SNOMED CT Case Studies

Case for Investment
Case Studies

CUH

Cambridge University Hospitals (CUH) is one of the largest healthcare trusts in England, caring for patients through its two hospitals – Addenbrooke's and The Rosie. It is also a leading national centre for specialist treatment, a comprehensive biomedical research centre, one of only six academic health science centres in the UK, and a university teaching hospital with a worldwide reputation for clinical excellence.

eHospital System

CUH deployed its £200 million eHospital clinical information system from Epic, for both inpatient and outpatient services, in October 2014. In June 2017 CUH launched the MyChart patient portal. CUH uses SNOMED CT for coding diagnoses, symptoms and problems in their eHospital system, key data that is used for many inpatient and outpatient clinical processes. In addition, this data is used for advanced analytics and research.

Key Quantitative Benefits

Key quantitative benefits achieved include:

- Chart Pulls - £460,000 saved annually in staff time as paper patient record retrieval is no longer required.
- Nursing Productivity - £1.1m saved annually in nursing time as observations and medication administration are recorded directly into patient records at the bedside, using handheld devices connected to our EHR.
- Adverse Drug Events - 850 significant adverse reactions prevented each year with electronic allergy-related prescribing alerts in our EHR triggering a change in medication prescriptions - saving 2,450 bed days a year, equivalent to £0.98 million/year.
- Medication Management - 100% recording of the indication for antibiotic prescribing leading to more meaningful antibiotic stewardship – antibiotics are only prescribed if they are truly needed.
- Patient Health Outcomes - 42% reduction in sepsis mortality with electronic sepsis alerts built into the EHR by the eHospital team.

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International

Out-Patient Clinics

Using fully digital out-patient clinics has enabled CUH to improve patient care, safety and experience; and to make the running of the busy clinics much more effective and efficient.

- Elimination of Paper: 100% reduction in paper first referrals from GPs to the consultant-led clinics/services because the EHR is integrated with the NHS e-Referral service.

- Appointment Efficiency Gains: 4,500 orthopedic clinic appointment slots per year were freed up because clinicians were able to view clinical notes and x-rays virtually in the EHR to determine whether a patient needs an appointment, or not.

- Effective Patient Communications: 80% of clinic letters in pediatric gastroenterology are given to the parents at the end of clinic because data from the EHR is automatically combined into a structured letter.

- Improved Clinic Throughput: 20% more patients are being seen in the surgical pre-assessment clinic as patients are able to complete their own initial documentation on a digital tablet, and save it to the EHR.

Emergency

Addenbrooke's Hospital is one of the busiest emergency (A&E) departments in the UK and is a Major Trauma Centre for the region. Quick and easy access to information is essential for all staff working in Emergency due to the high volume of patients being treated, twenty-four hours a day, seven days a week.

- Elimination of Paper: the need to urgently source paper records for ED patients has been completely eliminated.

- Emergency Department Efficiency Gains: a digital emergency department allows all care providers to gain rapid access to the patients information in the EHR.

- Appointment Efficiency Gains: No waiting for paper notes from the ED before follow-up appointments can be booked.

- Improved Coordination of Care: Letters are automatically sent from the EHR to the patients' GP when the patient is admitted to an inpatient area from the emergency department. Discharge summary letters are sent electronically from the EHR to the patient's GP within 24 hours of discharge from the emergency department.

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Digital Theatres and Critical Care

In high dependency areas, like operating theatres and intensive care, all of the physiological monitors and ventilators, in all 40 theatres,148 high-dependency areas and critical care beds, are connected to the EHR.

- Staff Efficiency Gains: data generated from medical devices is being automatically and continuously recorded directly into the EHR removing the need for manual transcription - a staff time saving equivalent to £2.6 million a year.
- Theatre Throughput: 18% increase in main theatre case volume through faster theatre turnaround/analytics in the EHR.
- Clinical Efficiency Gains: a 30 minute reduction in our Rapid Response Team getting to patients.
- Improved Patient Outcomes: 2-3 avoidable deaths prevented each year with electronic routine review of best practice for ventilator tidal volumes in the EHR.

Infection Control

Sepsis is a life-threatening condition that arises when the body responds to an infection by attacking its own tissues and organs. Every year in the UK approximately 250,000 people are affected by sepsis and it accounts for around 50,000 deaths. Research shows that for every hour delay in receiving antibiotics the risk of sepsis mortality increases by 8%.

- Improved Patient Care: 100% sepsis screening now occurs in the Emergency department.
- Improved Patient Care: 70% increase in patients receiving antibiotics for sepsis within 1 hour of arrival in Emergency with electronic sepsis alerts in our EHR.
- Improved Patient Care: 80% increase in patients receiving antibiotics for sepsis within 90 minutes of arrival in the ED.
- Improved Patient Care: a 50% increase in adult inpatients receiving antibiotics for sepsis within both 60 and 90 minutes of the sepsis alert being triggered in the EHR.
- Improved Patient Health Outcomes: 42% reduction in sepsis mortality across the Trust. At least 64 lives saved in 2018 with sepsis alerts created in the EHR.

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Cambridge University Hospitals NHS Foundation Trust

Case Studies

Interoperability

The eHospital system interoperates with the West Suffolk Hospital's Cerner Millennium EHR (they share 30% of patients). This digital link also connects Cambridge University Hospitals with all hospitals across the world that use an Epic EHR to advance the care of their internationally shared patients. Separately, CUH has been working with NHS Digital to develop and test a new FHIR medication specific message that will be used to share medication information between GPs and hospitals. Some elements of the message are human readable text, but there is also coded data using SNOMED CT and dm+d codes.

Patient Portal

At CUH, a patient's eHospital information is available to them electronically via Epic MyChart instead of being posted to them: appointment letters /past appointment details; current health problems/conditions; clinic letters/clinical correspondence; vital signs (weight, height, blood pressure, temperature, pulse, respiratory rate); test results; medications; known allergies.

- Access 24x7 - Patients can access their information in MyChart anytime and anywhere.
- Effective Appointments - CUH patients can also complete pre-appointment questionnaires electronically within MyChart, with the results then being discussed during their next clinic appointment. This makes appointments much more effective as our patients and clinicians spend more time discussing care and treatment plans together.
- Reduce Patient Visits - Empowering CUH patients to contribute to their health record, MyChart encourages our patients to contribute to their health information without having to make unnecessary visits to CUH hospitals.
- As of December 2019 23,000+ patients were using CUH MyChart.

For the detailed Cambridge University Hospitals NHS Foundation Trust Case Study see Appendix 5 here.

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Cambridge University Hospitals NHS Foundation Trust

Case Study #5

eHospital: A Clinical Information System
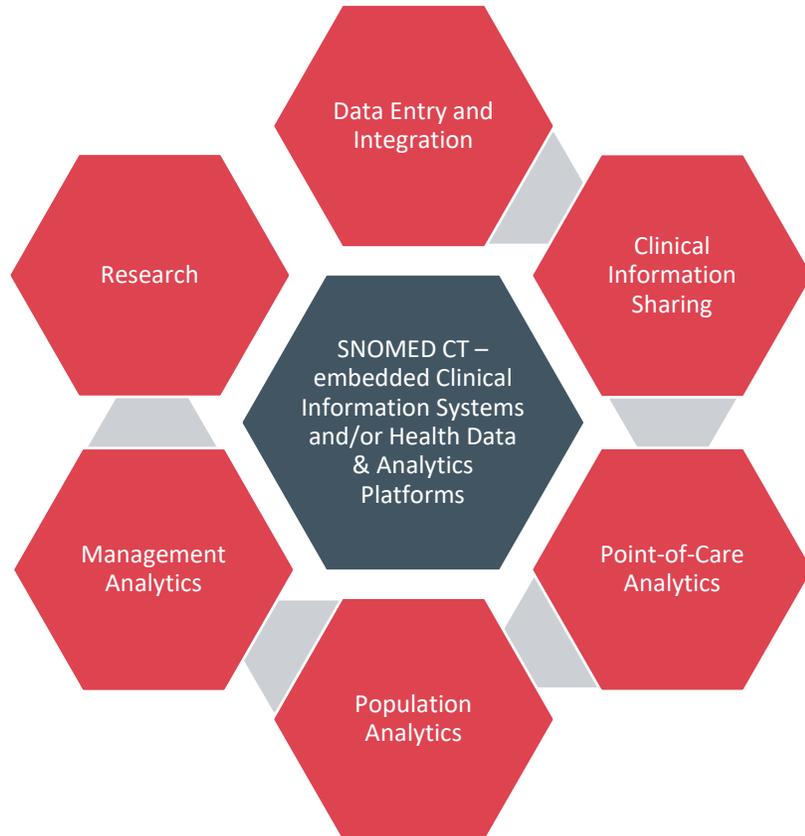
Cambridge University Hospitals' current digital maturity is the highest of any of the trusts visited.

National Advisory Group report on Health Information Technology in England, chaired by Professor Robert Wachter (September 2016)

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Case Study #5

eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

- Cambridge University Hospitals (CUH) is one of the largest healthcare trusts in England, caring for patients through its two hospitals – Addenbrooke's and The Rosie. Located on the 142 acre Cambridge Biomedical Campus, it is also a leading national centre for specialist treatment, a comprehensive biomedical research centre, one of only six academic health science centres in the UK, and a university teaching hospital with a worldwide reputation for clinical excellence.

- CUH deployed its £200 million *eHospital* clinical information system from Epic, for both inpatient and outpatient services, across the entire Trust in October 2014 – one patient, one record for all CUH patients[1]. In June 2017 CUH launched the MyChart patient portal. Through 2018 CUH deployed interoperability between *eHospital* and primary care, diagnostic services and acute care organizations in the UK and internationally. CUH is a HIMSS level 6 EMRAM organization, has won many national and international awards, and is recognized is a NHS Global Digital Exemplar organization.

- *eHospital* has enabled CUH to transform clinical processes from paper-based to fully digital ways of recording care and accessing information; supported by medical device integration, as well as handheld/mobile device integration to enable care to be recorded in real-time at the bedside. *eHospital* is connected to national systems such as the NHS Spine (national personal demographics service) and e-Referral Service from primary care to secondary care.

- CUH used **SNOMED CT** for coding diagnoses, symptoms and problems in their *eHospital* system, key data that is used for many inpatient and outpatient clinical processes. In addition, this data is used for advanced analytics and research[2].

1. Cambridge University Hospitals NHS Foundation Trust., "eHospital – Patients at the Heart of Our Digital Hospital", See a 28 page summary of the project at
    https://www.cuh.nhs.uk/sites/default/files/misc/Brochure_eHospital_Website%20Version_September%202019.pdf
2. Drumright, O'Neill, Chaudhry "Changing What We Do". A presentation about the Cambridge University Hospitals eHospital project and the links to the Cambridge Biomedical Research Centre. See
    https://community.jisc.ac.uk/system/files/515/cambridge%20implementation%20nhs%20he%20forum%20june%202015%20FINAL.pdf

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eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

The CUH eHospital implementation has resulted in both a significant number of **patient service outcomes** (e.g. access and productivity gains) and **patient health outcomes** (e.g. reduction in adverse events, morbidity and mortality) benefits.

Key Quantitative Benefits Achieved[3]

- **Chart Pulls** - £460,000 saved annually in staff time as paper patient records no longer require retrieval from medical records.

- **Nursing Productivity** - £1.1m saved annually in nursing time as observations and medication administration are recorded directly into patient records at the bedside, using handheld devices connected to our EHR.

- **Adverse Drug Events** - 850 significant adverse reactions prevented each year with electronic allergy-related prescribing alerts in our EHR triggering a change in medication prescriptions - saving 2,450 bed days a year, equivalent to £0.98 million/year.

- **Medication Management** - 100% recording of the indication for antibiotic prescribing leading to more meaningful antibiotic stewardship – antibiotics are only prescribed if they are truly needed.

- **Patient Health Outcomes** - 42% reduction in sepsis mortality with electronic sepsis alerts built into the EHR by the eHospital team.

3.   The CUH benefits detailed on this and subsequent pages are those that would use SNOMED CT encoded data as part of the clinical business process. CUH has also quantified other benefits (e.g. from medical devices) where SNOMED CT would not be used. These types of benefits have not been included in this case study.

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eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

<u>Out-Patient Clinics</u>

Using fully digital out-patient clinics has enabled CUH to improve patient care, safety and experience; and to make the running of the busy clinics much more effective and efficient.

- **<u>Elimination of Paper</u>**: 100% reduction in paper first referrals from GPs to the consultant-led clinics/services because the EHR is integrated with the NHS e-Referral service.

- **<u>Appointment Efficiency Gains</u>**: 4,500 clinic appointment slots per year were freed up in orthopedics for patients who absolutely need to come to hospital for treatment, because clinicians were able to view clinical notes and x-rays virtually (i.e. virtual fracture clinic) in the EHR to determine whether a patient needs an appointment, or not.

- **<u>Effective Patient Communications</u>**: 80% of clinic letters in pediatric gastroenterology are given to the parents at the end of clinic because data from the EHR is automatically combined into a structured letter.

- **<u>Improved Clinic Throughput:</u>** 20% more patients are being seen (i.e. capacity creation) in the surgical pre-assessment clinic as patients are able to complete their own initial documentation on a digital tablet, with the information then saved automatically to their health record within the EHR.

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eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

<u>Emergency</u>

Addenbrooke's Hospital is one of the busiest emergency (A&E) departments in the UK and is a Major Trauma Centre for the region. Quick and easy access to information is essential for all staff working in Emergency due to the high volume of patients being treated, twenty-four hours a day, seven days a week.

- **Elimination of Paper: the a**dministrative burden of urgently sourcing paper records for patients arriving in the emergency department has been completely eliminated.

- **Emergency Department Management Efficiency Gains**: a digital emergency department allows rapid access to the patients information in the EHR. Staff can see, at a glance, colour-coded information about: each patient; waiting time; which area and bed they are in; acuity level; early warning score with alerts; status of their emergency care pathway; when they were last reviewed by a clinician; and when assessments were completed.

- **Appointment Efficiency Gains**: Elimination of waiting for paper notes to be released from the emergency department before follow-up appointments can be booked.

- **Improved Coordination of Care**: Letters are automatically sent from the EHR to the patients' GP when the patient is admitted to an inpatient area from the emergency department.

- **Improved Coordination of Care:** Discharge summary letters are sent electronically from the EHR to the patient's GP within 24 hours of discharge from the emergency department.

Case Study #5

eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

Digital Theatres and Critical Care

In high dependency areas, like operating theatres and intensive care, a huge amount of data is created about severely unwell patients who are hooked up to ventilators, monitors, and other medical devices. Prior to having the EHR CHU clinical teams had to manually assimilate data from multiple sources and devices. Now, all of the physiological monitors and ventilators, in all 40 theatres,148 high-dependency areas and critical care beds, are connected to the EHR.

- **Staff Efficiency Gains**: data generated from medical devices is being automatically and continuously recorded directly into the EHR removing the need for manual transcription and associated errors - a staff time saving equivalent to £2.6 million a year.

- **Theatre Throughput:** 18% increase in main theatre case volume (i.e. capacity creation) through faster theatre turnaround and analytics in the EHR.

- **Clinical Efficiency Gains:** a 30 minute reduction in our Rapid Response Team getting to patients across our hospitals that need them the most.

- **Improved Patient Outcomes:** 2-3 avoidable deaths prevented each year with electronic routine review of best practice for ventilator tidal volumes in the EHR.

Case Study #5

eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

Sepis "the Silent Killer"

Sepsis is a life-threatening condition that arises when the body responds to an infection by attacking its own tissues and organs. Every year in the UK approximately 250,000 people are affected by sepsis and it accounts for around 50,000 deaths, more than bowel, breast and prostate cancer combined. Research shows that for every hour delay in receiving antibiotics the risk of sepsis mortality increases by 8% - this is the sepsis risk.

- **Improved Patient Care**: 100% sepsis screening now occurs in the Emergency department.

- **Improved Patient Care**: 70% increase in patients receiving antibiotics for sepsis within 1 hour of arrival in Emergency with electronic sepsis alerts in our EHR.

- **Improved Patient Care:** 80% increase in patients receiving antibiotics for sepsis within 90 minutes of arrival in Emergency.

- **Improved Patient Care**: a 50% increase in adult inpatients receiving antibiotics for sepsis within both 60 and 90 minutes of the sepsis alert being triggered in the EHR.

- **Improved Patient Health Outcomes**: 42% reduction in sepsis mortality across the Trust. At least 64 lives saved in 2018 with sepsis alerts created in the EHR.

Case Study #5

eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

Clinical Data Sharing Requiring Interoperability of Clinical Information Systems

- **Sharing the EHR beyond CUH** - Located 35 miles apart, approximately 30 per cent of patients attending CUH (i.e. Addenbrooke's and The Rosie) also present at the West Suffolk Hospital for care and treatment. In 2018 the CUH eHospital EHR (Epic) was connected to West Suffolk Hospital's Cerner Millennium EHR. At the push of a button, CUH clinicians are able to easily and securely access clinical information (i.e. conditions, treatments, and test results) about a patient that is held within West Suffolk Hospital EHR and vice-versa, enabling real-time information and data sharing to save time and reduce delays to care and unnecessary repeats of tests and procedures.

- This digital link also connects Cambridge University Hospitals with all hospitals across the world that use an Epic EHR to advance the care of their internationally shared patients.

- Finally CUH has integrated eHospital to Royal Papworth Hospital's Lorenzo system to enable the real-time sharing of test results as soon as they have been verified in CUH laboratories.

- Separately, CUH has been working with NHS Digital[4] to develop and test a new FHIR medication specific message that will be used to share medication information between GPs and hospitals. This has meant testing the functionality and all possible varieties of medication prescriptions to ensure that the structure of the medication data can meaningfully and safely convey the clinical message. Some elements of the message are human readable text, but there is also coded data using **SNOMED CT** and dm+d codes.

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4. Interview with Dr. Afzal Chaudhry, CCIO, CUH NHS FT., See https://www.thehtn.co.uk/2019/11/17/interview-series-dr-afzal-chaudhry-ccio-cambridge-university-hospitals-nhs-ft/

Case Study #5

eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

Patient Portal – clinical information sharing that allows CUH patients digital access to their health information

- **Electronic Record** - A patient's eHospital information is available to them electronically via Epic MyChart instead of being posted to them: appointment letters /past appointment details; current health problems/conditions; clinic letters/clinical correspondence; vital signs (weight, height, blood pressure, temperature, pulse, respiratory rate); test results; medications; known allergies.

- **Access 24x7** - Patients can access their information in MyChart anytime and anywhere. In the comfort of their own home they can access it on a desktop computer or laptop, or when on the move, at CUH hospitals or abroad via the 'MyChart' app for tablet and Smartphone devices. MyChart is also compatible with screen readers for visually impaired patients.

- **Effective Appointments** - CUH patients can also complete pre-appointment questionnaires electronically within MyChart, with the results then being discussed during their next clinic appointment. This makes appointments much more effective as our patients and clinicians spend more time discussing care and treatment plans together.

- **Reduce Patient Visits** - Empowering CUH patients to contribute to their health record, MyChart encourages our patients to contribute to their health information without having to make unnecessary visits to CUH hospitals. For example, if patients have been prescribed new medication by their GP, they can add the medication name, dose and frequency to their record via MyChart for discussion with their clinical team during their next hospital appointment.

- As of December 2019 23,000+ patients are using CUH MyChart. See CUH patient Allan Craig's experience on the next page.

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eHospital: A Clinical Information System

United Kingdom – Cambridge University Hospitals NHS Foundation Trust, Cambridge, England

I have always played an active role in my own treatment and like to understand my conditions. I have a range of medical problems, which started in 1969 when I was diagnosed with polycystic kidney disease. My blood pressure was controlled for a long time to help delay the need for dialysis treatment before I eventually had a successful kidney transplant in 1989. I was diagnosed with a serious heart condition and underwent a quadruple bypass and aortic valve replacement in 1999. As a result of the drugs I have to take following my transplant, I've also suffered with osteoporosis, abdominal hernias, basal cell carcinomas and several hematomas. I like to work with my clinicians in the management of my health conditions, which was why the MyChart patient portal particularly appealed to me. MyChart allows me to view my upcoming hospital appointments, details of past appointments and hospital visits, clinical letters from my doctors and my test results. I like how I can also access a health summary page, either on my computer at home or on my smartphone, which includes a full list of my medications, as well as links to further information to help me to manage my conditions and learn more about the medications that I have been prescribed. More and more people are living with a range of complex health conditions. Having all the information available in one place, explained in plain English, is really useful for patients like me, especially when I am regularly in and out of hospital and using other healthcare services. I can access MyChart from anywhere in the world with an internet connection, which gives me peace of mind when I want to travel because if I were to need medical help in another part of the UK or abroad, I can log in using my smartphone and show my information to those clinicians caring for me. Having my health information to hand has helped me to better manage my conditions and I believe that patient awareness and involvement contributes to a more joined-up health care system.

Transplant patient and user of MyChart, *Alan Craig* talks about his experiences
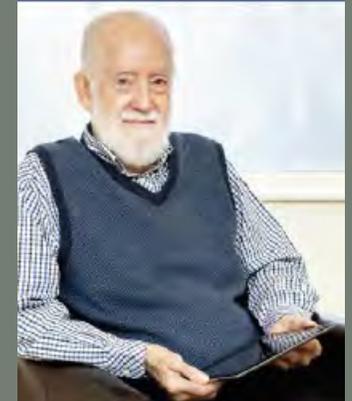
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