Leveraging AI based technology to transform the future of health care delivery in Leading Hospitals in Europe
The COVID-19 pandemic is putting enormous pressure on hospitals across Europe. They face a major problem, namely increasing the capacity of intensive care units. Hospitals are called upon to increase their productivity in order to improve quality and safety. In this context, the ODIN project, a European multi-centre pilot study focusing on hospital safety, productivity and quality, has identified **11 critical challenges for hospitals that can be solved through a combination of Robotics, IoT and AI**. The project will therefore contribute to the implementation of the European smart hospitals of the future.

As part of the leading infrastructures affected by Industry 4.0, hospitals have the opportunity to **reduce the workload of overstretched hospital staff, improve the patient experience** and **optimise the efficiency of healthcare**. These objectives can be achieved through the use of modern technologies in the diagnosis and treatment of patients, but also in logistics and management tasks in the background. The combination of **clinical expertise, patient data, the availability of environmental resources and profound research evidence** are conducive factors to further increase technology uptake.

Within the project, the main objective is to deliver an **open digital platform**, supporting a **suite of services and Key Enabling Resources (KERs) empowered by robotics, Internet of Things (IoT) solutions and specialized AI**. These resources will be implemented in three Reference Areas of Hospital Interventions: **eWorkers, eRobots and eLocations** and will be tested through **seven Clinical Use Cases** in leading hospitals of six European countries: Spain, France, Germany, Poland, Netherlands and Italy.

**OVERVIEW**

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A dynamic and collaborative mechanism is going to be built for an innovative procurement journey between healthcare providers and care givers that complies with applicable standards and regulations under national and European regulatory frameworks.

ODIN aims to deliver an open and secure platform, supporting a suite of services and Key Enabling Resources (KERs) empowered by robotics, IoT solutions and specialized AI. The platform will integrate an Evidence-Based Medicine approach, gathering data from tangible and intangible resources that will be analysed and interpreted by AI.

1. Digital platform empowered by robotics, IoT and AI

2. Co-creation space between healthcare suppliers and providers
A multi-centre cohort study will demonstrate the safety, efficacy and cost-effectiveness of ODIN’s Key Enabling Resources (KERs) and the ODIN platform. A combination of three intervention areas - eWorkers, eRobots and eLocations - and seven clinical use cases will be studied at six different pilot sites.

A communication and dissemination program is set up, that - together with an exploitation strategy – reaches out to a significant number of users and business partners to deliver ODIN solutions during and after the project lifetime.
AREAS OF INTERVENTION

**eWorkers**

**Enhanced Hospital Workers (eWorkers):** Explore how to empower hospital workers (e.g. nurses, porters, technicians, doctors, etc.) with appropriate technologies to enhance their skills and support their daily work.

By relieving workers from the burden of their routine activities, they can focus on critical tasks which demand all their human capabilities.

**eRobots**

**Enhanced Robots (eRobots):** Automate hospital processes that no longer need humans or can benefit from automation.

eRobots will have advanced perceptual capabilities (smell, sight, touch, taste and hearing), extreme connectivity capabilities (with other robots, hospital assets, humans, medical locations), advanced AI reasoning capability (both locally and remotely) and the ability to perform tasks (wheels, arms, hands, etc.).

**eLocations**

**Enhanced Locations (eLocations):** Instrument medical locations for enabling them to proactively support hospital processes.

By enhancing medical locations with sensors, technologies for interacting with humans and high connectivity for safe and effective interaction with workers, robots, devices, and other hospital assets.

eLocations will be able to provide real-time information about their underlying technical infrastructure (e.g. electrical systems, water pipes, air-conditioning systems, medical gases), which is crucial for the safety of people (patients, visitors and staff), robots, medical devices and equipment.
Aided logistic support: Intelligent use of technologies will help to improve the design, planning and execution of activities such as procurement, storage and distribution of various materials (medicines, medical and hotel supplies, meals, laundry, waste).

Management of medical devices and sites: The combination of IoT, robots, environmental sensors, wearable devices for workers and the Warwick Apollo Semantic Platform (WASP), a semantic solution for web architectures, will enable real-time management of medical devices and locations.

AI based support system for diagnosis: By personalising the diagnostic trajectory of patients based on probabilities and providing integrated capacity management of the entire diagnostic supply chain, diagnostic processes will be more efficient.
Clinical tasks and patient experience: ODIN technologies will support nursing staff and caregivers in monitoring and assisting patients. They will therefore reduce the workload of the clinic staff and increase the comfort of the patients.

Automation of clinical workflows: Implementing and validating a workflow-driven solution will support the automation of clinical research processes by enabling clinical workflows, data collection processes and sources.

Inpatient remote monitoring: A multi-sensor platform with flexible data communication capabilities will enable efficient communication between the different technologies and hospitals.

Disaster preparedness: Through the combination of the Warwick Apollo Semantic Platform (WASP), eWorkers, eRobotics and eLocations ODIN will introduce a shift within the approach to hospital disaster. It will help hospitals to properly consider the safety requirements for medical locations, patient safety and worker’s safety and to adopt rapidly when facing disasters.
The emergence of European-led AI based pilots for the smart hospitals of the future:
ODIN will deploy a set of six pilot demonstrations that will deliver innovative AI based solutions in six renowned and large hospitals: CBM (Italy), UMCU (Netherlands), CHB (Germany), HUSC (SERMAS Spain), MUL (Poland), and AMIS (France)

The demonstration of effectiveness of AI based technologies, such as smart robots, in a broad range of healthcare tasks: The ODIN services and the ODIN platform will create unique collaboration capabilities that machines and humans bring to the different areas supported by ODIN. ODIN aims at going further in the concept of Smart Hospitals, by redesigning work, rethinking work architecture, retraining professionals and rearranging the organization to transform current services offered by hospitals into value-based health services.

ODIN as an ecosystem for engagement among healthcare policy makers, investors, stakeholders and through the pilot: The ODIN consortium partners will engage with decision makers through various nodes and the ODIN ecosystem, influencing and supporting various stakeholders.

Ease of deployment and scalability of ODIN: The ODIN platform will offer easily accessible microservices based on robotics, IoT and AI. It will be API-based and therefore easy to implement and scale in terms of eWorkers, eRobots and eLocations.

Reaching a high leveraging effect on the other sources of funding, in particular regional and national funding: ODIN will implement sustainable solutions and promote real market opportunities. It will collaborate with regional, national and EU-funded programmes, provide content and engage in joint dissemination activities, share experiences and coordinate the design of the ODIN platform. This will prepare the ground for further sources of funding.

Contributing to trust and acceptance of AI technology: ODIN aims at showing the healthcare stakeholders why and how AI works, by gathering tangible results of the application of AI technologies.
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