Leveraging AI based technology to transform the future of health care delivery in Leading Hospitals in Europe

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ODIN Project
The ODIN project aims to provide smart hospital solutions by leveraging advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and Big Data. Starting from seven predefined use cases and to better entail the overall ODIN experimental framework there have been introduced three Reference Use Cases (RUCs) overarching all the case studies of the ODIN Pilot Journey. They help to keep an open approach within the organisation of the project allowing new coming partners from the Open Call to add new use cases if needed and to take into account all the objectives and categories covered by each of the original ones. The RUCs include three key aspects of hospitals and serve as a high-level guide:

- **RUC A “Health Services Management”**

- **RUC B “Goods and Devices Management”**

- **RUC C “Disaster Preparedness, Comprehensive of all the previous ones in a Disaster Management”**

The figure below shows the RUCs and Use Cases (UCs) distribution per pilot.
The vision of ODIN is to create a human-centred view of health for mapping digital health tools that create value for human beings in healthcare. To achieve this, ODIN presents a patient health framework that considers the entire healthcare journey, starting from the initial point of contact with the healthcare system. The framework is designed to be used in outpatient clinics and during patient admission to provide a comprehensive understanding of a patient’s health status. The figure below shows the ODIN patient health framework:

Self-monitoring - Selfcare layer: informal care, selfcare, public health. The layer where people (their loved ones or public health officials) monitor, diagnose or treat themselves. Digital health supporting this layer includes wearables, direct-to-consumer testing and apps, the internet, lifestyle interventions initiated by patients themselves and over the counter medication.

Primary care layer: first level of contact with the healthcare system for citizens, first line healthcare professionals may vary across systems, but think GPs, physical therapists, dieticians. Others are needed to diagnose or treat, using point of care testing and medication.

Outpatient clinic layer: care that is provided to patients by hospitals, while not admitting the patient. Diagnostics and treatment get more advanced and expensive, including imaging, lab tests and small medical procedures.

Hospital admission layer: care for which admission is necessary, such as critical illness, surgical procedures or intensive monitoring. Nursing is part of all phases.

By mapping the RUCs, along with the original use cases, to the patient health framework, the ODIN project can better understand the various patient trajectories and healthcare needs across the entire healthcare system. This mapping process serves as a valuable conversation starter with stakeholders and helps to further specify the needs of the healthcare system that ODIN aims to address. An example for the mapping for UC4 “Clinical Tasks and Patient Experience” is shown in the next figure:
THE REFERENCE USE CASES (RUCS) IN DETAIL

RUC A – HEALTH SERVICES MANAGEMENT

Focus

RUC A focuses on clinical and diagnostic-oriented activities, aiming to optimize patient care and support clinical workflows. It includes use cases that reduce the burden on healthcare providers by using AI-based support for diagnosis, automating clinical workflows, and providing inpatient remote rehabilitation. RUC A’s objective is to improve the quality and workflow of clinicians while optimizing the comfort perceived by patients during their journey and improving their health conditions.

RUC A comprises the following use cases (UCs):

UC4 “Clinical Tasks and Patient Experience” (being relevant for most of the piloting partners)

It aims to reduce the effort that clinical personnel must exert in therapeutic and diagnostic activities based on ODIN technology. This is intended not only to improve the quality and workflow of clinicians, but also to optimise the comfort perceived by patients during their journey and improve their health conditions.

UC3 “AI-based support system for diagnosis”

AI technologies to optimise the personalised search for the diagnosis considered most effective in each case, serving as a support to healthcare professionals in decision-making, considering probabilities as well as the capacity of available diagnostic modalities.

UC5 “Automation for clinical workflows”

Aims to respond/act against the emerging difficulty within workflows, which often follow processes that are not efficient enough. Therefore, this project, taking advantage of workflows and the collection of data and sources, aims to offer a solution by automating clinical research execution processes in order to reduce possible errors.

UC6 “Inpatient remote rehabilitation”

Remote patient monitoring covering both patient follow-up and simple and secure communication between patients and the relevant hospital sector. To this end, the ODIN project will deploy an AI system to automatically support patients and help healthcare staff to provide optimized lifestyle monitoring.

RUC A – PHASES

The following infographic outlines the key stages in the clinical process covered by RUC A. From admission and screening to diagnosis, treatment, monitoring, and follow-up, this visual guide helps to illustrate how ODIN’s advanced technologies and automation are utilized to optimize patient care and support clinical workflows.

1 Adapted version of the WHO navigation diagram for cardiovascular diseases.
RUC B aims to improve hospital logistics, clinical engineering, and the management of medical devices using ODIN technologies. By leveraging the capabilities of ODIN, this reference use case seeks to optimise procurement, storage, and distribution of materials, reduce redundant activities, and enhance the workflow and efficiency within hospitals. It also focuses on real-time management of medical devices to improve their performance and reduce adverse events, ultimately leading to better disaster preparedness.

RUC B comprises the following use cases (UCs):

UC1 “Aided logistic support”
Deals with the entire process of procurement, storage and distribution of different materials in the hospital environment focusing on activities within the hospital environment that are considered redundant (e.g., transport of consumables). It aims to leverage ODIN technology to optimize all these logistic activities, thus improving working conditions, optimizing the working time required by healthcare personnel for certain types of repetitive or risky tasks that do not require their attention, and the efficiency and workflow within the hospital.

UC2 “Clinical Engineering, MD locations, real-time management”
Focuses on the management of medical devices using ODIN technologies. This is particularly important as the current lack of real-time information exchange is one of the main causes of adverse events in the hospital environment. The correct functioning and adaptation to this use case will allow not only the optimisation of routine activities but also in disaster preparedness.

The RUC B infographics offer a clear and concise overview of the key phases involved in hospital logistics, clinical engineering, and medical device management using ODIN technology. They illustrate the planning, procurement, delivery, installation, cleaning, maintenance, and decommissioning stages, which contribute to optimizing workflow, reducing risks, and enhancing efficiency. By improving these processes, RUC B aims to improve patient care and help hospitals prepare for possible future catastrophes.

1 Adapted version of the WHO navigation diagram for cardiovascular diseases.
The RUC C infographic provides a visual representation of the disaster preparedness flowchart phases. The aim of this is to help hospitals respond quickly and recover faster from disasters, utilizing state-of-the-art simulations in EBM.

Focus

This reference use case aims to prepare hospitals for possible unforeseen and tragic events that may occur covering UC7 “Disaster Preparedness”. This peculiar RUC has been introduced to prepare and tackle the multitude of difficulties that hospitals had to face during the pandemic and other catastrophes: terror attacks, natural events, and on. For this purpose, ODIN approach and KERs will allow through different simulations, to contribute to hospital resilient management (e.g. crowd management, security, IPC support) and prepare hospitals for possible future catastrophes, always with the main objective of ensuring safety.

RUC C comprises the following use case (UC)

UC7 Disaster Preparedness

In order to support the hospital in rapidly adapting to face disasters, properly considering the safety requirements for medical locations, medical devices, patient safety and workers' safety. Currently, complex decisions such as identifying the location to create novel ICU beds, relies on individuals' knowledge and expertise. The complexity of hospitals is such that it requires scientific simulation before implementing any change.

RUC C – Phases

The RUC C infographic provides a visual representation of the disaster preparedness flowchart phases. The aim of this is to help hospitals respond quickly and recover faster from disasters, utilizing state-of-the-art simulations in EBM.
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