Summary of research proposal LROI

Title:
Developing a machine learning algorithm to predict probability of aseptic loosening of the glenoid component after anatomic total shoulder arthroplasty

Authors: GA Buijze, AA Macken, LC Macken, JHF Oosterhoff, MPJ van den Bekerom, D Eygendaal

Abstract:
Despite technological advancements in recent years, glenoid component loosening remains a common complication after anatomic total shoulder arthroplasty (ATSA) and is one of the main causes for revision surgery. Increasing emphasis is placed on the prevention of glenoid component failure. Previous studies have successfully predicted range of motion, patient-reported outcomes, and short-term complications after ATSA using machine learning methods, but an accurate predictive model for (glenoid component) revision is currently lacking. This study aims to use a large international database to accurately predict aseptic loosening of the glenoid component after ATSA using machine learning algorithms.

For this multi-centre retrospective study, individual patient data will be compiled from previously published studies reporting failure and revision of ATSA and from national registries such as the Dutch National Orthopaedic Intervention Registry (LROI). The compiled database will be used to train various machine learning algorithms (Stochastic Gradient Boosting, Random Forest, Support Vector Machine, Neural Network and Elastic-Net Penalized Logistic Regression). The developed and validated algorithms will be evaluated across discrimination (c-statistic), calibration, the Brier score, and the decision curve analysis. The best-performing algorithm will be used to create an online open-access prediction tool.

Approval date: August 2023