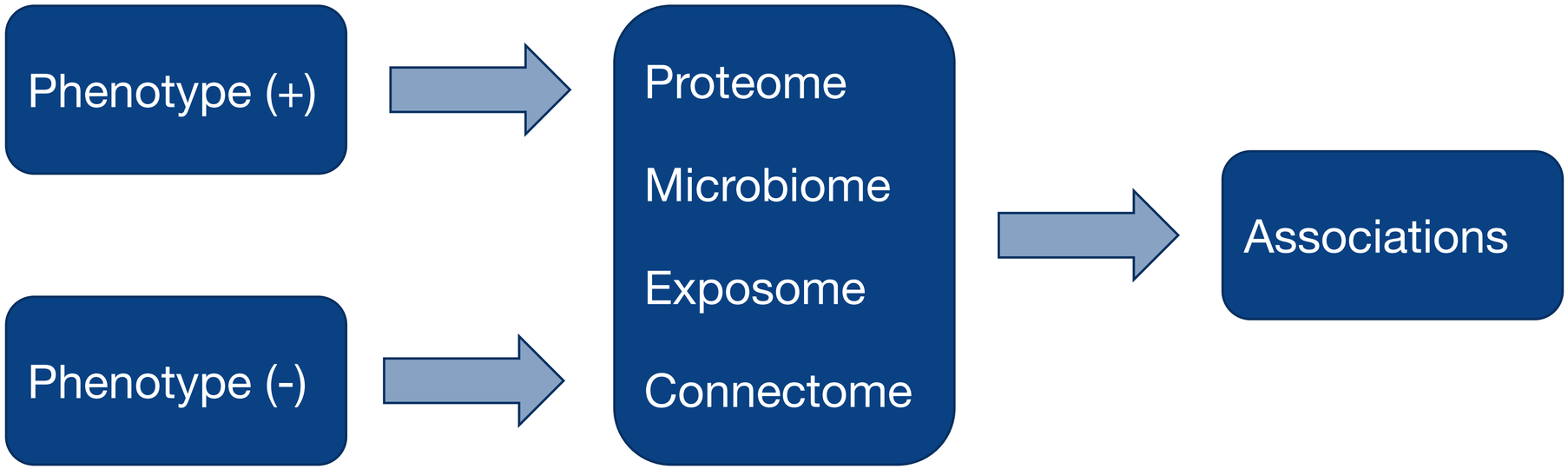
Digital Phenotypes

Learning Healthcare System

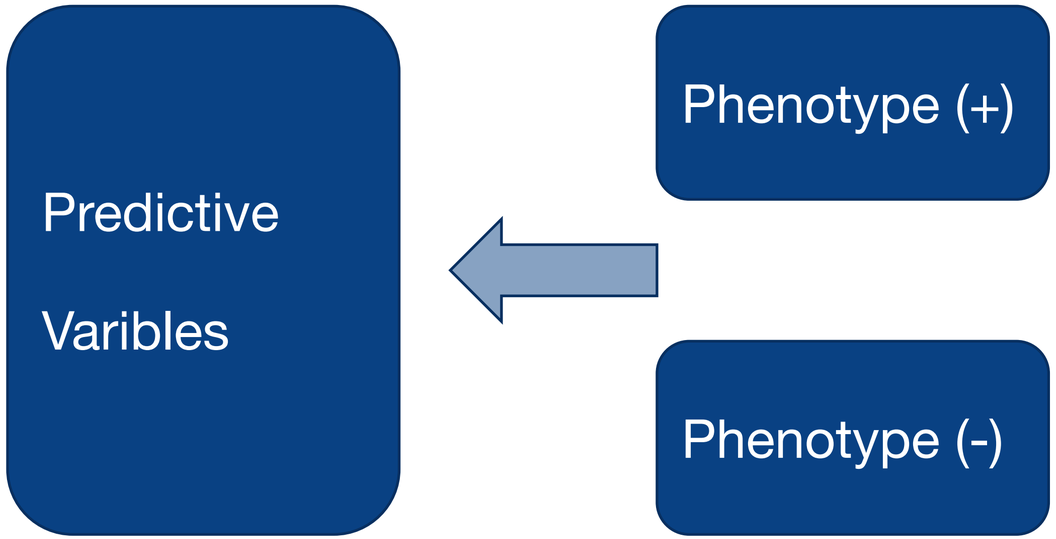
Phenotype

Combination of observable attributes of an organism
Result from the combination of genotype + environment

Classic Association Study



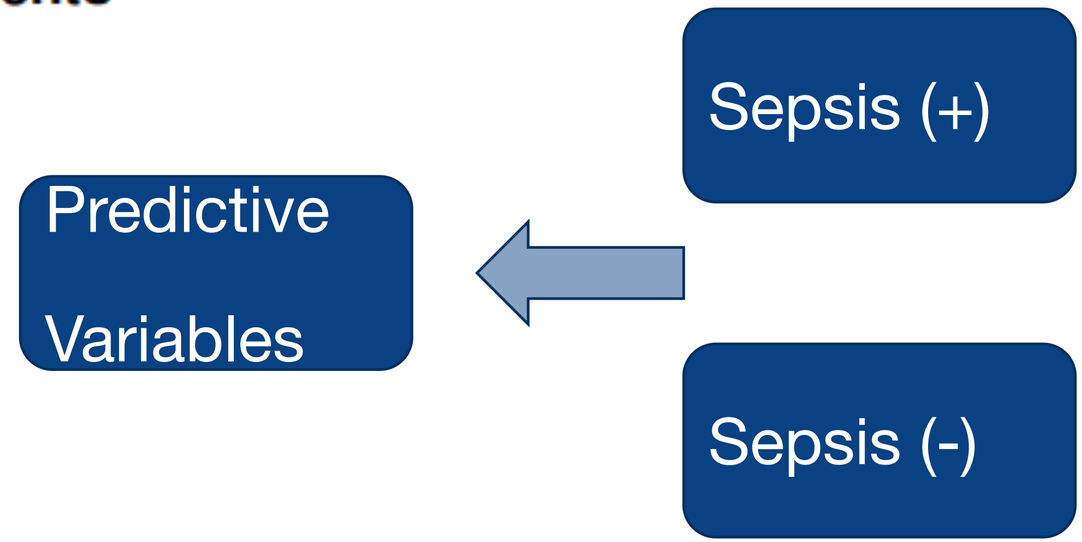
Study to predict clinical outcomes



A simple example

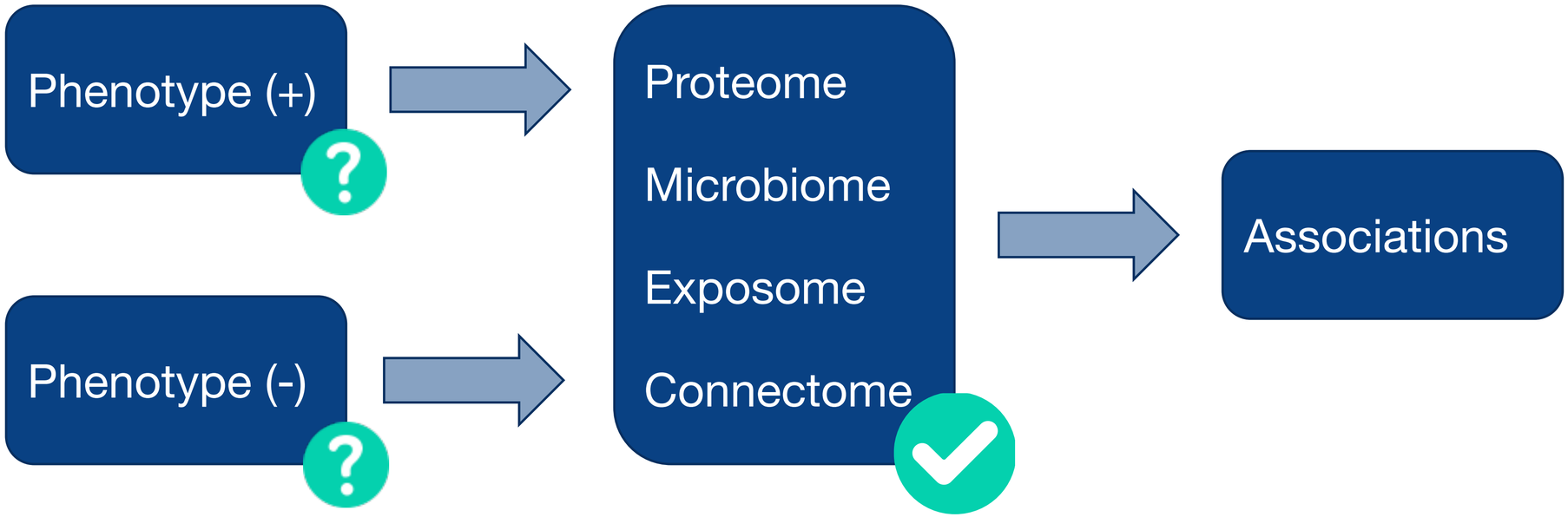
D104 CRITICAL CARE: A FINE BALANCE - SEPSIS DEFINITIONS, OUTCOMES AND EPIDEMIOLOGY / RAPiD: Rapid Abstract Poster Discussion Session / Wednesday, May 22/1:30 PM-3:30 PM / Trinity Ballroom 5-7 (Level 3), Omni Dallas Downtown

A Machine Learning Approach to Sepsis Prediction in non-Intensive Care Unit Patients



Michelson, A., Yu, S., Gupta, A., Lai, A. M., Kollef, M. H., & Payne, P. R. O. (2019). A Machine Learning Approach to Sepsis Prediction in non-Intensive Care Unit Patients. In *D104. CRITICAL CARE: A FINE BALANCE-SEPSIS DEFINITIONS, OUTCOMES AND EPIDEMIOLOGY* (pp. A7159-A7159). American Thoracic Society.

Classic Association Study



Complex or ‘subjective’ phenotypes are the most problematic

Extended Phenotype

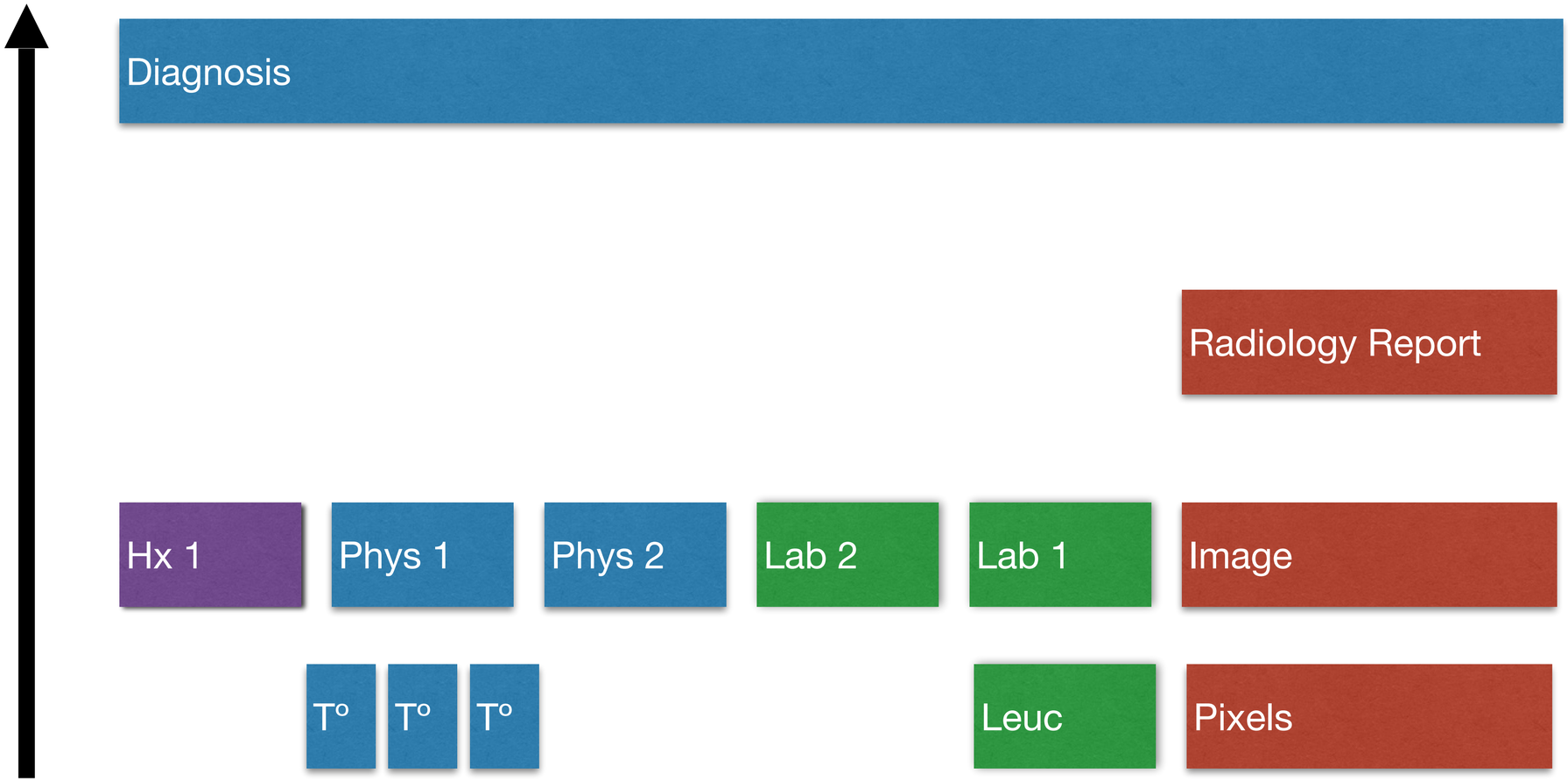
- Concept introduced by Dawkins in 1983
- Phenotype should also include the effect we exert on the environment
- Digital environments and automated data collection make possible to envision digital phenotypes

Digital Phenotype

- Retrospective EHR studies
- Quality measurement
- Surveillance
- Patient recruitment

Some issues with clinical data bases

Coexistence of different levels of abstraction



Phenotyping Methods

- Manual chart abstraction
- Codes (ICD-10, SNOMED-CT, etc.)
- Natural Language Processing (NLP)
- Ad-hoc algorithms

Defining your phenotypes in MIMIC

- Define your baseline cohort
  - Patients? Hospitalizations? ICU Stays?
  - Age range? Other demographics?

- Define clinical characteristics
  - Diagnoses? Procedures? Vital signs?
  - PICO framework

PICO Framework

- Patient
- Intervention/Exposure
- Comparison
- Outcome

Does the early initiation of antibiotics improve hospital survival in patients with Sepsis?

PICOizing the question

- **P**: sepsis
- **I**: early initiation of antibiotics
- **C**: delayed initiation of antibiotics
- **O**: survival at discharge

Defining the required data elements

Sepsis	Infection + Organ Failure	Confirmed Infection? Suspected infection?
Early Antibiotics	Antibiotic Administration Time of antibiotic administration	Which antibiotics? Time distance between Sepsis diagnosis? Admission? Other?
Delayed Antibiotics	Antibiotic Administration Time of antibiotic administration	
Hospital Death		

Can you think of some examples?