Introduction

Heart failure is a severe chronic disease with a great health care burden. **Frequent (re-)hospitalizations and a high mortality** remain an important issue. Optimal medical therapy (OMT) and lifestyle changes such as increased **physical activity (PA)** are the cornerstones of treatment. Based on the European Society for Cardiology (ESC) guidelines, regular aerobic exercise is recommended for all Heart Failure patients with reduced Ejection Fraction (HFrEF) patients. Several studies have shown that PA is just as effective as medical therapy and can lower hospital admissions and decrease mortality. However, **physical activity in this group of patients is challenging**. This pilot has three tracks to improve physical activity for this group of patients: (1) intervention study to demonstrate the **benefits of motivational feedback** on relevant outcomes, (2) **identifying high risk patients with Big Data techniques** to select patients for the intervention in the future and (3) **developing a secure multi party computation (MPC) technique** to improve the patient selection models with privacy sensitive data of different parties (see other poster).

Track 1 Erasmus MC: Demonstrate that monitoring physical activity in combination with motivational feedback benefits the level of participation in centre-based CR and, hence, the outcomes for these HF patients

1a. The Rotterdam study

The Rotterdam study is a prospective population based cohort study among adults and elderly in Rotterdam, the Netherlands, originating form 1989. The baseline measurements for the first cohort where completed between 1990 and 1993. The study was extended with two cohorts, in 2000-2001 and 2006-2008. The main objectives of the Rotterdam Study are to investigate the risk factors of cardiovascular, neurological, opthalmological and endocrine diseases in the elderly. The examinations consists of home interview and to visits to the research center. Every 3-4 years examinations will be repeated in potentially changing characteristics. Participants were followed for the most common diseases in the elderly. (Ikram *et al*, European Journal of Epidemiology 9, 807-850, 2017)
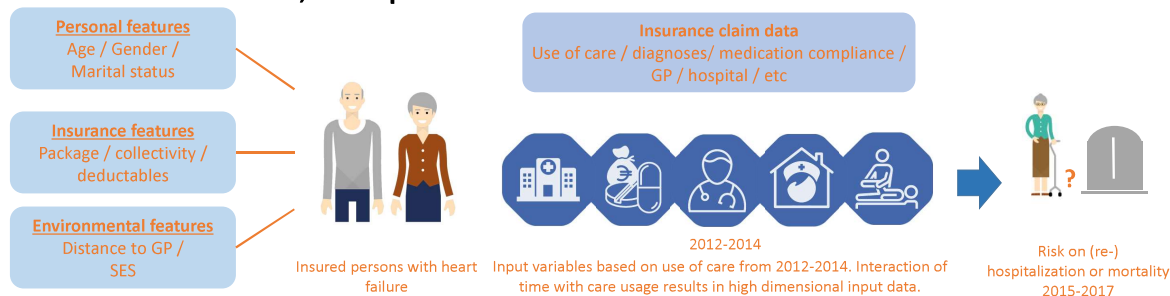
1b. Physical activity promotion trial

Study design: The proposed study is a randomized controlled trial with a follow-up of at least 6 months. A total of 180 patients will be randomized to 2 arms in a 2:1 fashion: (1) Physical activity monitoring device with feedback and motivation; (2) Physical activity monitoring device without feedback and motivation. Both arms will have standard of care (SoC), including standard cardiac rehabilitation (specific for HF) according to the Dutch guidelines along with OMT as prescribed by the treating physician. Additional measurements will take place at 3 time points: at baseline (within 6 weeks after inclusion), at the end of CR (16-20 weeks after inclusion) and at the end of follow-up (3 months after CR or at least 6 months after inclusion).

Study population: Patients aged 18-85 years with chronic HFrEF (NYHA class II and III) who have a clinically stable condition, an indication for physical exercise and CR, will be eligible to participate in this study. All included patients are required to have provided written informed consent.
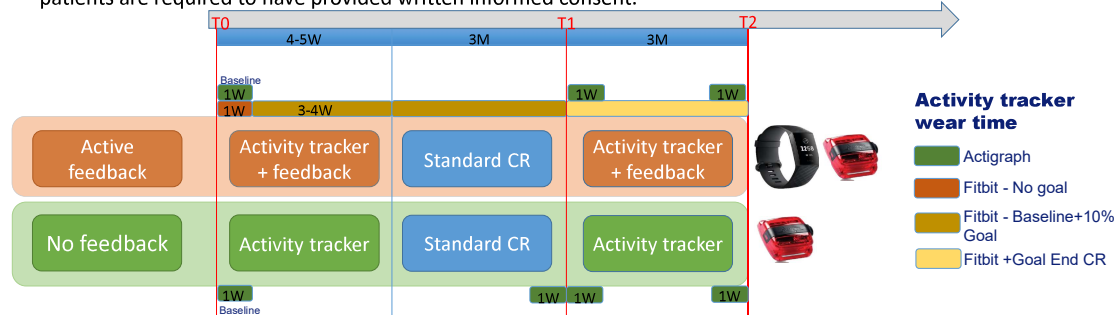
Track 2 Achmea: Identifying patients with high risk on (re-) hospitalizations and/or high mortality using Big data techniques with more than >5,000 input variables based on insurance claim data

Personal features — Age / Gender / Marital status

Insurance features — Package / collectivity / deductables

Environmental features — Distance to GP / SES

Insured persons with heart failure

Insurance claim data — Use of care / diagnoses/ medication compliance / GP / hospital / etc

2012-2014
Input variables based on use of care from 2012-2014. Interaction of time with care usage results in high dimensional input data.

Risk on (re-) hospitalization or mortality 2015-2017

Track 3 TNO: Combining data from both tracks using MPC (see other poster)

Results: Classification of high risk patients with a neural network and random forest performs significantly better than the baseline. Random forest has the best performance (misclassification 1/3 of baseline). Different architectures of neural networks will be estimated to improve the model performance.

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