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Newsletter N.9, February 2024

INTRODUCING DEUTSCHES FORSCHUNGSZENTRUM FUR KUNSTLICHE INTELLIGENZ GMBH (DFKI)

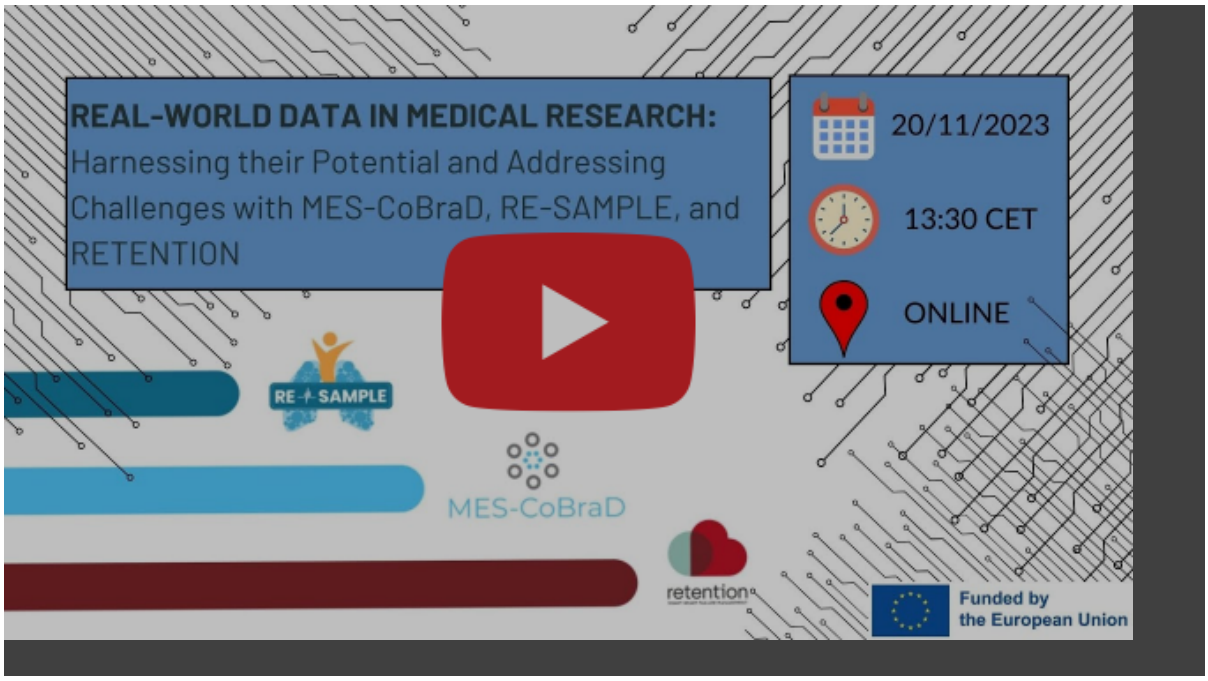
The German Research Center for Artificial Intelligence (DFKI), founded in 1988 as a non-profit public-private partnership, has research facilities in Kaiserslautern, Saarbrücken, and Bremen, a project office in Berlin, a Laboratory in Niedersachsen, and branch offices in Lübeck, St. Wendel, and Trier. DFKI is the leading research center in Germany in the field of innovative commercial software technology using Artificial Intelligence. Based on application-oriented basic research, DFKI develops product functions, prototypes, and patentable solutions in the field of information and communication technology. Research and development projects are conducted in 24 research departments, nine competence centers, and eight living labs.

DFKI is actively involved in numerous organisations representing and advancing Germany as a hub for cutting-edge research and technology. With a staff of more than 650 highly trained researchers and administrators, and over 400 students, DFKI enjoys an excellent reputation for its academic training of young scientists and serves as a stepping stone to leading positions in industry and successful careers as founders of spin-off companies.

DFKI participates in RE-SAMPLE with the research department for Cyber-Physical Systems, is the technical-scientific coordinator of the project, and contributes its expertise in semantic methods, symbolic and sub-symbolic machine learning, information security,

quality-oriented design of cyber-physical systems, and cognitively adequate technical systems with application in care and health.

Webinar on “Real-world data in medical research: harnessing their potential and addressing challenges with MES-CoBRaD and RETENTION”



On 20 November 2023, RE-SAMPLE met two other project consortia (MES-CoBRaD and RETENTION) to discuss the potential of real-world data (RWD) in advancing medical research and healthcare.

The session brought together experts from three European research projects that utilise RWD to tackle complex medical challenges, contributing to a digital transformation in healthcare delivery. The presenters shared their experiences on acquiring, analysing, and applying RWD within their respective projects, as well as addressing the challenges of collecting, anonymising, harmonising, and combining data.

The event focused on the remarkable potential of RWD and its application in enhancing healthcare outcomes, and gave insights into the challenges and best practices for medical research, as well as for clinical practice.

MES-CoBraD (Enhancing Complex Brain Disorder Management with RWD). Presented by Elissaios Karageorgiou.

In this presentation, we discovered how the MES-CoBraD project employs RWD to improve the diagnosis and treatment of Complex Brain Disorders. Experts discussed their approach to recruiting and collecting data. They also shared strategies for using, reusing, extending and expanding RWD within and beyond the current scope of the platform, while addressing privacy concerns, data management, and participant recruitment.

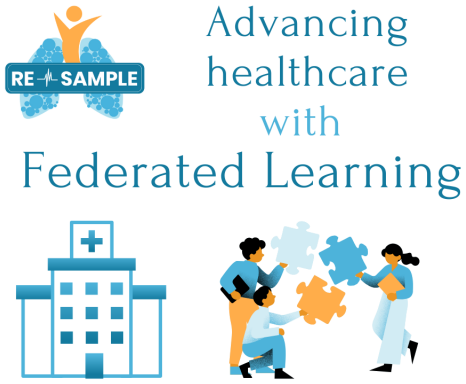
RETENTION (Heart Failure Patient Management and Interventions using continuous patient monitoring outside hospitals and RWD). Presented by Maria Roumpi and Nikos Vasileiou.

The project is targeting the development of an innovative platform supporting enhanced clinical monitoring and interventions aimed at improving the clinical management of patients with chronic heart failure. During this section, the path starting from the integration of devices to collect RWD leading to the sharing of data/models was explored, with a focus on data harmonisation, interoperability and the re-usability of the final solution.

RE-SAMPLE (Real-Time Data Monitoring for Shared, Adaptative, Multi-domain and Personalised Prediction and Decision-making for Long-term Pulmonary Care Ecosystems). Presented by Prof. Christos Kalloniatis and Dr. Anke Lenferink.

In this presentation, we learned how RE-SAMPLE approached RWD medical data and GDPR. More specifically, our project highlighted issues related to data anonymisation. We also looked closely at the process for obtaining consent in various cases.

Advancing Healthcare with Federated Learning in the RE-SAMPLE Project!



In the RE-SAMPLE project, we are exploring the potential of Federated Learning, a sophisticated method that utilises edge nodes and a central orchestrator server to refine medical insgihts. Here is a simple overview:

- Enhanced Insights: By leveraging data from diverse sources while maintaining confidentiality, Federated Learning helps clinicians gain insights into disease patterns, treatment effectiveness, and patient outcomes.
- Tailored Care: With Federated Learning, healthcare providers can develop customised treatment plan based on each patient's unique needs and circumstances, promoting a more individualised approach to care delivery.
- Ethical considerations: Privacy and ethical integrity are prioritised in

- Decentralised Learning: Federated Learning employs edge nodes spread across healthcare facilities. These nodes collaborate by training machine learning models on local patient data, ensuring privacy and security.
- Centralised Coordination: A central orchestrator server manages the collaborative efforts of these edge nodes. It consolidates knowledge from local model training, providing a comprehensive understanding without compromising patient privacy.

RE-SAMPLE's implementation of Federated Learning. Transparent governance and robust security measures safeguard patient trust and confidentiality.

- Driving Progress: Federated Learning represents a step forward in healthcare innovation, offering a pragmatic approach to improvising medical insights while respecting patient privacy and security.

RE-SAMPLE project team meets the Advisory Board

On 11 November 2023, the RE-SAMPLE Consortium met with its Advisory Board.

During this online meeting, we discussed our major outcomes, how to position the project and build a sustainable ecosystem, and how to openly disseminate AI models while ensuring privacy and compliance with the General Data Protection Regulation.

Publications

The Societal Impact of a Virtual Companionship Programme for People with Chronic Obstructive Pulmonary Disease

On 20 October 2023, Stephanie Jansen-Kosterink and Marian Hurmuz published a paper titled "The Societal Impact of a Virtual Companionship Programme for People with Chronic Obstructive Pulmonary Disease" as a preprint SSRN.
Link to publication

The abstract can be read below:

Introduction

The Social Return on Investment, or SROI methodology, is an alternative to traditional economic evaluation methodologies and is suitable to assess the societal impact of Digital Health Technologies, even in an early stage of development. Our aim is to present the SROI methodology and to assess the societal impact (forecast) of a Virtual Companionship Programme developed in the European RE-SAMPLE project for people suffering from Chronic Obstructive Pulmonary Disease.

Materials and Methods

To assess the societal impact of the RE-SAMPLE Virtual Companionship Programme, the principles and phases of the SROI methodology are followed. The SROI process leads to two clear products: an impact map and an SROI ratio (benchmark).

Results

Based on the final impact map, established together with consortium partners and a group from the Dutch pilot site, we were able to calculate the forecast SROI of the RE-SAMPLE Virtual Companionship Programme. The total input of this SROI is € 622k and the total outcome is € 746k, resulting in an SROI ratio of 1.20.

Discussion

The RE-SAMPLE Virtual Companionship Programme forecast SROI demonstrates what alternations are necessary to increase the societal impact to a more acceptable level, such as including more participants or lowering the costs for the hospital. Given our experience, we are enthusiastic about this pragmatic methodology and its potential to assess the social impact of Digital Health Technologies, due toits multi-stakeholder perspective and practicality. It is hoped this paper will encourage other academics to use this methodology to assess the societal impact of Digital Health Technologies and to publish their work.

Exploring Patterns of COPD Exacerbations and Comorbid Flare-Ups

On 16 November 2023, Sanne van Dijk, Marjolein Brusse-Keizer, Tanja Effing, Paul van der Valk, Eline Ploumen, Job van der Palen, Carine Doggen, and Anke Lenferink published a paper in the International Journal of Chronic Obstructive Pulmonary Disease. This paper was titled "Exploring Patterns of COPD Exacerbations and Comorbid Flare-Ups".

Link to publication

The abstract is presented below.

Background

Comorbidities are known to complicate disease management in patients with Chronic Obstructive Pulmonary Disease (COPD). This is partly due to lack of insight into the interplay of acute exacerbations of COPD (AECOPD) and comorbid flare-ups. This study aimed to explore patterns of AECOPDs and comorbid flare-ups.

Methods

Data of increased symptoms were extracted from a 12-month daily symptom follow-up database including patients with COPD and comorbidities (chronic heart failure (CHF), anxiety, depression) and transformed to visualisations of AECOPDs and comorbid flare-up patterns over time. Patterns were subsequently categorised using an inductive approach, based on both predominance (i.e., which occurs most often) of AECOPDs or comorbid flare-ups, and their simultaneous (i.e., simultaneous start in ≥ 50%) occurrence.

Results

We included 48 COPD patients (68 ± 9 years; comorbid CHF: 52%, anxiety: 40%, depression: 38%). In 25 patients with AECOPDs and CHF flare-ups, the following patterns were identified: AECOPDs predominant (n = 14), CHF flare-ups predominant (n = 5), AECOPDs nor CHF flare-ups predominant (n = 6). Of the 24 patients with AECOPDs and anxiety and/or depression flare-ups, anxiety and depression flare-ups occurred simultaneously in 15 patients. In 9 of these 24 patients, anxiety or depression flare-ups were observed independently from each other. In 31 of the included 48 patients, AECOPDs and comorbid flare-ups occurred mostly simultaneously.

Conclusion

Patients with COPD and common comorbidities show a variety of patterns of AECOPDs and comorbid flare-ups. Some patients, however, show repetitive patterns that could potentially be used to improve personalised disease management, if recognised.

Shifting Responsibilities: Developing a Pan-European Service Model for an eHealth Technology Supporting Self-Management of People with Chronic Obstructive Pulmonary Disease and Comorbidities

On 17 January 2024, Eline te Braake, Christiane Grünloh, and Monique Tabak published a paper in the International Journal of Chronic Obstructive Pulmonary Disease. This paper was titled "Shifting Responsibilities: Developing a Pan-European Service Model for an eHealth Technology Supporting Self-Management of People with Chronic Obstructive Pulmonary Disease and Comorbidities."
Link to publication

The abstract is presented below.

Introduction

The active participation of patients in their care via self-management is an important pillar to manage chronic conditions. Self-management education and continuous support are needed to improve patients' confidence to take such active role. One way to do this is through eHealth technologies. However, those technologies can only be successful when actively used in daily practice and when integrated in overall care. Therefore, this study investigated how a self-management eHealth technology could be implemented that emphasises the active role of patients in their care.

Methods

The service modelling method was utilized as implementation strategy. The design process consisted of five phases with salient stakeholders and consortium members of a European project to develop the service model. Studies with salient stakeholders were carried out in three different countries (Italy, Estonia, the Netherlands). A combination between face-to-face and online methods facilitated the participatory design process.

Results

Due to the pan-European context, different stakeholders in the three countries were identified. Research nurses and case managers were not yet established in practice but once implemented, expected to contribute to optimal implementation. During service modelling, a crucial step was revealed: providing self-management training before technology use to let patient familiarise with the concept of taking an active role. As HCPs felt that they were not necessarily equipped to guide patients in terms of self-management, they also should have access to such self-management training.

Conclusion

By demonstrating a way for implementation while emphasising patients' active role, we also showed the complexity of the method in two ways. First, by demonstrating the fine line between the descriptive and prescriptive model. Thus, showcasing the need to recognize that prescriptive models may be hampered by the delay in changing work practices. Second, by highlighting the importance of identifying country-specific differences in the pan-European context, revealing that service modelling is not a one-size-fits-all approach.

Lack of Evidence Regarding Markers Identifying Acute Heart Failure in Patients with COPD: An AI-Supported Systematic Review

On 23 February 2024, Sanne van Dijk, Marjolein Brusse-Keizer, Charlotte Bucsán, Eline Ploumen, Wendy van Beurden, Job van der Palen, Carine Doggen, and Anke Lenferink published a paper titled "Lack of Evidence Regarding Markers Identifying Acute Heart Failure in Patients with COPD: An AI-Supported Systematic Review" in the International Journal of Chronic Obstructive Pulmonary Disease.

Link to publication

The abstract is presented below.

Background

Due to shared symptoms, acute heart failure (AHF) is difficult to differentiate from an acute exacerbation of COPD (AECOPD). This systematic review aimed to identify markers that can diagnose AHF underlying acute dyspnea in patients with COPD presenting at the hospital.

Methods

All types of observational studies and clinical trials that investigated any marker's ability to diagnose AHF in acutely dyspneic COPD patients were considered eligible for inclusion. An AI tool (ASReview) supported the title and abstract screening of the articles obtained from PubMed, Scopus, Web of Science, the Cochrane Library, Embase, and CINAHL until April 2023. Full text screening was independently performed by two reviewers.

Twenty percent of the data extraction was checked by a second reviewer and the risk of bias was assessed in duplicate using the QUADAS-2 tool. Markers' discriminative abilities were evaluated in terms of sensitivity, specificity, positive and negative predictive values, and the area under the curve when available.

Results

The search identified 10,366 articles. After deduplication, title and abstract screening was performed on 5,386 articles, leaving 153 relevant, of which 82 could be screened full text. Ten distinct studies (reported in 16 articles) were included, of which 9 had a high risk of bias. Overall, these studies evaluated 12 distinct laboratory and 7 non-laboratory markers. BNP, NT-proBNP, MR-proANP, and inspiratory inferior vena cava diameter showed the highest diagnostic discrimination.

Conclusion

There is not much evidence for the use of markers to diagnose AHF in acutely dyspneic COPD patients in the hospital setting. BNPs seem most promising, but should be interpreted alongside imaging and clinical signs, as this may lead to improved diagnostic accuracy. Future validation studies are urgently needed before any AHF marker can be incorporated into treatment decision-making algorithms for patients with COPD.

European News

- Political Agreement on the Artificial Intelligence Act (AI Act) between the European Parliament and Council Link
- Deal on tackling Air Pollution between the European Parliament and Council Link

Events to come

Consortium Meeting: Bremen, May 2024

In May 2024, the RE-SAMPLE Consortium will meet in Bremen, Germany, for a new in-person meeting, kindly hosted by our partner DFKI!

Other interesting events

The Supporting Health by Technology Conference will be held in Groningen, Netherlands, on 30 and 31 May 2024.

ECSCW 2024
June 17th-21st | Rimini, Italy

The 22nd edition of the European Conference on Computer-Supported Cooperative Work (ECSCW) will take place in Rimini, Italy from 17 to 21 June 2024.

The ERS International Congress 2024 will be held from 7 to 11 September in Vienna, Austria.

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RE-SAMPLE

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