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TAKING COOPERATION FORWARD

OUTPUT FACT SHEET

Tools
Version 2

Project index number and acronym	CE1581 niCE-life
Output number and title	Output O.T2.1 – Intelligent Monitoring Tool
Responsible partner (PP name and number)	BUT PP2
Project website	https://www.interreg-central.eu/Content.Node/niCE-life.html
Delivery date	31/12/2020

Summary description of the key features of the tool (developed and/or implemented) and of its transnational added value

The Intelligent monitoring tool was designed by the Brno University of Technology (BUT, www.vutbr.cz) in WP T1 and tested by local neurologists from the Central European Institute of Technology (CEITECH, www.ceitec.eu) and the St. Anne's University Hospital in Brno (SAUH, https://www.fnusa.cz/) in the frame of WP T2. The tool offers innovation to the diagnosis of sleep disorders, especially in terms of the idiopathic rapid eye movement sleep behaviour disorder (iRBD) identification for Parkinson disease early detection.

Nowadays, RBD is correctly diagnosed based on screening in a sleep laboratory where the video-polysomnography (vPSG) is employed. Such an approach is expensive, not comfortable and does not offer a longitudinal assessment. The intelligent monitoring tool offers cheap (€150/device that can be reused) and affordable (diagnosis in the comfort of home with minimal impact on person daily life) alternative. Since the system enables remote diagnosis of iRBD, which is the early marker of α-synucleopathies, it could be used during the prodromal diagnosis of e.g., Parkinson's disease (PD). PD remains in prodromal stage (i.e., in a stage when the typical symptoms are not visible) for up to 10 years. After those 10 years when the symptoms start to be more pronounced (e.g., resting tremor, rigidity, bradykinesia, postural instability), there are already significant brain damages. Treatment is significantly more effective when administered early. Thus, the Intelligent monitoring tool could be used for timely intervention which could have a positive impact on patients' quality of life.

In the scope of WP T2, the Intelligent monitoring tool was locally tested. The questionnaires were provided to experts (neurologists) and also to end users. The results of the local testing were very positive. Findings and observations are currently being incorporated to the design prepared for testing in WP3.

NUTS region(s) where the tool has been developed and/or implemented (relevant NUTS level)

The Intelligent Monitoring Tool was primarily developed in Brno University of Technology, Faculty of Electrical Engineering, Department of Telecommunications (CZ064 NUTS level 3).

The tool is going to be tested and implemented in Samariterbund Burgenland (AT111 NUTS level 3) University Hospital Olomouc (CZ071 NUTS level 3).

Expected impact and benefits of the tool for the concerned territories and target groups

The expected benefits resulting from applying the tool is the possibility to comfortable screening for Parkinson's disease from sleep patterns. The disease develops up to 10 years before the first symptoms and with the visible symptoms there are already extensive and irreversible damage of the brain. There is no cure, early medication significantly slowdown its progress and sleep patterns are one of the early markers of the disease.

From the high-level perspective, the targeted use-case can be described as follows:
1. A patient at risk of having/developing sleep disorders (as mentioned in the previous section, this can be a prodromal marker of developing a neurodegenerative disorder such as PD/AD, etc.) borrows an actigraph from a doctor.
2. Next, he/she wears it for a couple of days during sleep according to the instructions provided by the doctor to acquire large enough data sample to be analyzed by the sleep monitoring system to compute relevant features describing the potential sleep-related problems and to assess and/or monitor the quality of sleep aiming at early identification of the development of a sleep disorder.
3. Then, he/she uploads the sleep data via the web interface/or brings the actigraph to the doctor for the processing and prediction/assessment. Finally, he/she gets a detailed report about his/her sleep from the doctor that is going to act accordingly.

Until these days the development of the tool did not lead to an uptake at policy or institutional level but we are in touch with Brno Municipality and coordinate joint next steps.

The Intelligent monitoring tool will be used and tested in WP T3 Samariterbund Burgenland (AT111 NUTS level 3, population: 0.3 mil.), University Hospital Olomouc (CZ071 NUTS level 3, population: 0.6 mil.) and by CEITEC (CZ064 NUTS level 3, population: 1.2 mil.). Every mentioned region benefits from the tool that has been developed in the niCE-life project. Approximately 2 % of people over 65 suffer by Parkinson disease in those regions, i.e. up to 8 400 people can be diagnosed in early stage of the disease and the organizations can diagnose approximately 50 cases each year and potentially 900 people in the short term range.

Sustainability of the tool and its transferability to other territories and stakeholders

The online sleep monitoring system will be used in the sleep clinics. Since the funds allocated to its development are bound to this specific project, the maintenance of the system beyond the scope of the project will be limited. However, when being accepted, future projects will be built on top of it (I.e., improvements, new versions, etc,|). The results of the pilot testing could be used by neurologists and other doctors to provide remote and objective diagnosis, assessment and monitoring of other neurological disorders (e.g., Alzheimer's disease) via the online sleep monitoring system. Most importantly, such a system and the results are applicable worldwide (sleep disorders are not territory specific, I.e., objective, data-driven approach is key in making a progress in the field). Finally, lesson learned from the development and implementation evolved around the positive feedback from doctors and patients themselves confirming sleep monitoring tool as being acceptable and suitable for real clinical use.

The AI powered software tool is being deployed and used by the Central European Institute of Technology (CEITECH, www.ceitec.eu, CZ064 NUTS level 3) neurological department and the St. Anne's University Hospital in Brno (SAUH, https://www.fnusa.cz/, CZ064 NUTS level 3) neurological department. There is high motivation for using the tool – it decreases need for Polysomography which is an expansive and usually quite overloaded laboratory device.

References to relevant deliverables and web-links
If applicable, pictures or images to be provided as annex

The main relevant project deliverables are reports related to the BUT tool development activity in WP2, namely:
D.T2.1.1 Intelligent monitoring tool – System specification, DT2.1.2 Coordination meeting, D.T2.1.3 Intelligent monitoring tool - Design and adjustment of the platform, D.T2.1.4 Intelligent monitoring tool – Testing of the monitoring tool in cooperation with local neurologist (CEITEC), D.T2.1.5 Intelligent monitoring tool – Testing of the Prototype and Finalization of the Tool.

The tool is deployed at: https://linda.utko.feec.vutbr.cz/