RESEARCH TOPIC DASMEN5

BIG DATA ANALYTICS TO DEVELOP PRECISION MEDICINE FOR PATIENTS WITH HEPATOCELLULAR CARCINOMA: THE HERCOLES PROJECT

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Abstract
The HERCOLES project (hepatocarcinoma recurrence on the liver study) was established in 2018 with the intent to be the first surgical Italian register aimed on the effects of surgery for hepatocellular carcinoma (HCC). This register includes more than 30 Italian centers, and has been divided in a first retrospective phase, and in a second prospective phase. The dataset includes more than 170 covariates on more than 2600 patients already enrolled in the retrospective phase over a period of 10 years. By using advanced big data analytics the project aims to: i) identify new prognostic and predictive factors affecting HCC patient survival; ii) improve outcome prediction by developing profile-specific therapeutic allocation algorithms. Clinical skills on the HCC management, including surgery, are prerequisite. Participation in the multidisciplinary liver tumors board, inpatient clinic, outpatient clinic as well as operating room will be guarantee.

Main technical approaches
The PhD candidate will learn to deal with big data (large nation-based datasets). Machine learning techniques (e.g. classification and regression trees, k-nearest neighbour algorithm) and advanced statistical modeling approaches (i.e. regularized regression, joint modeling of longitudinal and survival data) will be applied. Particular attention will be dedicated to assess the performance of the developed prediction tools and to validate the results (both using cross-validation techniques and on external data sources). Moreover, efforts will be spent to translate the research findings into clinical practice with the final aim to improve the care of HCC patients.

Scientific references
1) Famularo S, Donadon M, Cipriani F, et al. Hepatocellular carcinoma surgical and oncological trends in a national multicentric population: the HERCOLES experience Updates Surg. 2020 In Press;

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2) HERCOLES website: http://www.hercolesgroup.eu

3) Sidey-Gibbons J, Sidey-Gibbons C Machine learning in medicine: a practical introduction. BMC Med Res Methodol 19, 64 (2019).

4) Beam A, Kohane I. Big Data and Machine Learning in Health Care. J Am Med Assoc. 2018; 319(13):1317–8.

5) Steyerberg EW: Clinical Prediction Models, A Practical Approach to Development, Validation and Updating. 2009, Springer, New York

Type of contract

PhD scholarship of € 18.000 gross per year or equivalent contract.

Borsa di dottorato di € 18.000 annui lordi o forme di sostegno finanziario equivalenti.