Stanford MEDICINE

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INTRO TO HEALTHCARE STUDY GUIDE

MODULE 6- ETHICS

OVERVIEW OF AI APPLICATIONS IN DELIVERY OF HEALTH CARE SERVICES AND ETHICAL ISSUES

There are many parts of a modern health care system, each of which collects and analyzes data. Health care providers and intermediaries such as health insurance companies and government programs such as Medicare and Medicaid generate huge amounts of data about patients.

Potential applications of artificial intelligence:

- Increasing the accuracy of diagnosis
- Robotic surgeries
- Identifying candidates for drug development
- Determining the best treatments to use for specific patients

Artificial intelligence raises ethical issues that should be considered by its developers and users and important stakeholders such as patients.

What are the ethical issues? Very broadly speaking, the questions we should ask are:

1. Do artificial intelligence tools help or harm patients, their families and caregivers, or health care providers?
2. Are these tools socially just or not?

These ethical issues can arise from different aspects of AI:

- The nature of the data that are used
- The way the data are collected
- The way that AI models are designed
- How their output is interpreted and used

A big ethical concern raised by AI is about **the privacy and security of digital data**, especially in the domain of health care because health care data are **sensitive**.

AI can lead to conclusions that are **biased based on systematic error** because their models are trained on data that are unrepresentative of populations or features of interest.

Systematic error in AI models is especially bad in the health care context, since the output of these models can affect important and even life-and-death decisions. Systematic errors can lead to unfair decisions, especially if they discriminate against whole categories of socially-disadvantaged people such as racial minorities, women, children, and people with low incomes.

One type of ethical concern that is particularly relevant to AI is due to the **lack of transparency** of AI models.

Currently there are few standards or regulations for evaluating safety and effectiveness of many AI-based products used in health care.

It is critically important for clinicians and health systems that use AI in ways that can influence health care decisions to understand the limitations of the AI techniques, data and models as they are applied to their specific patient populations.

One type of ethical concern that we will focus on in this course is the issue of **conflicting or competing interests**. This is an issue that arises particularly in the domain of health care.

ETHICAL FRAMEWORKS FOR HEALTH CARE AND FOR AI

There are many ethical, legal and regulatory factors that determine and constrain the financing and delivery of health care in ways that do not apply to other types of products and services.

Broad ethical frameworks that are applicable to developing and using AI in the health care context:

1. All professionals are ethically bound and guided by professional ethics through codes and guidelines
    - Professionals: Those entrusted with the well-being of people who seek their specialized expertise in times of need
2. Physician are allowed access to their patients' private health and financial information and are even allowed to do things that would be considered criminal in other contexts. The social contract that is implicit in the concept of professions allows such actions if they are necessary to serve the well-being of clients
3. A key feature of professions is that they are given a lot of leeway to self-regulate
4. Professionals have fiduciary duties (ethical obligations to serve the best interests of their clients)

- Clinicians have to rely on regulators and drug and device manufacturers to ensure that the diagnostics and treatments that they provide to patients are safe and effective
- The regulatory systems in place to evaluate drugs and devices, and the certification systems to evaluate hospitals and laboratories are critical to maintaining trust of both clinicians and patients. This becomes very important when thinking about how to develop artificial intelligence for health care applications, because these systems need to be trusted in order to be implemented successfully.

While clinicians and health care organizations are trying to serve the best interests of their patients, they have interests of their own and are subject to many competing or conflicting interests.

Most importantly in the context of health care delivery are financial interests. Understanding the interplay of these interests and how they are shaped by the structure of the health system is critical to understanding how AI models can be aligned or misaligned with these interests and affect patient care and well-being.

AI AND INCENTIVES IN HEALTH CARE DELIVERY AND PAYMENT STRUCTURES

Large, complex health care systems exist in an environment of explicit incentives intended to drive behavior of patients and health care providers. These incentives are often for the purpose of improving the efficiency of health care.

How to improve the efficiency of healthcare:

1. Improve the quality of care
2. Reduce health care costs or the utilization of health care resources

The existence of incentive structures that are built into health care systems through payment models means that physicians, hospitals and insurers need to measure things related to quality of care, costs and utilization. These incentive structures have also led to classifying and predicting features of patients and patient care.

AI is particularly good at classifying and predicting, especially using really large datasets, and especially in terms of probabilities. AI-based predictive analytics are feverishly being applied to health data for classifying and predicting.

"Big data": Really large numbers of patients and huge amounts of electronic information. These data can be collected from individual patients from medical records, digital images and monitors.

AI is not only useful for analyzing big data but actually necessary for improving the accuracy of classification and prediction. AI models are designed to predict or identify sources of risk. AI can be particularly good at identifying risk that is unexpected or less obvious, but has limitations when applied to health data, and these limitations have ethical implications.

Types of risk:

- The probability of facing a financial loss associated with the use of healthcare. Financial risks are largely measured and predicted from the perspective of health care systems, providers, and insurers.
- The probability of medical harm associated with the use of health care

Example of applications that use AI-based predictive analytics:

> An insurance company builds an AI model that uses insurance claims, electronic health records and consumer data to predict which of its members are likely to incur the highest costs of care over the next year.
>
> An ethical challenge in building this model arises because we know that vulnerable populations such as the poor, people with disabilities, and people from racial and ethnic minorities tend to incur disproportionately high health care costs. In order to minimize the chances that predictive models discriminate against patients in these vulnerable groups, it is important for the model to risk adjust accurately.
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> The data that are available in health care domain rarely reflect what we actually want to measure. That means that our measurements used for predicting and classifying are **proxy measures**. When you use proxy measures, this introduces the possibility of systematic error, or bias because proxies are always imperfect. When the possibility of bias is introduced, there is also the possibility of discrimination, which is bias that leads to negative consequences for certain groups.
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> It is important to recognize the limitations of the models that are created when you lack data that are necessary to really explain the outcome of interest.

Deep knowledge of the clinical characteristics of patients represented in datasets and familiarity with the limitations of available data are necessary to avoid ethical pitfalls in model design.

MORE EXAMPLES OF AI AND INCENTIVES IN HEALTH CARE DELIVERY AND PAYMENT STRUCTURES

An example of a common application of AI:

A large information technology company sells analytic services to health systems to integrate patients' health data with insurance claims data to help reduce inpatient admissions, emergency department admissions, and readmissions

This model has been developed to predict hospital readmissions within 30 days of discharge. These predictive analytics have been developed in response to the Medicare Hospital Readmissions Reduction Program, or HRRP, which fines hospitals when they have excess readmissions within 30 days, after adjustment for medical risks. The program was designed to create financial incentives to reduce avoidable readmissions.

There is evidence that the imposition of fines does reduce readmissions. However, there is also evidence that the way that admissions are reduced might also lead to the unintended consequence of poorer or inappropriate care, or no care at all.

How information from a predictive model gets used in actual practice is also ethically relevant

Here is another example:

A health system develops a model to predict costs of patients who have joint replacements

This application of AI would be developed in response to a type of incentive program designed to encourage value-based care, and is known as bundled payments.

- **Bundled payments**: focus on lowering costs of care by paying multiple providers for what are called "episodes of care" for certain conditions. Payment is bundled for all of the care and providers as a group manage the costs. If the costs of caring for the patient exceed the bundled payment, the providers share the burden. If the costs are lower than the payment, providers share what is left.
- The intent of bundling payments for services included in an episode of care is to create incentives to improve patient outcomes in transition through better coordination of care. The intention is to align incentives of providers across a series of health care settings.

There are existing health disparities that could interact with the bundled payment programs to exacerbate these disparities. If predictive models do not include the right data, and do not risk-adjust appropriately, health disparities could be reinforced.

These are the main takeaway points:

- Health care systems deliberately use incentives
- These incentives make it useful to predict risk, AI can improve the accuracy
- Incentives can have unintended consequences
- It is important to understand and anticipate the impacts of proxy measures and the limits of health data on bias in models
- Important to understand how behavior of those who use the output of models could be affected in ways that could create unintended consequences

In short, fairly sophisticated and detailed knowledge of how health care services are delivered and paid for are necessary to understand how to build good and ethical AI models