Supporting COVID-19 patient management with data

Standing up a clinical data science team and getting answers in 2 weeks

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The team

- Faculty sponsor: Nigam Shah
- EMR Data specialists
  - Gomathi Krishnan
  - Jose Posada
- Data scientists
  - Alison Callahan
  - Birju Patel
- Informatics fellows
  - Dev Dash
  - Arjun Gokhale

- Requesting Clinicians
  - Ron Li
  - Kevin Schulman
  - Will Collins
- End users: Department of Medicine Task Force on COVID clinical guidelines
  - Kevin Schulman
  - Lisa Shieh
  - Ron Li
  - Charles Liao
  - Jingkun (Ginger) Yang

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Using practice based evidence to guide how we respond to the COVID surge

- Fast paced changes in patient care needs call for quick but informed decision making

- Key challenge during COVID surge: how to safely manage and discharge patients while preserving hospital capacity

- Evidence needed to assess
  1) is it safe to discharge patients on home O_2,
  2) is it safe to manage patients with HFNC on the floor, and
  3) how can we better risk stratify for complications such as VTE?

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The process

- Formalize questions using the PICO format
- Define cohort and variable definitions for each question
- Pull the data corresponding to each cohort and variable from STARR-OMOP and Clarity
- Sanity check the data by chart review and preliminary analyses
- Conduct the analyses to answer the question
- Write a report summarizing our findings

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Questions tackled so far

- Compared to patients not discharged on oxygen, are patients discharged with home oxygen more likely to be readmitted within 30 days?
- Among adult COVID+ patients with high oxygen needs, what is the rate of transfer to the ICU? What is the rate of intubation/mechanical ventilation?
- DO COVID+ patients with elevated admission D-dimer have a higher rate of DVT/PE or transfer to ICU compared to those with normal D-dimer?
- DO COVID+ patients with elevated admission CRP have a higher rate of DVT/PE or transfer to ICU compared to those with normal CRP?

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Translating a question into a cohort definition

- Question

  Among adult COVID+ patients with high oxygen needs, what is the rate of transfer to the ICU? What is the rate of intubation/mechanical ventilation?

- Our formulation

  Among adult patients (≥18 years old) admitted with a COVID-19 diagnosis (within 1 day before date of admission or during inpatient stay) or positive SARS-CoV-2 test result (within 14 days before date of admission, or during inpatient stay), and who did not have a DNR order and received at least 6 LPM O_2 at any time, how many were transferred to the ICU? How many of those patients were intubated and/or placed on mechanical ventilation?

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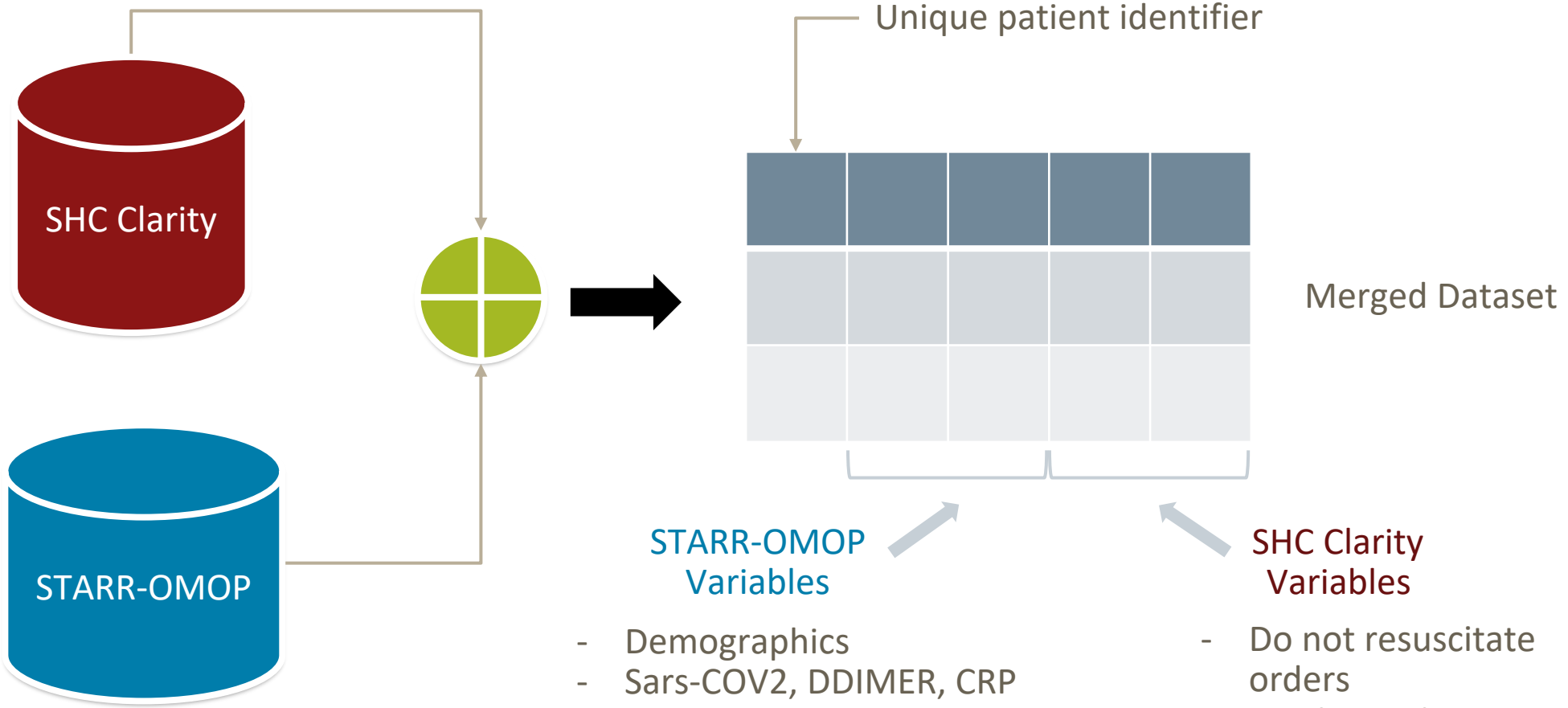
OMOP-CDM linked with Stanford internal Databases



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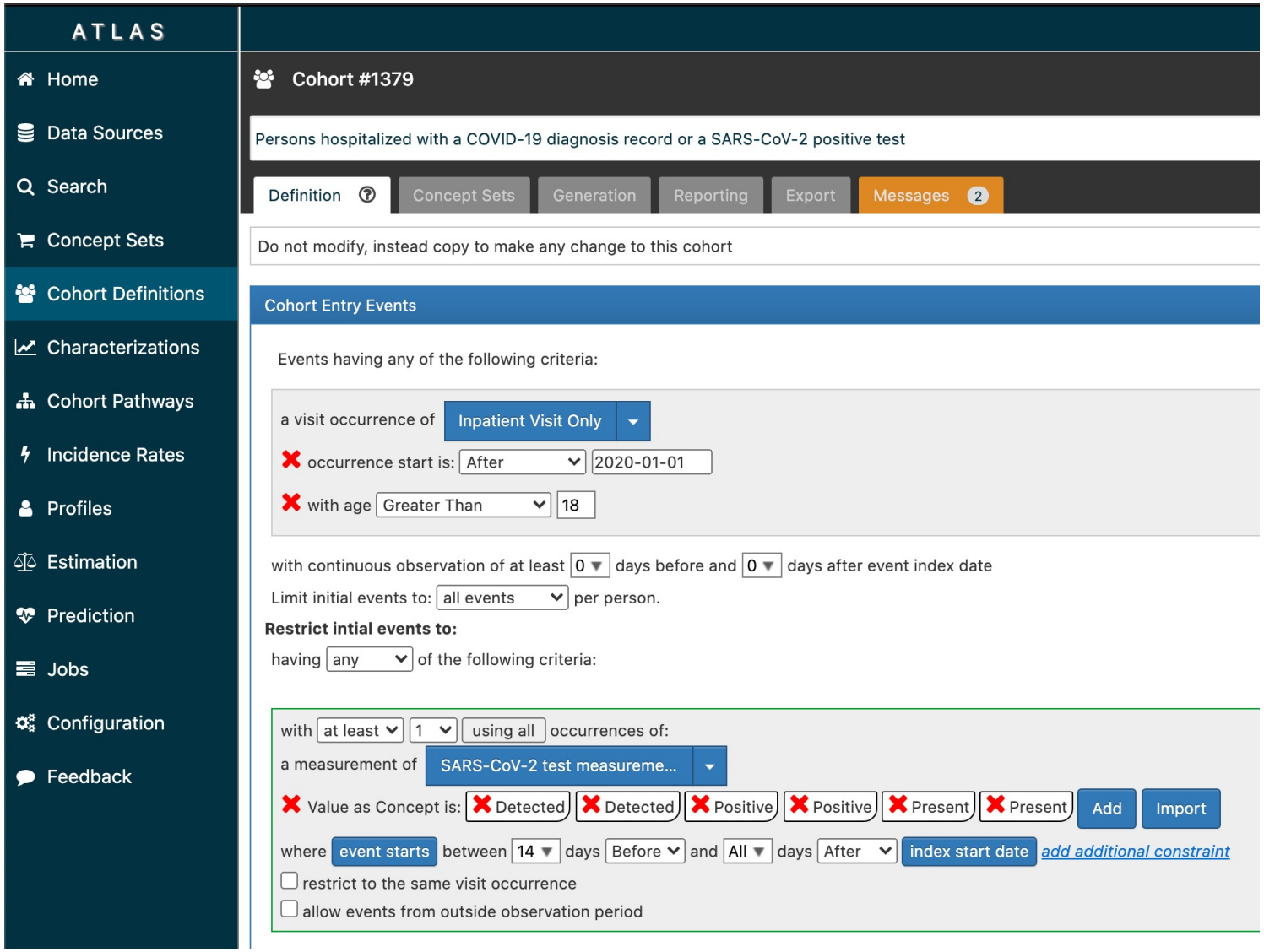
We reused CHARYBDIS Phenotypes



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Results from our descriptive analyses

Interpretation: Relatively low (14%) of patients requiring > 6L O_2 end up needing intubation, suggesting 6L O_2 threshold for ICU transfer may be relaxed if ICU capacity is constrained.

14% of patients with high oxygen need (31% of those transferred to the ICU) were intubated and placed on mechanical ventilation.

	Transferred to ICU	Not transferred to ICU	Total
Intubated	42	0	42
Not intubated	93	111	204
Total	135	111	246

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Challenges

- Identifying patients with a COVID diagnosis code who were not really COVID patients
  - Only apparent after chart review
- Effectively processing flowsheet data
  - Millions of rows!
- Pulling the relevant ventilation details from procedure orders
  - Relies on temporality and duration of orders
- Excluding clinically implausible oxygen records
  - Clinical expertise + deep familiarity with the data
- Tracking down and managing data anomalies
  - e.g. patients with a DNI/DNR order “look” different in the data

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Take-aways

- Data summaries are helpful, independent of statistical analyses
- 80% of our effort was in getting the data pulls done, and done correctly
  - The analyses were the easy part!
- > 300 hours of collective effort in a very short period
  - Amazing collaboration and communication: the team's diversity of skills and willingness to participate in long working calls and Slack threads were essential to making this happen.
- Use of both STARR-OMOP and Clarity data was essential

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