We are able to extend **CohortMethod** to perform comparative cohort studies in an observational database using Fine and Gray regression models for competing risks with fast and scalable computational methods.

**RESULTS**
- We apply **CohortMethod** to study the relative risk of hospitalization with heart failure for new users under angiotensin-converting enzyme (ACE) inhibitors and thiazide diuretics (THZ).

```
studyPopulations <- createSingleStudyPopulation(cohortMethodData = cdata,
                                             outcome = TRUE,
                                             firstExposureOnly = FALSE,
                                             riskIndicators = 0,
                                             riskIndicatorsData = TRUE)
studyPoprisk <- createSingleStudyPopulation(cohortMethodData = cdata,
                                             outcome = TRUE,
                                             firstExposureOnly = FALSE,
                                             riskIndicators = 0,
                                             riskIndicatorsData = TRUE)
studyPopCombined <- combineCompetingStudyPopulations(cohortMethodData = cdata,
                                                        outcome = TRUE,
                                                        firstExposureOnly = FALSE,
                                                        riskIndicators = 0,
                                                        riskIndicatorsData = TRUE)
```

**REFERENCES**
- Kawaguchi, Shen, Li, and Suchard (2019) use a novel forward-backward scan algorithm to linearize computations to reduce complexity from $O(n^2)$ to $O(n)$:
  - Log-pseudo likelihood
  - Gradient
  - Hessian diagonal
- We develop function `combineCompetingStudyPopulations` that combines two study populations, with the outcome of interest and competing event to generate a population with information on subjects experience either outcome.
- We include option `riskid` in the function `createRiskOutcomeModelArgs` where we specify the competing risk outcome concept ID to fit Fine Gray in the multiple analysis framework.
- Regression modelling is fitted using **Cyclops**

---

**Figure 1.** Generating combined study population for both outcomes and performing one-to-one matching on propensity scores.

```
outcomes <- createCombinedModelPopulation(population = studyPopCombined)
```

**Figure 2.** Fitting Fine and Gray model on our one-to-one matched population.

**REFERENCES**