SUPPLEMENTAL MATERIAL

Appendix A. R code for estimating subject-specific probabilities of cardiovascular and non-cardiovascular death within 5 years of hospital admission.

```
#############################################################################
# Two event types: cardiovascular death and non-cardiovascular death.
#
# Fits:
#   1) Two Fine-Gray subdistribution hazard models.
#   2) Two cause-specific hazard models.
#   3) Cox proportional hazards model for all-cause mortality.
# Estimates subject-specific estimates of cardiovascular death and
# non-cardiovascular death using F-G and CSH models.
# Estimates subject-specific risk of all-cause mortality.
#
# This code is provided for illustrative purposes only and comes with
# ABSOLUTELY no warranty.
#############################################################################

library(survival)
library(prodlim)
library(riskRegression)

#############################################################################
# Read in data for analysis.
# Note: The author is not permitted to disseminate the dataset. Please do
#       not contact the author requesting the dataset.
#############################################################################

effect1.df <- read.table("chf.txt",header=T)

effect1.df$event <- ifelse(effect1.df$event.type==0,0,1)
# Create simple event indicator for Cox model for all-cause death.

#############################################################################
# Fit Fine-Gray model to model subdistribution hazard of each of the two
# types of events. Use all baseline covariates.
#############################################################################

FG1 <- FGR(Hist(event.time,event.type) ~ age + female + sysbp + hrtrate +
  resp + neckvdis + s3 + s4 + rales + pedm + cmg + diabetes + cvatia +
  prevmi + afib + perartdis + copd + dementia + cirrhos + cancer + lbbb +
  hgb + wbc + sod + pot + glucose + urea + cr,
  cause=1,data=effect1.df)

FG2 <- FGR(Hist(event.time,event.type) ~ age + female + sysbp + hrtrate +
  resp + neckvdis + s3 + s4 + rales + pedm + cmg + diabetes + cvatia +
  prevmi + afib + perartdis + copd + dementia + cirrhos + cancer + lbbb +
  hgb + wbc + sod + pot + glucose + urea + cr,
  cause=2,data=effect1.df)

CIF.FG1 <- predict(FG1,newdata=effect1.df,times=(1:5)*365)
CIF.FG2 <- predict(FG2,newdata=effect1.df,times=(1:5)*365)
# Subject-specific risk of each outcome at 1-5 years.

CIF.FG1.5 <- CIF.FG1[,5]
CIF.FG2.5 <- CIF.FG2[,5]
# Subject-specific risk of each outcome at 5 years.

#############################################################################
# Fit cause-specific hazards models for each of the two types of events.
```

```
# Use all baseline covariates.
################################################################################

CSH <- CSC(Hist(event.time,event.type) ~ age + female + sysbp + hrtrate +
  resp + neckvdis + s3 + s4 + rales + pedm + cmg + diabetes + cvatia +
  prevmi + afib + perartdis + copd + dementia + cirrhos + cancer + lbbb +
  hgb + wbc + sod + pot + glucose + urea + cr,
  surv.type="hazard",data=effect1.df)

CIF.CSH1 <- predictRisk(CSH,times=(1:5)*365,cause=1,newdata=effect1.df)
CIF.CSH2 <- predictRisk(CSH,times=(1:5)*365,cause=2,newdata=effect1.df)
# Subject-specific risk of each outcome at 1-5 years.

CIF.CSH1.5 <- CIF.CSH1[,5]
CIF.CSH2.5 <- CIF.CSH2[,5]
# Subject-specific risk of each outcome at 5 years.

################################################################################
# Fit Cox model to model hazard of all-cause mortality.
# Use all baseline covariates.
################################################################################

cox.all <- coxph(Surv(event.time,event) ~ age + female + sysbp + hrtrate +
  resp + neckvdis + s3 + s4 + rales + pedm + cmg + diabetes + cvatia +
  prevmi + afib + perartdis + copd + dementia + cirrhos + cancer + lbbb +
  hgb + wbc + sod + pot + glucose + urea + cr,
  x=T,data=effect1.df)

CIF.COX <- predictRisk(cox.all,times=(1:5)*365,newdata=effect1.df)
# Subject-specific risk of death at 1-5 years.

CIF.COX.5 <- CIF.COX[,5]
# Subject-specific risk of death at 5 years.
```

Appendix B. SAS code for estimating subject-specific probabilities of cardiovascular and non-cardiovascular death within 5 years of hospital admission.

```
libname store '.';

* Read in the data for case study;
* Note: The author is not permitted to disseminate the dataset. Please do
#        not contact the author requesting the dataset;
* 'event_time' is the time-to-event outcome variable;
* 'event_type' denotes the type of event that occurred: '1' denotes
  cardiovascular death, '2' denotes non-cardiovascular death, '0' denotes
  a censored observation;
data cohort;
  set store.chf_effect1;
  keep event_time event_type
       age female vs_sysbp vs_hrtrate vs_resp neckvdis s3 s4
       rales pedm cmg diabetes cvatia prevmi afib
       perartdis copd dementia cirrhos cancer lbbb
       lb_hgb lb_wbc lb_sod lb_pot lb_glucose lb_urea lb_cr;
run;

* Fit a Fine-Gray subdistribution hazard model for CVD death and
  obtain estimated probability of death within 5 years for each subject.
  The estimates probabilities are in a variable called 'cif_fg1' in the
  Dataset 'FG1';
proc phreg data=cohort;
  model event_time*event_type(0) = age female vs_sysbp vs_hrtrate vs_resp
    neckvdis s3 s4 rales pedm cmg diabetes cvatia prevmi afib perartdis copd
    dementia cirrhos cancer lbbb lb_hgb lb_wbc lb_sod lb_pot lb_glucose
    lb_urea lb_cr /eventcode=1;
  baseline out=FG1 covariates=cohort timelist=1825 cif=cif_fg1;
run;

* Fit a Fine-Gray subdistribution hazard model for non-CVD death and
  obtain estimated probability of death within 5 years for each subject.
  The estimates probabilities are in a variable called 'cif_fg2' in the
  Dataset 'FG2';

proc phreg data=cohort;
  model event_time*event_type(0) = age female vs_sysbp vs_hrtrate vs_resp
    neckvdis s3 s4 rales pedm cmg diabetes cvatia prevmi afib perartdis copd
    dementia cirrhos cancer lbbb lb_hgb lb_wbc lb_sod lb_pot lb_glucose
    lb_urea lb_cr /eventcode=2;
  baseline out=FG2 covariates=cohort timelist=1825 cif=cif_fg2;
run;

* Fit a cause-specific hazard model for CVD death and obtain
  estimated probability of death within 5 years for each subject. We use
  time = '1824' as this is the last observed time of a CVD death.
  The estimates probabilities are in a variable called 'cif_csh1' in the
  Dataset 'CSH1';

proc phreg data=cohort;
  model event_time*event_type(0) = age female vs_sysbp vs_hrtrate vs_resp
    neckvdis s3 s4 rales pedm cmg diabetes cvatia prevmi afib perartdis copd
    dementia cirrhos cancer lbbb lb_hgb lb_wbc lb_sod lb_pot lb_glucose
```

```
    lb_urea lb_cr /eventcode(cox)=1;
  baseline out=CSH1 covariates=cohort timelist=1824 cif=cif_csh1;
run;


* Fit a cause-specific hazard model for non-CVD death and obtain
  estimated probability of death within 5 years for each subject. We use
  time = '1822' as this is the last observed time of a non-CVD death.
  The estimates probabilities are in a variable called 'cif_csh2' in the
  Dataset 'CSH2';
proc phreg data=cohort;
  model event_time*event_type(0) = age female vs_sysbp vs_hrtrate vs_resp
    neckvdis s3 s4 rales pedm cmg diabetes cvatia prevmi afib perartdis copd
    dementia cirrhos cancer lbbb lb_hgb lb_wbc lb_sod lb_pot lb_glucose
    lb_urea lb_cr /eventcode(cox)=2;
  baseline out=CSH2 covariates=cohort timelist=1822 cif=cif_csh2;
run;



* Fit a Cox proportional hazard model for all-cause mortality and
  obtain estimated probability of death within 5 years for each subject.
  The estimates probabilities are in a variable called 'cif_cox' in the
  Dataset 'Cox';
proc phreg data=cohort;
  model event_time*event_type(0) = age female vs_sysbp vs_hrtrate vs_resp
    neckvdis s3 s4 rales pedm cmg diabetes cvatia prevmi afib perartdis copd
    dementia cirrhos cancer lbbb lb_hgb lb_wbc lb_sod lb_pot lb_glucose
    lb_urea lb_cr  /ties=efron;
  baseline out=Cox covariates=cohort timelist=1825 cif=cif_cox;
run;
```