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AI-powered Lifestyle Intervention for Patient-Centered Cardiac Rehabilitation – the TIMELY Approach

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Background:

Cardiac rehabilitation (CR) is an evidence-based therapy to limit the physiological and psychological effects of CAD, manage symptoms, and reduce the risk of future events. CR is far from general implementation and the potential of CR components over the continuum of CAD is not fully exhausted. Current eHealth innovations allow the integration of artificial intelligence (AI) and Internet of Things (IoT)-devices to optimize personalized care and provide self-care assistance for disease control and prevention of CAD progression. TIMELY is the first AI-driven eHealth approach aiming to promote targeted and personalized lifestyle interventions based on CR components. TIMELY includes continuous risk prediction, decision support tools to identify the optimal time and route for targeted intervention and assists lifestyle changes based on psychosocial assessment and behavioral change models. The project is funded by the European Commission Horizon 2020 program (101017424).

Methods:

TIMELY is a patient-centered, modular platform using a Living Lab approach for iterative and participatory design. Routes for patient information and communication will be based on a (mobile) app complemented by adaptive chat bots for the assessment of psychosocial CR-relevant components. IoT-devices include self-applicable (long-term) ECG devices, activity trackers and hemodynamic monitors, and will inform about therapy progress, treatment deviation, and future risks. A data-driven TIMELY AI for the continuous and in-time prediction of individual risks is being developed, and AI behavioral change agents will be enabled to activate patients for optimized program adherence and to support long-term lifestyle changes. A multicentered RCT in Germany, Spain and The Netherlands will be conducted to provide evidence on the efficacy of the approach.

Results:

Since initiation of the project in 2021, the TIMELY platform has been developed based on an integrative database for interoperability with electronic health records, integration, and visualization of (real-time) data from IoT-devices, patient communication and data sharing. A prospective observational study is currently ongoing to document the clinical and psychosocial characteristics of CAD patients, and to collect long-term ECG, activity, and hemodynamic data during CR and 6-months follow-up. Evaluation of Living Lab guided interviews revealed patients' requirements and suggested good acceptance of the proposed solution. Patients reported high acceptance of the suggested eHealth solution in general and of individual components informing on current diagnosis, clinical and laboratory parameters, and future risks as well as support for physical activity including motivational messages, progress documentation and updates on recommended training. While assistance with smoking cessation and stress management was also considered as important, dietary support was not prioritized. Communication by adaptive chat bots was also generally accepted, even if personal feedback was highly appreciated.

Conclusions:

The TIMELY eHealth platform will be the first AI-powered multimodal intervention system supporting CAD patients to achieve long-lasting lifestyle changes based on individual needs. TIMELY may be applied in different European health care settings to coordinate a multidisciplinary care team to induce early targeted interventions for improved quality of life and health outcomes.

Resources: <http://timely-project.eu>

https://dgk.org/kongress_programme/jt2022/aV941.html