Actors with IT solutions primarily use them for administrative purposes and to manage their business processes. As for the exchanges and sharing of health data between different actors, they remain very limited, conducted mainly via unsecured instant messaging (such as WhatsApp) and traditional media (such as paper files).

The current legal framework struggles to keep up with technological evolution, raising concerns about the security of health data, the protection of patient privacy, and the accountability of health professionals, particularly in the context of the digitalization of the health sector.

Additionally, the absence of a clear governance policy for health data and an established strategy for integrating artificial intelligence in the field of health limits the potential for innovation and improvement in healthcare that technological advances can generate.

All these gaps underscore the urgency of concerted action between the government, the private sector, and civil society to overcome these obstacles and improve digital health in Morocco. A comprehensive and integrated strategy, more specific and appropriate regulation, and effective cooperation between all stakeholders are essential to address these deficiencies and fully exploit the potential of digital health in the country.

Insufficient Regulatory, Control, and Support Mechanisms

- **Absence of specific law on health data protection**

  Although Law No. 09-08 relating to the protection of personal data applies to health data, there is no specific legislation on the protection of health data, their use for research and development, forecasting, decision support, etc. A dedicated law could provide additional provisions and protections specifically tailored to sensitive health data. However, it should be noted that this situation is not unique to Morocco, as many countries, even among the most developed, face the same reality.

- **Lack of detailed directives and specific guidelines on the protection of health data**, particularly regarding security standards and best practices for handling such sensitive data.

- **Insufficient control and supervision**

  Despite the measures currently implemented by the CNDP, which is charged with overseeing and controlling the protection of personal data, there is a need to intensify monitoring and ensure stricter application of the provisions relating to the protection of health data.

- **Insufficient awareness and training**

  There is a noted lack of adequate awareness and training regarding the protection of health data, both among health professionals and data processing managers in facilities, roles that are almost non-existent in the vast majority of organizations. Increased awareness and specialized training can help prevent violations and misuse of health data.


MEDICAL
Health Care
Doctor
Hospital
Pharmacist
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Part 5

White Paper Recommendations

To promote the sharing of health data, it is crucial to create an environment conducive to digital health. The goal is to establish a common culture that can support a national strategy for the digitalization and sharing of health data. The following are strategic and operational recommendations derived from our interviews with health stakeholders, our field surveys, and the contributions of the working group that collaborated on this study.

Increasing digital maturity among all health Sector stakeholders

As highlighted by the majority of the stakeholders interviewed, the digitalization and sharing of health data are contingent upon the widespread adoption of health information systems by healthcare professionals nationwide. However, currently, due to the uneven or even limited level of digital maturity in Morocco’s health sector, only a few doctors, lab technicians, and pharmacists can contribute by providing data. This situation applies to a lesser extent in public hospitals, where the generalization of HIS (Health Information Systems) is underway.

To increase this digital maturity, it is essential to implement a comprehensive digital development strategy in care facilities and also among private sector health professionals. This strategy should include: awareness and training for health actors and patients, the creation of a robust and appropriate digital infrastructure, the adoption of interoperability standards, the development of secure health information management systems, and protection against cyber threats

It will also be important to encourage the participation of populations less familiar with technology, particularly vulnerable people who are particularly affected by the digital divide.

For success, this strategy must rely on a patient-centered and participative approach, bringing together all actors in the digital health ecosystem, with the Ministry of Health and Social Protection (MSPS) as the central coordinator. This approach must take into account the actions already undertaken, the challenges faced by each stakeholder, and their expectations.

Not to forget, the implementation of an attractive framework to increase corporate investments in digital health is essential. Finally, continuous evaluation of progress and a favorable and adapted legal framework must complement these initiatives, with the ultimate goal of improving the quality of care and the management of health systems.

Promoting a National Shared Medical Record (SMR)

- ### Defining Clear and Precise Objectives

It is essential to reinvigorate and accelerate the implementation of a SMR. This tool is highly anticipated by the various health sector actors consulted.

The SMR initiated by the ministry of health aligns perfectly with this objective. However, to ensure widespread implementation and seamless deployment, it is crucial to design it not merely as a technical solution for managing health data but rather as a device for communication and sharing of health data, connecting a user, knowledge, a situation, and a context. Above all, a SMR should be considered as an organizational project, not just a computer project. Its scope must extend beyond public care institutions to include private sector actors.

This national SMR will position itself as a central digital service for care coordination, while serving as a tool for the patient and the patient-health professional relationship. It will be designed as a national health project, with clear guidelines, stating its technical and functional aspects and especially its objectives and uses. It is imperative to integrate it into a comprehensive strategic vision, as its direction will be strongly influenced by its increasing interconnections with other aspects of e-health.

International experiences have shown that clarity in defining objectives before launching various national electronic records has had a positive impact on their success. Conversely, any ambiguity in objectives has hindered their progress and elicited reluctance. It is therefore essential to clarify the nature of the electronic record to be implemented in Morocco. This will help to delineate the respective areas of competence and the uses that will be assigned to it, although it must be designed to be scalable.

The national SMR is intended to be both personal and shared. Its goal should be to strengthen the patient's role as an actor in their health by facilitating their access to their health data. It is noted that more than 69% of patients surveyed during our field surveys have difficulty accessing their result histories. The SMR should also allow health professionals quick access to a patient's medical information (more than 50% of health professionals surveyed state that patient data are not accessible when needed). It should also focus on disease prevention.

Reconciling various imperatives, particularly the right of patients to the protection of their sensitive data and the access of health professionals to the information required for patient care, represents a mandatory preliminary step in defining the content of the SMR, the information that will be included, and its internal structure.

In principle, a SMR should include hospitalization and consultation reports, laboratory reports, medical results, information about diseases and allergies, etc.

Content

- Medical summary, prescriptions, test results
- History, hospitalization reports, etc.

Objective

- Better patient care, especially in emergencies
- Information sharing between practitioners

Its content will be defined by law, but it should not be limiting. The patient should have the opportunity to add documents that they consider important.

- **Integrate the SMR into a National Health Services Platform**

The SMR should primarily be considered within a State-platform[16] approach by integrating it into a national health services portal to be implemented by the State. This portal could more broadly host and federate existing and future public and potentially private digital health services. As mentioned earlier, this architectural model has been deployed in several countries.

The future SMR, will be, the first service to be established within this platform; it will store and secure patient medical information, including prescriptions, medications, test results, vaccination records, etc. It must rely on three pillars: ethics, security, and interoperability. In practice, this will involve the use of national registries such as the national identifier for professionals and facilities (INPE), the national patient identifier (INP), and existing or to be implemented security and interoperability registries based on defined requirements.

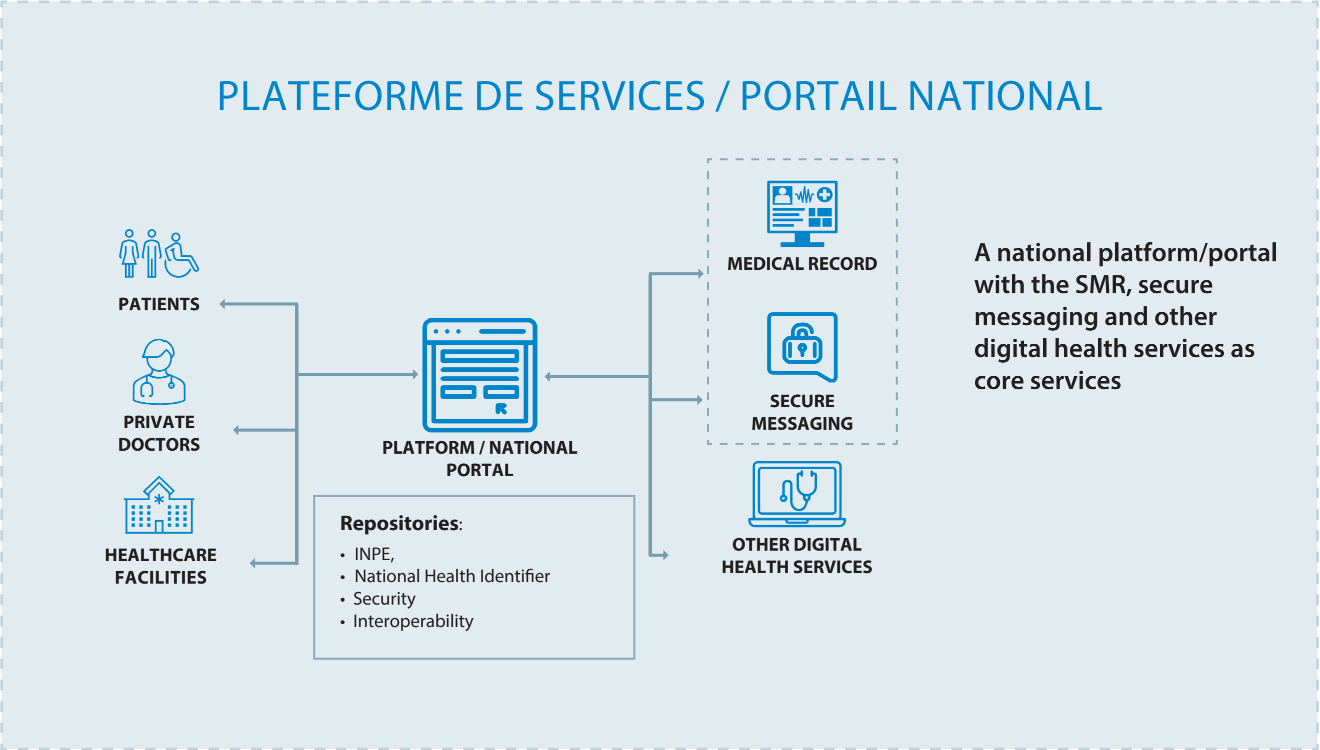

Illustration of the National Health Data Platform

The future SMR will be interoperable with various HIS, the CNSS's digital services, including its healthcare consumption history and digital prescriptions, the different health information systems of professionals and private sector care facilities, and possibly with connected devices provided they are approved (approval process to be defined).

The concept of a services platform or state-platform will facilitate the use and integration of the SMR with potential services associated with it and feeding it data. This should promote the creation of an open ecosystem for the benefit of citizens and health professionals.

The aim is to make this platform, and particularly the future SMR, a key tool for patients, enabling them to play a role in their own health and to have all their health data in a single space where the SMR will be at the heart of digital health services in Morocco.

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[16] The concept of a state-platform was coined by O'Reilly in 2011, who argues that the state should no longer be considered as a "vending machine" dispensing services but rather as a platform that aggregates a set of public data and produces digital services to ensure resources are accessible to everyone.

- **Implementing a Smart, Practical, and User-Friendly SMR**

The SMR will be accessible to all stakeholders in the healthcare system: patients, healthcare professionals, and care facilities. Access will be facilitated through a web portal, integrated tele-services in the business software of well-equipped healthcare professionals, and most importantly, via a mobile application. This approach will especially facilitate the adoption of the service by citizens, considering the high rate of smartphone ownership in Morocco[17], allowing them to access their health data from anywhere in the country.

The SMR must be designed in a way that it does not create administrative burdens that impact the medical time of healthcare professionals and will be user-friendly, with a simplified data entry interface and a smooth user journey. To make it more relevant and useful in the daily practice of healthcare professionals, it should be a space for storing and sharing structured data, based on market standards such as the Clinical Data Architecture (CDA), and not just a safe or a receptacle of unprocessable documents. Its real value lies in how it organizes and structures the medical data it receives.

One of the conditions for the success of the SMR lies in its being fed by both patients and healthcare professionals. It is preferable that healthcare professionals be required to populate it with all essential therapeutic and diagnostic documents. Some basic information, such as medical procedure consumption and prescriptions, could be automatically uploaded into it. In this context, collaboration with the CNSS is necessary for articulation with its projects to dematerialize care sheets and prescriptions.

The ambition is to facilitate the automatic transfer of data into the SMR with patient consent. Minimizing data entry is a critical challenge for the project's success. Access to the service should be free, and a financial incentive program, in the form of direct or indirect aids to private healthcare actors, could accelerate its generalization.

- **Promoting an Electronic Exchange System Among Healthcare Professionals**

The SMR could include a secure messaging system ensuring the confidentiality, integrity, and security of the exchanged medical information. It would enable the transmission of sensitive data such as test results, prescriptions, and patient information. It would also allow healthcare professionals to communicate effectively while adhering to the confidentiality norms required by medical regulations. Today, it is an indispensable tool for care coordination, telemedicine, etc.

In this context, it would be conceivable to integrate into the platform a trusted space including a certified common directory of all healthcare professionals. The INPE directory issued by the National Health Insurance Agency (ANAM) for the identification of healthcare professionals and facilities could serve as a solid basis for this initiative.

This exchange system has a dual objective: to facilitate exchanges by making them safer and to protect the liability of healthcare professionals.

- **Promoting a Unique Digital Identifier for Patients and Healthcare Professionals, the INS**

A unique patient identifier is crucial for the sharing of health data. Firstly, it ensures precise and unambiguous identification of each patient, avoiding any confusion or errors related to homonyms or inaccurate information. The creation of the National Health Identifier (INS) by the MSPS represents a significant advancement, perfectly meeting the expectations of the various actors identified during our field study. Moreover, it meets the functional requirements essential for the establishment of a national SMR.

The INS will promote secure and efficient management of patient health data and will become a mandatory reference element. It is imperative to consider the INS project as a crucial preliminary step to the digitalization and sharing of health data, and its implementation must be accelerated.

For healthcare professionals, a uniue identifier will also play an essential role in the context of health data sharing and the establishment of a SMR. Firstly, it ensures precise identification of each healthcare professional,

thus avoiding any potential confusion or errors related to homonyms or inaccurate information. This ensures that medical information is associated with the correct provider.

Furthermore, the health professional's identifier is a key element for tracing actions undertaken in the SMR. It helps to document and track medical interventions transparently, allowing for precise accountability of the various actors involved.

The INPE issued by the ANAM perfectly meets the identified needs. Nevertheless, it is essential to ensure that all healthcare professionals have access to this identifier and that its allocation is facilitated.

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[17] Mobile telephony is widespread for almost all households, both in urban and rural areas. Almost all individuals (12-65 years old) have mobile telephony (94.4%). This proportion rises to 97.1 per cent in urban areas and 89.8 per cent in rural areas (https://www.anrt.ma/indicateurs/etudes-et-enquetes/enquete-annuelle-marche-des-tic)

- **Ensuring patient consent**

94% of the citizens surveyed agree to share their health data with their doctors, while 87% believe they are the legitimate owners of their data and wish to have control over its use and sharing. They feel they have the right to object to the sharing of their data and to know the purposes for which it is collected and used.

The issue of informed patient consent is of great importance, especially when considering the potential use of their data in contexts other than care coordination, such as medical research projects. It is crucial, then, to address this issue before the SMR project begins.

In this context, the SMR could be used by citizens to learn about the use of their data and to directly grant their permissions-consents for its sharing. The idea of implicit consent with an automatic opening of a SMR for each citizen is desired to ensure its generalization. This should free citizens from the hurdle of creating and activating their SMR and will also cover populations remote from digital access. However, it will be essential to ensure the patient's right to object to the opening of a SMR and to the use of their data. Legal provisions must regulate this system with the definition of specific circumstances where exceptions to informed consent are allowed. These exceptions should be limited to situations such as public health needs in emergencies, justified legal requirements, or the processing of data in an aggregated manner. The exceptions must be legal, necessary, proportionate, and not abusive.

Making data security a priority

All consulted stakeholders are aware that patients' health data are sensitive and valuable, making them a potential target for cyber-attacks, and the implementation of a national SMR could make patients' personal data more vulnerable. Therefore, an enhanced data security approach is necessary, as, in addition to data sharing, the SMR involves consolidating medical data from multiple sources.

- **Ensuring the Confidentiality of Health Data**

The confidentiality of health data is essential to establish patients' trust. This concern was consistently raised during our various exchanges and was systematically evident in the responses obtained during our field surveys.

Awareness of personal data protection is essential, particularly in Morocco where education on this subject is not yet fully developed. The digitalization and sharing of health data via a national SMR will raise questions about the use of this data. Therefore, it is crucial to launch awareness programs to inform citizens about the confidentiality of health data and the security measures in place to protect them. This approach can help educate our citizens on the importance of protecting their medical data and establish trust in digital health systems.

In Morocco, the protection of health data is mainly governed by Law No. 09-08 adopted in 2009 relating to the protection of individuals concerning the processing of personal data. This law establishes a general framework for the protection of personal data, including health data, by defining the rights and responsibilities of stakeholders in the processing of these data. To strengthen the confidentiality of health data and protect individual rights, it is necessary to comply with the national directive on information systems security. While not a prerequisite for launching the SMR, it would be appropriate to harmonize this law with international standards and accelerate the ongoing convergence work with the European Union's General Data Protection Regulation (GDPR).

- In the United States, **the Health Insurance Portability and Accountability Act (HIPAA)** sets national standards for the protection of medical data and personal health information. It applies to various health sector actors and ensures confidentiality by defining the limits on the use and disclosure of such data without patient consent. Additionally, it grants patients rights over their health information. It establishes national standards for the security of electronic health data, requiring covered entities to implement technical and non-technical safeguards.
- In Europe, **the General Data Protection Regulation (GDPR)** sets privacy and security rules for processing and storing personal data within the European Union. It also encompasses health information and applies to any organization that processes or stores such data, meaning it has a global scope and is related to data sharing between organizations.

- **Securing access to data**

To guarantee the confidentiality and security of health data, it is essential to implement rigorous authentication and access control mechanisms for both patients and healthcare professionals. Access should be secured through reliable electronic identification, including the authentication of healthcare professionals using methods such as electronic cards, certificates, two-factor authentication, combinations of usernames and passwords, etc. These authentication methods must be based on authorization matrices that specify the functionalities that can be accessed and the extent of the data that can be viewed (see, for example, the RBAC standard: role-based access control). These mechanisms aim to ensure that only authorized persons can access patient records.

The use of the National Electronic Identity Card (CINE) effectively meets the need to secure patient identification. However, it is necessary that this system is not limited only to actors in the public sector.

The project to integrate the INS (National Health Identifier) into the CINE represents a major opportunity for the implementation of a national SMR. If the choice of the CINE as a digital identification medium in the healthcare sector is confirmed, the systematic integration of the INS into the CINE is recommended. However, some questions remain unanswered, particularly concerning the identification of minors (as the CINE is only mandatory from the age of 18), foreign nationals in a regular situation with a residence permit, and people without a CINE (due to loss, emergencies, etc.). Therefore, consideration must be given to the methods of patient identification in the absence of a CINE.

The use of another identifier should only be authorized in the absence of the INS or CINE. Therefore, it is important to consider backup or degraded mode identification and authentication mechanisms to allow secure access to the SMR in the absence of the INS or CINE. The identification and authentication of healthcare professionals are also essential to ensure the security, confidentiality, and integrity of health data. Thus, it is prudent to explore the opportunity (benefits, feasibility, costs, etc.) of creating digital identification for healthcare professionals. Beyond the SMR, this digital identification could be used to enhance the security of access to all digital health services. This initiative should involve collaboration among all stakeholders in the sector.

Examples of Identification and Authentication Methods for Healthcare Professionals in Digital Health:

1. **Electronic Identification** using unique identifiers, such as a digital certificate, an electronic identity card, or a specific identifier assigned by health authorities.
2. **Multi-factor Authentication (MFA)**: This requires healthcare professionals to provide at least two different forms of identity proof to access digital health systems. This could be a password, a smart card, biometric recognition (fingerprint, facial recognition, etc.), or a security token.
3. **Healthcare Professional Cards**: Some countries issue special identity cards for healthcare professionals, which can be used for authentication.
4. **Verification of Qualifications** by health authorities before granting access to digital health systems.
5. Centralized Database of Healthcare Professionals to verify the identity of healthcare professionals authorized to access health data. It is regularly updated to keep track of changes in the professionals' status.

- **Securing Exchanges, Storage, and Availability of Health Data**

Data and communications encryption is essential to protect sensitive information during transfer and storage. Regular security audits, software updates, and constant monitoring are essential for detecting and preventing threats. Raising awareness among healthcare professionals, administrative staff, and patients about best practices in data security also plays a significant role in preventing human errors.

Moreover, secure data storage is crucial, including measures such as encryption and the use of cloud servers. It is also important to consider the data retention period and specify a reasonable timeframe after which data must be deleted from the system. Since personal health data can be considered "lifelong" data, the retention policies for care records should not create gaps in longitudinal health records.

Precautions regarding the hosting of SMR data must be taken, particularly concerning the choice of host, which must demonstrate a very high level of certification for health data storage: ISO 27001 certification, Health Data Host (HDS) certification, etc.

As part of the digital sovereignty supported by the Ministry of Digital Transition and Administrative Reform, the data must be stored on Moroccan territory (sovereign cloud). This will increase users' trust in the SMR. It will also be appropriate to strengthen and support the storage offer and infrastructure within the territory.

The overall data security policy must also take into account the media used for data transfer (USB drives, external hard drives, routers, servers, and databases) and the evolution of the health innovation ecosystem, and it must ensure the continuous availability of health data at all times.

- **Strengthening the National Security Policy**

In addition to the National Directive for Information Systems Security (DNSSI)[18], the General Directorate for Information Systems Security (DGSSI) must establish a national normative framework incorporating higher requirements for the security of health data across three dimensions: integrity, confidentiality, and availability. This framework must be enforceable against all actors in the health sector.

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[18] https://www.dgssi.gov.ma/fr/publications/directive-nationale-de-la-securite-des-systemes-dinformation-dnssi

Among the requirements of this new framework, one could mention the establishment of a certification process for IT solutions, particularly those that need to interface with the SMR (Digital Medical Record) and other digital services involved in the exchange and sharing of health data.

Some Reference Frameworks:

- **HIPAA** (Health Insurance Portability and Accountability Act): An American law that governs the security and confidentiality of health information in the USA. It sets strict requirements for health organizations.
- **GDPR** (General Data Protection Regulation): A European regulation that establishes strict rules for the protection of personal data. It applies to health data and requires appropriate security measures for their processing
- **NIST SP 800-66**: Recommendations and guidelines on information security specifically dealing with the security of electronic health data, published by the National Institute of Standards and Technology (NIST).
- **HITRUST Common Security Framework:** A framework that combines multiple security standards, including HIPAA and ISO 27001, to create a comprehensive security framework specifically tailored for the healthcare sector.
- **FIPS 140-2**: Security requirements for cryptographic modules. It is particularly relevant when using encryption to protect health data, established by the Federal Information Processing Standard (FIPS).
- **ENISA**: Guides of best practices and recommendation

Establishing a clear ethical framework

It is necessary to consider the ethical issues associated with the use of big data to prevent the risks of profiling resulting from the combination of different data sources. This approach highlights the importance of clear and precise communication with patients and the need to empower stakeholders. A dynamic ethical charter could be envisioned to ensure the quality of data collection, storage, and use. It would remind of the fundamental principles of bioethics to guide the use of personal data and serve as a reference to clarify the responsibilities and duties of citizens and healthcare professionals working with personal medical data.

In this context, the issue of data anonymization and pseudonymization is crucial. These processes help protect individuals' privacy while facilitating the use of data for study and research purposes. Anonymization removes all personally identifiable information, while pseudonymization replaces such data with identifiers. However, a balance must be found between data confidentiality and utility. Researchers must adhere to strict regulations, ensure data security, and act ethically. Transparency and documentation are essential.

Controlling the use of health data in artificial intelligence

Regarding concerns related to the use of data with artificial intelligence (AI), it is highly recommended to collaborate with medical associations to develop an appropriate control framework. It is advisable to capitalize on international work in this area. Significant international references address the regulation of AI and ethical issues, including:

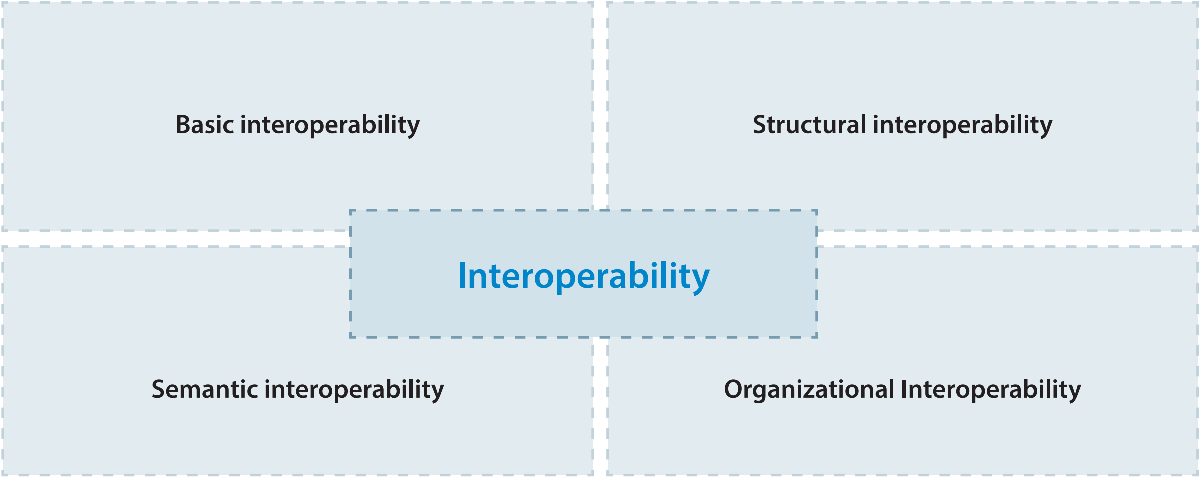
- World Health Organization (WHO) guidelines on AI in health;
- The World Economic Forum's AI Ethical Principles
- UNESCO's AI Ethical Principles ;
- The European Commission's White Paper discussing key issues of AI.

Creating a Specific Interoperability Framework for the Health Sector

Digital health data and systems need to be developed taking into account interoperability, which will facilitate the secure sharing of data between systems and reduce the risk of errors during data transfers.

The Healthcare Information and Management Systems Society (HIMSS) defines health interoperability as the ability of different information systems, devices, and applications (systems) to access, exchange, integrate, and cooperatively use data in a coordinated manner, within and across organizational, regional, and national boundaries, to ensure quick and transparent portability of information and optimize the health of individuals and populations globally. This interoperability refers to the ability of information systems to connect and communicate easily, even if they have been designed by different manufacturers. It is a framework that harmonizes the languages and concepts used in the health field, while addressing the specificities of different health actors.

This framework is divided into four levels:



1. Basic interoperability involves the ability to exchange data, for example, the ability to transfer clinical imaging files from one information system to another.
2. Structural interoperability means that data exchanges between systems can be interpreted according to the type of data; ideally, the structure of health data should remain constant from one system to another.
3. Semantic interoperability aims to make data clearly coded so that different systems use a common language, thus eliminating any ambiguity or divergence in the interpretation of information.
4. Organizational interoperability includes considerations of governance, policy, social, legal, and organizational factors to facilitate secure, transparent, and timely communication and use of data within and between organizations, entities, and individuals; it enables shared consent, trust, and integrated processes and workflows for end-users.

This will enable different systems and devices not only to exchange data but also to interpret it.

It is also important to note that standards play a crucial role in the interoperability of health data systems, enabling healthcare professionals, laboratories, hospitals, pharmacies, and patients to share data seamlessly. These standards cover five main categories: vocabulary/terminology, content, transport, privacy and security, and identifiers. Vocabulary standards ensure a clear understanding of health concepts, while content standards define the structure of exchanged data. Transport standards specify the message format, privacy and security standards protect data privacy and integrity, and identifier standards ensure a unique identification of patients, service locations, and healthcare professionals.

Although awareness of the importance of interoperability in exchanges is beginning to emerge in Morocco, and investments have been made in interoperability platforms (such as the one implemented by the ADD: GISRE), these advancements are still insufficient for the health sector, where interoperability needs are particularly complex due to the diversity of information systems and medical standards. This complexity is made even more challenging because different actors are not accustomed to working together and remain in siloed organizational modes.

The national interoperability platform envisaged by the MSPS in the context of establishing a smart national health system represents a promising first step and can serve as a foundation to meet the requirements for dematerialization and health data exchange, under certain conditions. Indeed, before discussing platforms and solutions, it is imperative to develop a comprehensive reference framework for the interoperability of health information systems, a specific framework proposing technical and, most importantly, semantic guidelines for health actors involved or who will engage in data exchange and sharing projects. It will be necessary to use existing terminology and definitions of key concepts such as data types, system protocols, and roles and responsibilities of stakeholders. These definitions are provided by global standard-setting bodies and are commonly used in both the public and private sectors. Existing data standards and frameworks (including ISO/ TS 22220:2011, HL7 FHIR, OpenHIE, GS1, and others) must be applied whenever possible. This promotes greater standardization and comparability of health data, which improves the interoperability of systems, data sharing, and data quality. It is necessary to proceed step by step, defining in a transparent and consensual manner for each business context the appropriate framework.

- **Interoperability Governance**

The development of the interoperability reference framework should be entrusted to an entity specialised in health information systems issues and challenges, possibly placed under the supervision of the Ministry of Health (MSPR) or a new structure responsible for digital health.

The main mission of this entity is to make this framework accessible and usable by all actors in the health sector. Information systems and digital health services or tools must comply with this interoperability framework, which should be mandatory. The entity would be responsible for publishing the functional and technical specifications for SMR access. It would also provide support to stakeholders to help them comply. It should set up tools to allow manufacturers to assess whether their solutions meet security and interoperability principles.

This entity could ensure the certification of different devices that can access the SMR, while collaborating with the entity responsible for security.

Defining clear governance

Developing a roadmap for the deployment of the SMR is a crucial step that requires a methodical approach. It is imperative to establish a realistic implementation schedule considering the project’s complexity. A solid methodology must be put in place to manage this large-scale project effectively. This roadmap must reflect a comprehensive strategy considering the digital maturity level of health actors. Interoperability issues must be integrated without underestimating the time needed to adapt existing information systems. Essential prerequisites, such as resolving the patient identifier issue, must not be overlooked.

Governance and project organization must also be clearly defined. Lessons learned from our international benchmark underscore the importance of good governance in the successful deployment of the SMR. The majority of interviewees recommend that responsibility should lie with the MSPS. A strategic and operational project ownership must be designated to ensure effective coordination. This governance must provide guidance and reference frameworks at the national level and ensure their proper implementation.

Various health actors (agencies, health professionals, and especially patient representative associations) must be involved.

Also, in an environment characterized by a diversity of solutions related to the electronic health record (EHR), data exchange requires the standardization of rules. In this regard, the creation of a specific regulation mechanism is necessary to standardize the solutions proposed by EHR editors (through specifications, usage guidelines, and patient protection measures, among others).

Recommendations summary

Strategic Axis

- Implement a strategy for digital development in the healthcare sector, including among private actors.
- Develop a culture of Public-Private Partnership (PPP), which is still not widespread in Morocco. PPPs must be seen as a means to facilitate effective public health actions.
- Establish a system of continuous evaluation to monitor the evolution of digital maturity in the healthcare sector.
- Strengthen and support the offer and infrastructure for storage at the national level to ensure digital sovereignty.
- Coordinate various national projects within a roadmap with clearly defined objectives.
- Ensure visibility for ecosystem actors regarding the progress of various national projects (Health Information Systems [SIH], National Health Identifier [INS], interoperability platform, etc.).
- Define a shared Medical Record (SMR) roadmap and clarify its objectives and uses, while assessing the expected benefits.
- Establish funding programs, especially for private actors, to facilitate the acquisition of health information systems and their integration into the SMR. Financial aid can be awarded to healthcare professionals or directly to publishers of certified solutions.

Technological Axis

- Deploy health information systems among all healthcare actors, including in the private sector.
- Design the SMR as a national data platform filled with structured data and accessible via a web portal, integrated tele-services in business software, and especially through a mobile application
- Interconnect the SMR with the CNSS system, particularly for retrieving patient consumption history through electronic care sheets and digital prescriptions.
- Establish a national SMR with mandatory feeding by all health professionals.
- Establish a secure exchange system to enable exchanges between healthcare professionals and between professionals and patients.
- Define and implement a specific interoperability reference framework for the healthcare sector, accompanied by a one-stop shop to support private companies in their compliance efforts.
- Encourage the development of local software solutions to reduce dependence on foreign products and ensure the sustainability of specialized companies, while considering the establishment of a label for solutions that meet national standards.

Security Axis

- Strengthen the national security policy by establishing a national normative framework that incorporates higher requirements for health data security and a certification process for IT solutions.
- Implement electronic identification devices to secure access to the SMR by patients and healthcare professionals, relying on the INS and CINE for patients and the INPE for healthcare professionals.
- Integrate data security from the design of services and processes.

Regulation and Ethics Axis

- Strengthen the current regulatory framework.
- Define measures to ensure the security and confidentiality of patients' health data.
- Integrate the requirement of patient informed consent and the right to object.

- Ensure the identification of data controllers in healthcare facilities.
- Address the anonymization and pseudonymization of data for research and study purposes.
- Build trust among citizens by giving them control over their data and ensuring transparency in the event of data breaches.
- Ensure compliance with international standards for digital health data exchanges and storage.

Governance Axis

- Create a national agency dedicated to digital health, equipped with the necessary resources and skills to fulfill its missions. This agency would play a central role in coordinating all sectors involved in digital health, overseeing interoperability, and certifying devices and solutions connected to the SMR. It could also be responsible for the operational implementation of the SMR, while strategic oversight of the project remains with the MSPS.
- Establish participatory and transparent governance for health data, defining sharing rules for individual care, public bodies, and national and regional stakeholders.
- Strengthen the mandate of the National Commission for the Control of Personal Data Protection (CNDP) as the supervisory body of the SMR system, ensuring its proper functioning.
- Involve all health actors, including agencies, health professionals, and patient representative associations.
- Clarify the responsibilities of the political authorities towards governance bodies.
- Empower governance bodies with the necessary skills to fulfill their missions.
- Establish precise specifications, based on explicit guidelines, to clearly define the roles and responsibilities of each entity.
- Ensure transparency regarding the timeline, budget, and organizational structure of the SMR project.

Implementation and deployment axis

- Secure the commitment of industry and health professionals regarding the deployment of the SMR.
- Co-design the SMR with health actors and citizens in an iterative approach to incorporate feedback and lessons learned.
- Integrate the SMR into an opt-out approach: SMRs are opened by default for everyone, with the option to opt-out.
- Deploy the SMR progressively based on the digital maturity of the actors, starting with specific categories like pharmacy and radiology.
- Pilot the SMR with a small group of health professionals and patients before national implementation.

Support and awareness axis

- Raise awareness among health actors and citizens about the benefits of digitalization and data sharing, while highlighting the associated security challenges.
- Develop general awareness about health data: digital education broadly (about what health data is, its uses and potential uses, recognizing the proper and improper use of health data), health education (explaining the benefits of having organized and processed health data), and therapeutic education (supporting patients who have a particular interest in using solutions like connected medical devices).
- Demonstrate the usefulness of the SMR to users to gain their buy-in and minimize reluctance.
- Encourage the participation of populations less familiar with technology, particularly those affected by the digital divide.
- Establish continuous evaluation of the regulatory framework to support the development of health data uses.

Conclusion

This white paper on the digitalization and sharing of health data in Morocco highlighted the significant progress made as well as the challenges that remain to be addressed. Based on an in-depth analysis of international experiences and local initiatives, we have identified key levers and obstacles to this digitalization of health data and, more broadly, to the digital transformation of our health system. Through our interviews, surveys and analyses, several central themes emerged, underscoring the importance of strengthened governance, a solid regulatory framework and a user-centric approach to successfuly achieve this digitalisation.

Our recommendations emphasize the need to accelerate the adoption of interoperability standards, enhance the security and protection of health data, and promote a culture of innovation and collaboration among all sector stakeholders. Moreover, it is crucial to adopt an inclusive strategy that considers regional disparities and varying levels of access to digital technologies to ensure no one is left behind.

As we move forward, a clear roadmap with precise steps, monitoring indicators and strong commitment from all stakeholders will be essential. This strategy will need to be supported by adequate investments, both in digital infrastructure and health professionals training, as well as educating citizens on the benefits of digital health.

In this context, an imminent launch of a national consultation tour could mark the beginning of a major initiative focused on the sharing and exchange of health data. The main objective is the co-construction of a digital health doctrine, with a focus on health data governance. This initiative aims to build a stable framework over time, enforceable and to be respected by all stakeholders in the health field.

The envisioned doctrine will play a crucial role in defining standards and structuring documents, including medical biology reports, radiology results, etc. It will serve as a guide, facilitating the establishment of clear and uniform standards for the sharing and exchange of medical information.

Simultaneously, the establishment of a health data usage and perceptions observatory, with active participation from civil society members, patient representatives, and health professionals, will complement this initiative. This participatory approach aims to integrate the diverse perspectives and needs of stakeholders, thus contributing to an inclusive and ethical approach to health data sharing.

In summary, such an ambitious initiative represents a significant advance towards effective governance of health data in Morocco. It is committed to establishing guiding principles, creating clear frameworks, and integrating the voices of civil society and health professionals to ensure a balanced and respectful approach to digital health issues in the country.

Finally, this White Paper should be seen not as an end point, but as a step in an evolving process. The digitalization of healthcare in Morocco is a journey that requires constant commitment, regular progress evaluation and adaptability to discoveries and new technologies. By working together, we can transform our healthcare system to be more resilient, accessible and tailored to the needs of all Moroccans.

List of Interviewees

INSTITUTIONAL & REGULATORS

Ministry of Health and Social Welfare

- Abdelkader Mhayi, Head of the Information Technology and Methods Division

National Social Security Fund

- Hassan Boubrik, Chief Executive Officer
- Lahcen Laghdir, Deputy Director
- Abderrahim Mrabti, DSI

National Commission for the Control of the Protection of Personal Data

- Omar Seghrouchni, President

National Council of the Order of Physicians

- Dr. Mohammadin Boubekri, President of the CNOM
- Dr. Najib Amghar, Secretary General of the CNOM

Digital development agency

- Hajar KHYATI, Head of the Interoperability and Digital Factory Department

HEALTHCARE PRODUCERS

Akdital Group

- Mohamed El Bouzidi, Information Systems Director

Oncorad Group

- Dr. Hamza Semlali
- Dr. Ale Marani
- Dr. Younes Shimi

CHU RABAT

- Linda Alami Hassani, Head of the Medical Affairs and Strategy Division

Hôpital universitaire international Mohammed VI

- Pr. Ahmed Bennana, Director
- Saloua Janah, HRIS special advisor

TRAINING AND RESEARCH

National School of Public Health
- Dr. Hassan Chrifi, Director

INDUSTRIAL

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- Abderrahim Zaaf, Founder

Curry
- Kenroy George, Founder

Data Pathology
- Dr. Hicham Elattar, Co-founder

Enovacom
- Driss Ait Mani, e-health expert

Magic Software
- Amine Tazi, Founder

Mediot, ABA Technology
- Dr Saad Chaachou, Deputy Chief Executive Officer

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- Abdelmjid Lotfi, CTO/CPO Co-Founder

Orange
- Brahim Sbaï, Vice President Global Sales
- Youssef Houari, Senior Manager, Corporate Sales

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- Taha Aït Hanine, Head of Public Afairs & Market Access

Sobrus
- Omar Sefiani, CEO

الضمان الإجتماعي
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الضمان الاجتماعي
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#ADD
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CNDP

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ABA TECHNOLOGY

DataPathology

nabady
Le soin de confiance

TecRad

SOBRUS

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Smedian

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