NHS Digital Academy

hfma

Case study update - using AI to unlock health records

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Introduction

In 2021, researchers at the National Institute for Health Research (NIHR) Maudsley Biomedical Research Centre (BRC), King's College Hospital and University College London Hospitals NHS Foundation Trust BRC, showcased their work with artificial intelligence (AI) in the HFMA case study 'Using AI to unlock health records'[1]. The development of CogStack[2] addressed the challenge of unstructured data in the NHS, searching for information within the narrative of electronic clinical records to add content and depth to the patient record using natural language processing. **Exhibit 1 d**escribes the purpose of CogStack.

Exhibit 1: The challenge of unstructured data

'When you visit your doctor or attend hospital a lot of information is collected about you on computers including your symptoms, tests, investigations, diagnosis, and treatments. Across the NHS this represents a huge amount of information that could be used to help us learn how to tailor treatments more accurately for individual patients and to offer them better and safer healthcare. The challenge we face is that most of the information held within these records is in written form which is difficult to use and learn from. We have developed the CogStack AI tools to read and understand this information.'

Professor Richard Dobson, group lead for CogStack and head of the Department of Biostatistics and Health Informatics at NIHR Maudslev BRC

Three years on the system is still in use at the original organisations and a further three London NHS providers have taken it on board, with plenty of interest from elsewhere in England and abroad. Creation of a commercial product structure is in progress. The CogStack system is co-owned by the developing NHS organisations, so this enabling technology can be purchased by other NHS bodies knowing the funds remain within the NHS family.

Starting with outpatient procedure coding, the system has expanded into other areas of coding, created patient safety alerts, been used in population health management projects, streamlined medication reviews, been a part of observational research and used for national registers and national audit.

Outpatient coding success

The system has made significant progress with the clinical coding of outpatient attendances. Clinical coders are not mandated to code outpatient activity. The profession focuses on inpatient episodes, which is – in part – a reflection that there are not sufficient clinical coders available to code all the millions of patient events each year. However, the CogStack team worked with clinical coders to provide an appropriate solution. Outpatient appointments for most specialities are quite predictable, with a defined range of procedures to record alongside the consultation.

The information included in the narrative record of the attendance is mined by the AI and suggests codes for the appointed person to select from. In the set-up phase, clinical coders co-designed the process and tested that the system – called 'My Aid' – was generating the correct coding options. The user can review the patient event and select the correct code for the care given: the system learns which natural language phrases link to specific codes and the body of evidence grows as more codes are selected.

The work in outpatients has not only produced a more accurate electronic patient record, but it has been financially productive, as the under-recording of clinical codes was adversely affecting the income received by the organisations. Outpatient activity in the contract had not had the procedures recorded in the commissioning data set, so the correct tariff price was not being applied. Procedures typically have a higher tariff than consultation-only attendances, so the value of the income received has risen to the appropriate level for the treatment provided. These calculations impact the planned

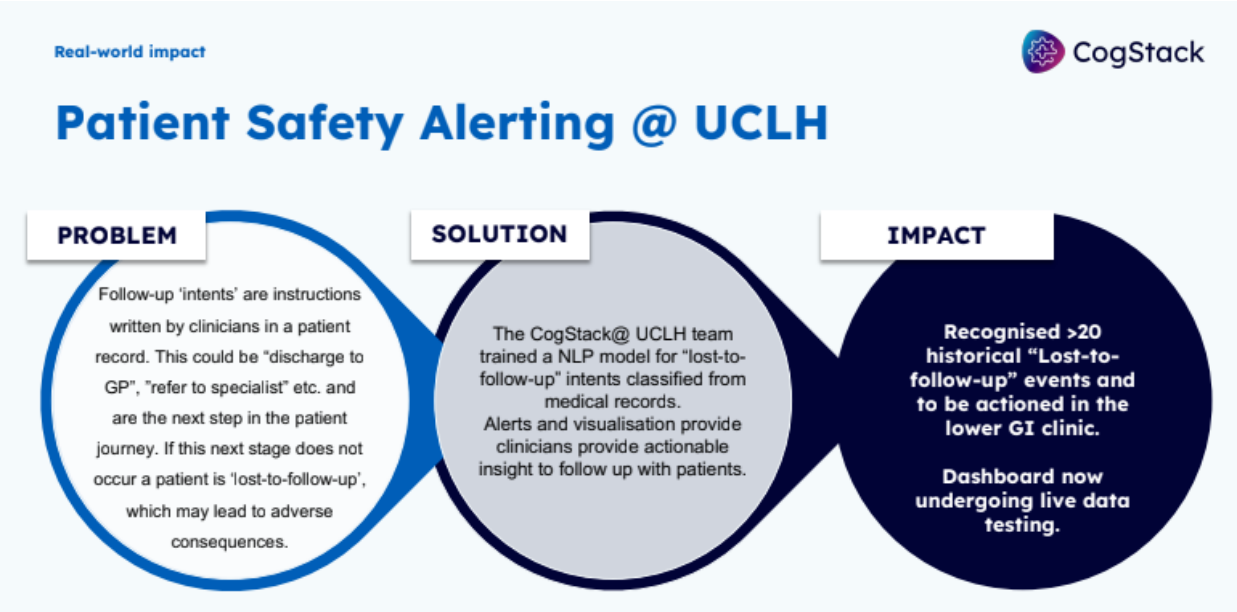
[1] HFMA, *Using artificial intelligence to unlock health records*, March 2022
[2] CogStack website, *Unlock the power of healthcare data with CogStack*, accessed May 2024

value of the contract, setting the correct expectation for income, and may also impact the variable portion of the contract for over/ underperformance.

Ensuring appropriate follow up

Some of the uses are shown in this update, with **Exhibit 2** giving a real-world example of the impact for patients that can be achieved by AI.

Exhibit 2: Preventing the 'lost to follow up' scenario

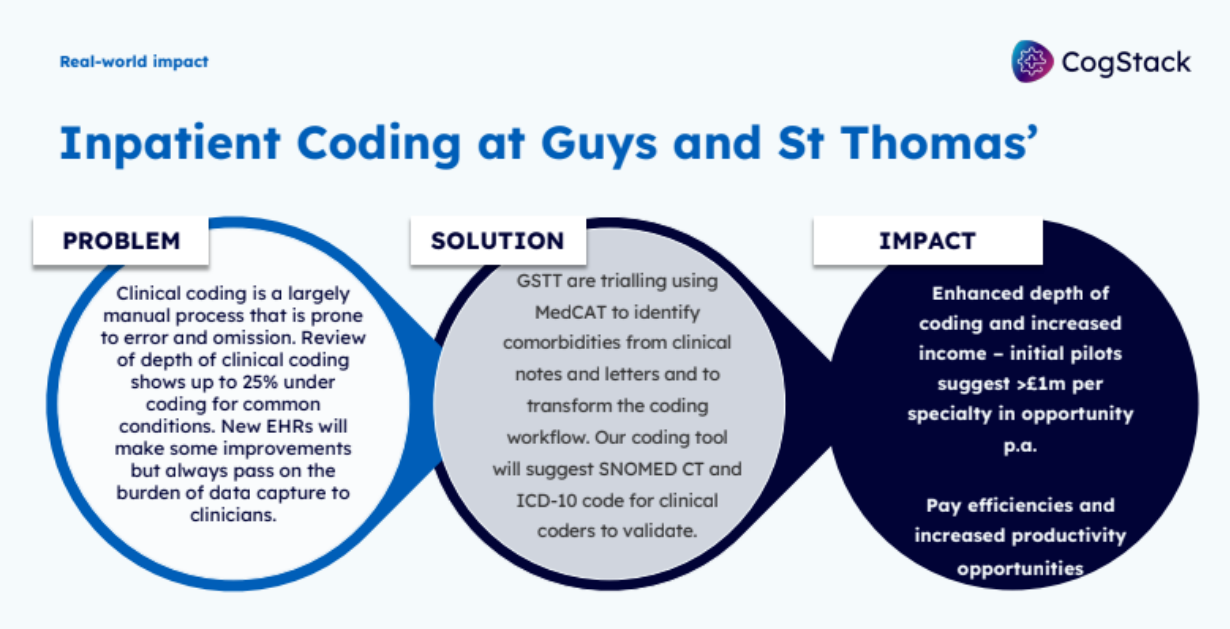


Coding inpatient records

Recently, the team – with a few clinical coders keen to relieve pressure on their profession by utilising available technology – has explored the use of CogStack to assist inpatient coding. Junior medical staff are allocated to test and validate the system by reviewing batches of patient episodes which have been coded by the tool. The work often supports their clinical audit projects so has gained plenty of buy-in, and the experience teaches them about the complexities of the coding process and how to use appropriate terminology in their documentation.

The inpatient tool now provides the clinical coders with an interface they can use to speed up their coding process by selecting options based on the underlying unstructured data. Shown in **Exhibit 3**, the systems bring together the different sources of information the coders already use, putting the information in one place and speeding up the coding process. The AI continually adjusts the codes offered, increasing accuracy over time.

Exhibit 3: Improving error and omission rates for inpatients with AI

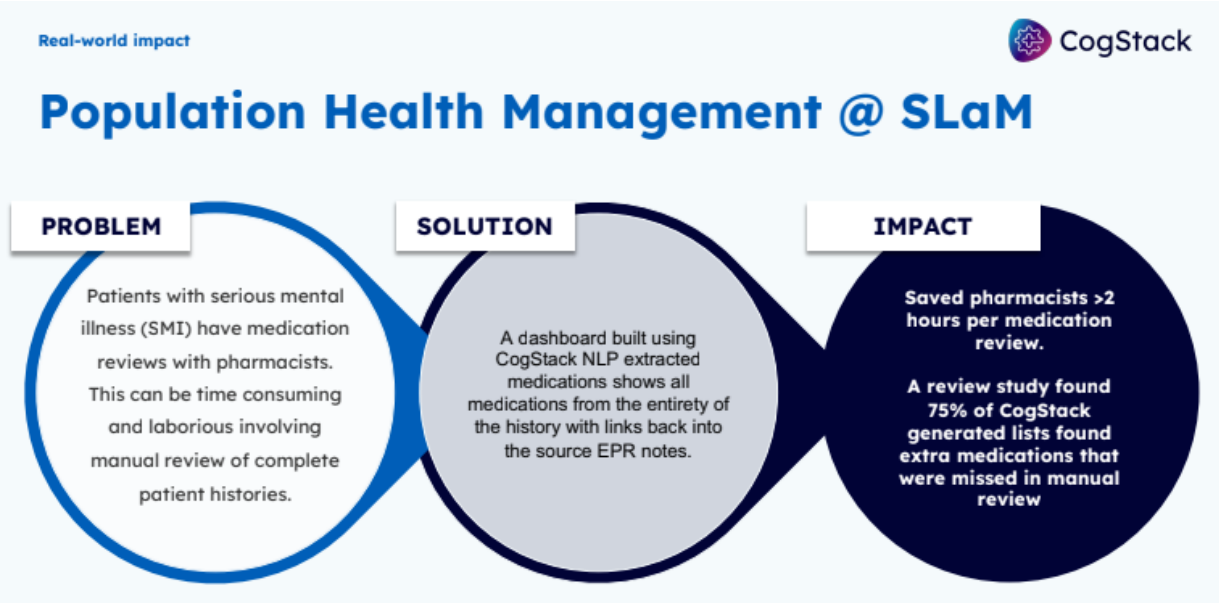


The CogStack team reported they initially found workforce apprehension about the use of AI for clinical coding. There was potential for tension with the clinical coding professionals, but the co-design of the module helped to build support, and those using it have found great benefits and engaged with it accordingly.

Medication reviews

Pharmacists have also taken CogStack forward with a population health approach. At South London and Maudsley NHS Foundation Trust, medication reviews that used to take around an hour have reduced to 20 minutes using the AI model. Reduction in the time taken for medication reviews for more complex patients has been even greater. These reviews can also include and collate reported side effects, which are not easily captured in the electronic health record. **Exhibit 4** describes the benefits of the AI process for medication reviews.

Exhibit 4: Population health management for patients with serious mental illness



Availability of CogStack

There is already a free version of CogStack available to NHS organisations via the Cogstack[3] website. This is the 'shell' system without any AI learning built in. Organisations using this will have to build the knowledge base in the same way the original team did, and then employ staff to validate the system learning. This model has been selected by healthcare organisations in Australia and Korea and the team are working on a collaboration project with the Netherlands for a version in the appropriate language.

The alternative – particularly useful for NHS organisations – is to purchase the fully formed system with the AI learning already built in. The licensing for this option is being finalised, and there are many organisations waiting to take part.

NHS England recognised CogStack in 2020[4] and is in discussions with the team about scalability. The team are also working with Amazon Web Services cloud storage[5] and Databricks data intelligence platform[6] on the infrastructure.

Many innovation teams are pushing the system forward as a viable model to release time for clinical and non-clinical staff, so the technology does more of the work and the humans can add more value. And the work has been wholly supported by clinicians on the ground. **Exhibit 5** illustrates the simple truth**.**

Exhibit 5: AI saving manpower

'The man-power required to trawl through the thousands of patients would just not be possible without CogStack.'

Dr Stam Kapetanakis, Consultant Cardiologist, Guy's and St Thomas' Hospital NHS Foundation Trust

For more information about CogStack, please visit URL link to www.cogstack.org, LinkedIn, or email contact@cogstack.org.

[3] CogStack, *Unlock the power of healthcare data with CogStack*, accessed May 2024
[4] NHS England - NHS Transformation Directorate, *CogStack case study*, August 2020
[5] Amazon web services, *About AWS*, Accessed May 2024
[6] Databricks, *The data and AI company*, accessed May 2024

About the HFMA

The Healthcare Financial Management Association (HFMA) is the professional body for finance staff in healthcare. For over 70 years, it has provided independent and objective advice to its members and the wider healthcare community. It is a charitable organisation that promotes best practice and innovation in financial management and governance across the UK health economy through its local and national networks.

The association also analyses and responds to national policy and aims to exert influence in shaping the wider healthcare agenda. It has particular interest in promoting the highest professional standards in financial management and governance and is keen to work with other organisations to promote approaches that really are 'fit for purpose' and effective.

The HFMA offers a range of qualifications in healthcare business and finance at undergraduate and postgraduate level and can provide a route to an MBA in healthcare finance. The qualifications are delivered through HFMA's Academy which was launched in 2017 and has already established strong learner and alumni networks.

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