**Summary of research proposal LROI**

**Title:**

Feasibility of Machine Learning and Competing Risk Analysis Algorithms to Predict Outcomes from the Dutch Arthroplasty Register

**Authors:**

JN Doornberg, JHF Oosterhoff, RM Peters, AAH de Hond, H Putter, JC Sorel, EW Steyerberg, PC Jutte, WP Zijlstra, RW Poolman

**Abstract:**

Predicting the probability of a good outcome -or inversely, a high chance of a complication- after Orthopaedic Arthroplasty is important when patient and Orthopaedic Surgeon discuss the option of operative treatment for arthrosis of hip or knee.

Artificial Intelligence is advancing in our life, in medicine, and also in Orthopaedic Outcome Research. There is a current trend -or hype- to utilize these modern algorithms, commonly referred as 'Machine Learning' (ML): patient factors are entered into an advanced mathematical model to determine which unique patient characteristics are important to predict patient outcome after surgery. However, these statistical steps are similar to 'classic' advanced regression analyses, referred to as multivariable logistic regression (LR) and competing risk analysis (CR, consisting of cause-specific Cox regression and Fine and Gray) probability calculators.

The transition, from 'classic' regression methods to identify patients' 'predictors of outcome' in Orthopaedic research studies, to 'contemporary' Machine Learning methodology seemed to have happened "overnight". This transition has not been based on a thorough comparison of traditional regression analysis versus ML, that show that ML is superior. With current belief that ML is beneficial in handling 'big data', advocates argue their benefits when aiming to develop an accurate probability calculator of patients' outcome. In contrast, our research group evaluated LR versus ML in previously published peer-reviewed Orthopaedic Trauma studies, and found no major advances when comparing these 'classic' and 'contemporary' derived probability calculators. In the fields of Arthroplasty Registries, the published literature investigating this subject is scarce, and direct comparison with good quality datasets of previously peer-reviewed studies are lacking.

Therefore, the aim of this study is to compare probability calculators to predict patients' outcome after Orthopaedic Arthroplasty Surgery, derived from 'classic' regression methods (competing-risk CR) versus Machine Learning (ML) methodology based on Dutch Arthroplasty Registry (LROI) data.

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