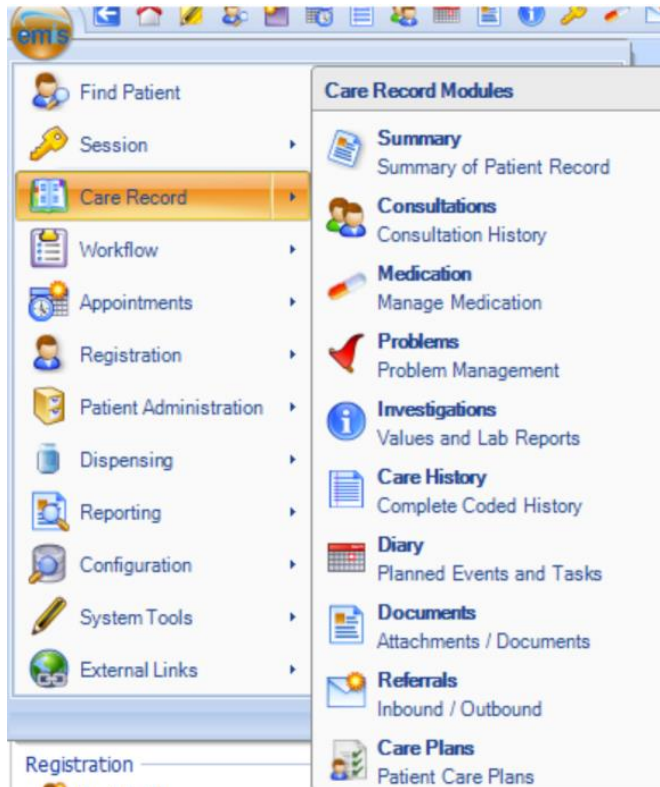# Processing free-text health data to support prescription decision-making for mental health patients

Turing Institute AI-Assisted Real-Time Decision Making Sandpit Funding

Harriet Cant

Background

- A patient's complete* medical profile is contained in **electronic healthcare records** (EHRs)

- GPs use EHRs **during consultations** to guide **decisions** around **prescribing**

- However, **EHRs are difficult to navigate,** especially in a 10 minute appointment, meaning important clinical information is often **available but not accessible**

*ideally

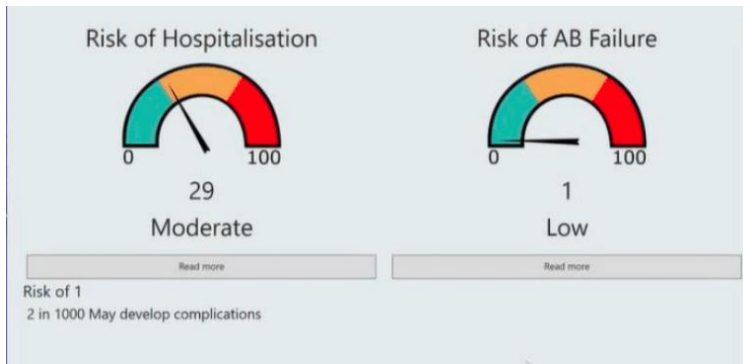# Background

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- **Knowledge Support Systems (KSS)** can be activated during consultations to **extract relevant data** from EHRs and summarise these in a clinically helpful, **user-friendly** manner. They can also **run analytics** on the patient's data, such as risk of hospitalisation

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What's the problem?
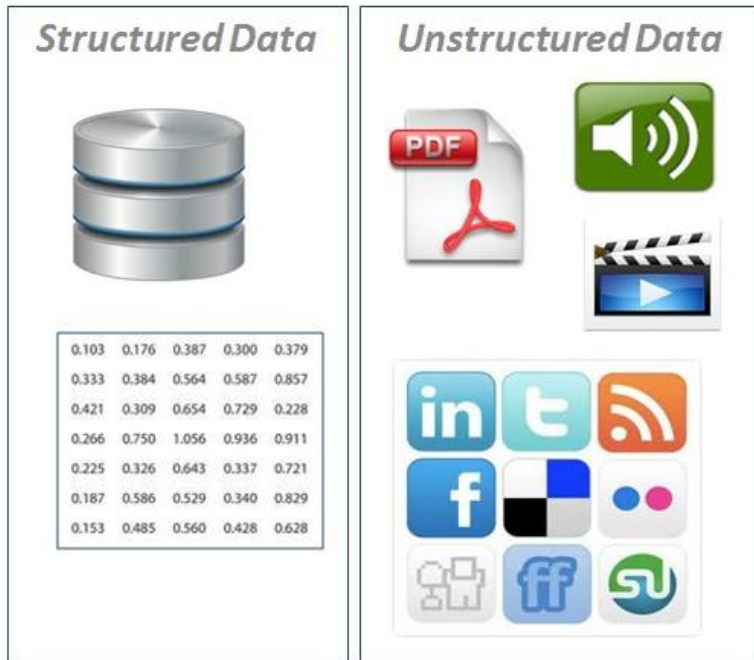
- KSSs have previously been developed to extract **structured data**, e.g. medication codes, date of prescription. However, **data relevant to prescribing are often coded as free-text**, such as reasons for stopping a previous medication

- The processing of free-text data is **significantly more complicated** than structured data →
  - Subjective, context dependent
  - Subject to more human error (typos)
  - Medical terminology and acronyms
  - Different underling architecture to data storage
  - Restricted access

Image from:
https://www.laserfiche.com/ecmblog/4-ways-to-manage-unstructured-data-with-ecm/

Study aim

Free-text data presents a different set of benefits and risks from both technical and clinical standpoints. These need to be explored before such data could be integrated into a KSS.

To assess the **technical feasibility** and **clinical benefit and risks** of integrating **free-text** electronic healthcare records (EHR) data into an existing **Knowledge Support System (KSS)** to support **prescription decision-making** for **mental health patients** in primary care
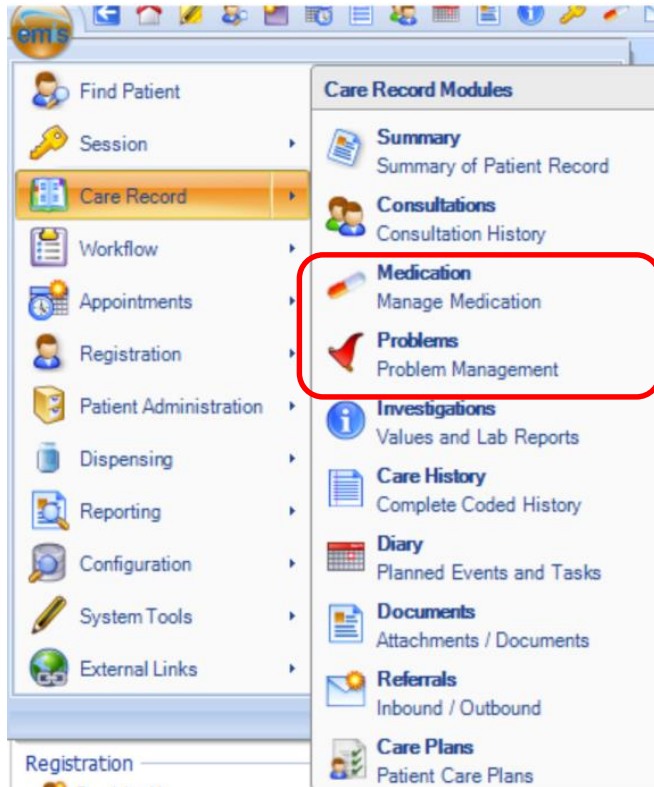
Application: why mental health patients?

- Mental health patients often have **complex** clinical histories and treatment profiles
    - → **EHRs** are more **difficult to navigate**
    - → More **at-risk** of important information being overlooked and the resulting **prescribing errors**

- Several contributing factors
    - High number of physical conditions/medications
    - On/off treatment (relapse), and switching due to side effects
    - Contact with secondary care units (e.g. psychiatrists)
    - Problems with adherence

- Additionally, more **records may be narrative** for mental health patients (e.g. patient experience as opposed to more objective metrics, like blood pressure for hypertension)

Image from:
https://pharmaceutical-journal.com/article/opinion/how-polypharmacy-has-become-a-medical-burden-worldwide

Looking inside an EHR

Complementary information spread across **multiple tabs**

Looking inside an EHR

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Data is mostly presented **chronologically** and not based on relevance to the appointment

Dense information in **small-text**, meaning GPs can only **scan** for **top-level** information

Case study: KSS for antibiotic prescribing

BRIT2 Knowledge Support System: Lower respi-
tract infection (disorder)

Patient Summary

ⓘ Patient characteristics that may be relevant to immune function and antimicrobi
prescribing.

Patient characteristics

Allergies		Other Comorbidities	
IUP		Diabetes	
Renal	No problem recorded	Height(cm)	
Hepatic	No problem recorded	Weight(kg)	
		BMI	

Antibiotic history

Prescribing over the last 12 months

Antibiotic, Antibiotic family, Prescription type, Issue date, Dose, Amount

Mr Edward Pugh
13/09/1948
73 y/o

Diagnosis Selection
Symptom Survey
Patient Summary
Patient Risk
Treatment Guidelines
Treatment Decision
Patient Leaflet
Update Medical Record

i About

Up to Symptom Survey

Down to Patient Risk

Only information **relevant** to antibiotic prescribing is shown, such as previous antibiotics instead of all previous treatments

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User-friendly presentation: large-text, clear subheadings, all patient info in one place

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Can combine with other useful information, such as NICE guidelines and personalised risk scores

Project questions: two streams

CLINICAL BENEFITS/RISKS

- Which free-text data would be of **greatest benefit** to extract from EHRs, and how should this be **presented**? E.g. adherence, reasons for stopping
- How serious could the **consequences** be to patients if extraction did not work as expected? What is an **acceptable risk**?

TECHNICAL FEASIBILITY

- Which clinical data **can existing natural language processing** (NLP) algorithms interpret? What are the **limitations**?
- Does the **EHR architecture** allow for these algorithms to process free-text data?
- What are the potential **technical risks and solutions**? E.g. error handling

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Iterative process

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Possible use cases

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Patient experience and quality of life

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Reasons why a medication was stopped → why not to re-prescribe

Reasons why a dose was altered

Treatment plans (e.g. dosing and administration, especially if off license)

Any questions?