Situation Report - Elective care recovery modelling (Inpatient)

v1.0.1

WWL DAA: Data Science

2023-04-12

Planned updates for later SitRep versions:

- *Add section on how this work should be used or interpreted*
- *Add long-waiter graphs of those specialities not forecast to clear by April 2024.*
- *Add figure/table numbers for simpler navigation*
- *Add contents page for simpler navigation*
- *Simplify graphics of graphs, alter figure legend type.*
- *Add outpatient and diagnostic lists*
- *Add non-elective work to produce a generalised SitRep*

Methodology

The subsequent work was produced by creating four separate forecasting algorithms, each of which produce models forecasting a horizon period of 365 days, using the last six months of waiting list size data (start and end dates of the training period are described below).

Subsequently the average of these four models was calculated to produce a *combinatorial* model. Combinatorial models reliably perform better than individual forecasts in many situations, particularly for long forecast horizons.

The final combinatorial model was then *positively biased* to the most recent month training data. This bias is a simple weighting calculation: using the last 30 days mean values for *demand*, *capacity*, and *error (ROTT - removals over than treatment)*, the combinatorial model is adjusted to reflect these characteristics. In addition, this calculation includes an exponent function that reduces the positive bias the further into the future we are predicting, producing a more realistic forecast.

Overall forecasts were produced by firstly running the model individually for each speciality, and each waiting list; the outputs of these models were simulated 50 times and 80% prediction intervals calculated from these results. Lists were grouped together and then specialities were concatenated and summed to produce the overall figures. Additionally, any individual forecast that was predicted to reach a forecast list size of 0 at any horizon day was adjusted to ensure that all subsequent horizon days were given a list size of 0.

An important difference between the methodology of the long waiter clearance table and the overall long waiter list forecast graph requires explanation. For the long waiter tables, the variable "Date list cleared" is the *first date the lower boundary of the 80% prediction interval touches 0 waiters*. Thus, these dates are the "best case scenario" of expected list clearance date. In contrast, the overall long waiter list graph summates the *mean* forecast position of each speciality for each date - thus, a more conservative forecast position is produced.

- AI Training period is from 2022-10-02 to 2023-03-31.
- Positive weighting estimated from 2023-03-01 to 2023-03-31
- Figures horizon lines depict mean predicted list size
- Figures shaded regions depict 80% prediction interval

Speciality: Long waiters forecast clearance dates

- *If a speciality has "Date list cleared" field = NA then this means the list does not reach zero by the horizon end date.*
- *See Methodology for determining the "Date list cleared" and a methodological comparison with the overall long waiters graph.*

Over 52 week waiters

Speciality	Date list cleared	List size at 2024-03-29	Difference from 2023-03-31
ENT	NA	98	+24.05 %
Gastroenterology	NA	54	+17.39 %
Oral Surgery	NA	11	+10 %
General Surgery	NA	34	+3.03 %
Trauma & Orthopaedics	NA	247	+2.07 %
Colorectal Surgery	NA	20	+0 %
Gynaecology	NA	25	+0 %
Urology	NA	37	-11.9 %
Breast Surgery	2023-04-14	NA	NA
Cardiology	2023-04-19	NA	NA
Ophthalmology	2024-03-24	NA	NA
Paediatric Dentistry	2023-04-13	NA	NA
Pain Management	2023-08-15	NA	NA
Plastic Surgery	2023-07-20	NA	NA
Thoracic Medicine	2023-12-03	NA	NA
Vascular Surgery	2023-12-19	NA	NA

Over 65 week waiters

Speciality	Date list cleared	List size at 2024-03-29	Difference from 2023-03-31
Trauma & Orthopaedics	NA	119	+1.71 %
Cardiology	NA	3	negligible
Thoracic Medicine	NA	10	negligible
Gastroenterology	NA	32	-3.03 %
ENT	NA	20	-16.67 %
Breast Surgery	2023-03-31	NA	NA
Colorectal Surgery	2023-07-10	NA	NA
General Medicine	2023-03-31	NA	NA
General Surgery	2023-04-22	NA	NA
Gynaecology	2023-08-31	NA	NA
Haematology	2022-12-06	NA	NA
Ophthalmology	2023-04-12	NA	NA
Oral Surgery	2023-03-31	NA	NA
Paediatric Dentistry	2023-05-14	NA	NA
Pain Management	2023-09-23	NA	NA
Plastic Surgery	2023-03-31	NA	NA
Rheumatology	2023-04-16	NA	NA
Urology	2024-03-25	NA	NA
Vascular Surgery	2023-06-24	NA	NA

Overall: Inpatient elective list forecast (specialities combined)