

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

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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

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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

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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