Titolo: A decentralised multi-source clinical and imaging data platform for personalised cardiac and mental health (CARMEN)

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Abstract del Progetto: Big Data innovations have already started to dramatically reshape our society, changing irreversibly many aspects of our lives, including medicine. Medical imaging plays a crucial role in this digital transformation by enabling personalised diagnostics and tailored treatment planning across not only most common diseases including cancer, cardiovascular and neuropsychiatric disorders, but also rare diseases.

Big imaging and clinical data are already a reality: up to 30% of the stored data worldwide now comes directly from the healthcare industry. The demand of diagnostic and research imaging is constantly increasing due to the push for early-stage diagnosis of chronic conditions, for tailored therapy planning, and for supporting the clinical needs from the rising ageing demographics. Despite this unprecedented growth, the main critical barrier for the application of big imaging data into clinical practice is the need of an infrastructure capable of storing, harmonising, processing, and distributing the complex information collected from the variety of exams across multiple centres while preserving the privacy and uniqueness of each patient. Only data that are efficiently organised and catalogued enable the development and application of Artificial Intelligence analytics, ultimately allowing the realisation of precision medicine methods.

The aim of this project is the creation and validation of an innovative digital platform for decentralised site-specific storage, analysis, and integration of multi-center and multi-source clinical and imaging data collected from healthy subjects and patients with cardiac or mental diseases.

The platform will facilitate evidence-based personalised clinical decision making via robust and flexible comparisons of new patient-specific data with already available normative and disease biobanks. Easy-to-use tools embodied in the platform will allow 1) to harmonise medical imaging data of any type and modality, 2) to synergically combine imaging and non-imaging data and 3) to extract quantitative biomarkers via automatic analytical pipelines. The biobanking architecture will link local databases to a public blockchain system: the unique nature of this solution will guarantee privacy, security, shareability, scalability, and continuity of the data without the necessity of creating a centralised organisation.

Our long-term aspiration is to create the foundation for a Big Data national medical imaging biobank and analysis platform built from a network of site-specific imaging repositories. Our decentralised system will link the multitude of clinical imaging sites preserving their independence and intellectual properties. This system will have the capacity to deliver precision medicine applications across a broader spectrum of clinical rare and non-rare diseases for improving clinical outcomes.



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