only 18% of information sharing occurring through the electronic record keeping system. The most surprising finding was the skills and confidence gap. Despite 60% reporting good confidence to use systems, only 14% of occupational therapists felt confident to capture the impact of occupational therapy. Analysis of the survey findings identified that there was no significant difference in self-reported data knowledge confidence in different contexts of practice or at different points in an occupational therapists career. Those that rated themselves as having proficient data knowledge skills were employed in roles that were closer to data e.g. quality improvement and fellowships.

Conclusion Occupational therapists are high users of multiple electronic record keeping systems and the most frequently accessed professional development activity was system specific training. 60% of occupational therapists feel confident to use different systems in practice, however it is concerning that confidence drops to 14% when asked how this data is used to evidence the impact of occupational therapy. Occupational therapy information has three components, information that relates directly to the person e.g. ability or impairment and information that relates to a persons occupations and the environments in which these are carried out. As a profession, we need to increase our data literacy knowledge and skills in relation to knowing when it is appropriate to format our information in a structured, unstructured or semi structured way. Occupational therapists need to grow in confidence around how information needs to be structured to aid information sharing and if other formats are required for secondary purposes e.g. extracting and analysing information that relates to participation in occupations. The survey findings could be useful insights for pre and post registration providers of occupational therapy education, system developers, professional bodies and organisations who employ occupational therapists.

16 A FRIENDLY ACCESSIBLE DESCRIPTION OF THE 'L-TEST' – MEASURING (DIS)INFORMATION IN INCOMPLETE INCIDENT REPORTING

Keith Reid. *CNTW NHS Foundation Trust; Northumbria University*

10.1136/bmjhci-2022-FCIASC.16

Objective Incomplete incident reporting is concerning. England's Mental Health Units Use of Force Act 2018 (Seni's Law), responding to deaths and incomplete reporting, will mandate central restraint reporting per-person including ethnicity. 'L' is a proposed test for disinformation, i.e. 'false surprise' regarding true reports. Information, or 'surprise', is measurable as H = -log(p) 'bits', as defined by Shannon (1948).

The author explains his conjectured 'L-test', in a friendly accessible way. It is generalisable from incomplete restraint reports to other incomplete centralised safety reports. L is increased if complete reports seem falsely surprising consequent to noise from incomplete reports.

Methods Incident registers and minimum data sets are ubiquitous. Each hospital reports diverse incidents alongside measures of size or need. Notionally then data may include a) restraints; b) detentions … m) bed days n) injuries.

L postulates that each hospitals' report of {a, b, ... m, n}, implies signals of ratios (log a/log b), (log a/log m)… which each can be received from the set of reports and combined to estimate e.g. a typical ratio of safety events per-patient per-month. Omissions are noise.

Procedure:

1. Split the ordered list of complete report estimates into alternate halves E 'even' and O 'odd'.
2. Derive a probability p(E~O) that E and O are similar using Mann-Whitney U test, approaching p(E~O) =1.0 for large similar E and O. The test tolerates non-normally distributed estimates.
3. Calculate h(E~O) information as -log(p(E~O)), approaching zero as O and E seem unsurprisingly similar.
4. Construct a noisy odd group 'NO' made of O mixed with estimates from incomplete reporters.
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L is the proportional increase in h(E~O) due to noise: $L = \frac{h(E\sim NO) - h(E\sim O)}{h(E\sim O)}$

Results Estimate signals support funnel plotting, scatter plotting, and coefficients of determination (R^2) as a measure of correlation.

The author will show that omissions (allowing for size and Poisson distribution) can be obvious on visual inspection of funnel and scatter plots and aid categorisation.

Where the estimates follow a normal distribution among reasonably complete reporters, this can be used to plot a typical ratio and infer incidents, with confidence intervals, even in null reporters, from measures of size and need.

Funnel plots from safety reports may have interesting properties such as innate asymmetry; they may reflect institutional-social processes such as regulation and closure as much as academic processes such as purported 'publication' bias.

H varies with the effect of incomplete reports and has other desirable features such as being zero when there are no omissions.

Conclusion Omitted reports have a measurable effect upon the standing of complete reports.

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In summary, L can tell investigators which incomplete reports skew the overall picture most.

In a context of restricted resource, regulatory efforts could concentrate on the omissions which have the most distorting effect – the biggest L score.

17 ELECTRONIC RECORDING OF PATIENT OBSERVATIONS WITH SAFETY FUNCTIONALITY IN THE ELECTRONIC HEALTH RECORD (EHR) FOR THE CHILDREN'S HOSPITAL AT IN LEEDS

Michelle Sykes. *Leeds Teaching Hospitals Trust, Project Support Officer, Leeds Teaching Hospitals Trust*

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Objective Electronic observations incorporating ePAWS (Paediatric Advanced Warning Score) was developed as a bespoke functionality within the EHR for implementation across the Children's Hospital. ePAWS supports the identification of patients at risk of deterioration using a graded

response strategy. To promote effective working, the functionality enables observations to be recorded via mobile device or ward computers and has enhanced safety features to support early identification of the deteriorating child. This work followed the successful development and implementation of eObservations incorporating NEWS2 for adult patients with a recognised improvement in the detection of deteriorating adults.

Methods ePAWS was developed from the existing paper based graded strategy. Logic within the functionality calculated the score and presents the relevant strategy advice to the user on observation submission removing the risk of calculation errors and ensuring appropriate actions are taken. Additional safety features including wristband scanning to support patient identification, requirement for a Registered Nurse countersignature for higher risk scores recorded by a clinical support worker, tasks generated for observation due time and for an intervention to be recorded for higher risk scores. To promote visibility, the ePAWS scores and related strategy colour present on the desktop, mobile and electronic white board. There is also the ability to set bespoke parameters for children with different physiological norms. The functionality displays the results in chart and table views with the ability to tailor this to view different trends.

Recognising the importance of the change in practice required for using the new functionality, an enhanced training and support plan was implemented utilising mandatory e-learning supported by a dedicated training team to provide group, one to one and go-live floor walking.

Results User engagement in the move to digital recording of electronic observations and ePAWS was seen across the Children's Hospital. Linking ePAWS to the electronic ward view was recognised to promote visibility of deteriorating patients and supporting staff to ensure observations are recorded and actioned in accordance with the strategy, promoting patient safety. Clinicians acknowledged the benefit of observations being recorded on a central digital system enabling all health professionals involved in the patients care to review the observations from anywhere in LTHT and externally. Clinician feedback recognised that a chart view which can be tailored to enable easy identification of trends e.g. looking at a patient's Blood Pressure over a period of time is valuable.

Supporting implementation with mandatory elearning to be completed prior to go-live and a dedicated support and training team ensured the functionality was quickly, effectively and safely embedded in practice. Staff highlighted the benefits of no missing paper documents, clear awareness of the actions to take and the additional patient safety from Registered Nurse countersigning for patients with higher scores.

Conclusion The implementation of electronic observations and ePAWS has been highly successful, with improvement in the escalation of care for deteriorating patients. The enhanced visibility and additional safety features within the system promote patient safety through clear, standardised strategy adherence.

The utilisation of e-learning and on the ward training and support during go-live was recognised to have supported the safe, timely transition to digital working. The e-learning is now part of the induction programme for all new trust clinical staff.

It is clear that functionality requires user training and support for it to achieve its potential for patient care and safety.

18 IMPLEMENTING SNOMED CT IN THE OXFORD ROYAL COLLEGE OF GENERAL PRACTITIONERS CLINICAL INFORMATICS DIGITAL HUB (ORCHID) SOME PROBLEMS ENCOUNTERED AND LESSONS LEARNED

John Williams. *FCI Trustee*

10.1136/bmjhci-2022-FCIASC.18

Objective Identification of significant problems encountered and solutions adopted while implementing SNOMED CT to replace legacy coding schemes in a busy research and surveillance unit using patient level coded General Practice data held in a database populated by extraction from a subset of English General Practices:

- Setting up a full SNOMED CT database from scratch
- Changing data extraction/search processes throughout the unit away from the use of legacy Read version 2 and Clinical Terms Version 3 codelists to reusable SNOMED CT 'variables' held in a library
- Establishing a robust process for curating, storing and maintaining SNOMED CT 'variables'

Methods Retrospective review of an implementation project.

- Setting up full SNOMED CT database. Research required to find clear instructions as to how the release files available from TRUD should be processed to build a fully functional database and to avoid pitfalls. Further research to develop understanding of SNOMED CT concept inactivation and how to mitigate effects
- Collation of legacy codelists into consistent format to pass through cross mapping tables
- Design and implementation of infrastructure to hold reusable SNOMED CT 'variables' taking into account naming, provenance, metadata to be included, handling of inactive concepts
- Development of robust and time efficient SNOMED CT variable curation process o Development of supporting tools o Training of clinicians to curate
- Explaining to researchers the concept of reusable 'variables' and the need for them to modify practices in order to match research and surveillance data needs to an existing library of 'variables' and to seek curation of new variables to fill gaps o Consideration of problems with defining research/surveillance data requirements
- Providing the means to search the library
- Explanation of the implications of inactivations
- Version controls
- Consideration of how best to convey the coverage and definition of 'variables' to others

Results

- SNOMED CT database successfully set up: Combination of experimentation, outdated advice found in grey literature, informal help from terminology expert colleague
- Legacy codelists: Found 350 in multiple formats, little or no provenance or definition, idiosyncratic naming. All translated in batch via cross mapping tables. Resulting outputs used as substrate for full curation. Only 154 of these taken forward. Full curation typically added many extra active and inactive concepts
- Infrastructure developed: Supporting:

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only 18% of information sharing occurring through the electronic record keeping system. The most surprising finding was the skills and confidence gap. Despite 60% reporting good confidence to use systems, only 14% of occupational therapists felt confident to capture the impact of occupational therapy. Analysis of the survey findings identified that there was no significant difference in self-reported data knowledge confidence in different contexts of practice or at different points in an occupational therapists career. Those that rated themselves as having proficient data knowledge skills were employed in roles that were closer to data e.g. quality improvement and fellowships.

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14 DIGITAL HEALTH SAFETY MATTERS: EARLY INSIGHTS FROM A PROMISING PRACTICE STUDY IN AUSTRALIA

Melissa Andison. *Surrey and Borders Partnership NHS Foundation Trust*

10.1136/bmjhci-2022-FCIASC.14

Objective It has been recognised that the Covid -19 pandemic positively accelerated digital adoption (Greenway et al., 2021; Issa, 2020). However, rapid deployments of technology do not often assess and understand patient safety risks; resulting in harm, which have ethical and legal considerations (HEE, 2019). The NHS has received caution of the potential risks of the use of new digital solutions during the pandemic (Hutchings, 2020). To nurture digital health safety, clinical safety risk management practice is worthy of study. Further, identifying factors that support the promising adoption and implementation of safety guidelines will develop maturity of the professional practice.

Methods Conducted for a Master's Dissertation in Digital Health Leadership with The Institute of Global Health Innovation Imperial College, this study uses a promising practice model to identify assets of the Australian healthcare system to achieve patient safety when deploying digital health technologies. The question guiding the study is: what are the factors that need to be evaluated to support the scaled adoption and implementation of digital health safety guidelines as a professional practice in Australia? Taking into consideration the socio-technological factors of digital health safety, the research strategy uses a mixed method to generate a creative and innovative study. Qualitative data has been collected from stakeholders including the Australasia Institute of Digital Health (AIDH) members and Certified Health Informatician Australasia (CHIA) Alumni via surveys, interviews and focus group. This will be analysed alongside data mined from existing documents and artifacts to understand trends, implications and what is grounded in national policy and strategy. It is expected data mining of resources will provide further insights into the maturity digital health safety practices.

Results The promising practice investigation is related to the larger problem of the adoption of safety standards to ensure innovative new ways of working do not compromise patient safety. The presentation will share results from the international literature review and early insights of the first phase of data analysis. Evidence from the literature has exposed the current healthcare information technology safety practice challenges. There were few studies that focused on the factors influencing the adoption of digital health safety standards. However, the review surfaced six key areas that need to be understood to improve safety practice and culture, which will be summarised in the presentation. A comparison of safety frameworks from England and Australia will be presented. In addition, a review of the unique assets of the Australian healthcare system will be provided. Finally, a maturity model to guide the professional practice to assist organisations determining their status in adopting digital health safety into governance, policy, process, culture, and other facets of operations will be shared (Rowlands, Zelcer & Williams, 2017).

Conclusion As a science, measuring the impact digital health and patient safety remains rudimentary (Singh & Sittig, 2016). The health science community recognises digital health safety is challenging and international efforts are being made to understand the socio-technical dynamics to ensure patient safety (Sittig et al., 2020). Given the national focus 'to embed digital clinical safety across health and care' (NHS X, 2021, p. 25), it is timely to look beyond to source exemplar organisations and best practice to participate in research (Gandhi et al., 2016). In contrast to the approach taken by the NHS Digital to mandate digital clinical safety standards, in Australia the Patient Safety Electronic Health (E-Health) Professional Practice Guidelines empowers organisations to establish 'best fit' with their strategic and operating context. This study is framed alongside the NHS Digital Clinical Safety Strategy and searches for evidence of a promising practice related to the Australian healthcare system and patient safety culture. This presentation will be beneficial for Digital Clinical Safety Officers and Chief Clinical Information Officers developing a clinical safety risk management process, investing in team building, recourses, and capability.

15 THE DATA LITERACY LEARNING AND DEVELOPMENT NEEDS OF OCCUPATIONAL THERAPISTS

Suzy England. *Royal College of Occupational Therapists*

10.1136/bmjhci-2022-FCIASC.15

Objective There is a lack of national occupational therapy impact data and occupational therapists report challenges collecting, using, and sharing information as part of professional practice. All occupational therapists need a firm grasp of data, but little is known about how confident occupational therapists feel working with data at different points in their career and in different roles and contexts.

The objective of this research is to better understand the challenges facing occupational therapists and to consider what activities will support the development of the professions data literacy skills as part of a two-year programme of activity led by the Royal College of Occupational Therapists.

Methods The research method is a UK survey open to every occupational therapist working in the UK (open throughout the duration of January). The survey is being shared through the monthly professional magazine (OT News), email networks, health and care digital forums as well as social media.

This is a descriptive study that will help the researcher to understand the confidence of occupational therapists to use, collect and share professional data alongside any barriers to improving data practices. The survey captures demographic and personal characteristics information which enables the researcher to identify differences between occupational therapists employed in different contexts in different geographical locations e.g. NHS and Local Authority as well clinical specialism e.g. physical and mental health. Occupational therapists are asked about their access to data literacy CPD opportunties and what they think they need from a professional body to improve their data literacy. The data will be analysed through descriptive statistics and the content analysis of open comments.

Results There were 349 responses to the survey with good representation from every region of the UK and different areas of practice. 60% of the occupational therapists who responded to the survey reported that they had satisfactory data knowledge skills to use systems in clinical practice. Occupational therapists are high users of multiple systems to collect and share information across organisational boundaries with

only 18% of information sharing occurring through the electronic record keeping system. The most surprising finding was the skills and confidence gap. Despite 60% reporting good confidence to use systems, only 14% of occupational therapists felt confident to capture the impact of occupational therapy. Analysis of the survey findings identified that there was no significant difference in self-reported data knowledge confidence in different contexts of practice or at different points in an occupational therapists career. Those that rated themselves as having proficient data knowledge skills were employed in roles that were closer to data e.g. quality improvement and fellowships.

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A.I. tools for front line clinicians in stroke, heart failure and vascular dementia. For the first time if successful we intend to explore the common causal factors across all 4 disease areas and create a unique synthetic/augmented data resource for the UK and Europe.

12 USABILITY AND ACCEPTABILITY OF WEARABLE TECHNOLOGY IN THE EARLY DETECTION OF DEMENTIA

Sarah Wilson. *Newcastle University*

10.1136/bmjhci-2022-FCIASC.12

Objective Digital technology is transforming health and social care. Digital technologies, which includes smartphones and wearables, can be used to predict, diagnose, monitor, and/or develop treatments for different diseases. These technologies also have the potential to detect markers of neurodegenerative diseases at a much early stage than is currently possible.

The Early Detection of Neurodegeneration (EDoN) initiative aims to use digital technologies to detect preclinical dementia, with aspirations to validate a digital toolkit for clinical practice. To enhance its development, we aimed to assess the usability and acceptability of the EDoN toolkit in people with cognitive impairments and their careers.

Methods Various UK-based networks such as Join dementia research were used to recruit participants.

The EDoN toolkit, which includes a smartwatch (Fitbit Charge 4),

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Results Sixteen semi-structured interviews were conducted with nine participants, at two-time points. Four participants had mild cognitive impairment, two had frontotemporal dementia, one had Alzheimer's disease and two were carers.

Key themes were identified and centre around usability, acceptability, and inequity. Sub-themes within usability included the utility of the toolkit, experiences of setting up the devices, comfort of the wearables, and preference towards the written guides over the video guides, especially amongst those 'who don't like technology' (P3) and 'prefer instruction booklets rather than go backward and forwards online'(P1). In terms of acceptability, participants appeared to show a greater acceptance for familiar devices (e.g., previously worn a fitbit) and an initial hesitancy for the EEG Headband as it looked 'cumbersome'(P3). They described the importance of understanding how the device worked and obtaining feedback for 'personal interest' (P4), and raised fears around the implications of a high score in practice, with their 'driving license being taken'(P3) . Various inequities of the toolkit were uncovered such as a lack of accessibility to compatible phones and Wi-Fi connection, 'sore patches' (P6) caused by the wearables amongst individuals with dermatological issues, and digital exclusion regarding poor digital literacy and the view that technology is 'alien'(P6).

Conclusion These results highlight that the EDoN toolkit was usable amongst only some individuals with cognitive impairments and their carers. Feedback on product acceptability and usability will be fed back to developers to help improve the different devices. Future work is needed to increase the inclusivity of the EDoN toolkit to support health equity and to reduce the stigma surrounding dementia.

Part II: ePosters

Winner of Best ePoster

13 THEMATIC REVIEW OF MEDICATION-RELATED INCIDENTS AT A MAJOR TEACHING HOSPITAL AND THE POTENTIAL MITIGATION OF THESE INCIDENTS WITH ELECTRONIC PRESCRIBING AND MEDICINES ADMINISTRATION

Adam Khimji. *University of Nottingham/Birmingham Community Healthcare NHS Foundation Trust*

10.1136/bmjhci-2022-FCIASC.13

Objective To describe the frequency of the different types of harmful medication related incidents reported from one NHS Trust. To then assess whether the likelihood of these incidents occurring would have been reduced by a specific ePMA system, Nervecentre.

Methods Two researchers retrospectively reviewed 387 medication related incidents reported to DATIX, a national reporting system, between September 2020 and August 2021 at Nottingham University Hospitals NHS Trust.

The incidents only involved hospital inpatients and had to be associated with patient harm. Descriptive statistics were used to describe the frequencies and percentages of incidents per type of medication-related error, degree of harm, hospital division and specialty. Incidents were classified based on the extent to which Nervecentre could have reduced the likelihood of the incident occurring.

The actions from this review were adopted into project planning, risk management and deployment planning with a view to repeating the review pre-deployment.

Results Administration incidents were commonly reported (179 incidents, 46.3%), with the Prescribing, Pharmacy and Discharge categories containing fewer incidents. Hospital divisions reported similar frequencies of incidents, with more variation observed between specialties. While most incidents were not likely to be impacted by ePMA (243 incidents, 63.1%), Nervecentre could have reduced the likelihood of 72 incidents (18.6%).

Configuration and development to the system had the potential to reduce the likelihood of a further 29 (7.2%) and 43 (11.1%) incidents, respectively. Analysis of harm suggested that the likelihood of approximately 1 in 5 moderate harm incidents could have been reduced by Nervecentre (without configuration).

Conclusion Implementation of Nervecentre would likely be an effective intervention to reduce many types of harmful medication-related incidents at this Trust. Alternative interventions are required to mitigate errors that would not be impacted by ePMA systems.

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A.I. tools for front line clinicians in stroke, heart failure and vascular dementia. For the first time if successful we intend to explore the common causal factors across all 4 disease areas and create a unique synthetic/augmented data resource for the UK and Europe.

12 USABILITY AND ACCEPTABILITY OF WEARABLE TECHNOLOGY IN THE EARLY DETECTION OF DEMENTIA

Sarah Wilson. *Newcastle University*

10.1136/bmjhci-2022-FCIASC.12

Objective Digital technology is transforming health and social care. Digital technologies, which includes smartphones and wearables, can be used to predict, diagnose, monitor, and/or develop treatments for different diseases. These technologies also have the potential to detect markers of neurodegenerative diseases at a much early stage than is currently possible.

The Early Detection of Neurodegeneration (EDoN) initiative aims to use digital technologies to detect preclinical dementia, with aspirations to validate a digital toolkit for clinical practice. To enhance its development, we aimed to assess the usability and acceptability of the EDoN toolkit in people with cognitive impairments and their careers.

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Conclusions In this study, we develop and evaluate a machine learning model for predicting positive urine cultures which is associated with UTI amongst outpatients using a real-world dataset. Our results demonstrate that the optimized model has the potential to decrease false positives and as a result minimize unnecessary antibiotic prescription. In future work, we are interested in further improving the model by leveraging temporal sequences of the input features, extensively fine-tuning hyperparameters of the model, and decreasing the performance gap across different patient subgroups. While our study uses a dataset collected in a single cohort, the results can be translated into other settings via external validation or by simply fine-tuning the model. Overall, our novel application is of high relevance to the clinical informatics community considering the global threat of antibiotic resistance, especially in the context of managing urinary tract infections.

11 WOUBOT AND TRUST4HEALTH; PREDICTIVE PERSONALISED AI TOOLS FOR FRONT LINE CLINICIANS

Elaine Taylor-Whilde, Syed Muhammad Ali Hasnain. *Nine Health Global Ltd*

10.1136/bmjhci-2022-FCIASC.11

Objective Integrating technological innovation in clinical big data from Nine Health Global (NHG) and data science Woubot is a prototype precognitive system for community & wound clinics. Focusing on leg ulcers, Woubot will produce recommendations from several thousand possible treatment combinations. Working with suppliers to the National Wound Care Strategy Programme, the project will create a suite of automated software tools with a user-friendly mobile application designed by doctors and nurses for their own use within the NHS. This will generate a personalised care pathway for each patient via a series of recommendations. TRUST4Health will apply the technology to other diseases.

Methods We undertook a feasibility study to test artificially intelligent software on data from Cegedim Thin and the NHS Community Data set. We combined know how from our A.I. diagnostic system Diagbot co-produced with a Chinese partner for grass roots doctors in China and applied data science techniques creating a new AI prototype system. With a consortium led by the Royal College of Surgeons in Ireland (RCSI) we have applied for Horizon 2022 EU government funding to build on the work in wounds and to apply the methods to 3 other vascular clinical diseases stroke, heart failure and dementia . Woubot will use artificial intelligence (AI) to identify people likely to develop chronic leg wounds and manage their preventative care. In those that already have leg wounds, such as diabetic foot ulcers, the software will help to ensure that evidence of effective treatment is turned into simple steps which are available quickly and easily to front-line staff. Our AI software will rapidly sift through millions of data items in secure NHS facilities. This will enable recommendations to be generated via a mobile app. A suite of software tools will generate a personalised care pathway with a series of recommendations for use in the NHS. Most of this care will be delivered by nurses and other healthcare professionals in clinics and the community. Prescriptions, whether for exercise, other lifestyle changes, medication or dressings, will be individualised for each patient based on their history and biological makeup and linked to the latest clinical evidence. We will also use image software to monitor progress easily and accurately.

Results We built a secure platform hosted by UK Cloud (Nine Health Community Interest Company is an NHS research data organisation)using wound data sourced from Cegedim Thin and the NHS Community Data set (NHS Humber Foundation Teaching Trust) using patient pseudonymised data sources (which have gone through the double de-identification process). Data was reviewed by a statistical expert to exclude bias and included a national sample from primary care and a local sample from Hull and East Riding where the demographic includes both inner city, city and rural and a diverse range of nationalities including black, ethnic and minority groups aged 19–80. We collated and analysed around 2000 comprehensive patient records of those with hard to heal wounds (diabetic foot ulcer and venous leg ulcer) across a 2-year period. A raft of modifiable predictive factors such as Vitamin B12 levels, the impact of BMI on healing were identified and analysed. Isolating the key measures enabled the prediction of time from developing diabetes to developing a foot ulcer and then the ability to predict time to an amputation. These results if validated by further research such as the Horizon 2022 EU Trustworthy A.I. project referred to above would enable targeted management to prevent these sequelae. We have developed clinical algorithms based on the national wound guidelines produced by the NWCSP for some parts of the patient pathway

e.g., initial assessment including red flags. We now need to validate via clinical trials and automate processes, combining existing data collected by the National Minimum Wound Assessment Data Set, our data sets and others @ NHS digital https://digital.nhs.uk/ HES, CSDS and other international data.

Conclusion Woubot https://fundingawards.nihr.ac.uk/award/AI_AWARD01723 has started to identify people likely to develop chronic leg wounds and suggested predictive factors which may prevent amputation and death. The automated identification of these factors will in the next phase enable management of their preventative care. In those that already have leg wounds, such as diabetic foot ulcers, the software will help to ensure that evidence of effective treatment is turned into simple steps which are available quickly to front-line staff. Dressing analysis (size and type over time) suggests a good proxy measure for wound healing. In the next phase recommendations for personalised care will be generated via a mobile app. The software will generate a personalised care pathway with a series of recommendations for use in the NHS. Most of this care will be delivered by nurses and other healthcare professionals in clinics and the community.

Prescriptions, whether for exercise, other lifestyle changes, medication or dressings, will be individualised for each patient based on their history and biological makeup and linked to the latest clinical evidence. The clinician chooses whether or not to accept the recommendations and records their decision.

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reaction is recorded this functionality is not provided which results in increased risk to the patient.

The aim of this project was to identify recurring free text reactions and incorporate these into the system. Future avoidance of free text documentation will improve data quality and make reaction data available during built-in prescribing decision support.

Methods Free-text allergy notes added to the electronic prescribing system since implementation in March 2018 were extracted using structured query language. The data was cleaned and analysed using the Python.

Natural language processing techniques were employed to clean the data and reduce the dimensionality of the data set. A drug library extracted from the electronic prescribing system was used to tag medications within the text.

After pre-processing the most commonly occurring phrases were found by counting the most frequent bigrams present in the text. Further analysis was carried out using the apriori algorithm.

Results A total of 2872 notes were identified for analysis. The most common terms found were already included as part of the electronic prescribing systems allergy documentation system. This included the terms 'rash' and 'penicillin' which were recorded 480 and 400 times respectively. Of the top 20 most frequently appearing terms two were identified as not included in the system. These were 'swelling' which was recorded 320 times and 'pain' documented 210.

Applying a Bi-gram and filter identified that the term swelling was most often associated with the phrase 'ankle swelling' which appeared 60 times. The apriori algorithm identified an association between the terms ankle and swelling and amlodipine with high levels of confidence.

Pain was most often associated with the phrases 'chest pain' appearing 38 times and 'abdominal pain' or 'abdo pain' appearing a combined 55 times. Both are reaction types which cannot be documented in the prescribing system without the addition of a free-text note.

Conclusion Natural Language Processing can be applied to large sections of unstructured clinical documentation to quickly analyse themes and trends. With appropriate cleaning and manipulation of the data commonly occurring phrases relevant to clinical practice can be identified.

This permitted recurring drug reactions to be identified and added to the electronic prescribing system. It is hoped this will reduce the frequency of free-text notes added in the future and improve reaction documentation. It is anticipated that patient safety will be improved by making more reaction data available for electronic decision support.

Packages such as Python NLTK used for natural language processing are freely available and allow users to process data which would be too time consuming to process manually.

10 DEVELOPMENT AND EVALUATION OF A MACHINE LEARNING MODEL TO PREDICT POSITIVE URINE CULTURES IN THE OUTPATIENT SETTING AND MINIMIZE THE USE OF ANTIBIOTICS

Farah E Shamout, Phillip Wang, Nasir Hayat, Vee Nis Ling, Terrence Lee St John, Ghadeer Ghosheh, Lelan Orquiola, Vansh Gadhia, Zaki Almallah. *New York University Abu Dhabi*

10.1136/bmjhci-2022-FCIASC.10

Objective Excessive prescription of antibiotics is amongst the principal drivers of antibiotic resistance, which is considered a surging threat to global health. The most frequent resistant pathogens are usually linked with urinary tract diseases, such as urinary tract infections (UTI). Studies have shown that clinicians may prescribe antibiotics based on presenting symptoms due to the prolonged time required to obtain the final results of urine bacterial cultures. While many of the current approaches to ameliorate prescribing behavior are educational or regulatory, here we develop and evaluate a logistic regression model that detects the risk of positive urine cultures based on the patient's history and presenting physiological data extracted from the electronic health records, to help clinicians make informed antibiotic prescription decisions without the need to wait for urine culture results.

Methods We used an anonymized dataset collected between 2015 and 2021 in a multi-specialty large hospital with primary, secondary and tertiary care facilities. The retrospective study received approval by the Institutional Review Board (IRB) from both the research institution and hospital (IRB references: HRPP-2020-173 & A-2019-054, respectively). We included adult outpatient encounters associated with at least one urine culture test. For the input features, we extracted and pre-processed each patient's demographics (age, sex), comorbidities (diabetes millutus, hypertension, cancer and hyperlididemia), vital signs (pulse, respiratory rate, oxygen saturation, temperature, systolic blood pressure, diastolic blood pressure and fraction of inspired oxygen), instant urine dipstick test results, all collected prior to the acquisition of the urine culture, as well as diagnosis codes (ICD-10 codes) and procedure codes (hospital custom codes) from the patient's previous hospital encounter. We defined the output as a binary label indicating a positive or negative urine culture result by processing textual data within laboratory test results. We assume a positive urine culture if the concentration of urine pathogen is higher than 100,000 colony forming units per milliliter (CFU/ml). We split the dataset randomly into a training (70%), and test set (30%). We optimized a logistic regression model using the training set with stratified k-fold validation, and evaluated it on the test set with 95% confidence intervals computed using bootstrapping with 1000 iterations.

Results After applying the inclusion criteria, the overall dataset consisted of 11,388 patients with 17,452 unique encounters (56.1% females; mean age 49.1 standard deviation 17.5 years). Amongst all encounters, 2,431 (13.9%) were associated with a positive label. We evaluated the models on the held-out test set consisting of 5,236 encounters (14.2% of encounters had positive urine culture). The logistic regression model achieved a 0.851 (0.837, 0.865 95% CI) Area Under the

Receiver Operating characteristic Curve (AUROC) and 0.584 (0.546, 0.618 95% CI) Area Under the Precision Recall Curve (AUPRC). Amongst the female population, the logistic regression model achieved a 0.806 AUROC compared to a 0.905 AUROC amongst males. When investigating different patient age groups, the model achieved a 0.84 AUROC amongst patients younger than 40 years, compared to 0.848 AUROC amongst patients who are 40 years or older.

We binarized the predictions by adjusting the threshold to achieve approximately 80% sensitivity on the test set, which is a clinically acceptable level of sensitivity. Amongst the 4,460 encounters associated with a negative urine culture in

the test set, 351 were prescribed with a UTI-related antibiotic during their respective encounters. With the fixed threshold, our model was able to correctly classify 59.0% (207/351) as negative amongst those who did not require an antibiotic.

Conclusions In this study, we develop and evaluate a machine learning model for predicting positive urine cultures which is associated with UTI amongst outpatients using a real-world dataset. Our results demonstrate that the optimized model has the potential to decrease false positives and as a result minimize unnecessary antibiotic prescription. In future work, we are interested in further improving the model by leveraging temporal sequences of the input features, extensively fine-tuning hyperparameters of the model, and decreasing the performance gap across different patient subgroups. While our study uses a dataset collected in a single cohort, the results can be translated into other settings via external validation or by simply fine-tuning the model. Overall, our novel application is of high relevance to the clinical informatics community considering the global threat of antibiotic resistance, especially in the context of managing urinary tract infections.

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around their use. Healthcare staff recognised the benefits of AI predictive tools in being able to 'detect deterioration quicker than you would currently do'(05-ID), which informed decisions around patient discharge: 'can you safely send them home (...) or do you want to keep them, in case they do deteriorate' (05-ID). They found AI predictive tools useful when explaining the potential risk of cardiovascular events to patients and encouraging medication adherence 'it does help so much convincing the patient to actually adhere to the medication' (07-Endo).

During COVID-19, AI prediction tools helped identify patients that might potentially need mechanical ventilation and ICU admission. Healthcare staff also felt it was important that AI predictive tools provided reliable information, that was easy to understand, and integrated with the current systems. A concern raised around the use of AI predictive tools was whether they might 'mislead junior doctors or doctors who would not have that much of a clinical sense and would totally depend on it' (07-Endo).

Conclusion This study demonstrated opportunities for the application of AI predictive tools in clinical practice. Concerns raised around the use of these tools should be considered by developers. We recognise that the perceptions of only a small number of clinicians were included mainly due to the increased time pressures on staff during the COVID-19 pandemic. Healthcare staff described essential features that will guide the future development of AI predictive tools with higher potential for application in real practice.

8 EVALUATION OF A TELEMEDICINE MODEL TO DELIVER CATARACT CARE USING IMAGING TECHNOLOGY INSTEAD OF TRADITIONAL F2F PATHWAYS

Pei-Fen Lin. *Moorfields Eye Hospital*

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Objective To set up and establish a sustainable telemedicine model to deliver cataract care pathway, where the traditional face-to-face cataract assessment clinic is replaced with a telemedicine consult with imaging technology to develop a safe, efficient telemedicine care delivery model in contrast to the current established traditional face-to-face pathways. To study the efficacy, efficiency, safety, patient experience of the new service. To assess usability and review risk of digital exclusion with patients and staff.

Methods Patients referred for cataract surgery from the community are booked into a video clinic (AttendAnywhere) as per date of referral. Patients were not pre-called or pre-selected for the digital pathway. After video consultation and pt confirmed to have symptomatic cataract affecting quality of life, the patient is preliminary listed for cataract surgery and verbally consented. The patient then attends a cataract imaging hub where anterior segment and fundus high resolution photography and optical coherence scans were performed. In addition, patient blood pressure and blood sugar are obtained. The results of the assessments are reviewed by the surgeon remotely to confirm the stratification of the cataract and plan for surgery. Any patient with unexpected findings or abnormal vitals were brought back for face to face review. Post-op patients are follow-up in the community. All patient consultation and imaging were recorded in an electronic patient records (Medisfot) Prospective data collected on patient demographics, access to video consult, referral date, review date, stratification, and outcome of surgery. Patient experience assessed via a post video clinic survey.

Results 403 patients were assessed, 42 excluded from the final data analysis due to erroneous bookings into the clinic. Total 361 patients correctly booked for new cataract assessment were included. 9 patients were brought back for further assessment in a face-to-face clinic as additional abnormalities were found on imaging. 299 listed for surgery (conversion to surgery rate of 82%). Average age of the patient is 74 yrs old. 31% >75 and

17% > 80 years old. 24% patients were the presumed digitally excluded group e.g. elderly, language barrier, care home resident, patient with partial or lack capacity, and lack of technology. To date, 166 patients have completed their surgery and 6 week post-op follow up. 96% reported improvement of vision post surgery. 7% had post-op complications and 3 patients had intraoperative complications. Cases were stratified and operated appropriately by all levels of surgeons, 52% by trainees and 48% by consultants or consultant grade surgeons.

No attendance to the emergency eye care service within 1 month post-operation. Patient survey showed 95% satisfied with care, 57% preferred the video clinic method. 82% would have come to a face to face clinic via a carbon emitting mode of transport, 60% by car.

Conclusion Digital cataract service (DCS) has demonstrated it is safe; patients with abnormal findings on imaging clinics were correctly stopped from proceeding with surgery. 96% of patients reported improvement of vision post surgery, this is better than the national audit standard of 95%. 4% patients had post-op complications which is lower than the 14% audit standard.

DCS is effective as it has a high conversion to surgery rate at 82% compared to the national average of 74%. The stratification of patients and their cataracts enabled surgery to be carried out safely by all levels of surgeons.

For patient experience it shortened the overall assessment time to 1.5 hours compared to a 3–4 hour wait in a face-to-face clinic. It also maximises the efficient use of staff, equipment and space; patients are consulted/assessed at time of arrival with no idle staff in the process. 24% patients with demographics traditionally included in the digitally excluded group were able to access the service by proxy, it also enabled clinicians to bring care to patients' home environment.

Overall DCS provides a safe, effective, efficient way of delivering cataract care with reduced carbon footprint by minimising patient and staff travelling.

9 FREE TEXT NOTES ADDED TO A PATIENT'S ALLERGY STATUS IN ELECTRONIC PRESCRIBING SYSTEMS DIGITALLY ANALYSED FOR BETTER USABILITY

Ben Logan. *St. Helens and Knowsley Teaching Hospitals*

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Objective Electronic prescribing systems often provide a drop-down list of medications and pre-specified reactions to record a patient's allergy status. This list is non-exhaustive; less common reaction types require the user to add a free text note.

The Careflow Medicines Management EPMA system provides decision support preventing a prescriber initiating a drug a patient has a recorded reaction to. Where a free text

reaction is recorded this functionality is not provided which results in increased risk to the patient.

The aim of this project was to identify recurring free text reactions and incorporate these into the system. Future avoidance of free text documentation will improve data quality and make reaction data available during built-in prescribing decision support.

Methods Free-text allergy notes added to the electronic prescribing system since implementation in March 2018 were extracted using structured query language. The data was cleaned and analysed using the Python.

Natural language processing techniques were employed to clean the data and reduce the dimensionality of the data set. A drug library extracted from the electronic prescribing system was used to tag medications within the text.

After pre-processing the most commonly occurring phrases were found by counting the most frequent bigrams present in the text. Further analysis was carried out using the apriori algorithm.

Results A total of 2872 notes were identified for analysis. The most common terms found were already included as part of the electronic prescribing systems allergy documentation system. This included the terms 'rash' and 'penicillin' which were recorded 480 and 400 times respectively. Of the top 20 most frequently appearing terms two were identified as not included in the system. These were 'swelling' which was recorded 320 times and 'pain' documented 210.

Applying a Bi-gram and filter identified that the term swelling was most often associated with the phrase 'ankle swelling' which appeared 60 times. The apriori algorithm identified an association between the terms ankle and swelling and amlodipine with high levels of confidence.

Pain was most often associated with the phrases 'chest pain' appearing 38 times and 'abdominal pain' or 'abdo pain' appearing a combined 55 times. Both are reaction types which cannot be documented in the prescribing system without the addition of a free-text note.

Conclusion Natural Language Processing can be applied to large sections of unstructured clinical documentation to quickly analyse themes and trends. With appropriate cleaning and manipulation of the data commonly occurring phrases relevant to clinical practice can be identified.

This permitted recurring drug reactions to be identified and added to the electronic prescribing system. It is hoped this will reduce the frequency of free-text notes added in the future and improve reaction documentation. It is anticipated that patient safety will be improved by making more reaction data available for electronic decision support.

Packages such as Python NLTK used for natural language processing are freely available and allow users to process data which would be too time consuming to process manually.

10 DEVELOPMENT AND EVALUATION OF A MACHINE LEARNING MODEL TO PREDICT POSITIVE URINE CULTURES IN THE OUTPATIENT SETTING AND MINIMIZE THE USE OF ANTIBIOTICS

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Objective Excessive prescription of antibiotics is amongst the principal drivers of antibiotic resistance, which is considered a surging threat to global health. The most frequent resistant pathogens are usually linked with urinary tract diseases, such as urinary tract infections (UTI). Studies have shown that clinicians may prescribe antibiotics based on presenting symptoms due to the prolonged time required to obtain the final results of urine bacterial cultures. While many of the current approaches to ameliorate prescribing behavior are educational or regulatory, here we develop and evaluate a logistic regression model that detects the risk of positive urine cultures based on the patient's history and presenting physiological data extracted from the electronic health records, to help clinicians make informed antibiotic prescription decisions without the need to wait for urine culture results.

Methods We used an anonymized dataset collected between 2015 and 2021 in a multi-specialty large hospital with primary, secondary and tertiary care facilities. The retrospective study received approval by the Institutional Review Board (IRB) from both the research institution and hospital (IRB references: HRPP-2020-173 & A-2019-054, respectively). We included adult outpatient encounters associated with at least one urine culture test. For the input features, we extracted and pre-processed each patient's demographics (age, sex), comorbidities (diabetes millutus, hypertension, cancer and hyperlididemia), vital signs (pulse, respiratory rate, oxygen saturation, temperature, systolic blood pressure, diastolic blood pressure and fraction of inspired oxygen), instant urine dipstick test results, all collected prior to the acquisition of the urine culture, as well as diagnosis codes (ICD-10 codes) and procedure codes (hospital custom codes) from the patient's previous hospital encounter. We defined the output as a binary label indicating a positive or negative urine culture result by processing textual data within laboratory test results. We assume a positive urine culture if the concentration of urine pathogen is higher than 100,000 colony forming units per milliliter (CFU/ml). We split the dataset randomly into a training (70%), and test set (30%). We optimized a logistic regression model using the training set with stratified k-fold validation, and evaluated it on the test set with 95% confidence intervals computed using bootstrapping with 1000 iterations.

Results After applying the inclusion criteria, the overall dataset consisted of 11,388 patients with 17,452 unique encounters (56.1% females; mean age 49.1 standard deviation 17.5 years). Amongst all encounters, 2,431 (13.9%) were associated with a positive label. We evaluated the models on the held-out test set consisting of 5,236 encounters (14.2% of encounters had positive urine culture). The logistic regression model achieved a 0.851 (0.837, 0.865 95% CI) Area Under the

Receiver Operating characteristic Curve (AUROC) and 0.584 (0.546, 0.618 95% CI) Area Under the Precision Recall Curve (AUPRC). Amongst the female population, the logistic regression model achieved a 0.806 AUROC compared to a 0.905 AUROC amongst males. When investigating different patient age groups, the model achieved a 0.84 AUROC amongst patients younger than 40 years, compared to 0.848 AUROC amongst patients who are 40 years or older.

We binarized the predictions by adjusting the threshold to achieve approximately 80% sensitivity on the test set, which is a clinically acceptable level of sensitivity. Amongst the 4,460 encounters associated with a negative urine culture in

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around their use. Healthcare staff recognised the benefits of AI predictive tools in being able to 'detect deterioration quicker than you would currently do'(05-ID), which informed decisions around patient discharge: 'can you safely send them home (...) or do you want to keep them, in case they do deteriorate' (05-ID). They found AI predictive tools useful when explaining the potential risk of cardiovascular events to patients and encouraging medication adherence 'it does help so much convincing the patient to actually adhere to the medication' (07-Endo).

During COVID-19, AI prediction tools helped identify patients that might potentially need mechanical ventilation and ICU admission. Healthcare staff also felt it was important that AI predictive tools provided reliable information, that was easy to understand, and integrated with the current systems. A concern raised around the use of AI predictive tools was whether they might 'mislead junior doctors or doctors who would not have that much of a clinical sense and would totally depend on it' (07-Endo).

Conclusion This study demonstrated opportunities for the application of AI predictive tools in clinical practice. Concerns raised around the use of these tools should be considered by developers. We recognise that the perceptions of only a small number of clinicians were included mainly due to the increased time pressures on staff during the COVID-19 pandemic. Healthcare staff described essential features that will guide the future development of AI predictive tools with higher potential for application in real practice.

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6 A NATIONAL SURVEY OF THE CURRENT PROVISIONS, PERCEPTIONS AND CHALLENGES REGARDING DIGITAL HEALTH EDUCATION IN THE UK MEDICAL UNDERGRADUATE CURRICULUM

Nishita Gadi, M Utukuri, B Osei-Boadu, Y Aung, E Le, A Deighton, C Dibblin, M Ferry, F D'Souza, J Hirniak, B Agboola, M Abedi, A Axiaq, C Chand, C Patel, M Pitt, B Harris, M Byrne, R Sethi. *Faculty of Digital Health; Nuffield Department of Surgical Sciences, University of Oxford*

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Objective Digital health (DH) is the integration of technologies to tackle challenges in healthcare. Its applications include mobile health, remote & wireless healthcare, artificial intelligence, and robotics. Digital technologies are increasingly being used to deliver routine care, whilst simultaneously patients are increasing their uptake of DH solutions (e.g. wearables).

With the adoption of DH increasing across the NHS, there is a growing need for a digitally literate workforce. However, there are no national standards on DH education for UK medical students. Consequently, this study sought to assess the current provisions, perceptions and challenges regarding DH education in the undergraduate medical curriculum.

Methods An anonymous cross-sectional online survey was developed following a literature search and by collecting iterative feedback from both researchers and external collaborators. The survey consisted of questions in 6 areas: (a) understanding of DH; (b) existing provision of DH education; (c) interest in DH education; (d) preferred means of delivering and assessing DH education; (e) impact of the COVID-19 pandemic on DH; and (f) demographic information.

The survey was administered via Qualtrics from March to October 2021, and disseminated to UK medical students via university mailing lists, social media and student representatives. Quantitative and qualitative data were collected pertaining to demographics, attitudes, preferences, and current provisions regarding DH education. Qualitative responses underwent thematic analysis. For quantitative analysis, R (version 3.5.0) and R Studio (version 1.1a) were used.

Results 514 complete responses were received from 39 UK medical schools in 2021. 57.2% of respondents were female, with a mean age of 22.9 ± 3.2. 65.8% of students considered DH 'extremely important' to future clinical practice, particularly the domains of electronic patient records, telehealth and smartphone applications. However, only 18.1% felt aware of the DH competencies required in clinical medicine. 70.2% of students reported receiving some DH education, with the highest proportion being in the form of lectures or seminars (30.5%, n=157), e-learning modules (28.6%, n=147) and ad hoc teaching during clinical placements (22.8%, n=117). However, only 25.7% felt satisfied with these provisions. Themes for student satisfaction related to a practical teaching approach, delivery of content appropriate for their training stage and coverage of topics in student interest. Conversely, student dissatisfaction originated from inadequate teaching, and subsequent fears of falling behind. 56.1% preferred DH education to be mandatory rather than elective, ideally through hands-on workshops (75.8%) and lectures and seminars (60.4%). 65.4% thought DH proficiency should be assessed in some capacity, of which 75.6% preferred formative assessment.

Conclusion This study represents the first national survey of UK medical students on DH education. Overwhelmingly, the results indicate that medical students recognise the significance of DH and would appreciate better formal integration into their curriculum; which is supported by previous similar studies in the literature. This study also identified how students would prefer to be taught and assessed on DH, in particular that they would prefer it be mandatory yet remain formative at present. Given the increasing ubiquity of DH in clinical practice, it is therefore crucial that universities and wider medical education organisations work to improve and standardise DH education, to better prepare medical students to adapt to the continuously developing digital landscape. This rings especially true in light of the recent COVID-19 pandemic which has highlighted the quintessential nature of DH to medical practice. Our intended future research from this study includes undergraduate focus groups for greater qualitative depth of information, and Delphi panels from wider medical education stakeholders into what should be included in DH education, with the eventual goal of developing a comprehensive and standardised national DH curriculum.

7 HEALTHCARE STAFF PERCEPTIONS ON USING ARTIFICIAL INTELLIGENCE PREDICTIVE TOOLS: A QUALITATIVE STUDY

Nehal Hassan, Robert Slight, Sarah Slight. *School of Pharmacy, Newcastle University*

10.1136/bmjhci-2022-FCIASC.7

Objective Artificial intelligence (AI) predictive tools can help inform the clinical decision-making process by, for example, detecting early signs of patient deterioration or predicting the likelihood of a patient developing a particular disease or complications postsurgery. However, it is unclear how acceptable or useful clinicians find these tools in practice. This project aims to explore healthcare staff' perceptions on the benefits and challenges of using AI tools to inform clinical decision-making in practice.

Methods Healthcare staff (physicians, pharmacists and nurses) working in different departments at one large teaching hospital in the North East were invited to participate in semi-structured interviews. Interviews were conducted between August and November 2021 by zoom videoconferencing, with questions focused on what AI predictive tools they currently use, how they guide daily tasks around diagnosis, management, prevention, prognosis and screening, and what challenges they face with their use. All transcribed files were checked for accuracy. Thematic saturation guided the volume of qualitative data collection. Qualitative data analysis and development of themes was performed for each interview using Nvivo 12 software. Ethical approval was obtained (20/EM/0183, IRAS 280077).

Results Ten healthcare staff were interviewed (physicians (n=7), pharmacists (n=1), surgeons (n=2)) from different medical specialities (e.g., Oncology, Endocrinology, Cardiology, Head and Neck, and transplant surgery). Five themes emerged, including the meaning of the term AI, the usefulness of AI predictive tools in informing clinical decision-making, features that healthcare staff found helpful, and challenges

around their use. Healthcare staff recognised the benefits of AI predictive tools in being able to 'detect deterioration quicker than you would currently do'(05-ID), which informed decisions around patient discharge: 'can you safely send them home (...) or do you want to keep them, in case they do deteriorate' (05-ID). They found AI predictive tools useful when explaining the potential risk of cardiovascular events to patients and encouraging medication adherence 'it does help so much convincing the patient to actually adhere to the medication' (07-Endo).

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visual analytics dashboard and guided by pharmacists' feedback, three customizable filters were applied. First, a filter to suppress alerts for medications that are ordered by the same prescriber during one session was implemented. Second, a filter to reduce alerts for medications that are commonly ordered both as scheduled and as needed was applied. Finally, customization was done on how long discontinued medications are eligible for alert checking by the medication CDS system. Data was collected 1 month prior to and 3 months after implementation for a duration of one month each. Alerts data was taken from the analytics dashboard. Pharmacists' perceptions of alert fatigue were collected using a voluntary online survey. Adverse medication events data was obtained from the hospital's incident reporting tool.

Results Comparing before and after implementation, total alerts decreased by 48.4% for pharmacists. In practice, this represented a reduction from 59.7 to 27.1 medication CDS alerts per day per pharmacist. However, pharmacists' alert override rate was minimally changed from 98.1% to 97.3%. Fourteen (78%) of the 18 pharmacists surveyed felt there was an overall decrease in unnecessary alerts while 67% perceived they were able to spend more time on reviewing meaningful alerts post-implementation. Compared to pre-implementation, pharmacists reported a minor reduction in the percentage of alerts they deemed unnecessary or inappropriate from 66.8% to 59.3%. However, 78% still remarked that there was room for improvement in the CDS alerting system. The number of adverse medication incidents were similar between the periods before and after implementation. No incidents were found to be a result of the new customized contextual filters.

Conclusion The use of customizable filters may be a viable alternate approach to reducing alert volume without needing to completely turn off specific alerts or changing alert severity. Pharmacists' perceptions of alert fatigue appeared to improve modestly post implementation. Comparison of medication incidents before and after implementation did not show an increase in medication errors. However, override rates remain elevated and pharmacists felt that further improvements could still be made to the medication CDS system.

5 THE LIMITATIONS OF USING COMMERCIAL WEARABLE ACTIVITY TRACKERS, SUCH AS FITBITS, FOR THE CLINICAL MONITORING OF PATIENT ACTIVITY LEVELS

Olivia Curtis. *Royal Marsden Hospital*

10.1136/bmjhci-2022-FCIASC.5

Objective There is increasing interest in remote monitoring of patients within the comfort and safety of their homes or care homes and became more pertinent during the COVID-19 pandemic to reduce hospital footfall and staff risk. While specifically designed medical devices exist, commercial wearable activity trackers (WAT), such as FitBits, are cheap, easy to use, and patients may already use them for lifestyle advice so their value in clinical intervention is of interest.

The feasibility of using commercial WAT for daily monitoring within a tertiary oncology centre was investigated, including limitations of non-medical devices, such as data collection and synchronisation errors.

Methods Participants were recruited for a study that investigated if remote monitoring of step counts was feasible and acceptable. Patients with advanced lung, upper and lower gastrointestinal cancer, or mesothelioma who were starting a new line of systemic anti-cancer treatment were recruited between December 2020 and December 2021.

Once recruited, participants were provided with a FitBit Inspire HR or Inspire 2 and asked to wear it every day for a 16-week monitoring period. Pseudo-anonymous accounts were created to register the FitBits without sharing patient identifiable data and the devices were set up to automatically synchronise data to the cloud-based platform, Fitabase, via their smartphone.

Steps were monitored on every workday and the ability to record heart rate was used as a proxy marker for compliance as it confirmed that the device was being worn. A day was considered complaint if the device was worn for >70% of waking hours, assumed for purpose of trial to be 7am to 10pm.

The manufacturer or age of the participant's smartphone was not recorded. Previous discussions with FitBit regarding synchronisation issues had highlighted potential clashes with other Bluetooth devices preventing automatic synchronisation so use of other such devices was documented.

Results Forty-seven patients were recruited and 43 were eligible for ongoing monitoring. Average age was 66 (SD 9) and majority were men (72%). Twenty-nine patients completed the maximum 112 days of monitoring.

Patients were eligible for monitoring on 3855 days. Of these, synchronisation errors occurred on 482 days (13%) and all data from the previous 24 hours was missing on 275 days (7%) due to synchronisation not occurring on the day on monitoring. Only 5 (11%) of participants did not have synchronisation errors during their monitoring period. The median number of synchronisation errors per patient was 8 and maximum of 49, which accounted for 64% of that participant's monitored days. One participant was withdrawn due to 100% synchronisation error over the first seven monitored days.

Twenty-two participants (47%) used other Bluetooth devices but there was no correlation between their use and synchronisation errors ($r=-0.32$), nor significant difference in synchronisation error rate ($p=0.08$).

562 days (15%) were considered non-compliant as heart rate was documented for less than 70% of the waking hour period. When synchronisation errors were removed, however, only 216 days (7%) were truly non-compliant due to the patient not wearing the device, rather than not having access to the data.

Conclusion This study has revealed a potential limitation of using commercial wearable activity trackers, such as FitBits, for clinical monitoring. While compliance with monitoring was good and matched previous reports on compliance at over 80%, the loss of data due to synchronisation errors reduced perceived compliance and, importantly for clinical interventions, reduced data available for immediate action.

Correcting these issues and restarting the automatic synchronisation was not a complex procedure but did necessitate a telephone call with the participant to manually synchronise the device, restart their smartphone or occasionally reinstall the app, which added to the participant burden of the investigation and overwhelmed the technological abilities of some participants. Currently, it is not clear what causes these synchronisation errors and, therefore, it is not possible to select patients who would be more suitable for this intervention.

The frequency of synchronisation errors mean that it is not feasible to use commercially available WAT for remote monitoring of patients and caution is needed if the results are used to guide clinical intervention, rather than simply offer lifestyle advice.

6 A NATIONAL SURVEY OF THE CURRENT PROVISIONS, PERCEPTIONS AND CHALLENGES REGARDING DIGITAL HEALTH EDUCATION IN THE UK MEDICAL UNDERGRADUATE CURRICULUM

Nishita Gadi, M Utukuri, B Osei-Boadu, Y Aung, E Le, A Deighton, C Dibblin, M Ferry, F D'Souza, J Hirniak, B Agboola, M Abedi, A Axiaq, C Chand, C Patel, M Pitt, B Harris, M Byrne, R Sethi. *Faculty of Digital Health; Nuffield Department of Surgical Sciences, University of Oxford*

10.1136/bmjhci-2022-FCIASC.6

Objective Digital health (DH) is the integration of technologies to tackle challenges in healthcare. Its applications include mobile health, remote & wireless healthcare, artificial intelligence, and robotics. Digital technologies are increasingly being used to deliver routine care, whilst simultaneously patients are increasing their uptake of DH solutions (e.g. wearables).

With the adoption of DH increasing across the NHS, there is a growing need for a digitally literate workforce. However, there are no national standards on DH education for UK medical students. Consequently, this study sought to assess the current provisions, perceptions and challenges regarding DH education in the undergraduate medical curriculum.

Methods An anonymous cross-sectional online survey was developed following a literature search and by collecting iterative feedback from both researchers and external collaborators. The survey consisted of questions in 6 areas: (a) understanding of DH; (b) existing provision of DH education; (c) interest in DH education; (d) preferred means of delivering and assessing DH education; (e) impact of the COVID-19 pandemic on DH; and (f) demographic information.

The survey was administered via Qualtrics from March to October 2021, and disseminated to UK medical students via university mailing lists, social media and student representatives. Quantitative and qualitative data were collected pertaining to demographics, attitudes, preferences, and current provisions regarding DH education. Qualitative responses underwent thematic analysis. For quantitative analysis, R (version 3.5.0) and R Studio (version 1.1a) were used.

Results 514 complete responses were received from 39 UK medical schools in 2021. 57.2% of respondents were female, with a mean age of 22.9 ± 3.2. 65.8% of students considered DH 'extremely important' to future clinical practice, particularly the domains of electronic patient records, telehealth and smartphone applications. However, only 18.1% felt aware of the DH competencies required in clinical medicine. 70.2% of students reported receiving some DH education, with the highest proportion being in the form of lectures or seminars (30.5%, n=157), e-learning modules (28.6%, n=147) and ad hoc teaching during clinical placements (22.8%, n=117). However, only 25.7% felt satisfied with these provisions. Themes for student satisfaction related to a practical teaching approach, delivery of content appropriate for their training stage and coverage of topics in student interest. Conversely, student dissatisfaction originated from inadequate teaching, and subsequent fears of falling behind. 56.1% preferred DH education to be mandatory rather than elective, ideally through hands-on workshops (75.8%) and lectures and seminars (60.4%). 65.4% thought DH proficiency should be assessed in some capacity, of which 75.6% preferred formative assessment.

Conclusion This study represents the first national survey of UK medical students on DH education. Overwhelmingly, the results indicate that medical students recognise the significance of DH and would appreciate better formal integration into their curriculum; which is supported by previous similar studies in the literature. This study also identified how students would prefer to be taught and assessed on DH, in particular that they would prefer it be mandatory yet remain formative at present. Given the increasing ubiquity of DH in clinical practice, it is therefore crucial that universities and wider medical education organisations work to improve and standardise DH education, to better prepare medical students to adapt to the continuously developing digital landscape. This rings especially true in light of the recent COVID-19 pandemic which has highlighted the quintessential nature of DH to medical practice. Our intended future research from this study includes undergraduate focus groups for greater qualitative depth of information, and Delphi panels from wider medical education stakeholders into what should be included in DH education, with the eventual goal of developing a comprehensive and standardised national DH curriculum.

7 HEALTHCARE STAFF PERCEPTIONS ON USING ARTIFICIAL INTELLIGENCE PREDICTIVE TOOLS: A QUALITATIVE STUDY

Nehal Hassan, Robert Slight, Sarah Slight. *School of Pharmacy, Newcastle University*

10.1136/bmjhci-2022-FCIASC.7

Objective Artificial intelligence (AI) predictive tools can help inform the clinical decision-making process by, for example, detecting early signs of patient deterioration or predicting the likelihood of a patient developing a particular disease or complications postsurgery. However, it is unclear how acceptable or useful clinicians find these tools in practice. This project aims to explore healthcare staff' perceptions on the benefits and challenges of using AI tools to inform clinical decision-making in practice.

Methods Healthcare staff (physicians, pharmacists and nurses) working in different departments at one large teaching hospital in the North East were invited to participate in semi-structured interviews. Interviews were conducted between August and November 2021 by zoom videoconferencing, with questions focused on what AI predictive tools they currently use, how they guide daily tasks around diagnosis, management, prevention, prognosis and screening, and what challenges they face with their use. All transcribed files were checked for accuracy. Thematic saturation guided the volume of qualitative data collection. Qualitative data analysis and development of themes was performed for each interview using Nvivo 12 software. Ethical approval was obtained (20/EM/0183, IRAS 280077).

Results Ten healthcare staff were interviewed (physicians (n=7), pharmacists (n=1), surgeons (n=2)) from different medical specialities (e.g., Oncology, Endocrinology, Cardiology, Head and Neck, and transplant surgery). Five themes emerged, including the meaning of the term AI, the usefulness of AI predictive tools in informing clinical decision-making, features that healthcare staff found helpful, and challenges

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support caseload management that was previously difficult to obtain through manual review of EHRs.

The systems efficiency audit revealed a reduction in duration of crisis and inpatient admissions following MaST implementation.

Conclusion The MaST RoC algorithm supports the identification of people more likely to use crisis services in NHS mental health trusts, is feasible to implement, and improves systems efficiency. The visualisation of these insights enables improved caseload management within community mental health teams. EHRderived algorithms can support real-world clinical practice to improve outcomes in people receiving NHS mental healthcare.

3 THE DOCUMENTATION OF ALLERGY ACROSS ELECTRONIC SYSTEMS FOR PATIENTS PRESENTING TO EMERGENCY DEPARTMENTS IN LEEDS

Jack Bennett, Madeleine Salter. *University of Leeds*

10.1136/bmjhci-2022-FCIASC.3

Objective How consistent is the recording of allergy documentation across multiple electronic systems in patients presenting to the emergency departments of a large UK tertiary trust?

Over 20% of the UK population are affected by one or more allergic disorders (1) and there has been shown to be a 615% increase in the rate of hospital admissions for anaphylaxis in the UK, between 1992 and 2012 (2). Correct documentation of patient allergies is essential to protect patients and prevent avoidable drug errors, estimated to cause around 1080 deaths annually in secondary care across England (3). Our objective was to determine how consistently allergies were recorded across multiple patient electronic record systems, in patients presenting to the emergency departments (ED) of Leeds Teaching Hospitals Trust.

Methods 50 patients were randomly selected from those presenting to the ED between 25th and 27th October 2021 with an allergy recorded on at least one electronic system. A further 51 patients were randomly selected from the those who had presented with anaphylaxis between 1st April 2020 and 31st March 2021. Their allergy status was then analysed retrospectively from the following five electronic records: Yorkshire Ambulance Service patient report form, Symphony (ED patient information system), the medical assessment record, Leeds Care Record (primary care summary) and eMEDS (electronic prescribing system). The patients' records were then compared for accuracy relative to each other and if they were not identical, compared against part 1.2.1 of NICE guideline CG183 (5). This states that their medical record must include one of the following: 'drug allergy', 'unable to ascertain' or 'none known'. Patients who did not have identical records, but 'unable to ascertain' listed instead, were recorded in a separate group as meeting this guideline due to the nature of ED presentations.

We excluded the following allergies: hay fever, dust mites and pollen. The group presenting with anaphylaxis had to have previously been diagnosed with the allergy before that attendance.

Results 413 individual electronic allergy records were analysed, of which 214 records were part of the anaphylaxis group and 199 were part of the non-anaphylaxis group. Only 17% of patients had synonymous records across the 5 possible electronic systems. Overall, 33% of patients had at least one record that stated they did not have an allergy when at least two others stated they did have an allergy. Concerningly in the anaphylaxis group, 20 individual records (9%) across 15 patients (27%) had records that stated they did not have an allergy, despite their attendance for an anaphylaxis reaction. 27% of all patients had either synonymous records or records that met the NICE guideline. Every patient who had three or more allergies did not have synonymous records.

Conclusion The inconsistency of recording allergy status in a patient's health record demonstrates the importance of improved interoperability between electronic systems, to reduce the risk of administration errors and patient harm due to multiple versions of the 'truth'. To mitigate the limitations of the current systems, it is important clinicians review the patient's allergy status every time a medication is prescribed. This can be especially challenging in emergency and urgent health care environments, when due to a patient's clinical status, they may be unable to provide an accurate allergy history.

Our findings are consistent with those of other studies, including a 2008 study which compared two key forms of patient allergy documentation, 36.5% of these records were not synonymous (4). This further suggests the need for additional research, not just across the trust but nationally. Depending on the results it is likely further safety measures may need to be introduced, especially in areas where multiple patient information systems are used or in patients who cannot accurately recall their own allergies. Further audits should also be carried out against the second part of the NICE guideline CG183, part 1.2.2, which sets criteria for how the allergy should be recorded (5).

4 REDUCTION OF ORDER ALERTS THROUGH FILTERS: IMPACT ON PHARMACISTS' OVERRIDE RATE AND PERCEPTIONS OF ALERT FATIGUE

Daniel Chan. *North York General Hospital (Toronto, Ontario, Canada)*

10.1136/bmjhci-2022-FCIASC.4

Objective Clinical decision supports (CDS) in electronic medication order systems identify alerts for clinicians. However, CDS may cause alert fatigue, which is the tendency for clinicians to ignore prompts presented by CDS due to excessive numbers and/or their perceived limited clinical significance. Alert fatigue may increase the risk of missing clinically relevant alerts. At North York General Hospital, pharmacists managed over 50% of all medication CDS alerts amounting to approximately 60 alerts per day per pharmacist with an override rate of over 90% indicating a high likelihood of alert fatigue. Thus, we attempted to reduce pharmacists' alert fatigue utilizing customizable filters.

Methods Optimizing medication CDS has traditionally centered around turning on or off alerts, changing alert severity levels or clinician role tailoring. These strategies can be labor and time-intensive requiring clinicians from different specialties to review hundreds of individual alerts. As such, this study pursued the use of customizable, context-based filters to reduce unnecessary alerts. Utilizing data from the EHR vendor's

visual analytics dashboard and guided by pharmacists' feedback, three customizable filters were applied. First, a filter to suppress alerts for medications that are ordered by the same prescriber during one session was implemented. Second, a filter to reduce alerts for medications that are commonly ordered both as scheduled and as needed was applied. Finally, customization was done on how long discontinued medications are eligible for alert checking by the medication CDS system. Data was collected 1 month prior to and 3 months after implementation for a duration of one month each. Alerts data was taken from the analytics dashboard. Pharmacists' perceptions of alert fatigue were collected using a voluntary online survey. Adverse medication events data was obtained from the hospital's incident reporting tool.

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Part I: ePapers

Winner of Best ePaper

1 DIGITAL TRANSFORMATION OF THE ACUTE MEDICAL TAKE – IMPROVING STANDARDS OF CARE

Helen Craggs. *Royal Bolton Hospital*

10.1136/bmjhci-2022-FCIASC.1

Objective With over 50 acute medical referrals per day at Royal Bolton Hospital, an efficient and safe acute medical take process is crucial to maintain high standards of clinical care. The existing process involved multiple non-communicating patient lists to track referrals. It also relied on manual data entry – resulting in patients being missed for clerking or not being identified for senior review – thereby missing national targets. A quality improvement project was designed to i). assess the functionality and safety of the current medical referral process and ii). develop a safer and more usable referral and patient tracking system.

Methods A new automated electronic Acute Medicine Referral List (AMRL) was outlined by the trust's IT team and clinicians. It was designed to integrate into the existing Electronic Patient Record (Allscripts).

The new AMRL system integrates into existing clinical practices of A&E and AMU clinicians. Clinical performance data from the pre-existing process and the new AMRL were benchmarked against Society of Acute Medicine Quality indicators, and analysed to assess the impact on the medical oncall team's working patterns, patient flow and patient outcomes.

A pre-intervention benchmark audit cycle (7 days of admission data) was carried in February 2020. The AMRL and referral process was subsequently implemented in November 2020. Following an interim spot audit and user survey, minor refinements were made to the AMRL. Two post-intervention audit cycles (7 days admission data) were then performed in January (6 weeks post intervention) and April 2021 (5 months post intervention).

Results Since introducing the electronic AMRL, patients waited less time for medical clerking ($\bar{x}$ 00:13 hours) and senior review ($\bar{x}$ 04:58 hours). There was also a 6.4% increase in the proportion of patients clerked within the 4 hour target window. When looking at weekend data, the impact of AMRL is more marked. The waiting times for medical clerking and consultant reviews at the weekend have improved by 25.1% and 26.1% respectively. There was a significant increase in the proportion of patients being reviewed by a consultant within 14 hours. This improvement was sustained through multiple audit cycles.

Overall, there was a measurable improvement in clinical performance against the national clinical quality indicators. The average hospital length of stay reduced by 1.3 days, equating to a reduction of approximately 15600 total occupied bed stays per annum.

Conclusions The introduction of the Acute Medicine Referral List, a single consolidated electronic patient list and referral process, has improved standards of care and patient flow within the organisation. Timely senior decision making has prompted earlier discharges and a reduction in overall inpatient length of stay – resulting in an estimated cost saving of £3.1 million.

The AMRL demonstrates how the unification of both patient referral listing and workflow systems can improve standards of patient care and experience. The primary reasons for success of the AMRL include: 1) the ability to integrate within established clinical and workflow systems and 2) stakeholders were responsive to feedback from end users, addressing pitfalls promptly to continuously improve on the systems usability and functionality.

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2 EVALUATION OF MAST (MANAGEMENT AND SUPERVISION TOOL) TO SUPPORT NHS COMMUNITY MENTAL HEALTH TEAMS IN IDENTIFYING RISK OF CRISIS AND COMPLEXITY ACROSS CASELOADS

Caroline Gadd. *Holmusk*

10.1136/bmjhci-2022-FCIASC.2

Objective The Management and Supervision Tool (MaST) helps NHS mental health care professionals identify patients who are most likely to need psychiatric hospital admission or home treatment, due to severe mental illness, through a Risk of Crisis (RoC) algorithm driven by electronic health record (EHR) data analytics. MaST improves the efficiency of caseload management of Mental Health Professionals. We describe the derivation and validation of the MaST RoC algorithm, and its implementation to support preventative mental healthcare in the NHS.

Methods The RoC algorithm was developed and evaluated with EHR data from six UK NHS trusts using Ordered Predictor List propensity scores informed by a priori weightings from pre-existing literature, as well as real-world evidence evaluating the associations of clinical risk factors with mental health crisis using NHS EHR data. Mental health crisis was defined as admission to a psychiatric hospital or acceptance to a community crisis service within a 28-day period. Predictor variables included age, gender, accommodation status, employment status, Mental Health Act (MHA) status (under section or Community Treatment Order), and previous mental health service contacts (including hospital admissions and crisis services). Data were analysed using Ordered Predictor List propensity scores. The algorithm was derived using structured EHR data from 2,620 patients in a single NHS trust and externally validated using data from 107,879 patients in five other NHS trusts. Qualitative and quantitative data on feasibility, acceptability and system efficiency impacts of MaST implementation were obtained through staff surveys and local audits.

Results The factors associated with greatest propensity for mental health crisis included recent previous crisis, multiple previous crises, higher number of mental health service contacts in recent weeks, MHA section, accommodation status and employment status. The RoC algorithm identified 64% and 80% crises in its top quintile. Sentiment analysis of staff surveys suggested that the use of MaST improved productivity by reducing time taken to access patient information to

support caseload management that was previously difficult to obtain through manual review of EHRs.

The systems efficiency audit revealed a reduction in duration of crisis and inpatient admissions following MaST implementation.

Conclusion The MaST RoC algorithm supports the identification of people more likely to use crisis services in NHS mental health trusts, is feasible to implement, and improves systems efficiency. The visualisation of these insights enables improved caseload management within community mental health teams. EHRderived algorithms can support real-world clinical practice to improve outcomes in people receiving NHS mental healthcare.

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Jack Bennett, Madeleine Salter. *University of Leeds*

10.1136/bmjhci-2022-FCIASC.3

Objective How consistent is the recording of allergy documentation across multiple electronic systems in patients presenting to the emergency departments of a large UK tertiary trust?

Over 20% of the UK population are affected by one or more allergic disorders (1) and there has been shown to be a 615% increase in the rate of hospital admissions for anaphylaxis in the UK, between 1992 and 2012 (2). Correct documentation of patient allergies is essential to protect patients and prevent avoidable drug errors, estimated to cause around 1080 deaths annually in secondary care across England (3). Our objective was to determine how consistently allergies were recorded across multiple patient electronic record systems, in patients presenting to the emergency departments (ED) of Leeds Teaching Hospitals Trust.

Methods 50 patients were randomly selected from those presenting to the ED between 25th and 27th October 2021 with an allergy recorded on at least one electronic system. A further 51 patients were randomly selected from the those who had presented with anaphylaxis between 1st April 2020 and 31st March 2021. Their allergy status was then analysed retrospectively from the following five electronic records: Yorkshire Ambulance Service patient report form, Symphony (ED patient information system), the medical assessment record, Leeds Care Record (primary care summary) and eMEDS (electronic prescribing system). The patients' records were then compared for accuracy relative to each other and if they were not identical, compared against part 1.2.1 of NICE guideline CG183 (5). This states that their medical record must include one of the following: 'drug allergy', 'unable to ascertain' or 'none known'. Patients who did not have identical records, but 'unable to ascertain' listed instead, were recorded in a separate group as meeting this guideline due to the nature of ED presentations.

We excluded the following allergies: hay fever, dust mites and pollen. The group presenting with anaphylaxis had to have previously been diagnosed with the allergy before that attendance.

Results 413 individual electronic allergy records were analysed, of which 214 records were part of the anaphylaxis group and 199 were part of the non-anaphylaxis group. Only 17% of patients had synonymous records across the 5 possible electronic systems. Overall, 33% of patients had at least one record that stated they did not have an allergy when at least two others stated they did have an allergy. Concerningly in the anaphylaxis group, 20 individual records (9%) across 15 patients (27%) had records that stated they did not have an allergy, despite their attendance for an anaphylaxis reaction. 27% of all patients had either synonymous records or records that met the NICE guideline. Every patient who had three or more allergies did not have synonymous records.

Conclusion The inconsistency of recording allergy status in a patient's health record demonstrates the importance of improved interoperability between electronic systems, to reduce the risk of administration errors and patient harm due to multiple versions of the 'truth'. To mitigate the limitations of the current systems, it is important clinicians review the patient's allergy status every time a medication is prescribed. This can be especially challenging in emergency and urgent health care environments, when due to a patient's clinical status, they may be unable to provide an accurate allergy history.

Our findings are consistent with those of other studies, including a 2008 study which compared two key forms of patient allergy documentation, 36.5% of these records were not synonymous (4). This further suggests the need for additional research, not just across the trust but nationally. Depending on the results it is likely further safety measures may need to be introduced, especially in areas where multiple patient information systems are used or in patients who cannot accurately recall their own allergies. Further audits should also be carried out against the second part of the NICE guideline CG183, part 1.2.2, which sets criteria for how the allergy should be recorded (5).

4 REDUCTION OF ORDER ALERTS THROUGH FILTERS: IMPACT ON PHARMACISTS' OVERRIDE RATE AND PERCEPTIONS OF ALERT FATIGUE

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Objective Clinical decision supports (CDS) in electronic medication order systems identify alerts for clinicians. However, CDS may cause alert fatigue, which is the tendency for clinicians to ignore prompts presented by CDS due to excessive numbers and/or their perceived limited clinical significance. Alert fatigue may increase the risk of missing clinically relevant alerts. At North York General Hospital, pharmacists managed over 50% of all medication CDS alerts amounting to approximately 60 alerts per day per pharmacist with an override rate of over 90% indicating a high likelihood of alert fatigue. Thus, we attempted to reduce pharmacists' alert fatigue utilizing customizable filters.

Methods Optimizing medication CDS has traditionally centered around turning on or off alerts, changing alert severity levels or clinician role tailoring. These strategies can be labor and time-intensive requiring clinicians from different specialties to review hundreds of individual alerts. As such, this study pursued the use of customizable, context-based filters to reduce unnecessary alerts. Utilizing data from the EHR vendor's

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Part I: ePapers

Winner of Best ePaper

1 DIGITAL TRANSFORMATION OF THE ACUTE MEDICAL TAKE – IMPROVING STANDARDS OF CARE

Helen Craggs. *Royal Bolton Hospital*

10.1136/bmjhci-2022-FCIASC.1

Objective With over 50 acute medical referrals per day at Royal Bolton Hospital, an efficient and safe acute medical take process is crucial to maintain high standards of clinical care. The existing process involved multiple non-communicating patient lists to track referrals. It also relied on manual data entry – resulting in patients being missed for clerking or not being identified for senior review – thereby missing national targets. A quality improvement project was designed to i). assess the functionality and safety of the current medical referral process and ii). develop a safer and more usable referral and patient tracking system.

Methods A new automated electronic Acute Medicine Referral List (AMRL) was outlined by the trust's IT team and clinicians. It was designed to integrate into the existing Electronic Patient Record (Allscripts).

The new AMRL system integrates into existing clinical practices of A&E and AMU clinicians. Clinical performance data from the pre-existing process and the new AMRL were benchmarked against Society of Acute Medicine Quality indicators, and analysed to assess the impact on the medical oncall team's working patterns, patient flow and patient outcomes.

A pre-intervention benchmark audit cycle (7 days of admission data) was carried in February 2020. The AMRL and referral process was subsequently implemented in November 2020. Following an interim spot audit and user survey, minor refinements were made to the AMRL. Two post-intervention audit cycles (7 days admission data) were then performed in January (6 weeks post intervention) and April 2021 (5 months post intervention).

Results Since introducing the electronic AMRL, patients waited less time for medical clerking ($\bar{x}$ 00:13 hours) and senior review ($\bar{x}$ 04:58 hours). There was also a 6.4% increase in the proportion of patients clerked within the 4 hour target window. When looking at weekend data, the impact of AMRL is more marked. The waiting times for medical clerking and consultant reviews at the weekend have improved by 25.1% and 26.1% respectively. There was a significant increase in the proportion of patients being reviewed by a consultant within 14 hours. This improvement was sustained through multiple audit cycles.

Overall, there was a measurable improvement in clinical performance against the national clinical quality indicators. The average hospital length of stay reduced by 1.3 days, equating to a reduction of approximately 15600 total occupied bed stays per annum.

Conclusions The introduction of the Acute Medicine Referral List, a single consolidated electronic patient list and referral process, has improved standards of care and patient flow within the organisation. Timely senior decision making has prompted earlier discharges and a reduction in overall inpatient length of stay – resulting in an estimated cost saving of £3.1 million.

The AMRL demonstrates how the unification of both patient referral listing and workflow systems can improve standards of patient care and experience. The primary reasons for success of the AMRL include: 1) the ability to integrate within established clinical and workflow systems and 2) stakeholders were responsive to feedback from end users, addressing pitfalls promptly to continuously improve on the systems usability and functionality.

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2 EVALUATION OF MAST (MANAGEMENT AND SUPERVISION TOOL) TO SUPPORT NHS COMMUNITY MENTAL HEALTH TEAMS IN IDENTIFYING RISK OF CRISIS AND COMPLEXITY ACROSS CASELOADS

Caroline Gadd. *Holmusk*

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Objective The Management and Supervision Tool (MaST) helps NHS mental health care professionals identify patients who are most likely to need psychiatric hospital admission or home treatment, due to severe mental illness, through a Risk of Crisis (RoC) algorithm driven by electronic health record (EHR) data analytics. MaST improves the efficiency of caseload management of Mental Health Professionals. We describe the derivation and validation of the MaST RoC algorithm, and its implementation to support preventative mental healthcare in the NHS.

Methods The RoC algorithm was developed and evaluated with EHR data from six UK NHS trusts using Ordered Predictor List propensity scores informed by a priori weightings from pre-existing literature, as well as real-world evidence evaluating the associations of clinical risk factors with mental health crisis using NHS EHR data. Mental health crisis was defined as admission to a psychiatric hospital or acceptance to a community crisis service within a 28-day period. Predictor variables included age, gender, accommodation status, employment status, Mental Health Act (MHA) status (under section or Community Treatment Order), and previous mental health service contacts (including hospital admissions and crisis services). Data were analysed using Ordered Predictor List propensity scores. The algorithm was derived using structured EHR data from 2,620 patients in a single NHS trust and externally validated using data from 107,879 patients in five other NHS trusts. Qualitative and quantitative data on feasibility, acceptability and system efficiency impacts of MaST implementation were obtained through staff surveys and local audits.

Results The factors associated with greatest propensity for mental health crisis included recent previous crisis, multiple previous crises, higher number of mental health service contacts in recent weeks, MHA section, accommodation status and employment status. The RoC algorithm identified 64% and 80% crises in its top quintile. Sentiment analysis of staff surveys suggested that the use of MaST improved productivity by reducing time taken to access patient information to

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