Digital Transformation of Healthcare

Ethics in Modeling

Michoel Snow, M.D. Ph.D., Glen Ferguson, Ph.D.

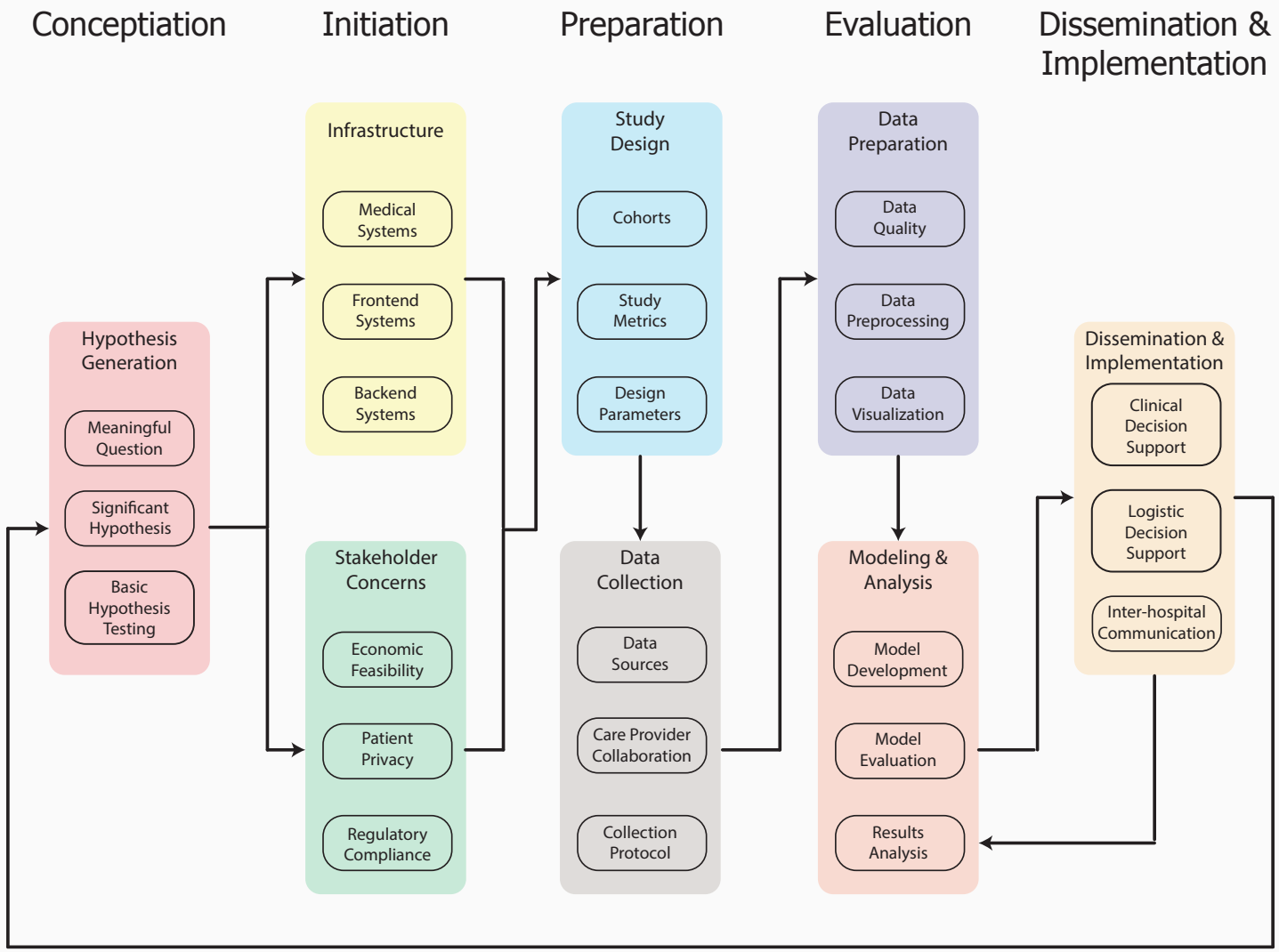
Center for Health Data Innovations

Ethics in Modeling

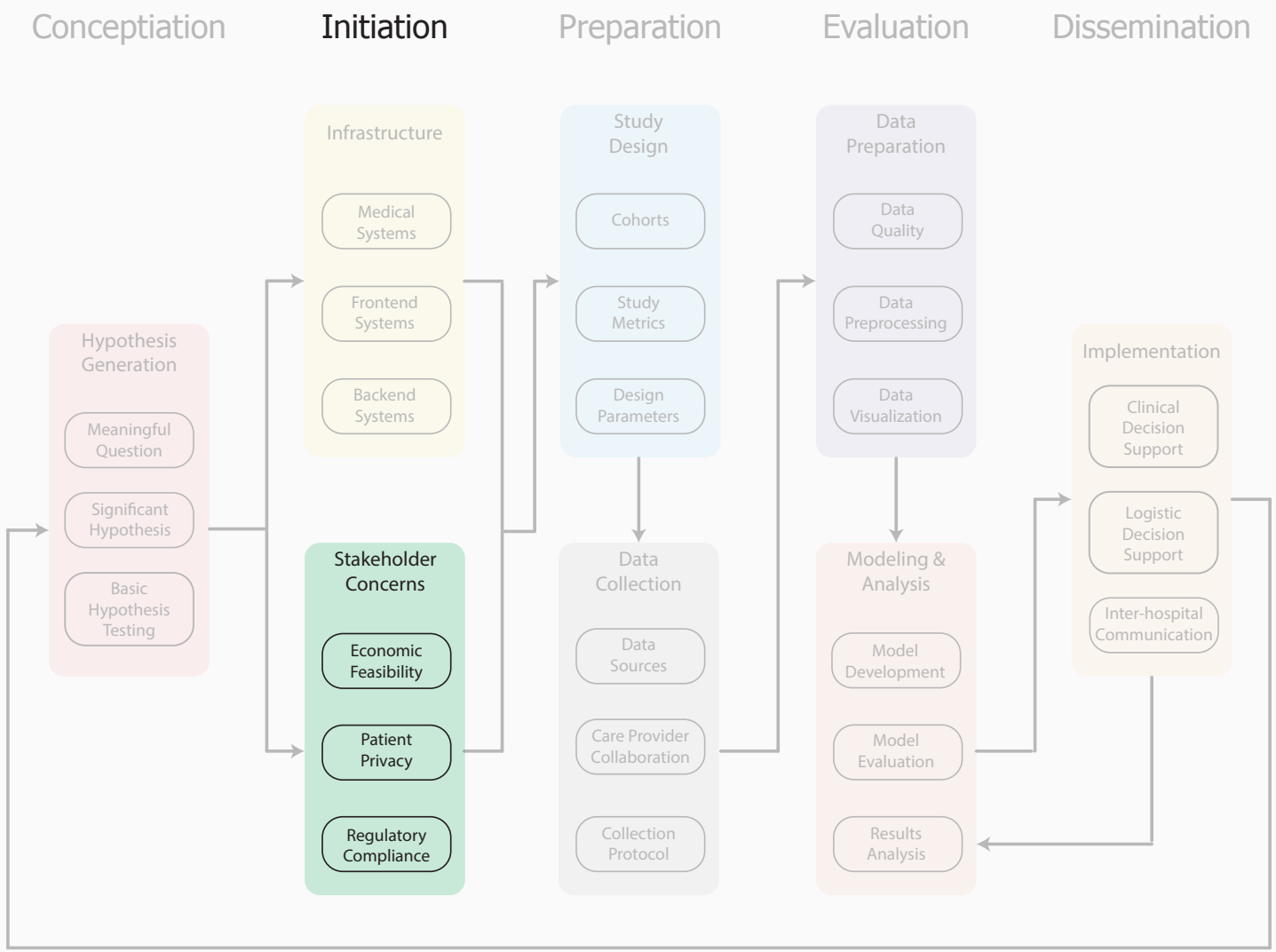
After this lecture students will be able to

- Identify possibly unethical models
- Describe tests used to determine model fairness
- Ethically evaluate model design goals
- Discuss the challenges patient privacy and data anonymization poses for machine learning models

Bioinformatics Pipeline



Modeling Ethics



Case 1[1]

- Risk assessments are used to inform decisions about who can be set free at every stage of the criminal justice system, from assigning bond amounts to even more fundamental decisions about defendants' freedom.
- ProPublica obtained the risk scores assigned to more than 7,000 people arrested in Broward County, Florida, in 2013 and 2014
- The formula was particularly likely to falsely flag black defendants as future criminals, wrongly labeling them this way at almost twice the rate as white defendants.
- White defendants were mislabeled as low risk more often than black defendants.
- Is this an ethical model?

[1] https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing

Case 2

- You are tasked with developing a protocol for all patients diagnosed with and begin treated for pneumonia.
- You decide to use all previous cases where patients where treated for pneumonia to build your neural network, with the inputs being the state of the patients at the beginning of the day and the outputs being the state of the patients at the end of the day?
- Are there any ethical concerns with this method of model building?
- How can you mitigate ethical issues before they arise?

Case 2

Case 2

- You are tasked with developing a protocol for all patients diagnosed with and begin treated for pneumonia.
- You decide to use all previous cases where patients where treated for pneumonia to build your neural network, with the inputs being the state of the patients at the beginning of the day and the outputs being the state of the patients at the end of the day?
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- Ethical concerns
  - Bias - are people being treated differently due to race, ability to pay without any evidence that there are improved outcomes
  - Negative outcomes - this model does not weight any outcome better or worse than any other, just uses what has been done before, e.g., if there is a novel treatment that does better than the standard protocol but has only been used in the past year, then it would be suppressed in this model
- Does a model need to be explainable to be ethical
- Is context essential in medicine and do machine learning models need to account for that

Currently Implemented Pipelines

- Are some types of CDS more or less ethical?
  - Respiratory failure
  - Spinal cord compression detection and prediction
  - Patient scheduling

Patient Privacy and Data Anonymization

- How Privacy is a fundamental right of patients, but how does that appear when dealing with models.
- Does all patient data need to be anonymized before feeding it into the model?
- Are there any negatives of feeding in anonymized data into a model?
- Where does patient consent fit in the era of big data?