No Child Left Behind – AI's role in Equalising Healthcare

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Introduction

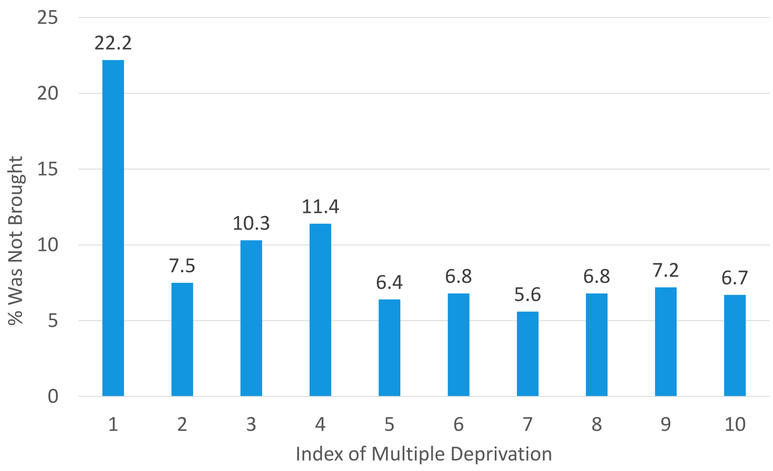
1.2 million paediatric appointments were missed in England between 2018-2019, costing the NHS £150 million and lengthening national paediatric waiting lists.

Missed appointments disproportionately affect children from lower socioeconomic backgrounds, exacerbating existing health inequalities. These missed opportunities for care contribute to preventable child deaths and untreated illnesses, particularly among already vulnerable populations.

Data from Electronic Patient Records (EPR) showed that within the Oxford paediatric population, patients with a lower index of multiple deprivation (IMD) contributed disproportionately to Was Not Brought (WNB) rates. This highlights systemic health inequalities, as 22.2% of non-attendance occurred in the lowest IMD group compared to 6.7% in the highest.

This pilot study, coordinated by the Children's Hospital Alliance (CHA) WNB Innovation program, aimed to reduce WNB rates amongst paediatric patients attending community paediatric and rheumatology outpatient appointments at the John Radcliffe Hospital and Nuffield Orthopaedic Centre in Oxford. They did this by targeting vulnerable populations predicted to be at high risk of missing appointments.

(Figure 1) Map summarising the hospitals that form the Children's Hospitals Alliance.



(Figure 2) Graph demonstrating Was Not Brought rates (%) in each Index of Multiple Deprivation Group for patients under 18 years attending general paediatric appointments at Oxford University Hospitals.

Methods

Development of the AI Tool

The Alder Hey Innovation team developed an artificial intelligence (AI) tool to identify children at risk of not being brought to appointments. Utilising longitudinal data from linked Electronic Patient Records and health inequality metrics, a design thinking and validation process identified 46 variables, which, through an algorithm, predict the likelihood of a child missing their appointment.

AI Tool trained using Oxford data

The AI tool was trained using historical EPR data submitted monthly from Oxford until population WNB rates could be predicted with 80% accuracy (20% allows for unpredictable events such as transportation breakdowns). Once trained at a population level, the tool predicts a child's individual risk of missing an appointment.

High-risk patients identified

Over a two-month period, live data was submitted every 2-4 weeks to the AI tool, assigning every appointment for a child in the upcoming 4-8 weeks a risk score within 1-2 hours of submission. Upcoming appointments were stratified by risk.

Phone call intervention

Administration-led telephone calls were made 2-10 days in advance of community paediatric and rheumatology appointments to patients with an 80%+ WNB risk score. Calls where there was a concern or subsequent non-attendance allowed staff members, patients, and their family/carers to identify barriers preventing attendance. Serious concerns were escalated to senior clinicians to ensure effective processes were developed.

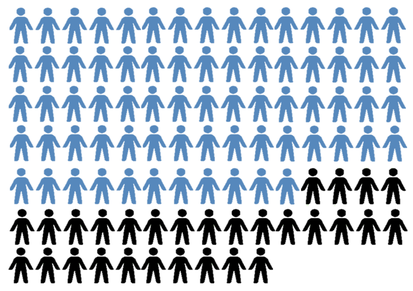
Data collection and analysis

Qualitative data was collated via standardised excel template questions agreed by the CHA trust members, trust feedback workshops hosted by the CHA with technical, clinical and operational teams; and by formal feedback requests and follow up evaluation calls with patients and families.

Quantitative data were collected on the levels of WNB rate before and after the intervention as well as some information on the costs of the programme.

Results

Was not brought rates reduced from 68% to 23%



A success for AI

18 data sets submitted

Each AI pack data provides predictions for all outpatient appointments submitted, equating to thousands of patient records.

It is estimated to take an individual 5-10 minutes to gather and cross reference all the relevant data points and health inequality metrics for an individual patient.

The AI tool is thus exceptionally-suited to optimise care:

1) Proactively identifies children currently excluded from health services.
2) Significant potential for upscaling nationally and internationally.
3) Identifies and enables targeted interventions for thousands of children that would be impossible with current resources.

Positive feedback from patients and staff

- Parents and carers felt more satisfied with the service.
- Patients felt heard and valued.
- Patients' background stories and social challenges were addressed.
- Staff felt satisfied with their ability to improve patient outcomes.
- Phone calls enabled joint problem-solving to help overcome the barriers to attendance.
- Increased collaboration of staff across the trust.

Challenges identified during the phone call intervention

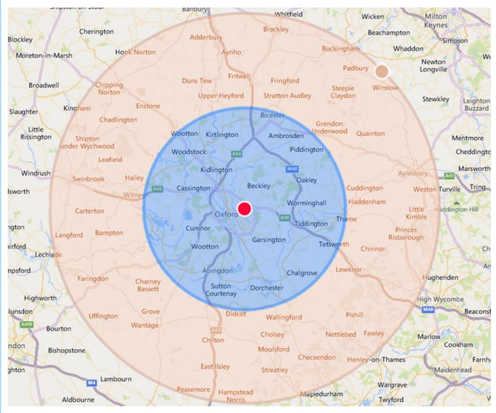
- ***Communication:*** letters lost, confusion over multiple appointments.
- ***Administrative difficulties:*** timing inconveniences, long waiting times between when the letter was sent and the appointment date.
- ***Access:*** cost of transportation and problems with public transport.
- ***Time:*** staff had to find time to make calls around their heavy workloads, a particularly difficult task during the COVID-19 pandemic.

Ethnic disparities

- Higher WNB rates amongst non-White-British ethnicities
- Even after the intervention, there were unusually high WNB rates amongst those who gave their ethnicity as Slovak or Romany Slovak, or people for whom Slovak or Romanian was their first language.

Drivers of missed appointments

- Waiting times
- Previous attendance behaviours
- Method of attendance
- Increased distance from hospital



(Figure 3) A map centred around the John Radcliffe (red dot). The blue and orange areas represent a 10- and 10-20-mile radius respectively. Patients within the orange area were found to have higher WNB rates.

Calls to patients alone do not help those who:

- Cannot afford transportation
- Are unable to take time off work
- Unable to find care for other dependent family members

Transportation subsidies are available at reception, when requested and signed by a clinician. This information was not always effectively communicated to patients.

Conclusions

- Artificial Intelligence is a powerful tool for identifying children at high risk of not being brought to clinics.
- WNB rates were significantly improved among high-risk paediatric patients.
- AI reducing WNB rates can alleviate financial and operational strain on the healthcare system.
- More comprehensive solutions are needed to fully address systemic health inequalities, particularly those relating to ethnicity and financial difficulty.

Future research and acknowledgements

Join us in pioneering AI for healthcare equity. Your hospital can reduce missed appointments too.
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