Holistic Health Records: Enhancing HL7/FHIR standard towards Fostering Personalization and Improving Prevention and Intervention in the eHealth

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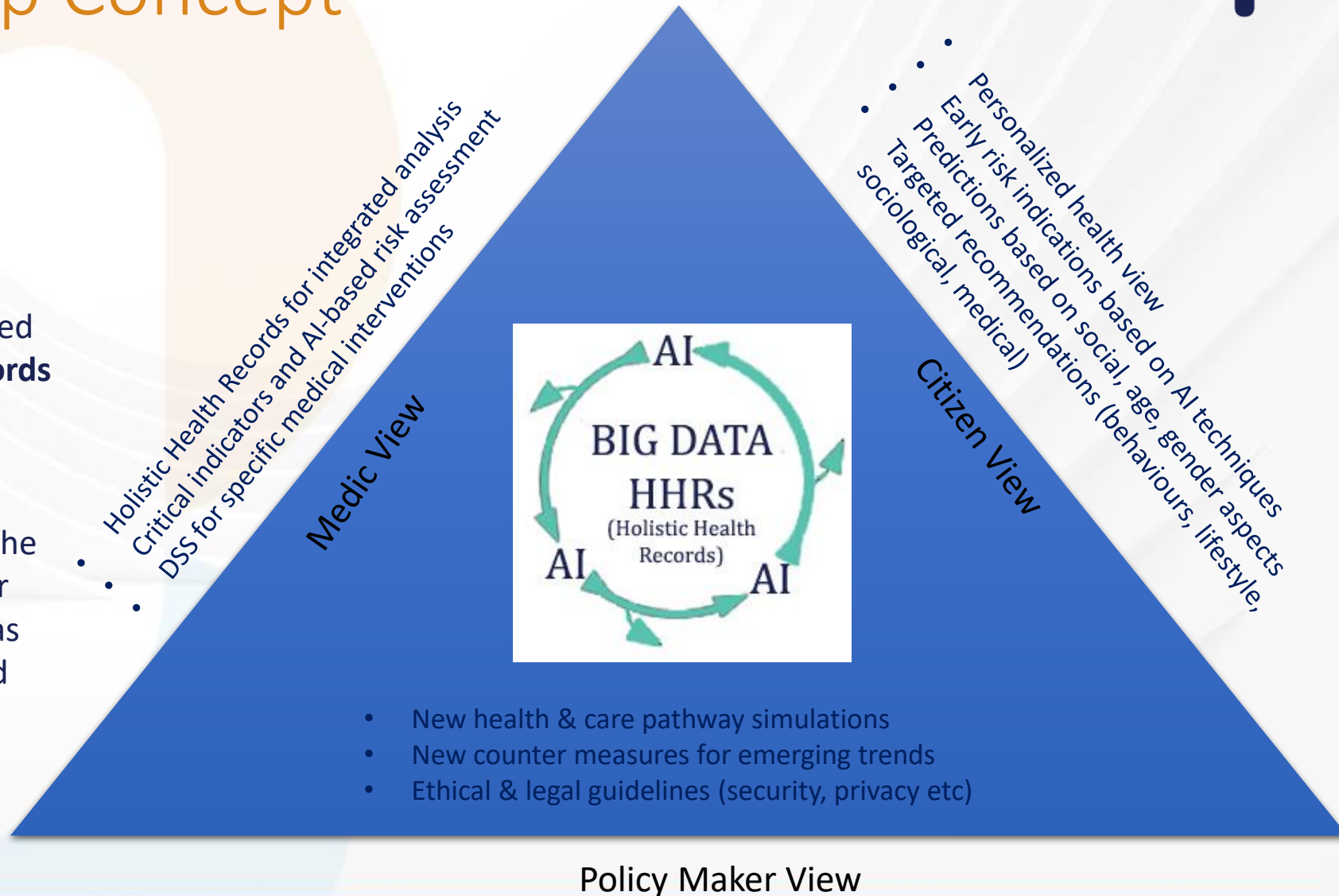Project Coordinator of the iHELP H2020 EU Funded Project

Outline

➢ The iHelp Concept

➢ Problems Statement

➢ Holistic Health Records (HHRs)

➢ Enhancements on HL7/FHIR

➢ Key benefits of HHRs

➢ HSBooster Service

➢ Conclusion

The iHelp Concept

☐ A **novel personalised-healthcare framework**.

☐ Collection, integration and management of health-related data from various sources in a standardised structure called **Holistic Health Records (HHRs)**

☐ **Advance AI techniques** will exploit HHRs to facilitate new insights into the underlying risks of Pancreatic Cancer and foster early predictions as well as the design of enhanced personalized prediction and intervention models
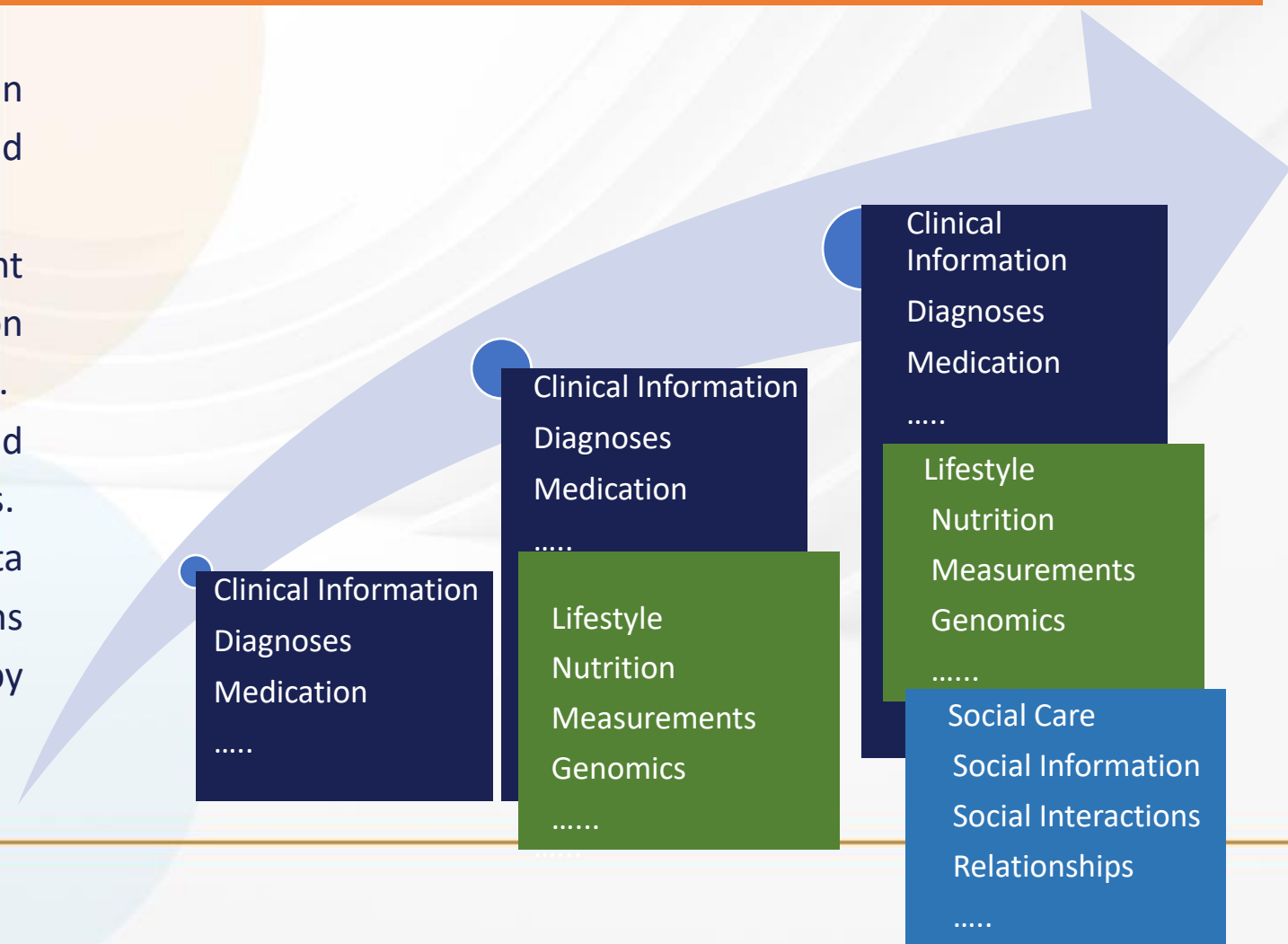
Medic View
- Holistic Health Records for integrated analysis
- Critical indicators and AI-based risk assessment
- DSS for specific medical interventions

BIG DATA HHRs (Holistic Health Records)

Citizen View
- Personalized health view
- Early risk indications based on AI techniques
- Predictions based on social, age, gender aspects
- Targeted recommendations (behaviours, lifestyle, sociological, medical)

- New health & care pathway simulations
- New counter measures for emerging trends
- Ethical & legal guidelines (security, privacy etc)

Policy Maker View

HSbooster.eu
Horizon Standardisation Booster

Help

Funded by
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Problems Statement

❑ **Divergent standards:** Different healthcare providers use different EHR/EMR tools, adopting divergent data representations (several standards exists, and custom structures are widely used as well).

❑ **Fail to describe the complete health information:** Adoption of novel data sources in the healthcare domain, like wearables, introduces new protocols and data formats, streams a big amount of data that the above-mentioned standards fail to completely support, along with the possibility of representing non-clinical events.

❑ **Need to differentiate clinical information:** Health-related data recorded by the patients needs to be differentiated from the information recorded by the health organizations moving towards improved and more personalized patient-centred healthcare strategies.

❑ **Low semantic interoperability:** Different medical terminologies/vocabularies/ontologies used (SNOMED, LOINC, ICD-x, ATC, Custom). Conversion from one terminology to another is not trivial.

Holistic Health Records (HHRs)

HHRs is a data model aiming at capturing clinical events and laboratory test results, but also properties about lifestyle, social care, personal measurements, environment, nutrition habits etc.

- ❑ Seek at capturing all health determinants than can be relevant for health risk detection and personal healthcare.
- ❑ Extract more knowledge from integrated patient data and defines the target data representation to which the raw datasets need to be converted.
- ❑ Different categories and data are provided and described through the utilization of HHR models.
- ❑ Compliant with the standard **HL7/FHIR** data format; so that the interoperability with systems adopting such a standard is guaranteed by design.

Clinical Information
Diagnoses
Medication
…..

Clinical Information
Diagnoses
Medication
…..

Lifestyle
Nutrition
Measurements
Genomics
……

Clinical Information
Diagnoses
Medication
…..

Lifestyle
Nutrition
Measurements
Genomics
……

Social Care
Social Information
Social Interactions
Relationships
…..

Enhancements on HL7/FHIR

❑ Modelling of both **primary** and **secondary data** (mapping into FHIR standard where possible, but also introducing extensions in terms of variables and codes).

❑ The HHR model is designed at an **ontological level**. This approach leads to two differences with the FHIR model:

   o the multiplicity constraints on the properties and attributes of the entities/classes represent **real word existence constraints**, and not integrity constraints, as stated in FHIR.

   o HHR uses abstract classes with no direct corresponding type in FHIR, but with related **super-types of FHIR resource types**.

❑ A HHR class may have **explicit subclasses** that are not represented as distinct resource classes in FHIR. In the HHR model explicit subclasses do not need a related FHIR extension.

❑ The HHR model uses **some specific stereotypes and patterns** to indicate ontological distinctions that cannot be expressed in standard UML format.

❑ **Promotes data integration and analysis:** Unlike FHIR, mainly focused on data exchange, the HHR model is intended to also support data integration and analysis. Implemented on top of existing FHIR libraries, HHR is usable independently from FHIR, while at the same time is applicable for different ambitions.

❑ **Less ambiguous and more understandable:** The higher specialization of the HHR model makes it less ambiguous and more understandable, thus minimizing the risk that different standard elements are used to represent the same type of information.

Key Benefits of HHRs (2/2)

❑ **Improved Personalized Patient Care:** HHR provide a comprehensive and up-to-date view of a patient's medical and non-medical history, including diagnoses, medications, allergies, test results, as well lifestyle habits, nutrition-related information etc.. This helps healthcare providers make more informed and personalized decisions, leading to improved personalized patient care and outcomes.

❑ **Enhanced Patient Engagement:** HHRs can empower patients by giving them access to their own health information. Patients can view their medical records, test results, nutrition habits, everyday activity, questionnaires, and treatment plans, which can lead to better engagement with their healthcare professionals and better management of their own health.

HSBooster Service

The goal is to get the HHR as an official extension to the FHIR standard

Identify the key milestones or processes towards having HHR adopted as an official FHIR extension

understand the process for making proposals for extensions to the FHIR standard

Engage with the FHIR standard and introduce the HHR model as a formal extension to the FHIR.

Conclusion

❑ An **integrated environment** for addressing the challenge of providing multi-dimensional analytic views on integrated data and extract value for different stakeholders in the healthcare domain.

❑ Enable the **collection, integration and management of health-related data from various sources** (medical records, wearables, mobile devices) in a standardised structure, the **HHRs**.

❑ Provide a **holistic view** of individualised data obtained from medical (primary) as well as from lifestyle, behavioural and social (secondary) aspects.

❑ Enable the **interoperability, sharing and re-use, and interlinking** of data and information.

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THANKS!

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