CMS832V0

MP 2020

MEASURE DETAILS

HOSPITAL HARM - ACUTE KIDNEY INJURY

Episode of Care Based Measure

Include Supplemental Data Element Calculations

The proportion of inpatient hospitalizations for patients 18 years of age or older who have an acute kidney injury (stage 2 or greater) that occurred during the encounter as evidenced by a substantial increase in serum creatinine value, or by the initiation of kidney dialysis (continuous renal replacement therapy (CRRT), hemodialysis or peritoneal dialysis)

SHOW ALL RESULTS

Initial Population:

```
define "Initial Population":
  "Encounter With Creatinine And Without Obstetrical Conditions"
```

SHOW RESULT

Denominator:

```
define "Denominator":
  "Initial Population"
```

SHOW RESULT

Denominator Exclusion:

```
define "Denominator Exclusion":
  "Encounter With 0.3 mg dL or More Increase in Creatinine"
    union "Encounter With eGFR Less Than 60"
    union "Encounter With Less Than 2 Creatinine Results Within 48 Hours of Arrival"
    union "Encounter With Initiation of Kidney Dialysis Less Than 48 Hours After Arrival"
    union "Encounter With High Risk Diagnosis for AKI"
    union "Encounter With High Risk Procedures for AKI"
```

SHOW RESULT

Numerator:

```
define "Numerator":
  "Encounter With 2 Times Serum Creatinine Increase"
    union "Encounter With Kidney Dialysis Administered 48 Hours or More After Arrival"
```

SHOW RESULT

Supplemental Data Elements:

```
define "Risk Variable All Encounter Diagnoses With POA Indication":
  "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
    where exists QualifyingEncounter.diagnoses AllDiagnosis
      return Tuple {
        encounter: QualifyingEncounter,
        diagnosis: QualifyingEncounter.diagnoses,
        POA: QualifyingEncounter.diagnoses.presentOnAdmissionIndicator
      }
```

SHOW RESULT

```
define "SDE Ethnicity":
  ["Patient Characteristic Ethnicity": "Ethnicity"]
```

SHOW RESULT

```
define "SDE Payer":
  ["Patient Characteristic Payer": "Payer"]
```

SHOW RESULT

```
define "SDE Race":
  ["Patient Characteristic Race": "Race"]
```

SHOW RESULT

```
define "SDE Sex":
  ["Patient Characteristic Sex": "ONC Administrative Sex"]
```

SHOW RESULT

```
define "Risk Variable Estimated Glomerular Filtration Rate for Females":
  if exists ( ["Patient Characteristic Sex": "Female"] ) then ( 142 * Min({("Index Creatinine" /
0.7), 1 })^ ( - 0.241 ) * Max({("Index Creatinine" / 0.7), 1 })^ ( - 1.200 ) * 0.9938 ^ (
AgeInYearsAt(start of "Measurement Period")) * 1.012 )
    else null
```

SHOW RESULT

```
define "Risk Variable Estimated Glomerular Filtration Rate for Males":
  if exists ( ["Patient Characteristic Sex": "Male"] ) then ( 142 * Min({("Index Creatinine" /
0.9), 1 })^ ( - 0.302 ) * Max({("Index Creatinine" / 0.9), 1 })^ ( - 1.200 ) * 0.9938 ^ (
AgeInYearsAt(start of "Measurement Period")) )
    else null
```

SHOW RESULT

```
define "Risk Variable First Respiratory Rate in Encounter":
  First(["Physical Exam, Performed": "Respiratory rate"] FirstRespRate
      with "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
        such that Global."NormalizeInterval"(FirstRespRate.relevantDatetime,
FirstRespRate.relevantPeriod)during Global."HospitalizationWithObservation"(InpatientEncounter)
          and FirstRespRate.result is not null
      sort by Global."EarliestOf"(relevantDatetime, relevantPeriod)
  ).result as Decimal
```

SHOW RESULT

```
define "Risk Variable First Heart Rate in Encounter":
  First(["Physical Exam, Performed": "Heart rate"] FirstHeartRate
      with "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
        such that Global."NormalizeInterval"(FirstHeartRate.relevantDatetime,
FirstHeartRate.relevantPeriod)during Global."HospitalizationWithObservation"(InpatientEncounter)
          and FirstHeartRate.result is not null
      sort by Global."EarliestOf"(relevantDatetime, relevantPeriod)
  ).result as Decimal
```

SHOW RESULT

```
define "Risk Variable First Systolic Blood Pressure in Encounter":
  First(["Physical Exam, Performed": "Systolic blood pressure"] FirstSystolicBP
      with "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
        such that Global."NormalizeInterval"(FirstSystolicBP.relevantDatetime,
FirstSystolicBP.relevantPeriod)starts during Global."HospitalizationWithObservation"
(InpatientEncounter)
          and FirstSystolicBP.result is not null
      sort by Global."EarliestOf"(relevantDatetime, relevantPeriod)
  ).result as Decimal
```

SHOW RESULT

```
define "Risk Variable First Temperature in Encounter":
  First(["Physical Exam, Performed": "Body temperature"] FirstTemp
      with "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
        such that Global."NormalizeInterval"(FirstTemp.relevantDatetime,
FirstTemp.relevantPeriod)during Global."HospitalizationWithObservation"(InpatientEncounter)
          and FirstTemp.result is not null
      sort by Global."EarliestOf"(relevantDatetime, relevantPeriod)
  ).result as Decimal
```

SHOW RESULT

Definitions:

```
define "Encounter With Age 18 and LOS 48 Hours":
  ["Encounter, Performed": "Encounter Inpatient"] InpatientEncounter
    where InpatientEncounter.relevantPeriod ends during day of "Measurement Period"
      and AgeInYearsAt(date from start of Global."HospitalizationWithObservation"
(InpatientEncounter))>= 18
      and duration in hours of Global."HospitalizationWithObservation" ( InpatientEncounter ) >= 48
```

SHOW RESULT

```
define "Inpatient Encounter With Creatinine":
  from
    "Encounter With Age 18 and LOS 48 Hours" InpatientEncounter,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] CrLab
    where CrLab.result is not null
      and CrLab.relevantDatetime more than 48 hours after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and CrLab.relevantDatetime during Global."HospitalizationWithObservation" (
InpatientEncounter )
    return InpatientEncounter
```

SHOW RESULT

```
define "Encounter With Creatinine And Without Obstetrical Conditions":
  "Inpatient Encounter With Creatinine" InpatientEncounter
    where not exists InpatientEncounter.diagnoses EncounterDiagnoses
      where EncounterDiagnoses.code in "Obstetrics and VTE Obstetrics"
```

SHOW RESULT

```
define "Serum Creatinine Sequence By Quantity":
  ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] CrRange
    with "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
      such that CrRange.relevantDatetime during Global."HospitalizationWithObservation" (
QualifyingEncounter )
        and CrRange.result.value is not null
    sort by result.value
```

SHOW RESULT

```
define "Highest Serum Creatinine":
  Last("Serum Creatinine Sequence By Quantity").result.value
```

SHOW RESULT

```
define "1.5 Increase In Creatinine":
  "Highest Serum Creatinine" / 1.5
```

SHOW RESULT

```
define "2.0 Increase In Creatinine":
  "Highest Serum Creatinine" / 2
```

SHOW RESULT

```
define "Lowest Serum Creatinine":
  First("Serum Creatinine Sequence By Quantity").result.value
```

SHOW RESULT

```
define "Increase Of 0.3 Or More Using Lowest Creatinine Within 24 Hours":
  from
    "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] IndexCreatinineLabResult,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] SubsequentCreatinineLabResult
    where ( SubsequentCreatinineLabResult.result.value ) - ( IndexCreatinineLabResult.result.value
) > 0.299
      and IndexCreatinineLabResult.result.value = "Lowest Serum Creatinine"
      and IndexCreatinineLabResult.relevantDatetime 48 hours or less before
SubsequentCreatinineLabResult.relevantDatetime
      and IndexCreatinineLabResult.relevantDatetime during Global."HospitalizationWithObservation"
( InpatientEncounter )
      and SubsequentCreatinineLabResult.relevantDatetime during
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and IndexCreatinineLabResult.relevantDatetime 24 hours or less after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and SubsequentCreatinineLabResult.relevantDatetime 48 hours or less after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and IndexCreatinineLabResult.id != SubsequentCreatinineLabResult.id
    return InpatientEncounter
```

SHOW RESULT

```
define "Serum Creatinine Sequence by time":
  ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] CrSeq
    with "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
      such that CrSeq.relevantDatetime during Global."HospitalizationWithObservation" (
QualifyingEncounter )
        and CrSeq.result.value is not null
```

SHOW RESULT

```
define "Earliest Serum Creatinine":
  First("Serum Creatinine Sequence by time").result.value
```

SHOW RESULT

```
define "Increase Of 0.3 Or More Using First Creatinine Within First 48 Hours":
  from
    "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] IndexCreatinineLabResult,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] SubsequentCreatinineLabResult
    where ( SubsequentCreatinineLabResult.result.value ) - ( IndexCreatinineLabResult.result.value
) > 0.299
      and IndexCreatinineLabResult.result.value = "Earliest Serum Creatinine"
      and IndexCreatinineLabResult.relevantDatetime 48 hours or less before
SubsequentCreatinineLabResult.relevantDatetime
      and IndexCreatinineLabResult.relevantDatetime during Global."HospitalizationWithObservation"
( InpatientEncounter )
      and SubsequentCreatinineLabResult.relevantDatetime during
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and IndexCreatinineLabResult.relevantDatetime 48 hours or less after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and SubsequentCreatinineLabResult.relevantDatetime 48 hours or less after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and IndexCreatinineLabResult.id != SubsequentCreatinineLabResult.id
    return InpatientEncounter
```

SHOW RESULT

```
define "Encounter With 0.3 mg dL or More Increase in Creatinine":
  if exists "Increase Of 0.3 Or More Using Lowest Creatinine Within 24 Hours" then "Increase Of 0.3
Or More Using Lowest Creatinine Within 24 Hours"
    else if exists "Increase Of 0.3 Or More Using First Creatinine Within First 48 Hours" then
"Increase Of 0.3 Or More Using First Creatinine Within First 48 Hours"
    else null
```

SHOW RESULT

```
define "Lowest Creatinine Within First 24 Hours":
  Min(["Laboratory Test, Performed": "Creatinine Mass Per Volume"] LowCreatinine
      with "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
        such that LowCreatinine.relevantDatetime during Global."HospitalizationWithObservation"
(QualifyingEncounter)
          and LowCreatinine.relevantDatetime 24 hours or less after start of
Global."HospitalizationWithObservation"(QualifyingEncounter)
          and LowCreatinine.result is not null
      return LowCreatinine.result.value
  )
```

SHOW RESULT

```
define "First Creatinine Within First 48 Hours":
  First(["Laboratory Test, Performed": "Creatinine Mass Per Volume"] FirstCreatinine
      with "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
        such that Global."NormalizeInterval"(FirstCreatinine.relevantDatetime,
FirstCreatinine.relevantPeriod)during Global."HospitalizationWithObservation"(InpatientEncounter)
          and Global."NormalizeInterval"(FirstCreatinine.relevantDatetime,
FirstCreatinine.relevantPeriod)48 hours or less after start of
Global."HospitalizationWithObservation"(InpatientEncounter)
          and FirstCreatinine.result is not null
      without "Lowest Creatinine Within First 24 Hours" LowSerum
        such that LowSerum is not null
      sort by relevantDatetime
  ).result.value
```

SHOW RESULT

```
define "Index Creatinine":
  Coalesce("Lowest Creatinine Within First 24 Hours", "First Creatinine Within First 48 Hours")
```

SHOW RESULT

```
define "Male eGFR":
  if exists ( ["Patient Characteristic Sex": "Male"] ) then ( 142 * Min({("Index Creatinine" /
0.9), 1 })^ ( - 0.302 ) * Max({("Index Creatinine" / 0.9), 1 })^ ( - 1.200 ) * 0.9938 ^ (
AgeInYearsAt(start of "Measurement Period")) )
    else null
```

SHOW RESULT

```
define "Male Encounter With eGFR Less Than 60":
  "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
    where "Male eGFR" is not null
      and "Male eGFR" as Decimal < 60
```

SHOW RESULT

```
define "Female eGFR":
  if exists ( ["Patient Characteristic Sex": "Female"] ) then ( 142 * Min({("Index Creatinine" /
0.7), 1 })^ ( - 0.241 ) * Max({("Index Creatinine" / 0.7), 1 })^ ( - 1.200 ) * 0.9938 ^ (
AgeInYearsAt(start of "Measurement Period")) * 1.012 )
    else null
```

SHOW RESULT

```
define "Female Encounter With eGFR Less Than 60":
  "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
    where "Female eGFR" is not null
      and "Female eGFR" as Decimal < 60
```

SHOW RESULT

```
define "Encounter With eGFR Less Than 60":
  "Male Encounter With eGFR Less Than 60"
    union "Female Encounter With eGFR Less Than 60"
```

SHOW RESULT

```
define "Encounter With Less Than 2 Creatinine Results Within 48 Hours of Arrival":
  "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
    where ( Count("Creatinine Lab Test With Result"(InpatientEncounter))< 2 )
```

SHOW RESULT

```
define "Serum Creatinine Sequence Hi To Lo Ratio":
  "Highest Serum Creatinine" / "Lowest Serum Creatinine"
```

SHOW RESULT

```
define "Serum Creatinine Normal":
  if exists ( ["Patient Characteristic Sex": "Female"] ) then 1.02
    else if exists ( ["Patient Characteristic Sex": "Male"] ) then 1.18
    else null
```

SHOW RESULT

```
define "Encounter With 1.5 Times Serum Creatinine Increase":
  from
    "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] HighCrLab,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] LowCrLab
    where ( "Serum Creatinine Sequence Hi To Lo Ratio" > "Serum Creatinine Normal" )
      and HighCrLab.result.value = "Highest Serum Creatinine"
      and "1.5 Increase In Creatinine" >= LowCrLab.result.value
      and LowCrLab.relevantDatetime 7 days or less before HighCrLab.relevantDatetime
      and HighCrLab.relevantDatetime 48 hours or more after start of
Global."HospitalizationWithObservation" ( QualifyingEncounter )
      and HighCrLab.relevantDatetime 30 days or less after start of
Global."HospitalizationWithObservation" ( QualifyingEncounter )
    return QualifyingEncounter
```

SHOW RESULT

```
define "Encounter With 2 Times Serum Creatinine Increase":
  from
    "Encounter With 1.5 Times Serum Creatinine Increase" QualifyingEncounter,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] HighCrLab,
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] LowCrLab
    where ( "Serum Creatinine Sequence Hi To Lo Ratio" > "Serum Creatinine Normal" )
      and HighCrLab.result.value = "Highest Serum Creatinine"
      and "2.0 Increase In Creatinine" >= LowCrLab.result.value
      and LowCrLab.relevantDatetime before HighCrLab.relevantDatetime
      and LowCrLab.relevantDatetime during Global."HospitalizationWithObservation" (
QualifyingEncounter )
      and HighCrLab.relevantDatetime 48 hours or more after start of
Global."HospitalizationWithObservation" ( QualifyingEncounter )
      and HighCrLab.relevantDatetime 30 days or less after start of
Global."HospitalizationWithObservation" ( QualifyingEncounter )
    return QualifyingEncounter
```

SHOW RESULT

```
define "Encounter With Kidney Dialysis Administered Less Than 48 Hours After Arrival":
  from
    ["Procedure, Performed": "Hospital based dialysis services"] Dialysis,
    "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
    where Dialysis.relevantPeriod starts less than 48 hours after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and Dialysis.relevantPeriod starts during Global."HospitalizationWithObservation" (
InpatientEncounter )
      and not exists "Encounter With 2 Times Serum Creatinine Increase"
    return InpatientEncounter
```

SHOW RESULT

```
define "Encounter With Initiation of Kidney Dialysis Less Than 48 Hours After Arrival":
  "Encounter With Kidney Dialysis Administered Less Than 48 Hours After Arrival"
```

SHOW RESULT

```
define "Encounter With High Risk Diagnosis for AKI":
  "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
    where exists ( QualifyingEncounter.diagnoses HighRiskforAKI
        where HighRiskforAKI.code in "High Risk Diagnosis for AKI"
          and HighRiskforAKI.presentOnAdmissionIndicator in "Present on Admission or Clinically
Undetermined"
    )
      and QualifyingEncounter.relevantPeriod during Global."HospitalizationWithObservation" (
QualifyingEncounter )
```

SHOW RESULT

```
define "Encounter With High Risk Procedures for AKI":
  "Encounter With Creatinine And Without Obstetrical Conditions" QualifyingEncounter
    with ["Procedure, Performed": "High Risk Procedures for AKI"] HighRiskProcedures
      such that HighRiskProcedures.relevantPeriod during Global."HospitalizationWithObservation" (
QualifyingEncounter )
```

SHOW RESULT

```
define "Encounter With Kidney Dialysis Administered 48 Hours or More After Arrival":
  from
    ["Procedure, Performed": "Hospital based dialysis services"] Dialysis,
    "Encounter With Creatinine And Without Obstetrical Conditions" InpatientEncounter
    where Dialysis.relevantPeriod starts 48 hours or more after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and Dialysis.relevantPeriod starts during Global."HospitalizationWithObservation" (
InpatientEncounter )
      and not exists "Encounter With 2 Times Serum Creatinine Increase"
    return InpatientEncounter
```

SHOW RESULT

Functions:

```
define function "Creatinine Lab Test With Result"(InpatientEncounter "Encounter, Performed" ):
  from
    ["Laboratory Test, Performed": "Creatinine Mass Per Volume"] CrLab
    where CrLab.result is not null
      and CrLab.relevantDatetime 48 hours or less after start of
Global."HospitalizationWithObservation" ( InpatientEncounter )
      and CrLab.relevantDatetime during Global."HospitalizationWithObservation" (
InpatientEncounter )
    return CrLab
```

```
/*calculates the difference in calendar days between the start and end of the given
interval.*/define function "LengthInDays"(Value Interval<DateTime> ):
  difference in days between start of Value and end of Value
```

```
/*@description: Returns an interval of date values extracted from the input interval of date-time
values
@comment: This function returns an interval constructed using the `date from` extractor on the
start
and end values of the input date-time interval. Note that using a precision specifier as part of a
timing phrase is preferred to communicate intent to perform day-level comparison, as well as for
general readability.*/define function "ToDateInterval"(period Interval<DateTime> ):
  Interval[date from start of period, date from end of period]
```

```
/*returns list of all locations within an encounter, including locations for immediately prior ED
visit.*/define function "HospitalizationLocations"(Encounter "Encounter, Performed" ):
  Encounter Visit
    let EDVisit: Last(["Encounter, Performed": "Emergency Department Visit"] LastED
        where LastED.relevantPeriod ends 1 hour or less on or before start of Visit.relevantPeriod
        sort by
        end of relevantPeriod
    )
    return if EDVisit is null then Visit.facilityLocations
      else flatten { EDVisit.facilityLocations, Visit.facilityLocations }
```

```
/*Returns the arrival time in the ED for the encounter.*/define function
"EmergencyDepartmentArrivalTime"(Encounter "Encounter, Performed" ):
  start of First(("HospitalizationLocations"(Encounter))HospitalLocation
      where HospitalLocation.code in "Emergency Department Visit"
      sort by start of locationPeriod
  ).locationPeriod
```

```
/*Hospitalization returns the total interval for admission to discharge for the given encounter, or
for the admission of any immediately prior emergency department visit to the discharge of the given
encounter.*/define function "Hospitalization"(Encounter "Encounter, Performed" ):
  Encounter Visit
    let EDVisit: Last(["Encounter, Performed": "Emergency Department Visit"] LastED
        where LastED.relevantPeriod ends 1 hour or less on or before start of Visit.relevantPeriod
        sort by
        end of relevantPeriod
    )
    return Interval[Coalesce(start of EDVisit.relevantPeriod, start of Visit.relevantPeriod),
    end of Visit.relevantPeriod]
```

```
/*Returns admission time for an encounter or for immediately prior emergency department
visit.*/define function "HospitalAdmissionTime"(Encounter "Encounter, Performed" ):
  start of "Hospitalization"(Encounter)
```

```
/*Returns earliest arrival time for an encounter including any prior ED visit.*/define function
"HospitalArrivalTime"(Encounter "Encounter, Performed" ):
  start of First(("HospitalizationLocations"(Encounter))HospitalLocation
      sort by start of locationPeriod
  ).locationPeriod
```

```
/*Returns the length of stay in days (i.e. the number of days between admission and discharge) for
the given encounter, or from the admission of any immediately prior emergency department visit to
the discharge of the encounter*/define function "HospitalizationLengthofStay"(Encounter "Encounter,
Performed" ):
  LengthInDays("Hospitalization"(Encounter))
```

```
/*Returns the latest departure time for encounter including any prior ED visit.*/define function
"HospitalDepartureTime"(Encounter "Encounter, Performed" ):
  end of Last(("HospitalizationLocations"(Encounter))HospitalLocation
      sort by start of locationPeriod
  ).locationPeriod
```

```
/*Hospital Discharge Time returns the discharge time for an encounter*/define function
"HospitalDischargeTime"(Encounter "Encounter, Performed" ):
  end of Encounter.relevantPeriod
```

```
/*Hospitalization with Observation and Outpatient Surgery Service returns the total interval from
the start of any immediately prior emergency department visit, outpatient surgery visit or
observation visit to the discharge of the given encounter.*/define function
"HospitalizationWithObservationAndOutpatientSurgeryService"(Encounter "Encounter, Performed" ):
  Encounter Visit
    let ObsVisit: Last(["Encounter, Performed": "Observation Services"] LastObs
        where LastObs.relevantPeriod ends 1 hour or less on or before start of Visit.relevantPeriod
        sort by
        end of relevantPeriod
    ),
    VisitStart: Coalesce(start of ObsVisit.relevantPeriod, start of Visit.relevantPeriod),
    EDVisit: Last(["Encounter, Performed": "Emergency Department Visit"] LastED
        where LastED.relevantPeriod ends 1 hour or less on or before VisitStart
        sort by
        end of relevantPeriod
    ),
    VisitStartWithED: Coalesce(start of EDVisit.relevantPeriod, VisitStart),
    OutpatientSurgeryVisit: Last(["Encounter, Performed": "Outpatient Surgery Service"]
LastSurgeryOP
        where LastSurgeryOP.relevantPeriod ends 1 hour or less on or before VisitStartWithED
        sort by
        end of relevantPeriod
    )
    return Interval[Coalesce(start of OutpatientSurgeryVisit.relevantPeriod, VisitStartWithED),
    end of Visit.relevantPeriod]
```

```
/*Hospitalization with Observation returns the total interval from the start of any immediately
prior emergency department visit through the observation visit to the discharge of the given
encounter*/define function "HospitalizationWithObservation"(Encounter "Encounter, Performed" ):
  Encounter Visit
    let ObsVisit: Last(["Encounter, Performed": "Observation Services"] LastObs
        where LastObs.relevantPeriod ends 1 hour or less on or before start of Visit.relevantPeriod
        sort by
        end of relevantPeriod
    ),
    VisitStart: Coalesce(start of ObsVisit.relevantPeriod, start of Visit.relevantPeriod),
    EDVisit: Last(["Encounter, Performed": "Emergency Department Visit"] LastED
        where LastED.relevantPeriod ends 1 hour or less on or before VisitStart
        sort by
        end of relevantPeriod
    )
    return Interval[Coalesce(start of EDVisit.relevantPeriod, VisitStart),
    end of Visit.relevantPeriod]
```

```
/*Hospitalization with Observation Length of Stay returns the length in days from the start of any
immediately prior emergency department visit through the observation visit to the discharge of the
given encounter*/define function "HospitalizationWithObservationLengthofStay"(Encounter "Encounter,
Performed" ):
  "LengthInDays"("HospitalizationWithObservation"(Encounter))
```

```
/*First Inpatient Intensive Care Unit returns the first intensive care unit for the given
encounter, without considering any immediately prior emergency department visit.*/define function
"FirstInpatientIntensiveCareUnit"(Encounter "Encounter, Performed" ):
  First((Encounter.facilityLocations)HospitalLocation
      where HospitalLocation.code in "Intensive Care Unit"
        and HospitalLocation.locationPeriod during Encounter.relevantPeriod
      sort by start of locationPeriod
  )
```

```
/*Given a datetime and a period, returns the period (if a period is provided) or the interval
beginning and ending on the datetime (if a datetime is provided)*/define function
"NormalizeInterval"(pointInTime DateTime, period Interval<DateTime> ):
  if pointInTime is not null then Interval[pointInTime, pointInTime]
    else if period is not null then period
    else null as Interval<DateTime>
```

```
/*Given an interval, return true if the interval has a starting boundary specified (i.e. the start
of the interval is not null and not the minimum DateTime value)*/define function "HasStart"(period
Interval<DateTime> ):
  not ( start of period is null
      or start of period = minimum DateTime
  )
```

```
/*Given an interval, return true if the interval has an ending boundary specified (i.e. the end of
the interval is not null and not the maximum DateTime value)*/define function "HasEnd"(period
Interval<DateTime> ):
  not (
    end of period is null
      or
      end of period = maximum DateTime
  )
```

```
/*Given an interval, return the ending point if the interval has an ending boundary specified,
otherwise, return the starting point*/define function "Latest"(period Interval<DateTime> ):
  if ( HasEnd(period)) then
  end of period
    else start of period
```

```
/*Given an interval, return the starting point if the interval has a starting boundary specified,
otherwise, return the ending point*/define function "Earliest"(period Interval<DateTime> ):
  if ( HasStart(period)) then start of period
    else
  end of period
```

```
/*Given a pointInTime or period, if the pointInTime is specified, returns the pointInTime, returns
the ending point of the period if the period has an ending boundary specified, otherwise returns
the starting point of the interval*/define function "LatestOf"(pointInTime DateTime, period
Interval<DateTime> ):
  Latest(NormalizeInterval(pointInTime, period))
```

```
/*Given a pointInTime or period, if the pointInTime is specified, returns the pointInTime, returns
the starting point of the period if the period has a starting boundary specified, otherwise returns
the ending point of the period*/define function "EarliestOf"(pointInTime DateTime, period
Interval<DateTime> ):
  Earliest(NormalizeInterval(pointInTime, period))
```

Unused Definitions: >

TERMINOLOGY

Body temperature
2.16.840.1.113762.1.4.1045.152
Draft

Creatinine Mass Per Volume
2.16.840.1.113762.1.4.1248.21
Draft

Emergency Department Visit
2.16.840.1.113883.3.117.1.7.1.292
Draft

Encounter Inpatient
2.16.840.1.113883.3.666.5.307
Draft

Ethnicity
2.16.840.1.114222.4.11.837
Draft

Female
Direct Reference Code
N/A

Heart rate
Direct Reference Code
N/A

High Risk Diagnosis for AKI
2.16.840.1.113762.1.4.1248.12
Draft

High Risk Procedures for AKI
2.16.840.1.113762.1.4.1248.19
Draft

Hospital based dialysis services
2.16.840.1.113762.1.4.1179.4
Draft

Intensive Care Unit
2.16.840.1.113762.1.4.1029.206
Draft

Male
Direct Reference Code
N/A

ONC Administrative Sex
2.16.840.1.113762.1.4.1

Draft

Observation Services
2.16.840.1.113762.1.4.1111.143
Draft

Obstetrics and VTE Obstetrics
2.16.840.1.113762.1.4.1248.33
Draft

Outpatient Surgery Service
2.16.840.1.113762.1.4.1110.38
Draft

Payer
2.16.840.1.114222.4.11.3591
Draft

Present on Admission or Clinically Undetermined
2.16.840.1.113762.1.4.1147.197
Draft

Race
2.16.840.1.114222.4.11.836
Draft

Respiratory rate
Direct Reference Code
N/A

Systolic blood pressure
Direct Reference Code
N/A

TEST PATIENTS

100

PASS 53 /53

99

› COVERAGE

DENEXPass 0.4CreatinineIncrease

PASS

DENOMPass CreatinineAfter48Hours	PASS
DENOMPass RVAllDiagnosesPOA	PASS
DENOMPass RVFemaleEGFR	PASS
DENOMPass RVFirstBodyTemp	PASS
DENOMPass RVFirstHeartRate	PASS
DENOMPass RVFirstRespiratoryRate	PASS
DENOMPass RVFirstSystolicBP	PASS
DENOMPass RVMaleEGFR	PASS
DENOMPass RVMaleEGFR	PASS
DENEXFail FemaleEnceGFR60	PASS
DENEXFail FemaleEnceGFR62	PASS
DENEXFail HighRiskDxPOAisN	PASS
DENEXFail HighRiskProcStartsAfterDischarge	PASS
DENEXFail HighRiskProcStartsBeforeEncounterStart	PASS
DENEXFail LessThan2SCrResultsIn48Hrs	PASS
DENEXFail MaleeGFRNotCalculated	PASS
DENEXFail TwoSCrResultswithin48Hrs	PASS
DENEXPASS HighRiskDxPOA	PASS
DENEXPASS HighRiskProcDuringEncounter	PASS
DENEXPASS Increase0.3UsingFirstSCrin48	PASS
DENEXPass 0.3SCrIncrease	PASS
DENEXPass CreatIncreaseGT0.3	PASS
DENEXPass CreatIncreaseGT0.3FromIndexCreat	PASS
DENEXPass DialysisBefore48HrsAndAfter48Hrs	PASS
DENEXPass DialysisLT48HrsAfterStart	PASS
DENEXPass DialysisWithin48Hrs	

PASS

DENEXPass Increase0.3UsingLowestScrInFirst24Hrs PASS

DENEXPass Increase0.3mgSCrUsingLowestIn24Hrs PASS

DENEXPass Increase0.3mgSCrUsingLowestIn24HrsV2 PASS

DENEXPass LessThan2CreatinineInFirst48Hrs PASS

DENEXPass MaleeGFRLT60 PASS

DENEXPass NoSCrWithin48HrsOfArrival PASS

DENEXPass SCr increased 0.3mg PASS

DENEXPass TwoEncountersLTTwoCreatinineTestIn48Hrs PASS

DENEXPass TwoSCrOnly1Within48HrsOfArrival PASS

DENEXPass eGFRLT60 PASS

IPPFail Age17StartAdmit PASS

IPPFail EncounterWithCreatinineTestsNoResults PASS

IPPFail NoSCrAfter48Hrs PASS

IPPFail ObstetricsDxDuringEncounter PASS

NUMERFail SCrincreaseLT2xbaseline PASS

NUMERPass 2TimeIncreaseInCreatinine PASS

NUMERPass 2xIcreaseInSCrAndDialysis PASS

NUMERPass 2xIncreaseUsingLowestInFirst24Hrs PASS

NUMERPass DialysisAfter48Hrs PASS

NUMERPass DialysisAt48HrsNoEndDateTime PASS

NUMERPass DialysisGT48HrsAfterStart PASS

NUMERPass DialysisStartedat48Hrs PASS

NUMERPass SCr increase 2x baseline PASS

NUMERPass SCrIncrease2x PASS

NUMERPass SCrIncrease2xAndDialysis PASS

NUMERPass SCrIncrease2xBaseline PASS