XpanDH

Expanding Digital Health through a pan-European EHRxF-based Ecosystem

D3.5 (D3.3)- X-Bundle Readiness steppingstone guides

WP3 – Organisational Readiness

31.07.2024

Authors:

Name	*Organisation*	*Name*	*Organisation*
Juliana Sá; Maria Manuel Salazar	CHUP	Anne Moen	UiO
Eleonora Varntoumian	EHMA	Becze Orsolya	OKFO
Birgit Bauer	EDHA		
Sofia Franconi; Jürgen Brandstätter	IHE-EUR		
Nenad ZIVKOVIC	Gnomon		

Additional contribution:

Name	*Organisation*	*Contribution*
Henrique Martins	ISCTE	Contribution with document revision.
Anderson Carmo	ISCTE	Contribution with document revision and format adaptation.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or HaDEA. Neither the European Union nor the granting authority can be held responsible for them.

Document control	
Status	Final
Version	1.0
Type of Document	R: Document, report;
Dissemination Level	PU – Public
Work Package	WP3 – Coordination
Full document name	D3.5 (D3.3)- X-Bundle Readiness steppingstone guides for review
Link to access document	N/A
Partner lead(s)	CHUP
Other partners involved	EHMA, Gnomon, IHE-EUR, EDHA, UiO, OKFO
What did this document aim to achieve?	It intends to describe the process of building educational guides about the EEHRxF and the readiness model adapted to the different stakeholders based on their preference.
Present the main methodological approaches in bullet point format	
What were the main findings or take-away messages? What implications does it have for the XpanDH project?	
Which project stakeholder group would benefit the most from the document and why?	

Healthcare Professional	X
International Adherence Network/Initiative	
Investors and Funding	
Patient Organization	X
Patient/Caregiver	X
Pharma (Marketing&Sales / Medical Dept. / R&D)	
Public Authority or Policymaker	X
Regulatory body	
Standardization Body/ Open-Source Network Researcher/Academic	X
Statutory Health Insurance Company	
Technology & Service Provider	X
Other	

List any relevant organizations or social media accounts for wider visibility	

Revision History			
Version	**Date**	**Author**	**Description**
0.1	10/06/2024	Juliana Sá	First deliverable draft
0.2	10/06/2024	Eleonora Varntoumian Birgit Bauer Becze Orsolya Anderson Carmo	Revision of the document, comments and text update.
0.3	21/06/2024	Juliana Sá	Incorporation feedback from partners and integration further explanatory content.
0.4	24/06/2024	Henrique Martins	Revision of the document, comments and text update.
0.5	25/07/2024	Juliana Sá, Anderson Carmo, Simon Lewerenz, Henrique Martins,	Comments and inputs to the document.
0.6	29/07/2024	Juliana Sá	Incorporation of the feedback and final version.
1.0	31/07/2024	Anderson Carmo	Final revision prior submission.

Content

List of abbreviations

Acronym	Description
Digital Transformation of Health and Care	A part of Digital Single Market empowering citizens and building a healthier society
EEHRxF	European electronic health record exchange format
EHDS	European health data space
eHDSI	eHealth digital service infrastructure
eHDSI Member State Expert Group (eHMSEG)	Composed of Technical, Semantic or Organization Experts according to the configuration, nominated by the participating Member States. It performs the operational impact assessment
eHealth	The World Health Organization defines eHealth as the use of information and communication technologies (ICT) for health
eHealth Digital Service Infrastructure (eHDSI)	The term used for the generic and core services for the cross-border health data exchange under the Connecting Europe Facility financing
Electronic Health Record (EHR)	A collection of longitudinal medical records or similar documentation of an individual in digital form. This set of health information based on the principle one EHR per patient in a country
Electronic Health Record Exchange Format (EHRxF)	Seeks to facilitate the cross-border interoperability of EHR, currently being developed by EC, the recommendation released in 2019
ePrescription (eP)	A system allowing to prescribe and dispense medicinal products. It is generally understood as a prescriber's ability to electronically create an accurate, much less error-prone and understandable prescription. The electronic prescription may be either directly sent to a pharmacy or to an ePrescription vault from where every pharmacy can retrieve it. ePrescription may be also used by nurses to administer medicines and by pharmacies to review orders and manage the supply of medicines
GDPR	REGULATION (EU) 2016/67 general data protection regulation
Health Care Provider (HCP)	An individual healthcare professional or a healthcare institution licensed to provide medical care
Health Level 7 (HL7)	HL7 is a standards development organization, publishing a set of standards for the exchange, integration, sharing, and retrieval of electronic health information. These standards define how information is packaged and communicated from one party to another, setting the language, structure and data types required for seamless integration between systems.
HIMSS	Healthcare Information and Management Systems Society
HIT	health information technology
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD)	The purpose of the ICD is to permit systematic recording, analysis, interpretation and comparison of mortality and morbidity data collected in different countries or areas and at different times. The ICD is used to translate diagnosis of

	diseases and other health problems from words into an alphanumeric code, which permits easy storage, retrieval and analysis of the data
Interoperability	The ability of different systems, organizations or countries to exchange (health) information and use it meaningfully. That means the participants must be able to understand and interpret the shared information correctly, which basically means using the same standards and processes to provide an eHealth service
Patient Summary	A standardized set of basic medical data that includes the most important clinical facts (e.g. allergies/intolerances, chronic conditions) required to ensure safe provision of healthcare. This summarized version of the patient's medical data gives health professionals the essential information they need to provide care in the case of an unexpected or unscheduled medical situation (e.g. emergency or accident)
Refined eHealth European Interoperability Framework (ReEIF)	Provides a common framework of terms and methodologies that serves as a key instrument to address eHealth interoperability issues
X-Bundle	The so-called X-bundles, an aggregation of interoperability assets that support the connection of health systems in different ways, based on EEHRxF specifications.

Executive summary

The release of the 2019 recommendation on the European Electronic Health Record Exchange Format (EEHRxF) prompted the European Commission and Member States to collaborate on developing resources that enable broad access to and exchange of health data at both national and cross-border levels. With the approval of the Regulation on the European Health Data Space such efforts become not only mandatory but also cornerstone to achieving its final purpose. XpanDH is dedicated to facilitating the widespread adoption of EEHRxF by nurturing a pan-European ecosystem of early adopters of new or adapted digital solutions that implement EEHRxF specifications. Ongoing education is imperative to keep healthcare professionals and all other stakeholders updated on advancements and changes in EEHRxF standards. This collaborative and structured approach to education fosters more cohesive and effective EEHRxF implementation across healthcare settings, ultimately improving patient outcomes and facilitating daily operations through better data exchange. Different healthcare roles require specific digital skills. For example, direct care professionals need to focus on contributing to harmonized data entry/capture and accessing and interpreting patient data which may come from other institutions or countries, health managers on data entry standards and privacy regulations, and IT professionals on technical implementation and maintenance. Forming role-specific training groups ensures each group receives the necessary knowledge for their responsibilities, enhancing the overall efficiency and effectiveness of the healthcare system. To this end, XpanDH has included the creation of educational materials on the EEHRxF tailored to the different stakeholders' groups and promoting achieving the next step of readiness in the implementation of the format.

1 Introduction

This deliverable is predominantly focused on the detailed description of the process of developing the educational content that will be spread to raise awareness of the topic and promote the development of skills in each professional group.

1.1 Background

XpanDH project aims to prepare and equip individuals and organizations to effectively utilize the European Electronic Health Records Exchange format (EEHRxF), namely, how to utilize EHRs that have been transformed to offer EEHRxF-based digital services (please see D1.4 for details of use cases and domains). By fostering a pan-European ecosystem of early adopter of the X-Format through a Network of Networks approach, the project seeks to develop and enhance a sustainable and scalable interoperability environment for digital health innovations across Europe. This effort involves engaging both the supply and demand sides of healthcare provision to ensure comprehensive readiness and adoption of the EEHRxF.

The primary goal of the EEHRxF in line with the approved Regulation on the European Health Data Space[1] (EHDS) is to facilitate seamless health data exchange in and across member state borders, enabling better healthcare delivery and coordination. Readiness Model for Organisations (RMO) and Readiness Model for Vendors represent significant improvements in readiness assessment processes towards an easier adoption of the EEHRxF. By addressing key dimensions like understanding EEHRxF specifications and market readiness, these models aim to enhance interoperability and healthcare delivery across Europe. To this end, systems need to be ready, processes need to be ready (please see deliverable D3.1.2 and D.3.2.2 Readiness Model) as well as those that create them. If healthcare organizations are not ready, and especially if their health workforce is not ready, then initial adoptionand regular in-service use will not scale-up.

For this, our focus is mainly on training and education, providing resources and training programs for healthcare professionals and organizations to understand and implement EEHRxF and the benefit of using the EEHRxFormat Readiness Model

surveys (in particular RMO) to understand the current status and leverage the level of adoption. The network of networks, using the 10 X-nets (T5.1 Expanding the networks around XpanDH adoption domains and beyond) approach employed involves Integrating existing national and regional health information networks into a cohesive European framework; engaging a diverse range of stakeholders, including healthcare providers, technology vendors, policymakers, and patients, to foster collaboration and consensus; and supporting innovation centres to share best practices, and reinforce the continuous improvement of EHR systems. To ensure the successful adoption of the EEHRxF, the XpanDH project addresses both supply (engaging EHR vendors and technology providers) and demand (working with healthcare providers, patients, and public health institutions) aspects of healthcare provision. Training needs to be tailored to that all relevant stakeholders regarding the exchange format and the readiness model in two main approaches: technical and organizational aspects and inclusion of the EEHRxF in their clinical approach and patients' pathways. A structured approach to this training can significantly enhance the adoption and utilization of the standard across healthcare systems.

The first step in the training process involves ***raising awareness about EEHRxF through workshops and seminars***. These sessions serve to introduce the concept, benefits, and requirements of EEHRxF to a broad audience. Additionally, developing e-learning modules can provide a basic understanding of EEHRxF. These online courses should be accessible to all relevant personnel, allowing them to learn at their own pace and convenience.

Inadequate education and training can threaten the adoption of electronic health records (EHRs) and negatively impact the quality of health professionals' documentation, limiting the full potential of these tools. For instance, a literature review on the subject suggests that EHR education for nurses should be tailored specifically to their unique workflows compared to other health professionals. It is recommended to transition from traditional classroom-based learning to blended approaches that incorporate non-traditional methods to support interactive,

workflow-based content. These methods include e-learning, utilization of nurse superusers or peer coaches, and simulation training[1].

Moreover, implementing EHRs without adequate related training may endanger health professionals' well-being and not only impact job satisfaction and morale but also have the potential to lead to errors in healthcare delivery, affecting patient safety and overall clinical outcomes.[2] Different groups can experience increased stress, frustration, and workflow inefficiencies due to unfamiliarity with system functionalities. Therefore, emphasising focused training in digital skills tailored to the specific needs of healthcare professionals is not merely beneficial but essential. Health managers trained in maintaining data quality and adhering to privacy regulations can help ensure that patient data is reliable and secure. IT professionals can focus on implementing robust security measures and maintaining the integrity of interoperable systems, protecting sensitive health information. Ongoing education tailored to different groups keeps all professionals updated on advancements in EEHRxF standards. This continuous learning helps maintain high standards and adapt to new technologies or regulatory changes, ensuring the system evolves to meet emerging needs.

Moreover, training for the EEHRxF is essential to ensure health data interoperability across member states. A key feature of the use of EEHRxF is ensuring health data interoperability, in all its facets, technical interoperability (i.e. the presence of infrastructure that can support the exchange of structured data using appropriate ports and interface points); semantical interoperability (i.e unambiguous representation of clinical concepts by use of international standard reference systems and ontologies), syntactical interoperability (i.e. health data as

[1] Ting J, Garnett A, Donelle L. Nursing education and training on electronic health record systems: An integrative review. Nurse Educ Pract. 2021 Aug;55:103168. doi: 10.1016/j.nepr.2021.103168. Epub 2021 Aug 6. PMID: 34411879

[2] Heponiemi T, Gluschkoff K, Vehko T, Kaihlanen AM, Saranto K, Nissinen S, Nadav J, Kujala S. Electronic Health Record Implementations and Insufficient Training Endanger Nurses' Well-being: Cross-sectional Survey Study. J Med Internet Res. 2021 Dec 23;23(12). doi: 10.2196/27096. PMID: 34941546; PMCID: PMC8738988

standardized data formats)[3]. For that, training programs must focus on equipping healthcare professionals and IT specialists with the necessary skills to manage and exchange health records effectively, understand and implement international standards, and use appropriate data formats to maintain consistency and accuracy in health information exchange.

The Managing Digital Transformation in the Health Sector (ManagiDiTH) is a four-year project, launched in January 2023 and funded by the European Union, with the aim of creating a new master's degree curriculum that equips healthcare professionals with the competencies needed to develop digital services in the health sector. The Joint Master's program is designed to oversee the digitalization of health services. It promotes the adoption of data science and information system resources to innovate clinical approaches, enhance services, and reorganize processes. The program is structured around a modular set of Curricular Units, which includes a compulsory core and optional, flexible components. This structure allows students the freedom to customize their educational journey and concentrate on two specific areas of specialization. The ManagiDiTH Master program comprises three main components: Health Sector Skills, Societal Skills, and Digital Skills. Within the Digital Skills component, students can choose between two branches: data Science and Interoperability, based on their interests and background profiles. Training will be delivered in synchronous and asynchronous online lessons. The project aims to enroll about 300-400 students annually. These professionals can be included as feedback providers and benefit from the support provided by the guides for educational activities built in this context.

However, given the intensive nature of the Master's program, it may be challenging for most professionals and lacks customization for specific roles.

In the same line of ManagiDiTH, the *Xpanding Innovative Alliance* (XiA) is an ERASMUS-LS action that will be a four-year project to be launched in January 2025

[3] Stellmach C, Muzoora MR, Thun S. Digitalization of Health Data: Interoperability of the Proposed European Health Data Space. Stud Health Technol Inform. 2022 Aug 31;298:132-136. doi: 10.3233/SHTI220922. PMID: 36073471.

and funded by European Union. Xia project is dedicated to advancing interoperability within the healthcare sector, particularly in anticipation of the EHDS regulation. Through a comprehensive educational initiative, XiA aims to address the skills gap in advanced digital health interoperability standards among healthcare providers, digital health solution providers, and individuals. By developing high-quality educational materials and courses, XiA seeks to equip stakeholders with the necessary skills to embrace EHDS-related standards and foster a culture of interoperability.

The primary objectives of XiA include developing personalized learning pathways, accrediting educational initiatives, and promoting the integration of digital transformation, interoperability, and cybersecurity skills. Through micro-credentialing and partnerships with academic networks, XiA aims to ensure the sustainability and scalability of its educational programs.

By fostering cross-border collaboration and engaging external entities, XiA seeks to empower healthcare providers, enhance the competitiveness of digital health companies, and strengthen the skills of EU health professionals. Through an open approach to interoperability standards and education, XiA aims to sustain its efforts and drive lasting impact in the field of digital healthcare.

In this case, micro learning experiences will be implemented to best tailor education to health professionals' schedules as well as to allow different degrees of customization

This document intends to describe the initial approach to the T3.3, reflect on the results of the discussions and work produced, and described the next steps described to be followed in the project.

1.2 The Readiness Model

The maturity level of healthcare organizations in terms of their digital capabilities is crucial for the successful exchange of medical data. The level and type of guidance required significantly depend on how ready each organization is from both a technical and organizational standpoint. For the scope of this deliverable, we

address the digital maturity of healthcare systems across various organizations, regions, and countries within the context of cross-border health data exchange. When determining maturity levels, it is essential to consider the regulatory and operational characteristics specific to each member country.

This Readiness Model survey aims to assess the anticipated impact of the EEHRxF on current interoperability use cases. It focuses on the most sought-after benefits of using the EHRxF in the short, medium, and long term, as well as identifying the main barriers to its current adoption. The survey should be completed by organizations that are affected by the EEHRxF in their daily operations, particularly those that treat patients and use systems for recording or accessing clinical healthcare data (use of RMO). There is a need to provide educational materials and training for healthcare organizations to help them achieve the necessary digital maturity. This includes guidance on regulatory and operational requirements, technical standards, and best practices personalised to the different stakeholders.

1.3 Key constituencies

1.3.1 **User:** any stakeholder who interacts with EHR systems in different capacities. That includes healthcare providers, administrative staff, patients, informal careers researchers and public health officials, IT professionals, and regulatory bodies. Because EEHRxF has sensible health information, users need to be authorized to access part or all information preferable by a dual way of protection.

1.3.2 **Healthcare Management**: individuals with administrative and managerial roles responsible for overseeing the operation of healthcare facilities and ensuring the delivery of high-quality care. The practice involves offering leadership, management, and direction to organizations delivering healthcare services, including various units within these organisations. This encompasses community, primary, secondary, and tertiary care provision.

1.3.3 **Health Professionals**: individuals who provide medical care and related health services. “Health professionals' study, advise on, or provide preventive,

curative, rehabilitative, and promotional health services based on an extensive body of theoretical and factual knowledge in diagnosis and treatment of disease and other health problems.[4],[5]

1.3.4 **Patients User**: individuals with long-term, chronic or short-term illnesses who receive or are registered to receive healthcare services.

1.3.5 **Informal Carers**: individuals, often family members or friends, who provide care and support to someone who is elderly, ill, or disabled. These carers do so without formal training or compensation, including a variety of tasks such as personal care, household chores, and providing emotional support.

1.3.6 **Citizens user**: all individuals within a community or country, encompassing both patients and those not currently receiving healthcare services.

1.3.7 **Health Systems**: organizations and networks that deliver healthcare services to the population. These include hospitals, clinics, primary care practices, and specialized care facilities.

1.3.8 **Vendors**: companies and organizations that develop, sell, implement, and support EHR software and related technologies.

2 Objectives and approach and methodology

The T3.3 aims to enhance the efficiency of the training process within the healthcare system by providing tailored training for different roles. This role-specific training approach ensures that each group possesses the necessary knowledge and skills to manage health data effectively.

The main goals of this task are:

- To create easy to use (online and paper based) guides for key constituencies (previously defined in this document).
- To promote educate the relevant parties on the next steps to take to reach their next level in the Readiness Model by creating

[4] https://cdn.who.int/media/docs/default-source/health-workforce/dek/classifying-health-workers.pdf
[5] https://ehma.org/projects/xpandh/

materials/curricula and choosing methods for effective education, providing what they need to advocate for and to obtain the EEHRxF gains.

2.1 Method in 5 steps

To plan and solidify the objectives of T3.3, several meetings were held, resulting in a detailed, multi-step plan.

1st Step: the initial step focused on identifying the need to raise awareness among key constituencies about the EEHRxF and its compliance to the EHDS Regulation[6].

2nd Step: understand the different preferences on formats to learn about the EEHRxF and upscale maturity. To facilitate this, a short survey was circulated among stakeholders, consisting of three questions to determine ermining their preferences for learning platforms about the EEHRxF. This survey was distributed through the X-Nets, the Multistakeholder forum, and other activities related to the project where it could reach a broad audience. Preliminary results from this survey can be found in the following section. These results will play a crucial role in shaping the strategy for selecting the most effective platforms for disseminating information about the EEHRxF.

3rd Step: the activities will take place involving the different stakeholders using the educational materials and educational guidance including a syllabus and methodological advice for educational activities. Content build to each group using a common framing answering on: "European Health Data Space and Exchange Format: why this matters to me?"

[6] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022PC0197

4th Step: use partners from the project (X-Nets and X-Bubbles) and other related projects (such as ManagiDiTH) to apply the educational guidance and gather feedback for improvement.

5th Step: incorporate feedback to improve the trial "curricula" and gather strategies to make the feedback loop permanent in future.

Two main areas of training have been identified as key content for educational materials. The first area focuses on educating stakeholders—such as citizens, patients, caregivers, and health professionals—about "the format" itself and how it can be practically applied in daily health activities. This training needs to explain the format and its benefits in simple language, highlighting its clinical impact. The second area of training requires more specialized content aimed at developing technical expertise with focus on the Readiness Model Survey. This will enable institutions to achieve readiness based on feedback from the readiness model survey, these educational materials will be directed to managers, vendors and technological professionals.

Education on the exchange format - EEHRxF

Education to leverage readiness for adoption – The readiness model survey

An initial framework being developed is for citizens and patients, and it is currently in the early stages of drafting. This scheme aims to provide clear and accessible information, ensuring that the overall public can understand and benefit from the EEHRxF. Finding synergies with other project tasks was also an important step in the process. T3.3 X-Bundle Readiness steppingstone guides and capacitation involved discussion with WP5 Growing Digital Health ecosystems and WP7 Dissemination and Outreach in two meetings and follow-up tasks concerning dissemination materials and the involvement of X-Nets in the process of building and disseminating

educational content. The education methods to reach the next level in the readiness model and the materials/curriculum developed in the aim of T3.3 X-Bundle Readiness steppingstone guides and capacitation will also be used within the scope of T4.2 EHRxF-based infrastructure (X-Bundle) feasibility demonstration, which will contribute to the necessary training of early adopters to assess and assist in eliminating obstacles and reaching their next readiness level.

3. Preliminary reflection

A survey distributed to all consortium members under WP3 included a section on educational preferences. Twelve responses were collected, representing each key constituency. When asked about their preferred methods for learning about the readiness model, most responses indicated webinars, online sessions, conferences, workshops, and online learning platforms. There was also a noted need for visual aids and incorporating feedback mechanisms into these platforms. Regarding the effectiveness of disseminating knowledge and advocating for the benefits of EEHRxF, respondents highlighted the importance of a stronger online presence, structuring information according to the target audience, and developing clear and concise messages. When asked about the preferred educational materials and strategies for sharing information about EEHRxF with peers, most referred to digital guides/manuals with both detailed and summary content such as fact sheets, interactive workshops/webinars, online courses with interaction, and mentorship programs provided by experienced professionals.

These results suggest a strong preference for interactive learning about EEHRxF, emphasizing hands-on training and feedback mechanisms. Multiple platforms must be utilized to address diverse preferences and learning styles effectively. Additionally, it was understood that citizens and patients require a very specific approach to educational materials, primarily focused on raising awareness about

EEHRxF. This was addressed through an online session held in April, in collaboration with the German Data Saves Lives DE Initiative[7].

4. Preliminary Recommendations for Capacity Building on the Format

Guidance to education (preliminary)

Early discussion on educational guidance can be based in the different stakeholders involved and considering the focus of the message to be more or less, technical. A preliminary version of educational recommendations for guidance including content that as an effective educational structure:

- **Modular Learning** with modules that cover various aspects of interoperability, such as data standards, system integration, and regulatory compliance, which can be directed to more specific target professionals within the organization. This means adaptable and flexible curricula that can be as personalized for the need as possible.
- **Case Studies** with real-world case studies to illustrate successful interoperability implementations and the lessons learned from failures, cases can also be used as examples to analyse interoperability solutions used by leading organizations that are more advance in readiness for adoption.
- **Virtual Simulations** develop virtual simulation environments where learners can practice implementing and troubleshooting interoperability solutions
- **Interactive Sessions** organize sessions that include hands-on activities with interoperability tools and systems, such as webinars and workshops.

Particular features should be included tailored to the different constituencies; some examples can be found below.

[7] https://www.datasaveslives.de/

a. Healthcare managers and vendors:

- Content focus: the exchange format and the readiness model survey
- Details: Create easy to use materials that specify the benefits of the exchange format to the management of health care institutions and services.
- Educational guidance:
  - Easy-to-use materials that can be used as ladder to the next level of readiness (according to the Readiness Survey), based on the dimensions identified:
    - **Processes**
    - **Care professionals**
    - **IT Implementation**
    - **Awareness raising**

- Conduct webinars and conferences featuring experts in health data interoperability. Utilize case studies and success stories from various European countries to illustrate the practical benefits and achievements in health data interoperability, such as case-studies.
- Use social media campaigns to reach a wider audience, emphasizing key messages and engaging with healthcare managers through interactive content and discussions.

a) Informal training

- Establish peer learning groups where healthcare managers can share experiences, discuss challenges, and exchange solutions between institutions with different levels of readiness.

b) Formal training

- Developing comprehensive certification programs focused on health data interoperability.
- Collaborate with academic institutions and professional bodies to ensure the certification programs are recognized and valued.

b. Health professionals:

- Content focus: the exchange format
- Details: definition of "the format", potential benefits, potential disadvantages for professionals, citizens and workflows (higher focus on workflows innovation).
- Educational guidance:

a) Awareness raising

- Multimedia platforms (e.g., videos, podcasts, social media) to highlight the importance of interoperability in improving patient care and outcomes.
- Create easy-to-understand informational pamphlets and posters to be displayed in healthcare facilities, explaining the basics of interoperability format.
- Sessions in about the exchange format as part of existing medical conferences or standalone events, focusing on the latest trends, challenges, and opportunities.

b) Informal training

- Incorporate discussions on interoperability into regular clinical meetings, such as case presentations and case conferences.
- Establish interprofessional learning communities within healthcare institutions where healthcare professionals can collaborate and learn from each other.

c) Formal training

- Integrate courses on health informatics and interoperability into undergraduate, postgraduate and continuous professional development curricula. This can be done using simulation-based learning and case-based learning methodology.
- Develop and offer specialized professional development programs and workshops on interoperability for practicing healthcare professionals, which should have academic institutions accreditation.

c. For patients, informal carers and citizens:

- Content focus: the exchange format
- Details: definition of "the format", potential benefits, potential disadvantages
- Educational guidance:

a) Awareness raising

- Reach out to prominent European patient organizations, influencers and independent patients' experts to introduce them to the project.
- Develop and distribute easy-to-understand informational brochures and posters in healthcare facilities, community centres, and public places that explain interoperability and its impact on patient care in straightforward language.

b) Informal training

- Collaborate with patient advocacy groups and support networks to provide informal training sessions and utilize social media platforms to cultivate an online patient community.
- Create an online portal with educational resources such as articles, videos, infographics, and interactive quizzes that explain the importance of interoperability and how it works within the European health data space.

5. Next steps

Following steps include compiling the results from the educational preferences to learn about the EEHRxF and adapt the content to the preferences identified while offering comprehensive and accessible educational resources, that will allow stakeholders to be better equipped to implement and utilize these standards, leading to more efficient healthcare delivery, reduced administrative burdens, and enhanced patient care. Additionally, well-structured educational materials help in aligning with the European Union's regulations and initiatives aimed at improving cross-border healthcare services and patient safety.

Different formats and contents will be used to different key constituencies, ensuring that each stakeholder group receives information tailored to their specific needs and levels of expertise.[8] For instance, healthcare providers might benefit from practical guides and case studies that demonstrate the application of EEHRxF in clinical settings, while IT professionals might require more technical documentation and training on data standards and integration techniques. Patients, on the other hand, can be provided with simplified materials that explain how EEHRxF enhances their care and protects their data.

By diversifying the educational content, we can ensure that all stakeholders are engaged and informed, ultimately fostering a more cohesive and effective implementation of EEHRxF across Europe. In this regard, a sequence of webinars aimed to different stakeholders will be held in September/October to raise awareness and test some educational content, after that the content will be adapted and improved to more definitive formats as booklets, leaflets and videos.

These materials will be analysed and discussed in the X-Bubbles (please see D3.2) to gather feedback and suggestions for improvement.

To ensure continuity and integration of these materials with academia and the formal health professionals training, a focus group will be hosted to discuss the materials and it possible future use in the formal educational process across different countries in Europe.

Moreover, ongoing feedback mechanisms should be established to continually assess the effectiveness of the educational materials and make necessary adjustments, ensuring that the content remains relevant and up to date with the latest technological advancements and regulatory changes. Programmed workshops and webinars will be used to provide continuous learning opportunities and support,

[8] https://op.europa.eu/en/publication-detail/-/publication/af7f7807-6ce1-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-190694287

these will be also moments to collect feedback from the materials that were created and to further optimize them.

Additionally, a focus group involving academic experts from both healthcare and IT field will be held to further develop educational materials that will be suitable to be integrated in academic curricula and that are aligned with the current undergraduate and postgraduate practices.

6.Conclusion

The production of educational materials began by the identification of preferences for learning, although the short number of answers results were able to highlight the need for a robust online presence, clear messages tailored to specific audiences, and visual aids. It is evident the necessity to customized materials will be developed for different groups: practical guides for healthcare providers, technical documentation for IT professionals, and simplified explanations for patients. Educational activities were globally understood not only as formal but also as informal activities and raise awareness moments. In this way, description of actions on all these three levels were defined in a very preliminary version. However, there is a need to have a strong structure for educational guidance on interoperability readiness which would benefit from a syllabus that incorporates all the content and recommended methodologies to approach each key constituency. There should be an effort to integrate educational materials into academic and professional training programs across Europe. Continuous feedback mechanisms need to be stablished to ensure the content remains relevant and effective, fostering successful EEHRxF implementation through understanding the current level of readiness and stepping the stones of the ladder. Next steps will be important to refine the preliminary discussion and to pilot educational guides.