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Brokering Innovation Through Evidence

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Improving how hospitals forecast unplanned admissions

Balancing demand for beds and other resources is a challenge for many hospitals.

Unplanned hospital admissions have been increasing in Bristol's Southmead Hospital. This puts pressure on services and staff. Accurately forecasting demand in the short-term (the next few days to a few weeks) and long-term (up to a year) is now a crucial part of planning.

Hospitals can plan care more effectively if forecasting is improved. Better forecasting means less crowded hospitals, fewer cancellations and better care.

What was the aim of the project?

To forecast both long and short-term demand North Bristol Trust, which runs Southmead Hospital, looks at demand in previous years to forecast for the future.

We wanted to compare the forecasting tool already used by the Trust with a new, more accurate forecasting model.

What did we do?

We looked at the number of unplanned admissions for Southmead Hospital between September 2016 and March 2020.

We looked at how long patients were staying in hospital and whether they were undergoing surgery or other treatments.

We used an approach called 'Multivariate Seasonal AutoRegressive Integrated Moving Average' (MSARIMA) to predication admissions and bed occupancy.

The research is supported by the National Institute for Health and Care Research (NIHR) Applied Research Collaboration (ARC West) at University Hospitals Bristol and Weston NHS Foundation Trust.

How did we involve people?

We explained our ideas on how to run the study during a workshop and invited members of the public to give us suggestions and comments to help us develop it. The final study was shaped with these comments and suggestions in mind.

What we found and what does this mean?

Our model was able to forecast the number of unplanned admissions more accurately than the existing system. We could improve forecasts of admissions 95.6 per cent of the time, compared to the standard approach used to predict admissions.

The models we used can help predict the number of admissions in other contexts to improve patient flow through the hospital. However, we found that our model was less accurate the farther forward in time we went, and it sometimes underestimated the number of admissions.

We found it harder to predict surgical admissions and stays of under 48-hours. This may be because we did not have enough information available and because of differences in the number of daily admissions.

Our models were also not quite as successful at forecasting bed occupancy as they were at forecasting unplanned admissions. This is because it is harder to say how long a patient will stay in hospital once they have been admitted.

What next?

We are working with North Bristol Trust to re-calibrate the forecasting model post-COVID.

We are aiming to bring the model into operational use later in 2023.

Read the paper

Can we accurately forecast non-elective bed occupancy and admissions in the NHS? A time-series MSARIMA analysis of longitudinal data from an NHS Trust

Emily Eyles, Maria Theresa Redaniel, Tim Jones, Marion Prat, Tim Keen

Published in BMJ Open
http://bit.ly/3lBaWaQ

Find out more

Improving how hospitals forecast unplanned admissions - ARC West (nihr.ac.uk)

What is NIHR ARC West?

At the NIHR Applied Research Collaboration (ARC) West, we conduct applied health research with our partners and others in the health and care sector, alongside patients and members of the public. Applied health research aims to address the immediate issues facing the health and social care system. We also help bring research evidence into practice and provide training for the local workforce

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