**1.antibiotic**

with abx as

(

SELECT DISTINCT

drug

, route

, case

when lower(drug) like '%adoxa%' then 1

when lower(drug) like '%ala-tet%' then 1

when lower(drug) like '%alodox%' then 1

when lower(drug) like '%amikacin%' then 1

when lower(drug) like '%amikin%' then 1

when lower(drug) like '%amoxicill%' then 1

when lower(drug) like '%amphotericin%' then 1

when lower(drug) like '%anidulafungin%' then 1

when lower(drug) like '%ancef%' then 1

when lower(drug) like '%clavulanate%' then 1

when lower(drug) like '%ampicillin%' then 1

when lower(drug) like '%augmentin%' then 1

when lower(drug) like '%avelox%' then 1

when lower(drug) like '%avidoxy%' then 1

when lower(drug) like '%azactam%' then 1

when lower(drug) like '%azithromycin%' then 1

when lower(drug) like '%aztreonam%' then 1

when lower(drug) like '%axetil%' then 1

when lower(drug) like '%bactocill%' then 1

when lower(drug) like '%bactrim%' then 1

when lower(drug) like '%bactroban%' then 1

when lower(drug) like '%bethkis%' then 1

when lower(drug) like '%biaxin%' then 1

when lower(drug) like '%bicillin l-a%' then 1

when lower(drug) like '%cayston%' then 1

when lower(drug) like '%cefazolin%' then 1

when lower(drug) like '%cedax%' then 1

when lower(drug) like '%cefoxitin%' then 1

when lower(drug) like '%ceftazidime%' then 1

when lower(drug) like '%cefaclor%' then 1

when lower(drug) like '%cefadroxil%' then 1

when lower(drug) like '%cefdinir%' then 1

when lower(drug) like '%cefditoren%' then 1

when lower(drug) like '%cefepime%' then 1

when lower(drug) like '%cefotan%' then 1

when lower(drug) like '%cefotetan%' then 1

when lower(drug) like '%cefotaxime%' then 1

when lower(drug) like '%ceftaroline%' then 1

when lower(drug) like '%cefpodoxime%' then 1

when lower(drug) like '%cefpirome%' then 1

when lower(drug) like '%cefprozil%' then 1

when lower(drug) like '%ceftibuten%' then 1

when lower(drug) like '%ceftin%' then 1

when lower(drug) like '%ceftriaxone%' then 1

when lower(drug) like '%cefuroxime%' then 1

when lower(drug) like '%cephalexin%' then 1

when lower(drug) like '%cephalothin%' then 1

when lower(drug) like '%cephapririn%' then 1

when lower(drug) like '%chloramphenicol%' then 1

when lower(drug) like '%cipro%' then 1

when lower(drug) like '%ciprofloxacin%' then 1

when lower(drug) like '%claforan%' then 1

when lower(drug) like '%clarithromycin%' then 1

when lower(drug) like '%cleocin%' then 1

when lower(drug) like '%clindamycin%' then 1

when lower(drug) like '%cubicin%' then 1

when lower(drug) like '%dicloxacillin%' then 1

when lower(drug) like '%dirithromycin%' then 1

when lower(drug) like '%doryx%' then 1

when lower(drug) like '%doxycy%' then 1

when lower(drug) like '%duricef%' then 1

when lower(drug) like '%dynacin%' then 1

when lower(drug) like '%ery-tab%' then 1

when lower(drug) like '%eryped%' then 1

when lower(drug) like '%eryc%' then 1

when lower(drug) like '%erythrocin%' then 1

when lower(drug) like '%erythromycin%' then 1

when lower(drug) like '%factive%' then 1

when lower(drug) like '%flagyl%' then 1

when lower(drug) like '%fortaz%' then 1

when lower(drug) like '%furadantin%' then 1

when lower(drug) like '%garamycin%' then 1

when lower(drug) like '%gentamicin%' then 1

when lower(drug) like '%kanamycin%' then 1

when lower(drug) like '%keflex%' then 1

when lower(drug) like '%kefzol%' then 1

when lower(drug) like '%ketek%' then 1

when lower(drug) like '%levaquin%' then 1

when lower(drug) like '%levofloxacin%' then 1

when lower(drug) like '%lincocin%' then 1

when lower(drug) like '%linezolid%' then 1

when lower(drug) like '%macrobid%' then 1

when lower(drug) like '%macrodantin%' then 1

when lower(drug) like '%maxipime%' then 1

when lower(drug) like '%mefoxin%' then 1

when lower(drug) like '%metronidazole%' then 1

when lower(drug) like '%meropenem%' then 1

when lower(drug) like '%methicillin%' then 1

when lower(drug) like '%minocin%' then 1

when lower(drug) like '%minocycline%' then 1

when lower(drug) like '%monodox%' then 1

when lower(drug) like '%monurol%' then 1

when lower(drug) like '%morgidox%' then 1

when lower(drug) like '%moxatag%' then 1

when lower(drug) like '%moxifloxacin%' then 1

when lower(drug) like '%mupirocin%' then 1

when lower(drug) like '%myrac%' then 1

when lower(drug) like '%nafcillin%' then 1

when lower(drug) like '%neomycin%' then 1

when lower(drug) like '%nicazel doxy 30%' then 1

when lower(drug) like '%nitrofurantoin%' then 1

when lower(drug) like '%norfloxacin%' then 1

when lower(drug) like '%noroxin%' then 1

when lower(drug) like '%ocudox%' then 1

when lower(drug) like '%ofloxacin%' then 1

when lower(drug) like '%omnicef%' then 1

when lower(drug) like '%oracea%' then 1

when lower(drug) like '%oraxyl%' then 1

when lower(drug) like '%oxacillin%' then 1

when lower(drug) like '%pc pen vk%' then 1

when lower(drug) like '%pce dispertab%' then 1

when lower(drug) like '%panixine%' then 1

when lower(drug) like '%pediazole%' then 1

when lower(drug) like '%penicillin%' then 1

when lower(drug) like '%periostat%' then 1

when lower(drug) like '%pfizerpen%' then 1

when lower(drug) like '%piperacillin%' then 1

when lower(drug) like '%tazobactam%' then 1

when lower(drug) like '%primsol%' then 1

when lower(drug) like '%proquin%' then 1

when lower(drug) like '%raniclor%' then 1

when lower(drug) like '%rifadin%' then 1

when lower(drug) like '%rifampin%' then 1

when lower(drug) like '%rocephin%' then 1

when lower(drug) like '%smz-tmp%' then 1

when lower(drug) like '%septra%' then 1

when lower(drug) like '%septra ds%' then 1

when lower(drug) like '%septra%' then 1

when lower(drug) like '%solodyn%' then 1

when lower(drug) like '%spectracef%' then 1

when lower(drug) like '%streptomycin%' then 1

when lower(drug) like '%sulfadiazine%' then 1

when lower(drug) like '%sulfamethoxazole%' then 1

when lower(drug) like '%trimethoprim%' then 1

when lower(drug) like '%sulfatrim%' then 1

when lower(drug) like '%sulfisoxazole%' then 1

when lower(drug) like '%suprax%' then 1

when lower(drug) like '%synercid%' then 1

when lower(drug) like '%tazicef%' then 1

when lower(drug) like '%tetracycline%' then 1

when lower(drug) like '%timentin%' then 1

when lower(drug) like '%tobramycin%' then 1

when lower(drug) like '%trimethoprim%' then 1

when lower(drug) like '%unasyn%' then 1

when lower(drug) like '%vancocin%' then 1

when lower(drug) like '%vancomycin%' then 1

when lower(drug) like '%vantin%' then 1

when lower(drug) like '%vibativ%' then 1

when lower(drug) like '%vibra-tabs%' then 1

when lower(drug) like '%vibramycin%' then 1

when lower(drug) like '%zinacef%' then 1

when lower(drug) like '%zithromax%' then 1

when lower(drug) like '%zosyn%' then 1

when lower(drug) like '%zyvox%' then 1

else 0

end as antibiotic

from `physionet-data.mimiciv\_hosp.prescriptions`

-- excludes vials/syringe/normal saline, etc

where drug\_type not in ('BASE')

-- we exclude routes via the eye, ears, or topically

and route in ('IV','IV DRIP','IV BOLUS','IV FLUSH','IV FLUSH\*')

and lower(route) not like '%ear%'

and lower(route) not like '%eye%'

-- we exclude certain types of antibiotics: topical creams, gels, desens, etc

and lower(drug) not like '%cream%'

and lower(drug) not like '%desensitization%'

and lower(drug) not like '%ophth oint%'

and lower(drug) not like '%gel%'

-- other routes not sure about...

-- for sure keep: ('IV','PO','PO/NG','ORAL', 'IV DRIP', 'IV BOLUS')

)

select

pr.subject\_id, pr.hadm\_id

, ie.stay\_id

, pr.drug as antibiotic

, pr.route

, pr.starttime

, pr.stoptime

from `physionet-data.mimiciv\_hosp.prescriptions` pr

-- inner join to subselect to only antibiotic prescriptions

inner join abx

on pr.drug = abx.drug

-- route is never NULL for antibiotics

-- only ~4000 null rows in prescriptions total.

AND pr.route = abx.route

-- add in stay\_id as we use this table for sepsis-3

LEFT JOIN `physionet-data.mimiciv\_icu.icustays` ie

ON pr.hadm\_id = ie.hadm\_id

AND pr.starttime >= ie.intime

AND pr.starttime < ie.outtime

WHERE abx.antibiotic = 1

**2. suspicion of infection**

WITH ab\_tbl AS

(

select

abx.subject\_id, abx.hadm\_id, abx.stay\_id

, abx.antibiotic

, abx.starttime AS antibiotic\_time

-- date is used to match microbiology cultures with only date available

, DATETIME\_TRUNC(abx.starttime, DAY) AS antibiotic\_date

, abx.stoptime AS antibiotic\_stoptime

-- create a unique identifier for each patient antibiotic

, ROW\_NUMBER() OVER

(

PARTITION BY subject\_id

ORDER BY starttime, stoptime, antibiotic

) AS ab\_id

from `my-project-7777-306214.sepsis3antibiotics.sepsis\_antibiotic` abx

)

, me as

(

select micro\_specimen\_id

-- the following columns are identical for all rows of the same micro\_specimen\_id

-- these aggregates simply collapse duplicates down to 1 row

, MAX(subject\_id) AS subject\_id

, MAX(hadm\_id) AS hadm\_id

, CAST(MAX(chartdate) AS DATE) AS chartdate

, MAX(charttime) AS charttime

, MAX(spec\_type\_desc) AS spec\_type\_desc

-- identify negative cultures as NULL organism or a specific itemid saying "NEGATIVE"

, MAX(

CASE WHEN org\_name IS NOT NULL

AND org\_itemid != 90856

AND org\_name != ''

THEN 1 ELSE 0

END) as PositiveCulture

from `physionet-data.mimiciv\_hosp.microbiologyevents`

group by micro\_specimen\_id

)

-- culture followed by an antibiotic

, me\_then\_ab AS

(

select

ab\_tbl.subject\_id

, ab\_tbl.hadm\_id

, ab\_tbl.stay\_id

, ab\_tbl.ab\_id

, me72.micro\_specimen\_id

, coalesce(me72.charttime, DATETIME(me72.chartdate)) as last72\_charttime

, me72.positiveculture as last72\_positiveculture

, me72.spec\_type\_desc as last72\_specimen

-- we will use this partition to select the earliest culture before this abx

-- this ensures each antibiotic is only matched to a single culture

-- and consequently we have 1 row per antibiotic

, ROW\_NUMBER() OVER

(

PARTITION BY ab\_tbl.subject\_id, ab\_tbl.ab\_id

ORDER BY me72.chartdate, me72.charttime NULLS LAST

) AS micro\_seq

from ab\_tbl

-- abx taken after culture, but no more than 72 hours after

LEFT JOIN me me72

on ab\_tbl.subject\_id = me72.subject\_id

and

(

(

-- if charttime is available, use it

me72.charttime is not null

and ab\_tbl.antibiotic\_time > me72.charttime

and ab\_tbl.antibiotic\_time <= DATETIME\_ADD(me72.charttime, INTERVAL 72 HOUR)

)

OR

(

-- if charttime is not available, use chartdate

me72.charttime is null

and antibiotic\_date >= me72.chartdate

and antibiotic\_date <= DATE\_ADD(me72.chartdate, INTERVAL 3 DAY)

)

)

)

, ab\_then\_me AS

(

select

ab\_tbl.subject\_id

, ab\_tbl.hadm\_id

, ab\_tbl.stay\_id

, ab\_tbl.ab\_id

, me24.micro\_specimen\_id

, COALESCE(me24.charttime, DATETIME(me24.chartdate)) as next24\_charttime

, me24.positiveculture as next24\_positiveculture

, me24.spec\_type\_desc as next24\_specimen

-- we will use this partition to select the earliest culture before this abx

-- this ensures each antibiotic is only matched to a single culture

-- and consequently we have 1 row per antibiotic

, ROW\_NUMBER() OVER

(

PARTITION BY ab\_tbl.subject\_id, ab\_tbl.ab\_id

ORDER BY me24.chartdate, me24.charttime NULLS LAST

) AS micro\_seq

from ab\_tbl

-- culture in subsequent 24 hours

LEFT JOIN me me24

on ab\_tbl.subject\_id = me24.subject\_id

and

(

(

-- if charttime is available, use it

me24.charttime is not null

and ab\_tbl.antibiotic\_time >= DATETIME\_SUB(me24.charttime, INTERVAL 24 HOUR)

and ab\_tbl.antibiotic\_time < me24.charttime

)

OR

(

-- if charttime is not available, use chartdate

me24.charttime is null

and ab\_tbl.antibiotic\_date >= DATE\_SUB(me24.chartdate, INTERVAL 1 DAY)

and ab\_tbl.antibiotic\_date <= me24.chartdate

)

)

)

SELECT

ab\_tbl.subject\_id

, ab\_tbl.stay\_id

, ab\_tbl.hadm\_id

, ab\_tbl.ab\_id

, ab\_tbl.antibiotic

, ab\_tbl.antibiotic\_time

, CASE

WHEN last72\_specimen IS NULL AND next24\_specimen IS NULL

THEN 0

ELSE 1

END AS suspected\_infection

-- time of suspected infection:

-- (1) the culture time (if before antibiotic)

-- (2) or the antibiotic time (if before culture)

, CASE

WHEN last72\_specimen IS NULL AND next24\_specimen IS NULL

THEN NULL

ELSE COALESCE(last72\_charttime, antibiotic\_time)

END AS suspected\_infection\_time

, COALESCE(last72\_charttime, next24\_charttime) AS culture\_time

-- the specimen that was cultured

, COALESCE(last72\_specimen, next24\_specimen) AS specimen

-- whether the cultured specimen ended up being positive or not

, COALESCE(last72\_positiveculture, next24\_positiveculture) AS positive\_culture

FROM ab\_tbl

LEFT JOIN ab\_then\_me ab2me

ON ab\_tbl.subject\_id = ab2me.subject\_id

AND ab\_tbl.ab\_id = ab2me.ab\_id

AND ab2me.micro\_seq = 1

LEFT JOIN me\_then\_ab me2ab

ON ab\_tbl.subject\_id = me2ab.subject\_id

AND ab\_tbl.ab\_id = me2ab.ab\_id

AND me2ab.micro\_seq = 1

**3. sepsis**

WITH sofa AS

(

SELECT stay\_id

, starttime, endtime

, respiration\_24hours as respiration

, coagulation\_24hours as coagulation

, liver\_24hours as liver

, cardiovascular\_24hours as cardiovascular

, cns\_24hours as cns

, renal\_24hours as renal

, sofa\_24hours as sofa\_score

FROM `physionet-data.mimiciv\_derived.sofa`

WHERE sofa\_24hours >= 2

)

, s1 as

(

SELECT

soi.subject\_id

, soi.stay\_id

-- suspicion columns

, soi.ab\_id

, soi.antibiotic

, soi.antibiotic\_time

, soi.culture\_time

, soi.suspected\_infection

, soi.suspected\_infection\_time

, soi.specimen

, soi.positive\_culture

-- sofa columns

, starttime, endtime

, respiration, coagulation, liver, cardiovascular, cns, renal

, sofa\_score

-- All rows have an associated suspicion of infection event

-- Therefore, Sepsis-3 is defined as SOFA >= 2.

-- Implicitly, the baseline SOFA score is assumed to be zero, as we do not know

-- if the patient has preexisting (acute or chronic) organ dysfunction

-- before the onset of infection.

, sofa\_score >= 2 and suspected\_infection = 1 as sepsis3

-- subselect to the earliest suspicion/antibiotic/SOFA row

, ROW\_NUMBER() OVER

(

PARTITION BY soi.stay\_id

ORDER BY suspected\_infection\_time, antibiotic\_time, culture\_time, endtime

) AS rn\_sus

FROM `my-project-7777-306214.sepsis3antibiotics.sepsis\_suspicion\_of\_infection` as soi

INNER JOIN sofa

ON soi.stay\_id = sofa.stay\_id

AND sofa.endtime >= DATETIME\_SUB(soi.suspected\_infection\_time, INTERVAL '24' HOUR)

AND sofa.endtime <= DATETIME\_ADD(soi.suspected\_infection\_time, INTERVAL '12' HOUR)

-- only include in-ICU rows

WHERE soi.stay\_id is not null

)

SELECT

subject\_id, stay\_id

-- note: there may be more than one antibiotic given at this time

, antibiotic\_time

-- culture times may be dates, rather than times

, culture\_time

, suspected\_infection\_time

-- endtime is latest time at which the SOFA score is valid

, endtime as sofa\_time

, sofa\_score

, respiration, coagulation, liver, cardiovascular, cns, renal

, sepsis3

FROM s1

WHERE rn\_sus = 1

**4. sepsis (antibiotics administered for at least 72 consecutive hours)**

select g.\*,case when suspected\_infection\_time<=sofa\_time then suspected\_infection\_time else sofa\_time end as sepsis\_time from

(select \* from `my-project-7777-306214.sepsis3antibiotics.sepsis\_new`

where stay\_id in (

select stay\_id from

(select stay\_id, min(starttime) as starttime, max(stoptime) as stoptime

from (

select \* from `my-project-7777-306214.sepsis3antibiotics.sepsis\_antibiotic`

where stay\_id in (select stay\_id from `my-project-7777-306214.sepsis3antibiotics.sepsis\_new`)

)t

group by stay\_id)f

where f.stoptime>=DATETIME\_ADD(f.starttime, INTERVAL 72 HOUR)

)

and stay\_id in (

select stay\_id from `physionet-data.mimiciv\_derived.icustay\_detail`

where los\_icu>=1

and los\_hospital>=los\_icu

and admission\_age>=18

and icustay\_seq=1

)

)g