Clinical Decision Support

Class 2 | 8 June 2024

Electronic Health Records and Data Structures

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Welcome Back!

Questions or Concerns?

Course Topic Outline

Getting Data In

1. EHRs and Clinical Records

   Origin and relevant history of the medical record; contemporary promise and problems

2. Clinical Decision Support

   Uses of medical record data to drive patient care

Storing, Finding, Retrieving

1. Data Structures and Liquidity

   Relational database structures and effective use of EHR data

2. Data Curation

   Raw data, refined data, and patient data from non-EHR sources

Turning Data into Insight

1. Leading Innovation

   Analytics strategy in healthcare organizations

2. Systemic Analytical Decision Making

   Designing an environment compatible with data-driven decision making

Individual Essay

Submit an essay of between 1,000 and 1,200 words, depicting your side of a conversation about a healthcare analytics topic, in the spirit of the following scenario. You are at the health system where you work as a clinician and you find yourself in the break room or on an elevator with one of the leadership team, who have just learned of your promotion to a mid-level analytics leadership role. Interested to gauge your acumen and get to know you better, they ask a question or make a comment and look to you expectantly. You have about six minutes to get your point across to them, advocating for the solution or approach you believe is most relevant.

- Using material covered during Weeks 1 and 3, select a prompt from the list on Canvas and respond accordingly.
- Due July 4th; 20% of final grade

Example Prompts (see Canvas for full list):

- You say that we're considering deploying IBM-Watson in the cancer center? You know, here's why that's a good idea…
- No, I hadn't heard — we're really contracted with CMS to be paid for value, as an Accountable Care Organization? This is terrible! Here's why paying physicians to keep their patients well will never work…
- I'm sorry to hear that your mom had to be admitted, and I completely sympathize with you about the challenges of getting medical records to follow us from one hospital to another. You may have heard that I'm our representative on the IT Interoperability Improvement workgroup—of the approaches we've been exploring, I think these are the process and systems changes we most need to make to improve patient data sharing…

Don’t forget the Rubric!

Elevator Pitch Grading Rubric

Criteria	Ratings				Pts
Essay retains character of a partisan spoken response	**6.0 pts** **Full Marks** Clearly articulated argument for or against a specific concrete approach or solution, delivered as well-scripted monologue, without grammatical errors	**4.0 pts** **Moderate Performance** An argument is clearly made, presentation departs from character of spoken response, minor grammatical errors	**2.0 pts** **Poor Performance** An argument is present, but is presented in a confusing manner, with grammatical errors	**0.0 pts** **No Marks** Argument is missing entirely; no recommendation is endorsed; or character of spoken response is absent; or grammatical errors abound	6.0 pts
Essay makes good use of course concepts in framing	**6.0 pts** **Full Marks** Demonstrates a strong and accurate understanding of the concepts, which are	**4.0 pts** **Moderate Performance** Missing one or more obviously relevant	**2.0 pts** **Poor Performance** Demonstrates over-reliance on the formulation or arguments	**0.0 pts** **No Marks** Fails to make use of or to identify concepts from the course; or	6.0 pts

Team Data Analytics Project

- Dataset will be provided
- Due July 31st; 30% of final grade
- Teams will share or divide up among yourselves these "research publication project" tasks:

  - Research question identification
  - Study design
  - Data management
  - Data analysis
  - Written Findings (2-5 pages)

- Step 1: Determine "research" question
- Step 2: Examine data dictionary to identify useful variables to include

Questions from Last Session – Courtesy Spencer

- Who owns the EHR data?

- Can EHR data ever be considered truly protected? Should we focus on a reasonable security bar, then build in high redundancy back ups to restart the hospital in the event of an attack?

- Business Continuity
- Disaster Recovery

Clinical Decision Support

Class 2 / Week 3

Uses of medical record data to drive patient care

Class 2 Learning Objectives

- Understand the promise of supporting clinical decision making with data and analytics; be able to articulate where our current capabilities fall short of the promise.
- Distinguish the pros and cons of knowledge-based and AI/predictive model approaches to to CDS.
- Appreciate the challenges associated with using alerts in an EHR workflow, without *overusing* them.
- Articulate your own explanation for the limited success of AI in healthcare in this era of facial recognition, driver-assisting cars, and convincing chatbots.
- Understand the risks and mitigations associated with AI-supported CDS.

Class 2 Topic Outline

- I: Clinical Decision Support Prior to AI
  - Knowledge and Reasoning
  - What is Clinical Decision Support?
- II: Clinical Decision Support and AI

Class 2 Topic Outline

- I: Clinical Decision Support Prior to AI
  - Right information, right person, right time, right format—what have been some of the changes to care delivery instigated or supported by this goal?
  - “POMR was more powerful as a remedy to bad documentation practices than as a computerized CDS tool.” Agree or disagree?
  - Could or should CDS be used beyond aiding in diagnosis and treatment plans? How would you envision that working?

Knowledge and Reasoning

- Understand the Task
  - Need the Robot to Walk
    - Cause it to learn to walk?
    - Program it to walk?
  - Diagnose the illness
    - Show lots of labelled data allowing the machine to learn?
    - Specify all the steps a human clinician would take to diagnose?
    - Show all the data you can obtain and see what the model learns?
- Data base or Knowledge base as ”seed”
  - Graph/network, Structured
  - Logic-based, Procedural
- Semantic tangle: Which better illustrates “Reasoning”
  - Probabilistic forward-chained (e.g. logistic regression)?
  - Convolutional neural network with back propogation?
  - PROMIS-style system with pre-programmed rules?
  - Generative AI like LLM?

Clinical Decision Support

- Earlier approaches started by automating the “human logic”
  - Crompton’s flow sheets
  - Weed’s POMR
  - E-prescribing and Rx counter-indications
- Subsequent approaches modeled probabilities of occurrence
  - Data-driven designs using techniques like regression to predict future
  - Optum’s care management system
- Contemporary approaches (LLM, Deep Learning) model a system in which causes unknown to the clinician may be learned by the machine

Class 2 Topic Outline

- II: Clinical Decision Support and AI
  - What problem is a clinician attempting to solve in diagnosing a patient? Does this differ from the problem POMR or Deep Learning are attempting to solve? What about Generative AI?
  - Do you see a role for CDS in leveraging streams of IoT data such as from wearable devices?
  - If alerts easily lead to “alert fatigue,” what other ways can CDS influence clinical workflow? How is this handled in other AI-to-workflow applications? (Cf. late-model cars or the Boeing 737-Max?)
  - Is CDS a better fit for Computerized Physician Order Entry (CPOE) than for patient diagnosis and treatment?
  - What risk is posed by bias, “black boxes,” and job replacement?