Waiting List Dynamics
Demand and Capacity
Model User Guide
1. Introduction

The Intensive Support Team (IST) has developed a series of demand and capacity models designed to help organisations achieve an appropriate balance between demand and capacity, and to ensure that waiting lists are of an appropriate size. These models can act as a helpful starting point for organisations to better understand demand and plan capacity accordingly. The models are freely available via the NHS IMAS website using the following link: www.nhsimas.nhs.uk/ist

The IST recommends operational managers work with information colleagues to pull together the various data items required to complete the models. It is important to agree a standard dataset for each model, including, where possible, a standard data source so the models are consistent across the Trust.

This user guide is aimed primarily at users new to the Waiting List Dynamics Demand and Capacity Model and should be read alongside the information and instructions contained in the model. The guide follows the same structure as the model with a section for each of the tabs included in the model.

The model can be used at specialty, sub specialty, geographical site level or consultant level. The level at which it is appropriate to model will need to be determined by what is most appropriate and useful for the service.

The model is Excel based and requires as a minimum Excel 2010 to operate correctly.

2. Welcome tab

This tab includes an overall introduction to the model and an overview of the data required to populate the model.

3. Data tab

- Select the Trust name from the drop down box
- Select the name of the specialty from the drop down box. If the name of the specialty you wish to model is not included in the drop down list select ‘Other’ and enter the name manually in the box below.
- Using the slider enter the number of patients currently waiting for elective admission. Include all patients waiting i.e. those both with and without an admission date.

3.1 Waiting List Data

- Enter 52 weeks’ worth of decisions to admit data in date order i.e. week one longest ago and week 52 most recent. The 52 week period selected should be the most recent 52 week period where a full set of data is available. It is important to note the date range for this 52 week period, as other parameters within the model should be calculated based on this 52 week period where possible.
- For the same 52 week period enter the number of waiting list removals – this should be patients who have had a decision to admit but are removed from the waiting list without being treated (ROTT). This may include patients who have changed their mind about having surgery or who are unfit when reviewed at pre-operative assessment.
- For the same 52 week period enter the number of patients waiting for admission each week, exclude patients who are on a clock pause. This information is not essential to the working of the model.
• Sense check the information as you enter it – does it look right and reflect operational reality? Are there any unexpected peaks or troughs or patterns in the data? If so these need to be checked to ensure the data is accurate. Is the number of patients waiting fairly consistent or is it changing? Is this correct? Decision to admit data is presented graphically on the graph and SPC tabs where it may be easier to identify any anomalies or unexpected patterns in the data (see SPC below).

• If the specialty includes more than one type of service such as adult and paediatric consideration should be given as to whether to model the two elements separately. Generally speaking if the capacity is able to be used interchangeably then the services can be modelled together, if however the capacity is not able to be used flexibly between the two elements of service they should be modelled separately.

• The model assumes the same demand profile in the future as that in the decision to admit data entered, i.e. it does not include growth in demand. If growth is anticipated this will need to be calculated outside of the model and can then be reflected in the model by adjusting the ‘Mean DTA’s per week’ in the parameters tab.

4. Capacity tab

This section of the model is concerned with what capacity is expected to be available for elective admissions for the year going forward not what capacity has been available in the past. However if there is a difference within these capacity levels, it could potentially explain any significant capacity gaps that might be identified later in the model. Core capacity can be defined as that which is included in consultant and Trust Grade job plans and is therefore regularly available (i.e. funded capacity). Ad hoc capacity might typically be waiting list initiative sessions that are planned or capacity provided by locums.

Models should be reviewed if staff changes result in additional or loss of capacity (for example the loss of a senior middle grade doctor who was able to treat patients independently who is replaced with a junior middle grade who does not treat patients independently.

4.1 Mean normal capacity

• Enter core capacity i.e. what is in the job plans on left side of the spread sheet and ad hoc capacity on the right. Does capacity vary between individuals or lists? Does this represent operational reality?

• Critical data to enter is the number of admissions per list and the number of weeks per year. 42 – 45 weeks is fairly standard for elective capacity but this may need to be reduced if there are on call commitments which impact upon elective activity. It is unlikely that the number of weeks per year will be the same for all elements of capacity. Remember that where lists fall on a Monday a number will be lost due to bank holidays – this should be reflected in the number of weeks per year the list takes place.

• Capacity data is best entered in the two tables as it is easy to review and sense check against operational reality. If however this level of detail is not available for ad hoc capacity it can be entered manually using the slider at the top right of the page.

• Where the slider is across to the far right of the slider box the number is calculated from data entered elsewhere in the model. If the slider is not at the far right of the slider box the data has been entered manually using the slider.

• The ‘capacity calculator’ box should be selected in order for the model to calculate capacity from the information entered in the capacity tables.

• The two tables at the bottom of the spread sheet page do not need to be completed as these are a look back at capacity delivered in the previous 52 week period and are not used by the model to determine capacity requirements. However, if populated the tables can be used to cross check previous activity against capacity, in which case the ‘toggle’
at the top of the sheet should be moved to select ‘historical data’ rather than ‘capacity calculator’.

5. Parameters tab

- Mean decisions to admit and the ROTT rate are populated from data entered elsewhere in the model. The ROTT rate should be sense checked to ensure that it reflects operational reality. A ROTT rate of more than 15% should be investigated.
- Enter the proportion of cancer / urgent admissions for the service. If modelling a sub specialty or specific element of a larger service the urgency rate for that element of service or sub specialty should be entered not that of the entire specialty.
- Enter the number of patients with a clock pause. This should usually be less than 5% of patients. This data item does not have an impact on the outputs of the model and is therefore not essential.
- Enter the number of patients on a planned waiting list (admission method 13). These patients are not included in the required capacity calculation as they clinically need to wait a specified time for treatment. If there are a large number of planned patients the service will need to make appropriate capacity available on top of that calculated by the model when these patients are clinically ready to be treated. The data inputted into this parameter will not be included in the calculated capacity requirement.
- Data has to be entered manually into the three ‘target waiting time’ boxes using the sliders. The number of weeks entered should be what the service aspires to achieve not what is currently being delivered.
- Target waiting time for urgent patients will usually be between two to four weeks from the decision to admit.
- Maximum routine waiting time is following the decision to admit and should usually not be more than ten weeks. If the service selects a longer maximum waiting time then other elements of the pathway such as first and follow up outpatients and diagnostics need to support this in order to ensure that the overall pathway can be delivered within 18 weeks. For example if maximum waiting time for first outpatients and elective admission are both six weeks this leaves a further six weeks for the diagnostic and follow up elements of the patient pathway.
- The ‘week routine admissions commence’ and ‘target routine waiting time’ affect the calculation of sustainable waiting list size not the capacity calculation.

6. Summary tab

6.1 Indicator Box
- The ‘indicator’ box summarises data entered elsewhere in the model and identifies the net weekly change to the waiting list. The 65th percentile of decisions (DTA) to admit minus ROTT is equal to the capacity requirement at the 65th percentile and the 85th percentile of DTA minus ROTT is equal to the capacity requirement at the 85th percentile.

6.2 Current capacity
- This summarises the core, ad hoc and total capacity available as entered elsewhere in the model.

6.3 Required capacity
- If capacity is set at the mean all patients will get seen across the year but waiting times will vary and some patients will experience a long wait as the Trust will only have enough capacity half the time on a weekly basis to meet demand. A sustainable service capacity
is somewhere between the 65th and 85th percentiles. Meaning the service has enough capacity to meet demand between 65% and 85% of the time.

- It is for services to determine where it is appropriate to set capacity within the approximate sustainable range. This will depend on the flexibility required of the service i.e. if there are a lot of cancer / urgent patients then the service will need to have more choice of admission dates available in order to offer patients a suitable date within the short waiting time.
- If there is a large degree of variation in demand for the service, greater flexibility will be required in order to effectively manage peaks in demand. The graph at the top of work book page shows the demand for the service for the 52 week period and shows visually the amount of variation in demand. A larger version of this graph is included on the SPC tab within the model.
- The required capacity table shows the number of weeks which will be needed to clear the backlog of patients with the existing capacity. If this says N/A this means that the backlog cannot be cleared within existing capacity.

6.4 Your capacity versus your demand
The graphs shows visually core capacity (orange) and ad hoc additional capacity (green) against the number of decisions to admit by week (blue line). ROTT is indicated by the red block. Theoretically if the blue (DTA) line is within the coloured block area there should be sufficient capacity to meet demand minus ROTT.

6.5 Clearing a backlog
- The ‘waiting list consistent with RTT delivery’ is provided as a range and is calculated on the number of weeks which the Trust want the service to admit people within – therefore adjusting capacity has no impact on the calculated sustainable waiting list size.
- In the model the term ‘backlog’ refers to the number of patients waiting over the sustainable waiting list size not those waiting over 18 weeks.
- The model estimates the maximum (not target) waiting list size which will allow you to offer patients a range of dates and still achieve the median wait target.
- The ‘required reduction in backlog’ is calculated from the difference between the estimated sustainable waiting list size and the size of the current waiting list.
- The model calculates the time which will be taken in weeks, to clear the backlog of patients if the service continues with current capacity.

6.6 Sustainable waiting list
- This graph shows how patients would be appointed over the course of the admission period selected in the parameters tab and summarised in the table in this section.

6.7 Understanding and managing risk
The table highlights the proportion of the waiting list which is paused. This is RAG rated as follows; Red if over 5%, Amber if between 2% – 5% and Green if less than 2% of the waiting list is paused. This result does not have an impact on the demand and capacity outputs from the model.

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1 Percentile - measure used in statistics indicating the value below which a given percentage of observations in a group of observations fall, e.g. a score in the 86th percentile is higher than 85% of the other scores – this means that if capacity is set at the 85th percentile the service will have enough capacity in place to meet demand 85% of the time.
7. Graphs tab

7.1 Variation in demand
- The ‘range of distribution’ graph shows visually the amount of variation in demand (DTA) for the service. The less variation there is the more confident you can be to set capacity at the 65th percentile. If there is a lot of variation it may be better to plan capacity on the 85th percentile. This graph is only useful if there are at least 8-10 data points (DTA) per week otherwise the low number distorts the distribution.
- The same information is showed in a different graphical form in the second graph below.

7.2 Actual activity against plan
- The blue data point on the vertical axis is the current waiting list (both dated and undated). The purple line shows what will happen to the waiting list with the current capacity. The green and red lines on the graph indicate the 65th and 85th percentiles of estimated sustainable waiting list. Ideally the purple line would be between the green and red lines.
- The graph can be used to show the impact on the backlog of any changes made in the scenario planning section on the planning tab.
- The graphs can be cut and pasted into other documents such as business cases.

7.3 Your capacity versus your demand
This graph is the same as that on the summary tab (see above).

8. Calculations tab
This section summarises key elements of data entered in the model and shows the methodology behind the calculations. It is included for information only and cannot be edited.

9. Planning Tab

9.1 Planned activity
- Data can be entered into the tables in the planning tab to model the impact of changes in capacity (increases and decreases) on the service.
- The model allows two different changes in capacity to be modelled, each with up to four different elements.
- If additional capacity is to be modelled the number of slots per week should be entered within the scenario with a description of what the additional capacity is. If capacity is being removed the number of slots should be entered with a minus symbol in the scenario section.
- The impact of the scenarios on the waiting list size can be seen in the RAG rated waiting list size at the bottom of each of the two scenarios.
- The scenario start date should be entered into the ‘plan start date’ cell above the scenarios. Changes to capacity do not have to be for the entire 52 week period – if a shorter period is required the change should be entered into the relevant weeks only rather than all the weeks within the table.

9.2 Actual activity
- This table can be used to monitor progress against the planned scenarios. Data should be entered manually.
10. SPC (statistical process control) tab

- The graph shows DTA (demand) plotted on an SPC chart. The chart includes Upper Control Limit (UCL) and Lower Control Limit (LCL)\(^2\) lines and the average (mean) of DTA. This graph again shows the level of variation in demand for the service but also identifies what is normal variation for the service and what is special cause variation (statistically significant unexpected data points).
- Generally speaking most data points within the UCL and LCL are part of the normal variation to be expected in demand for the service.
- Where there are unexpected data points or unusual patterns in the data these are identified on the graph by a red flag and an explanation is included under the graph.
- If there is a step change in the level of DTA this can be seen on the SPC chart. If the step change in the level of DTA demand is expected to remain at the new level the data in the SPC chart can be split to reflect the new level of demand. In this case the data should be split at the first data point of the new pattern using the ‘split chart at week’ drop down box under the chart.
- It would not be appropriate to split the data at less than a quarter of a year as there would be insufficient data points to calculate accurately. If a split is applied the model recalculates using the latest part of the data and the changes can be seen in the summary tab.

11. Model outputs

Key outputs from the model include:

- Weekly waiting list net change - the variation that will be seen on a weekly basis in the waiting list size
- Capacity requirement - based on the current level of demand at the 65\(^{th}\) and 85\(^{th}\) percentile (capacity range)
- Weekly capacity surplus / deficit - presented as a range.
- Backlog and clearance times - based on the sustainable waiting list size for the service

It is important to sense check model outputs against operational reality and with clinicians, including consultants. It may take a couple of iterations of the data before you are satisfied that it is accurate. This may be particularly challenging if there is poor data quality.

12. Reviewing the models

The IST recommends that:

- A note is kept of data sources and any assumptions or exclusions applied through the modelling to inform future iterations of the model – a blank tab within the model can be used for this purpose.
- Trends in demand are monitored and capacity plans reviewed if required.
- The model is reviewed quarterly or sooner if things change.
- The model is completely refreshed at least annually or sooner if things change.

\(^2\) The upper and lower control limits are statistically calculated numbers that define the range of normal variation within the data. Typically they are set at 3 standard deviations from the mean value.
13. Using the models

Further information on demand and capacity modelling is contained within the Elective Care Guide - 'Referral to Treatment Pathways: A Guide for Managing Efficient Elective Care' which is available from the following link:

http://www.nhsimas.nhs.uk/what-we-can-offer/intensive-support-team/rtt-pathways-guide/

If you have any questions regarding the IST demand and capacity models or would like support to use them within your organisation contact us by email to:

nhsimas.ist@nhs.net