Discussion Regarding Informatics and Medical Student Education

27 May 2021

Agenda

1. Brief Introductions
2. AMC Proposed Capabilities and Activities for Digital Health
    1. EPA 2
3. Informatics, Data Science and Redesigned MD Curriculum
    1. Design Process
        1. Survey
        2. Melbourne (informal) committee
    2. Discovery Subject
    3. Core
    4. Year 1 emphasis
4. Challenges
    1. Working through the bureaucracy
    2. Fitting materials into curriculum
    3. Attracting medical students

Foundation Level: Entrustable Professional Activities (EPA) mapped to Horizons in the Digital Health RoadMap (Pages 30-39)

EPA	EPA Outcomes (Individual Performance)	EPA Outcomes (Workforce Capability Shift)	Horizons	Domains	Sub-Domains	Sub-Domains	Sub-Domains
EPA 1: Effectively conducts telehealth consultations and uses digital records for safe and quality care.	▪ **Access and review patient information** in a digital record system ▪ Consult effectively with patients using **telehealth systems** and, with reference to, **electronic records**. ▪ **Synthesise information** relevant to patient care from **multiple sources**. ▪ Observe **privacy and security of information** in telehealth consultation and digital record system. ▪ Prepare **clear records in line with Australian Medical Board Code of Conduct**: *8.4.1 Keeping accurate, up-to-date and legible records that report relevant details of clinical history, clinical findings, investigations, information given to patients, medication and other management.* *8.4.2 Ensuring that your medical records are held securely and are not subject to unauthorised access.* *8.4.3 Ensuring that your medical records show respect for your patients and do not include demeaning or derogatory remarks.* *8.4.4 Ensuring that the records are sufficient to facilitate continuity of patient care.* *8.4.5 Making records at the time of the events, or as soon as possible afterwards. 8.4.6 Recognising patients' right to access information contained in their medical records and facilitating that access.* *8.4.7 Promptly facilitating the transfer of health information when requested by the patient ·* ▪ **Upload an electronic record**. ▪ **Treat complex case use** of telehealth and electronic records (vulnerable patients and patients and/or colleague who may be resistant to digital technologies, sensitively and ethically). ▪ **Reflect on practice performance** and improvement through **audit of patient records** in an electronic record system.	▪ **Improve digital literacy** across the health workforce. ▪ Develop new mindsets and new skills. ▪ Lead people through complexity. ▪ Create more **adaptive cultures** which will challenge deeply held norms of behaviour. ▪ **Mobilise diverse stakeholders** to adopt new ways of working and interacting with a focus on change.	**1. Current Technologies**	**Health System**	Current State	Future State	Continuous Improvement
				Workforce	Medical	Intra-professional	Interprofessional
				Health Context	Community	Hospital	Personalised
				Technology	Critical appraisal of technologies	Privacy and security	Implementation barriers and solutions
				Data and Information Quality	Data quality	Data management	Information creation, use and sovereignty
				Clinical Practice	Clinical processes and pathways	Expertise and lifelong learning	Ethics, policy and the law
				Future Proof	Current challenges in health	Opportunities and risks	Redundancy
				People and Value Based Care	Culture and Improved Patient Experiences	Needs and expectations	Lifelong health and learning journeys

EPA	EPA Outcomes (Individual Performance)	EPA Outcomes (Workforce Capability Shift)	Horizons	Domains	Sub-Domains	Sub-Domains	Sub-Domains
EPA 2: Critically appraises and uses an emerging technology for effective decision making in Healthcare.	▪ Select a **validated clinical decision support tool with integrated technology solutions** – refer to a curated collection per specialty, for the various stages in the clinical process (diagnostics, prognosis, and therapeutics), and for **priority health system contexts** of validated clinical decision support tools ▪ **Gain awareness of how to use the decision support tool** ▪ Explore the **benefits and challenges** for patients and clinicians of **usage of the clinical decision support** ▪ **Critically appraise the assumptions** on which the decision tool **algorithms** are based and consider ways in which **transparency** about these assumptions can be improved to foster **effective use of the decision tool and rigor of the judgments made in its usage** · Reflect on the similarities and differences of your clinical practice, with and without use of the decision tool, including ethical implications ▪ Observe **privacy and security of information** in use of the decision tool and possible areas of bias ▪ Consult effectively with patients about, and with reference to, decision support ▪ **Treat complex case use** of decision support (vulnerable patients and patients/colleagues who may be resistant to decision support) **sensitively and ethically** ▪ Reflect on **practice performance and improvement** through audit of clinical practice with and without decision support – refer to the six dimensions of **impact evaluation on clinical practice and health system improvement**: **effectiveness** (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission), **efficiency of services** (using resources in best way, balancing costs and benefits) **timeliness** (reducing waiting times, GPs or before surgery), **patient quality and safety** (quality, risk and bias in care), patient-centredness (as measured by patient satisfaction and outcomes) and **equity** (access to quality services).	▪ Anticipate and respond to **emerging technologies** most relevant to their area of focus. ▪ Resolve **new ethical dilemmas** and **refine policy** and roles related to use of new technologies. ▪ Learn **new ways of working across health** with support of emerging technologies and the health team.	**2. Emerging Technologies**	**Health System**	Current State	Future State	Continuous Improvement
				Workforce	Medical	Intra-professional	Interprofessional
				Health Context	Community	Hospital	Personalised
				Technology	Critical appraisal of technologies	Privacy and security	Implementation barriers and solutions
				Data and Information Quality	Data quality	Data management	Information creation, use and sovereignty
				Clinical Practice	Clinical processes and pathways	Expertise and lifelong learning	Ethics, policy and the law
				Future Proof	Current challenges in health	Opportunities and risks	Redundancy
				People and Value Based Care	Culture and Improved Patient Experiences	Needs and expectations	Lifelong health and learning journeys

EPA	EPA Outcomes (Individual Performance)	EPA Outcomes (Workforce Capability Shift)	Horizons	Domains	Sub-Domains	Sub-Domains	Sub-Domains
EPA 3: Provides value-based care for patients and their families with integration of effective use of personalised technologies.	▪ Understands the **principles and practice of value-based care** ▪ Gains an in-depth perspective of **the challenges associated with engaging in healthcare for patients and carers**, and the influences of **personal and community context** through patient interviews and observations in clinical and home contexts, and patient journey mapping (including patients with routine and complex health conditions and different patient cohorts which may include homeless, paediatric, in aged care facility, adolescent drop in centre, Indigenous, disabled, CALD patient and carer, etc.) ▪ Reflects on why value-based care matters including **review of benefits, risks and required shifts in current practices** in terms of fostering health literacy, empowerment, and improved health experiences and outcomes ▪ Understands how **technology can be leveraged** to develop **sustainable models** of value-based care in clinical settings and home and community health environments ▪ **Understands** that technologies have **underpinning assumptions and algorithms** ▪ Reviews and builds an **awareness of the benefits and risks of a range of personalised technologies for different consumer groups**, consumer health **needs, and preferences** aligned with specialty fields of practice and a range of health conditions and health settings ▪ Identifies opportunities for shifts in personal practice and system improvements to integrate value-based care leveraging sustainable use of personalised technologies ▪ **Reviews current clinical workflows** and develop plans to integrate improvement to practices identifying **anticipated positive impacts** for consumers, personal professional performance and performance at a system level ▪ **Implement the planned change** ▪ **Monitors the outcomes** and impacts of the planned change	▪ Adopt more **patient centred approaches** to health. ▪ Use **new technologies integrated with transformational goals for better care** (value-based healthcare, personalised medicine, consumers as partners and care outside hospital settings). ▪ Engage in **small scale trials** and transformational change programs in **health impacting ways** of working, roles, contexts of health provision and outcomes.	**3. Personalised Technologies**	**Health System**	Current State	Future State	Continuous Improvement
				Workforce	Medical	Intra-professional	Interprofessional
				Health Context	Community	Hospital	Personalised
				Technology	Critical appraisal of technologies	Privacy and security	Implementation barriers and solutions
				Data and Information Quality	Data quality	Data management	Information creation, use and sovereignty
				Clinical Practice	Clinical processes and pathways	Expertise and lifelong learning	Ethics, policy and the law
				Future Proof	Current challenges in health	Opportunities and risks	Redundancy
				People and Value Based Care	Culture and Improved Patient Experiences	Needs and expectations	Lifelong health and learning journeys

	▪ Reflects on practice performance and improvement of shift in practice towards value-based care through audit of clinical practice using **key impact metrics** drawing on data entered as discrete data fields in digital record system: · effectiveness (curing patients at a better rate – reducing complications, reducing readmission, reducing emergency admission, learning a new skill, making a shift in personal practice) · efficiency of services (using resources in best way, balancing costs and benefits) · timeliness (reducing waiting times, GPs or before surgery) · patient quality and safety (quality, risk and bias in care) · patient-centredness (as measured by patient satisfaction and outcomes) · equity (access to quality services).						

<u>Possible Additional Entrustable Professional Activities (EPA) mapped to the Digital Roles Framework</u> ***(TBC following consultation)***
EPA 4: Patient Experience and Outcomes
EPA 5: Clinical Digital Skills
EPA 6: Digital Champion
EPA 7: Clinical and Technology Boundary Spanner
EPA 8: Technologist
EPA 9: Leader and Executive
EPA 10: Business and Administrator
EPA 11: Educator and Researcher

Sample Survey Responses:

Top "Top-Two" Concepts for MD Students

- data: 21
  - (standards, understanding data generation, data science, etc.)
- reasoning: 19
  - (**Reasoning under uncertainty**, cognitive limitations, biases, etc.)
- technology: 17
  - (CCDS, EHRs, programming, etc.)

Sample Responses

> Medical students should understand that the human mind is only capable of processing 3-5 concepts at one time, and is prone to biases. Therefore the human mind has faults/limitations that can be aided and enhanced by external systems. Computers happen to be good at addressing limitations of the mind. But computers have their faults, too, and so the user must be vigilant to these and not assume all things computed are correct or appropriate for the situation. (*Scott Narus, Ph.D.*)

> (1) If you don't maintain up-to-date problem lists and allergy lists, your decision support won't fire correctly. (2) Indiscriminate copy and paste adds noise, not signal, to the medical record, making it harder to identify the issues for that patient (not to mention potentially raising issues of billing fraud or suitability of the record as a defense in liability cases). (*Barbara Moore, M.D.*)

> Medicine essentially is "information interpretation"-Informatics can be the conduit for this. (*Deepti Pandita, M.D.*)

> Enough about the technology underlying health information management and decision support that the student (and in time the practitioner) becomes an informed and suitably critical adopter and consumer of computer-based solutions to common clinical information management problems. Future physicians must help to assure that informatics-produced commercial solutions are appropriate for real-world use, with evidence that adequate attention has been paid to human-computer interaction, interface design, and usability. (*Ted Shortliffe, M.D., Ph.D.*)

> Knowledge overload due to exponentially growing medical knowledge especially in genomic and molecular areas that require new ways for healthcare providers to manage medical knowledge. Data overload due to increasing amounts of clinical data per patient that will only increase as genomic and molecular data flows into EHRs will require new ways to efficiently retrieve relevant patient data for the clinical task at hand. (*Shyam Visweswaran, M.D., Ph.D.*)

> Your brain is no longer good enough to provide the best patient care, you need informatics. Use of clinical decision support does not make you a crippled doctor, you still need good clinical judgement when using computers for patient care. (*Karim Keshavjee, M.D.*)

> (1) The EHR is a tool for improving both decision-making and collaboration (among caregivers, patients, and others with impact on health and well-being) in clinical care. The latter is probably more important than the former. (2) It is possible to generate useful interpretations of a patient's data using automation; it is uncommon to do it well routinely. (*Peter Haug, M.D.*)

Medical Student Feedback from ISYS90069

- Focus on **clinical reasoning**. In Digital Transformation of Health I've personally found the historical aspects of health informatics interesting, however I think more students will engage in the subject if the content upskills their careers. For example, teaching could focus on how to use health data to guide decision making.
- The subject should get students to think about **why** we use health informatics, how it can be optimised for clinical use and **what can go wrong** with patient safety (e.g. The Overdose reading from The Digital Doctor). I think the medical school would appreciate the **emphasis on being a safe clinician**.
- **Hospital-related activities**. I suggest activities that allow students to be attached to clinical teams in their area of choice, to devise informatics-based solutions to clinical problems. This idea was brought up last week and I think this will garner a lot of interest given the opportunity for students to make hospital connections.

I apologise that I won't be able to attend tomorrow, but I really hope the meeting goes well. Please let me know about the progress!

Kind regards,

Tai (MD4)

Most valuable materials from ISYS90069 for medical students:

- Healthcare systems around the world
- Larry Weed, problem-oriented data, SOAP notes, history of medical records ** most valuable
- The Overdose, The Digital Doctor

Ways to "advertise" informatics to medical students:

- Make it clinical - direct impact on some aspect of clinical care.
- Work with clinicians - the chance to work e.g. "in the cardiology team" or "with a surgeon" would be appealing.
- Give examples of informatics solutions that have already changed healthcare e.g. https://medicine.unimelb.edu.au/mms/mms-staff-news/newsletter-issue-4-december-2016/2016-google-impact-challenge-success

I also note that I chatted to my brother about this, who is doing software engineering at UniMelb. He said that software engineering students would love to teach basic coding to med students. Maybe a worthwhile resource to tap into (but could be more applicable for MBSI).

Thanks Brian,

Aidan (MD4)

As I mentioned in last weeks meeting, the key materials from the class are: - Electronic medical records: common mistakes in note taking, writing only what you KNOW, Larry Weed's lecture on the medical record. - Clinical decision support tools; what they are, how you can incorporate them into your workflow and how they may shift learning attention from memorisation to soft clinical skills such as communication, efficiency and team-work. - Medical error and how bioinformatics may be able to reduce these rates.

In terms of advertising this to the medical students, I have number of suggestions:

1. We received a bioinformatics lecture in my MD1 year. So there is time/scope to include a lecture on the topics I've listed about. At the end, flag that bioinformatics is an option in the discovery pathway.

2. Really stress the clinical links. Mention that you can work closely with specialist **team at** hospital to help design a clinical support tool, etc that will be used widely. Stress that this is a unique opportunity to perform both the research and the translation.

3. Lastly, I think it would be good if you could get more Melbourne/Australian doctors/physicians in the lectures. That is a great way to add validity.

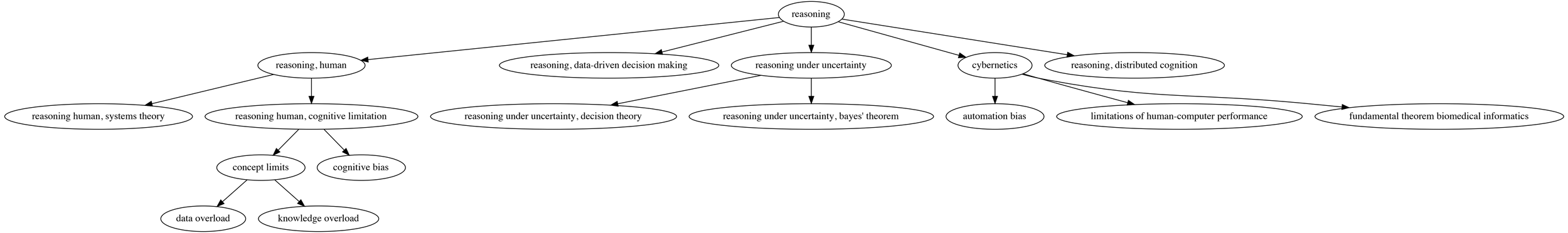
At the end of the day, medical students will want to take a class that is a) interesting b) clinically relevant c) supported yet flexible and d) provides them with an advantage to their classmates

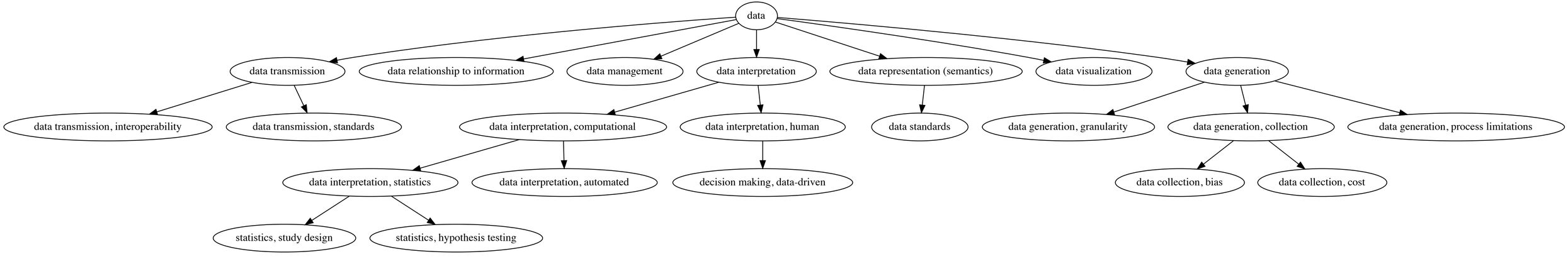
I hope this helps, and I'm sorry I can't come this morning.

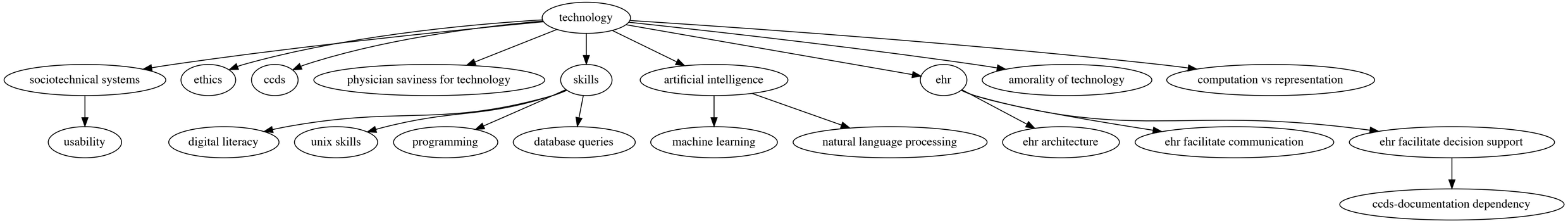
Warm regards, Emma

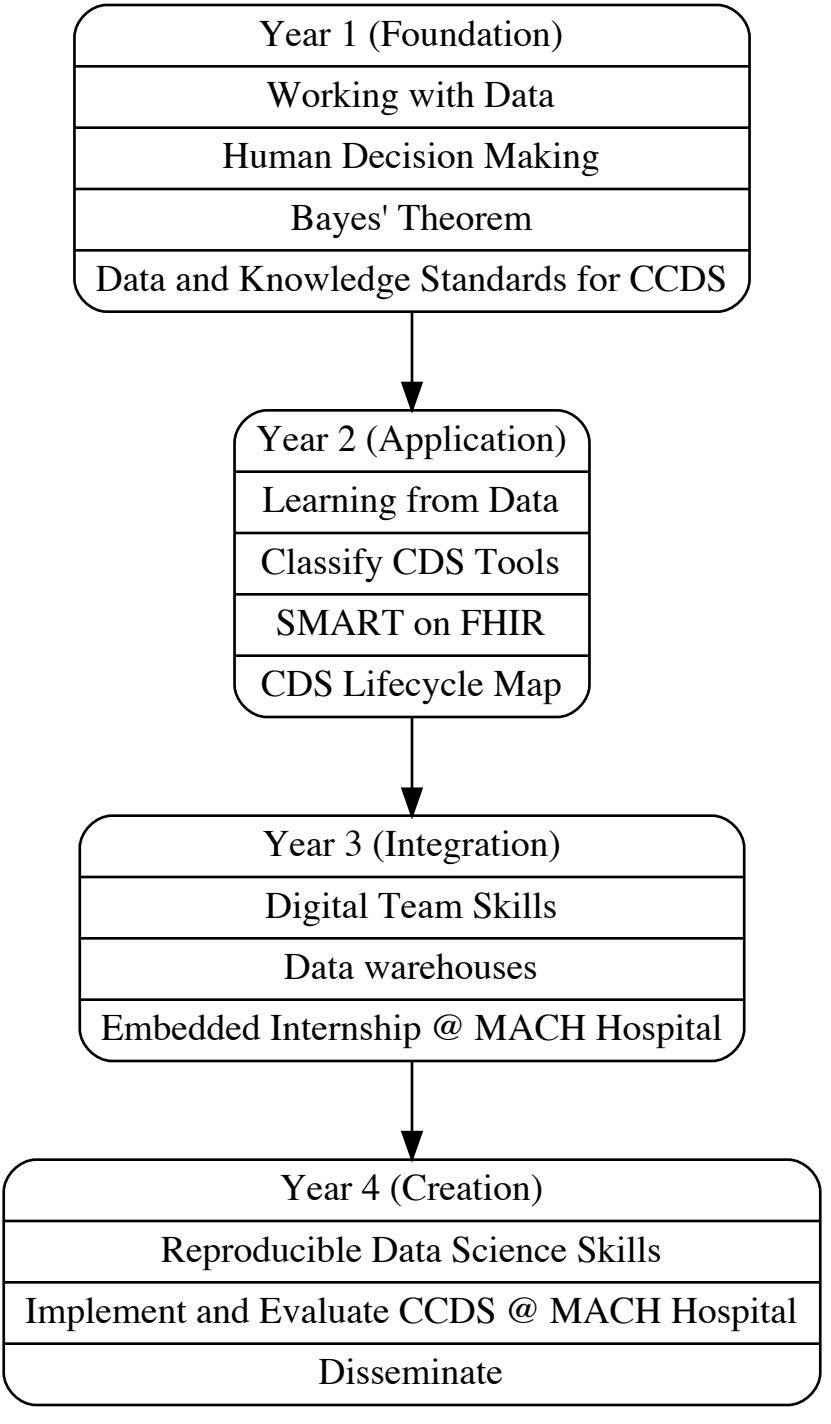
Additional Resources focused at medical students

Interviews with clincians intersecting informatics and patient care: e.g. https://youtu.be/652RmFCvV-w


reasoning
reasoning, human
reasoning, data-driven decision making
reasoning under uncertainty
cybernetics
reasoning, distributed cognition
reasoning human, systems theory
reasoning human, cognitive limitation
reasoning under uncertainty, decision theory
reasoning under uncertainty, bayes' theorem
automation bias
limitations of human-computer performance
fundamental theorem biomedical informatics
concept limits
cognitive bias
data overload
knowledge overload


data
data transmission
data relationship to information
data management
data interpretation
data representation (semantics)
data visualization
data generation
data transmission, interoperability
data transmission, standards
data interpretation, computational
data interpretation, human
data standards
data generation, granularity
data generation, collection
data generation, process limitations
data interpretation, statistics
data interpretation, automated
decision making, data-driven
data collection, bias
data collection, cost
statistics, study design
statistics, hypothesis testing


technology
sociotechnical systems
ethics
ccds
physician saviness for technology
skills
artificial intelligence
ehr
amorality of technology
computation vs representation
usability
digital literacy
unix skills
programming
database queries
machine learning
natural language processing
ehr architecture
ehr facilitate communication
ehr facilitate decision support
ccds-documentation dependency


Year 1 (Foundation)
Working with Data
Human Decision Making
Bayes' Theorem
Data and Knowledge Standards for CCDS
Year 2 (Application)
Learning from Data
Classify CDS Tools
SMART on FHIR
CDS Lifecycle Map
Year 3 (Integration)
Digital Team Skills
Data warehouses
Embedded Internship @ MACH Hospital
Year 4 (Creation)
Reproducible Data Science Skills
Implement and Evaluate CCDS @ MACH Hospital
Disseminate

Outline of MD1 Informatics Discovery Subject

1. Decision making, information, and the roles of patients, physicians, and policy makers.
2. Consequences of Imperfect Decision Making
3. Causes of Imperfect Decisions
4. Foundations of Human Decision Making
5. Bayes' Theorem and Making Optimal Decisions Under Uncertainty
6. Computer assisted decision making (CDSS
7. Data, Information, Knowledge, and Wisdom
8. Technical requirements for computer assisted decision making
9. How to create a usable CDSS
10. How to evaluate a CDSS

CourseLO|Course Level Learning Outcomes
