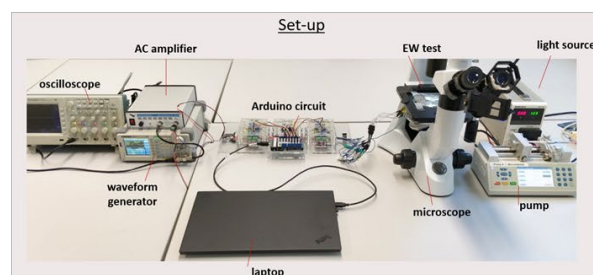
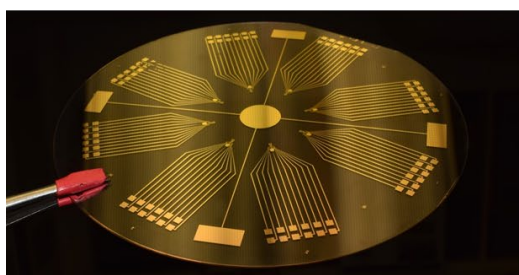


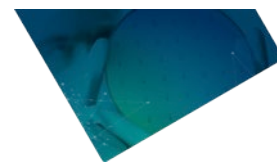
## Improved wearable early warning patches to reduce serious complications and disabilities among hospital patients

Paris, 14 September 2021- Every year thousands of patients in Europe and elsewhere die or suffer serious complications and / or disabilities following ‘adverse events’ during their stay in hospital or after discharge. The PENTA project, Sentinel, aims to reduce these risks to patients through an improved wearable early warning system (EWS) – a ‘patch’ – that detects when a patient’s condition is deteriorating. Unlike existing EWS, the future Sentinel patch will measure biomarkers (biological molecules) as well as physiological and contextual indicators. In addition, Sentinel is seeking to increase use of EWS in hospitals by ensuring that its semi-continuous monitoring and results analysis fit with existing caregiver work routines.

Adverse events are estimated to affect up to 12% of hospitalized patients and to cause up to 95,000 patient deaths per year in the European Union alone. Current EWSs measure physiological vital signs (such as blood pressure and respiration rates) and levels of consciousness. However, clinicians consider that biomarkers contained in sweat and / or interstitial fluid (between body cells) can also be valuable indicators of deteriorating condition. Efforts have been made to include these markers to improve existing EWSs, either through point-of-care (POC) testing or increased central lab testing. But the lack of integration into caregiver workflows has prevented widespread take-up.

Sentinel is addressing these issues by realizing significant innovations in sweat rate and biomarker sensing technologies, that will enable a wearable solution based on semi-continuous quantitative sensing of all three indicators: physiological, contextual and biomarker. The project will focus on two key use cases, sepsis and delirium. And amongst a range of innovations, it will work on advances in micro/nano technologies and microfluidics, as well as manufacturing technologies and verified prototypes. Noteworthy is the research towards utilizing sweat as biomarker-rich biofluid with fully non-obtrusive access, however the sweat rate especially in sedentary state is very small, in the order of 0.2 nL/min per gland, insufficient to transport sweat even in small microfluidic channels in a clinical relevant timely manner to the biosensors. Sentinel is approaching this dilemma by an innovative active transport mechanism that can even accelerate the smallest amounts of sweat. One of the test platforms is depicted below.





To achieve its wide-ranging goals, the Sentinel project brings together partners with expertise spanning components (sensors and materials), integration (microfluidics and assembly) and the signal chain (electronics, software, analytics, and clinical decision-support). Besides being able to leverage state-of-the-art technologies around vital signs monitoring patches (energy, materials, and systems), the project will involve clinical end-users to help identify requirements and deliver relevant clinical results.

Together, the Sentinel partners will target four key market segments: POC diagnostics, wearables for healthcare, electrochemical sensor technologies and the wider diagnostics market. All of these represent significant commercial opportunities. For instance, the global market for POC diagnostics in 2015 was valued at nearly USD 18 billion, with predictions to grow to USD 28.3 billion in 2021<sup>1</sup>. Meanwhile, the global market for *wearable healthcare devices* was anticipated to reach a revenue of USD 18.9 billion in 2020<sup>2</sup>. Demand for electrochemical sensors is also set to grow strongly (particularly for continuous sensing) and the biochemical sensor market is forecasted to reach USD 58.48 billion by the end of 2025<sup>3</sup>.

At a time of rising chronic illness and ageing populations, Sentinel enables European companies to deliver health, social and economic benefits. Plus, its outcomes will have potential in other areas from promoting healthy lifestyles to technologies for emerging applications such as safer driving.

#### About the PENTA programme

PENTA is a [EUREKA](#) cluster whose purpose is to catalyse research, development and innovation in areas of micro and nanoelectronics enabled systems and applications. Guided by the [Electronic Components & Systems \(ECS\) Strategic Research and Innovation Agenda \(SRIA\)](#) four technology layers, four cross-sectional technologies and six ECS key application areas, the PENTA programme enables the development of electronic solutions to help drive the digital economy through the formation of collaborative ecosystems along the ECS value chain. This creates the opportunity for rapid competitive exploitation and a strong impact on European societal challenges. PENTA supports SMEs, large corporations, research organisations and universities to work together in project consortia by facilitating access to funding, fostering collaborative work and creating consortia in areas of mutual industrial and National interest. PENTA is managed by the Industry Association AENEAS

More on PENTA: <http://www.penta-eureka.eu>

More on AENEAS: <https://aeneas-office.org>

#### About the Sentinel project:

Sentinel is a RD&I project consortium involving 9 partners from 4 countries. The project partners are: Philips Electronics Nederland BV (Project leader), AZ Turnhout, Catharina Ziekenhuis, Eindhoven University of Technology, Jobst Technologies GmbH, Micronit BV, Sapienza University- Dept. Mech Aerosp. Eng., TEGEMA and Verhaert New Products & Services NV. Sentinel consortium members are located in Belgium, Germany, Italy and the Netherlands.

More on Sentinel: <https://penta-eureka.eu/project-overview/penta-call-4/sentinel/>

---

<sup>1</sup> Western Europe Point-of Care Testing (POCT) market, Frost & Sullivan, 2016

<sup>2</sup> Wearable report, Frost & Sullivan, 2016

<sup>3</sup> Biochemical Sensor Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2017 – 2025