MIMIC-III
A Freely Available
Critical Care Database

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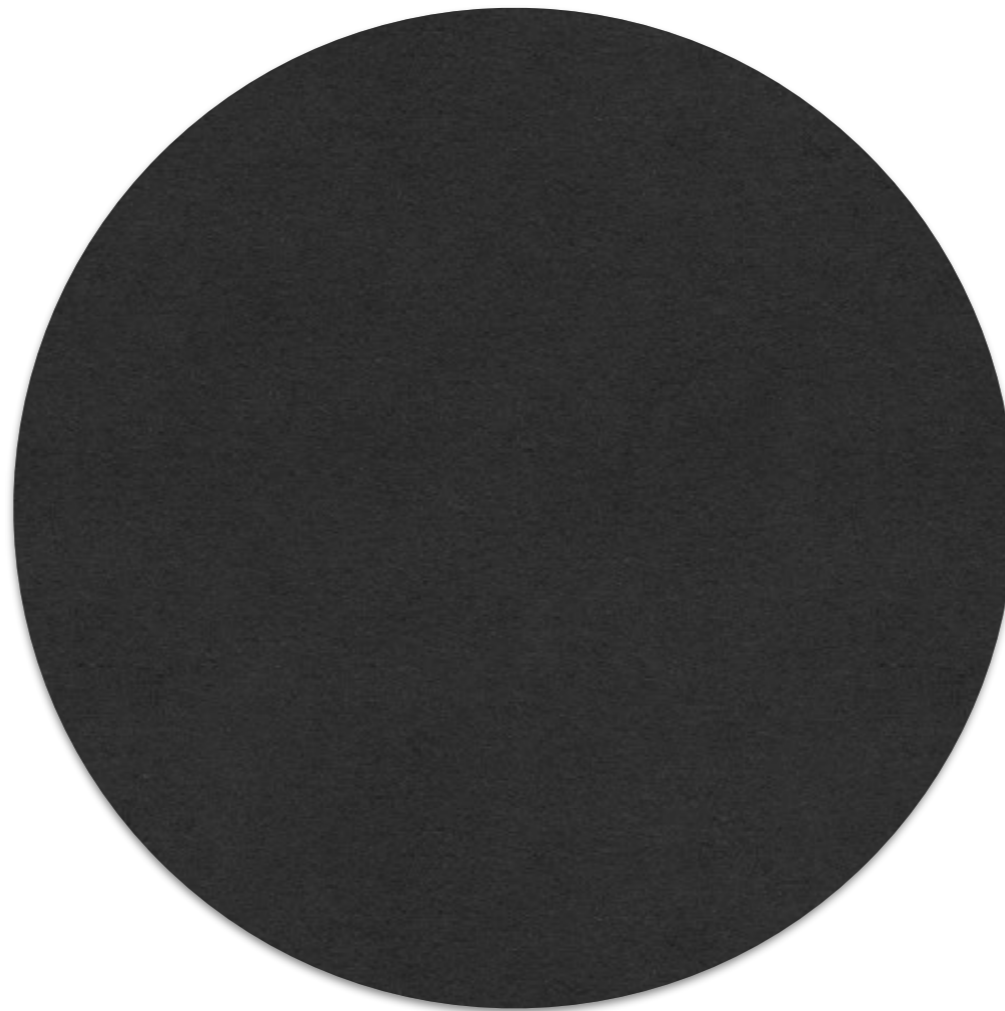
Research opportunity

- Huge volumes of data are captured daily

- *…data that could be used to discover new knowledge for the benefit of patients*

- *<u>but</u>, this data is inaccessible to researchers*

Collaborative research

MIMIC is an openly available dataset developed by the MIT Lab for Computational Physiology, comprising deidentified health data associated with ~40,000 critical care patients. It includes demographics, vital signs, laboratory tests, medications, and more.
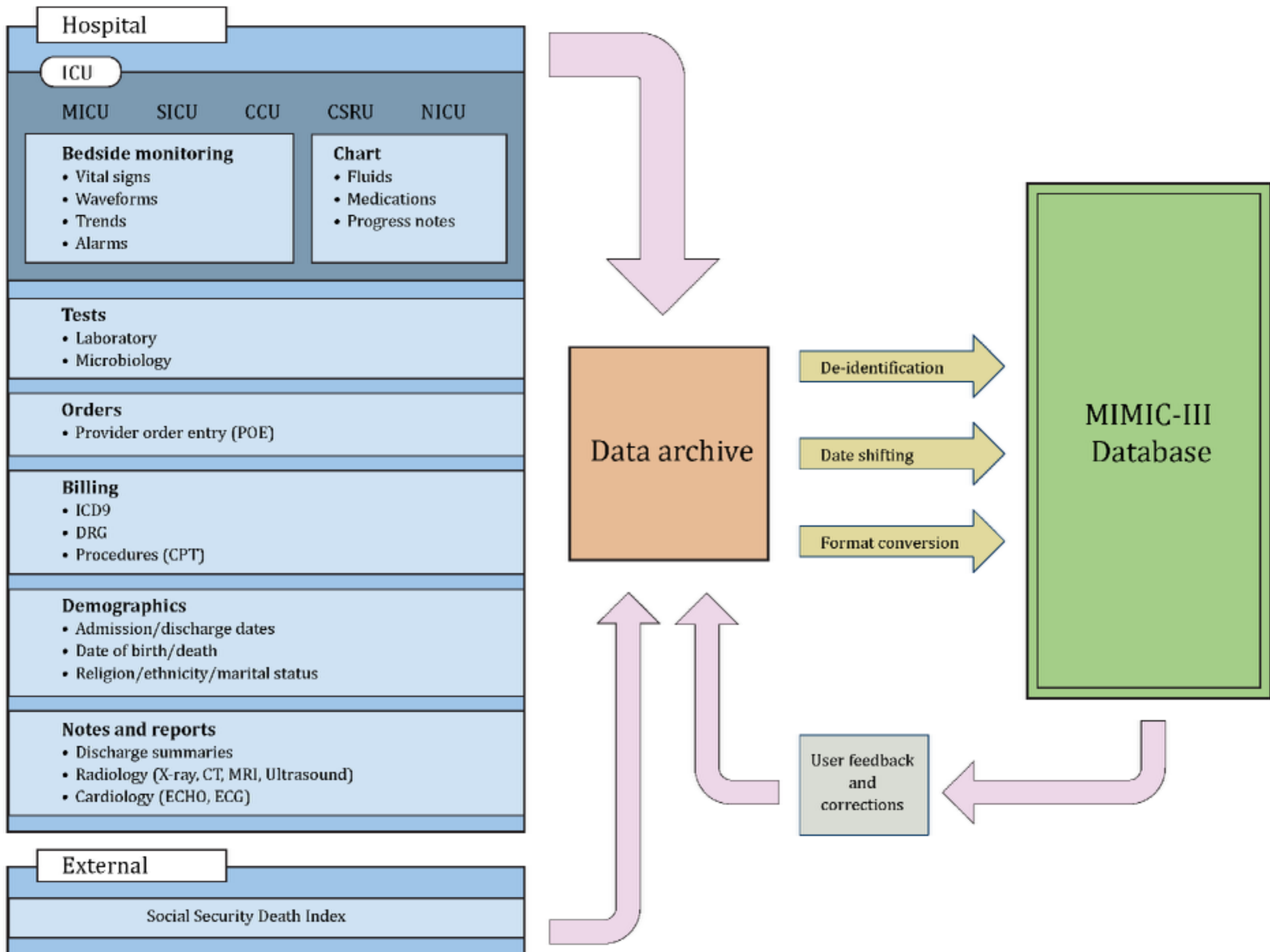
http://mimic.physionet.org

MIMIC-I

- 1992 - 1999
- Required consent from patient and health care provider
- 90 records, 40 hour duration
- Manual extraction of paper records for clinical data

MIMIC-III

- 2001 - 2012
- Waived consent for data collection
- ~40,000 patients
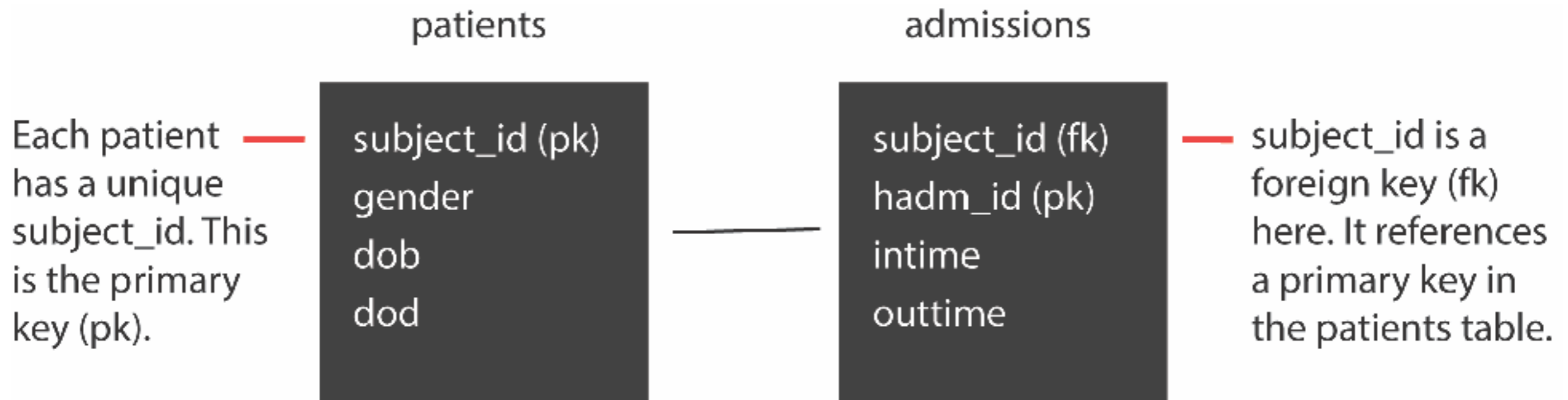- Data extracted from digital systems

Hospital

ICU

MICU   SICU   CCU   CSRU   NICU

Bedside monitoring
- Vital signs
- Waveforms
- Trends
- Alarms

Chart
- Fluids
- Medications
- Progress notes

Tests
- Laboratory
- Microbiology

Orders
- Provider order entry (POE)

Billing
- ICD9
- DRG
- Procedures (CPT)

Demographics
- Admission/discharge dates
- Date of birth/death
- Religion/ethnicity/marital status

Notes and reports
- Discharge summaries
- Radiology (X-ray, CT, MRI, Ultrasound)
- Cardiology (ECHO, ECG)

External

Social Security Death Index

Data archive

De-identification

Date shifting

Format conversion

MIMIC-III Database
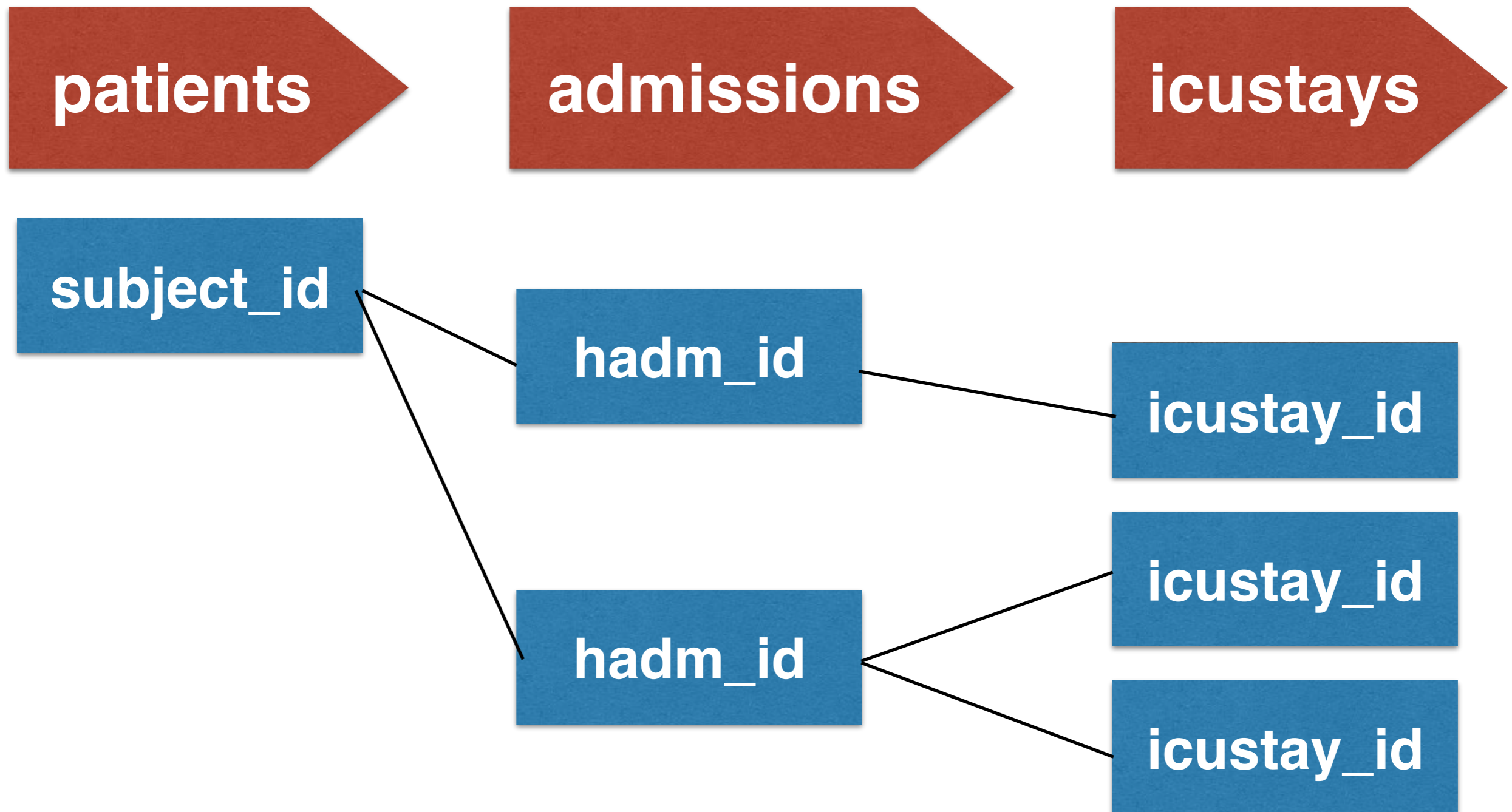
User feedback and corrections

Accessing MIMIC

Two key steps to gaining access to MIMIC:

- **complete a recognized course in protecting human research participants** that covers Health Insurance Portability and Accountability Act (HIPAA) requirements

- **sign a data use agreement**, which outlines appropriate data usage and security standards, and forbids efforts to identify individual patients.

Relational database
(a collection of linked spreadsheets)

Each patient has a unique subject_id. This is the primary key (pk).

patients

subject_id (pk)
gender
dob
dod

admissions

subject_id (fk)
hadm_id (pk)
intime
outtime

subject_id is a foreign key (fk) here. It references a primary key in the patients table.

Patient tracking tables

Events tables

chartevents — Charted observations for a patient

labevents — Lab measurements both within hospital and outpatient clinics

inputevents — Input fluids (e.g. intravenous medications)

microbiology events — Microbiology measurements and sensitivities

noteevents — Deidentified patient notes

Other data tables

diagnoses_icd   Hospital assigned diagnosis codes

procedures_icd   Hospital assigned procedure codes

caregivers   Caregivers who have recorded data

prescriptions   Medications ordered for a patient

Admission Date: [**2952-11-3**]   Discharge Date: [**2952-11-9**]

Date of Birth: [**2887-7-23**]   Sex: F

Service: MEDICINE

Allergies:
No Known Allergies / Adverse Drug Reactions

Attending:[**First Name3 (LF) 3925**]
Chief Complaint:
Sepsis, respiratory distress

Major Surgical or Invasive Procedure:
None
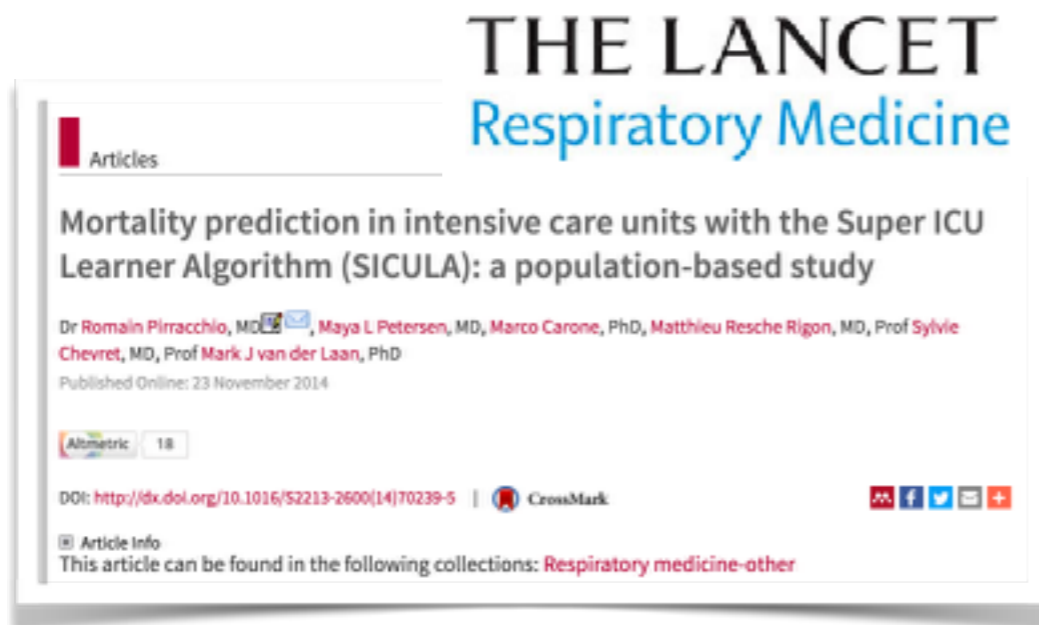
History of Present Illness:
F w/ h/o metastatic breast cancer to breast and lungs
currently receiving CMT, brought to the ED by
rehab for abnormal labs. She was found to be neutropenic, anemia
and thrombocytopenic. At the rehab, vitals were reportedly T
100.4, HR 107, BP 92/42. There is also a concern for possible...

Code status	Full code					Comfort measures
GCS: Verbal	Oriented	Oriented	Oriented	Confused	Confused	Incomprehensible sounds
GCS: Moto	Obeys commands	Obeys commands	Obeys commands	Obeys commands	Obeys commands	Flex-withdraws
GCS: Eye	Spontaneously	Spontaneously	Spontaneously	To speech	To speech	None
Platelet, K/uL	48 53		46		45	
Creatinine, mg/dL	0.7		0.7		0.8	
White blood cell, K/uL	9.1 12.4		16.8		23.2	
Neutrophil, %	37					

Morphine Sulfate
Vancomycin (1 dose)
Piperacillin (1 dose)
NaCl 0.9%   10.0mL/hour   10.0mL/hour   10.0mL/hour
Amiodarone   1mg/min   0.5mg/min   0.5mg/min
Dextrose 5%   50mL/hour 25mL/hour   25mL/hour

Measurement, absolute value

Legend:
- Heart rate
- O2 saturation
- NIBP, mean
- Respiratory rate
- Intake volume, dL
- Output volume, dL

Time after admission to the intensive care unit, hours

15
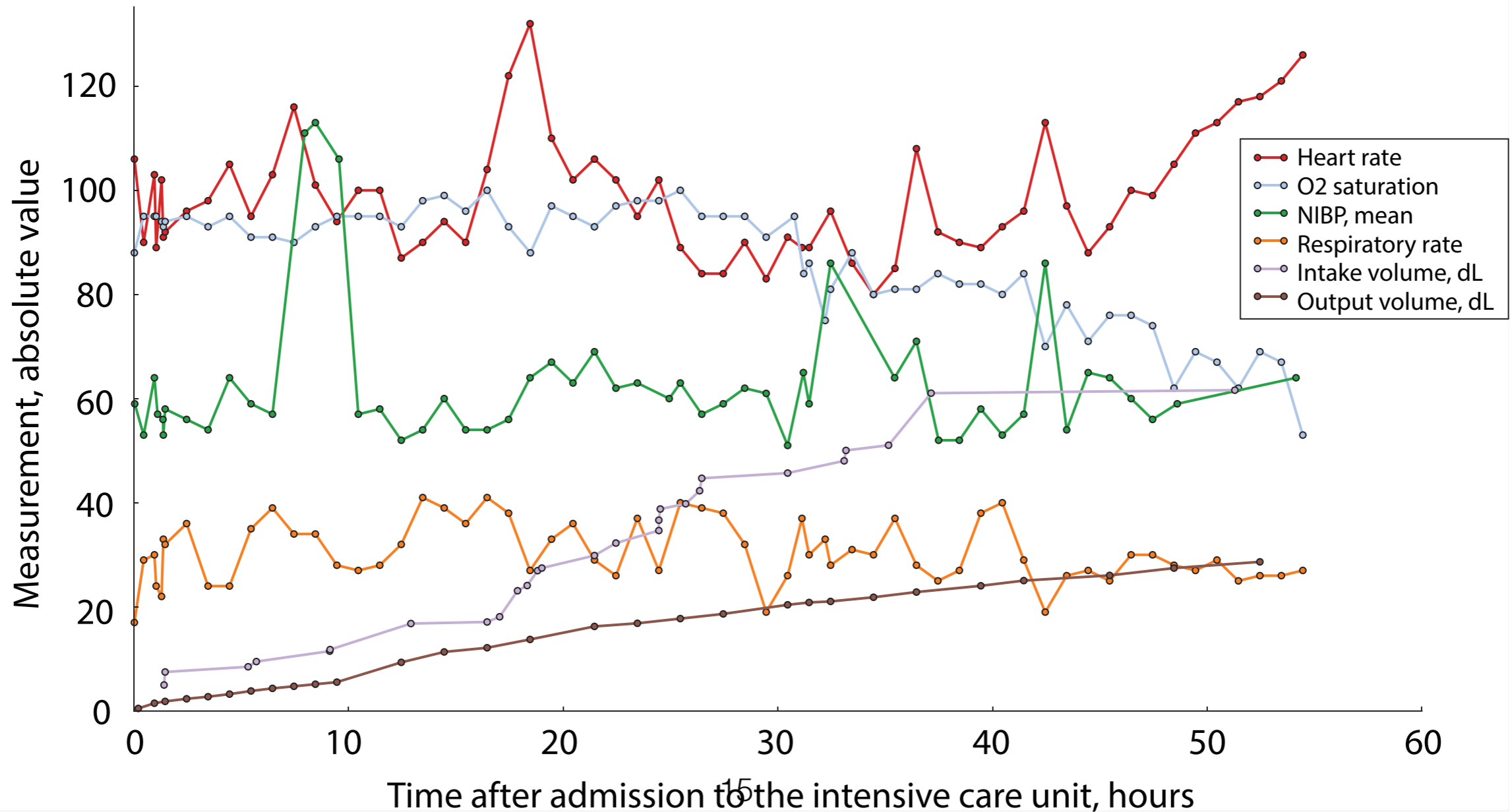
Widely used internationally

Research

Education

A "datathon" model to support cross-disciplinary collaboration

Jerôme Aboab[1,*], Leo Anthony Celi[1], Peter Charlton[1], Mengling Feng[1], Mohammad Ghassemi[1], Dominic C. Marshall[1,†], Louis Mayaud[1], Tristan Naumann[1], Ned McCague[1], Kenneth E. Paik[1], Tom J. Pollard[1], Matthieu Resche-Rigon[1], Justin D. Salciccioli[1] and David J. Stone[2,3]

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