NHS Blood and Transplant

NHSBT Board
27 July 2017

Long-term demand forecast – Blood Components

1.   Status – Public

2.   Executive Summary

2.1   This paper sets out the long-term demand forecast for red cells and platelets for 2019-20, 2020-21 and 2021-22 to inform financial and operational planning. Forecast has been developed using a statistical forecast based on historical hospital orders and, then overlaying existing available intelligence on main factors contributing to demand. The paper also describes key uncertainties that could have a significant impact on this forecast.

2.2   Based on current assumptions, red cells demand is expected to continue to decline albeit potentially at a slower pace as hospitals close the gap in terms of implementing patient blood management strategies and the impact of population ageing continues to increase.

2.3   The platelet forecast is more uncertain with the 50% confidence forecast including both a scenario of continued decline and of increased demand. The central scenario for platelets is for broadly flat demand.

2.4   Demand for components with universal blood groups is expected to continue to grow as a percentage of total demand, mainly driven by hospitals' need to simplify activities in transfusion laboratories and further reduce waste.

2.5   This forecast would have to be reviewed if there is a government decision to inject additional funding to the NHS, or if initiatives to reduce inappropriate use of components are less effective than in the last five years or, to a lesser extent, if population growth is significantly different from the ONS population forecast used for this forecast.

3.   Action Requested

The Board is asked to note the new proposed long-term demand forecast and the need to review the Blood Supply 2020 strategic and financials plans to reflect this new demand forecast and other recent developments.

4.   Proposal

Proposed new long-term demand forecast is presented in the table below with 50% confidence intervals.

Red Cells. '000 units

Red cells	Central forecast	50% Confidence - Low	50% Confidence – High	% Change vs. 16/17 - Central	% Change vs. 16/17 – Low	% Change vs. 16/17 - High
2016-17	1,522	n/a	n/a	n/a	n/a	n/a
2017-18	1,464	1,428	1,548	-3.8%	-6.2%	+1.7%
2018-19	1,428	1,365	1,537	-6.2%	-10.0%	+1.0%
2019-20	1,400	1,308	1,525	-8.0%	-13.7%	+0.2%
2020-21	1,373	1,252	1,512	-9.8%	-17.4%	-0.7%
2021-22	1,349	1,196	1,498	-11.3%	-21.1%	-1.5%

Based on this forecast, use of red cells per 1,000 population would reduce from 27.4 units/1,000 pop. in 2016/17 to 23.6 units/1,000 pop. by 2021-22 in the central forecast. Taking the 50% confidence forecast, the potential use by 2021-22 could range from 21.1 units/1,000 pop. to 26.2 units/1,000 pop. Note that other international blood services are already at c21 units/1,000 pop.

Platelets. '000 units

	Central forecast	50% Confidence - Low	50% Confidence – High	% Change vs. 16/17 - Central	% Change vs. 16/17 – Low	% Change vs. 16/17 – High
2016-17	261	n/a	n/a	n/a	n/a	n/a
2017-18	259	241	277	-0.9%	-8.0%	+6.1%
2018-19	259	230	288	-0.9%	-11.9%	+10.1%
2019-20	259	221	297	-0.9%	-15.3%	+13.5%
2020-21	259	213	305	-0.8%	-18.5%	+16.8%
2021-22	259	205	314	-0.8%	-21.6%	+20.1%

5. Background

5.1 In 2006, the DH Analytical Team was commissioned to build a long term demand forecast for NHSBT. That DH Long Term Demand model was not embedded or updated by NHSBT mainly due to its complexity. As a result, there was no agreed demand forecast for 2019/20, 2020/21 and 2021/22 to inform the 5-year strategic and financial planning.

5.2 Following the review of the 2006 DH Analytical model, a decision was made not to update. Instead, it was agreed to develop a new long term demand forecast using NHSBT internal capabilities and a working group representing the Patient Blood Management (PBM) team, clinicians and the Central Planning Team.

5.3 The new forecast is built in two parts:

- Statistical forecast developed by the Statistics and Clinical team based on five years of historical hospital orders.

- Overlay existing intelligence gathered by the PBM and Clinical teams. Focus is on factors that will accelerate or slow down the trends already captured by the statistical forecast.

5.4 So far, long term demand forecast has been developed for red cells and platelets only. The working group is also currently developing a forecast for all plasma components: UK and non UK FFP, UK and non UK cryoprecipitate.

5.5 This long term demand forecast will be refreshed every six months as part of the Integrated Supply Planning process at the Demand Review meetings, by updating the statistical forecast and existing intelligence gathered and documented so far.

6. Methodology and assumptions

6.1 The first stage was to build a new statistical forecast using the R statistical package, based on the last five years of historical demand from hospitals.

6.2 The forecast is built at the level of monthly demand by manufacturing site and ABO/RhD blood group. HLA/HPA-selected platelets were modelled and forecast separately.

6.3 The monthly forecasts by manufacturing site and ABO/RhD blood group were then aggregated to produce forecasts for each financial year until 2021/22, for total red cells and total platelets.

6.4 Detail on the data and a statistical method used is given in Appendix 1.

6.5 The team also contacted other blood services to understand their approach to forecast demand for years three to five. In general, other blood services do not forecast demand beyond two years. The few that do (e.g. Australia, Canada) do also forecast using a statistical forecast using five or six years of historical data and then adjusting it to reflect further changes impacting demand.

6.6 The second stage was to overlay intelligence gathered by the PBM and Clinical teams on external factors impacting demand.

6.7 Those external factors were grouped in two categories:

- *Factors that are having or will definitely have an impact on the demand (up or down)*. These factors were quantified, based on information provided by the working group, and appropriate adjustments were made to the base statistical forecast.

- *Factors where the future impact is unknown or may not materialise*. These are mainly linked to ongoing research studies (e.g. use of whole blood for trauma). A list of these factors has been compiled and will be incorporated, as required as part of the Integrated Supply Planning at the Demand Review every six months.

6.8 External factors with an expected impact on red cells are summarized in the table below, including if the statistical forecast was adjusted.

Factors that are having/will have an impact	Description	Impact on demand	Statistical forecast adjusted?
PBM initiative – appropriate use	• NICE guidelines promoting single pack of RBC in stable patients and restrictive use • Iron use – BSH guidance	Down	No
Clinical practice	▪ Use of Tranexamic acid (TXA) in surgery ▪ Continue increase towards less invasive surgeries/ treatments	Down	No
Patient demographics	▪ Increase in Haemoblobinopathy patients (particularly sickle cell)	Up, varies by blood group	Yes
Population	▪ ONS estimates of population growth by age band (low, high scenarios)	Up	Yes
Waiting time and cancelled operations	▪ Financial constraints impacting on waiting times and cancelled operations for non clinical reason	Down	No

6.9 Demand from haemoglobinopathy patients is assumed to increase by 50% over the next five years in line with the blood group mix of this cohort of patients and statistical forecast has been adjusted accordingly.

6.10 Increase in red cell demand driven by population growth and aging is based on the average ONS population growth scenario by age group, weighted to factor in the different use of red cells by age group based on clinical audits. Due to changes in population structure, faster growth in demand is expected over the next five years, as summarised below.

- 2012-2017: actual growth of 6.8%
- 2017-2021: forecast growth of 8.1%

6.11 For non HLA matched platelets, clinical audits indicate that inappropriate use stands still at c30% of total demand (detailed in Appendix 3). The working group concluded that the rate of reduction of inappropriate use will be similar to the last five years and statistical forecast therefore was not adjusted.

6.12 For platelets, as for red cells, the statistical model was adjusted to account for an acceleration of the impact of the ageing population. Note that for platelets the impact of population changes is smaller than for red cells as platelet use is more intensive in middle age range (40-60) and some of these age groups are expected to actually reduce in size over the next five years.

- 2012-2017: growth 6.2 %
- 2017-2022: growth of 6.5 %

6.13 This demand forecast assumes that hospital waste for red cells and platelets would remain similar to current levels.

6.14 The working group then considered which elements of the forecast could be different and the main ones are the following:

- Significant increase in funding to NHS depending on government policies.

- Assumption that PBM initiatives and clinical practices would have a similar impact over the next five years to what they have had over the last five years.

- To a lesser extent, if future population growth is significantly different from the ONS average population forecast.

7   Conclusion

Based on current context and assumptions, NHS Blood and Transplant should update strategic and financial plans for:

- A continuous decline in the demand of red cells vs. 2016/17 of c11% over five years (-175,000 units), which is less than in the last five year. However, decline could be as high as 20% (-320,000 units)

- For platelets, NHSBT should retain flexibility to increase or reduce production of platelets +/-20%, equivalent c50,000 ATDs.

- A continuous increase in the proportion of universal blood groups (Appendix 4).

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Appendices

Appendix 1: Statistical forecast methodology

Data were extracted from the PULSE database on all clinical requests for blood components from hospitals in England, excluding military bases and transfers to other blood services. Volumes were converted to single-unit equivalents where necessary. Individual components were allocated to macro families (red cells, unmatched platelets, HLA/HPA-selected platelets) and total demand was calculated, producing a monthly time series for each manufacturing site and ABO/RhD blood group. Data from June 2012 to March 2017 were used in modelling (the request data from early 2012 are missing from PULSE).

For each component/site/blood group time series, state-space analysis in R was used to create a model incorporating a local linear trend and a seasonal effect. From these models, forecasts (with standard errors) were then produced for each month from April 2017 to March 2022.

Adjustments for increased demand due to population growth (red cells and unmatched platelets) and haemoglobinopathy treatment (red cells only) were applied at the level of individual blood group forecasts, and then aggregated over blood groups and sites to produce the final forecast figures for total red cells and total platelets presented in section 4.

Appendix 2: Platelets inappropriate use (based on clinical audit 2016)

Category	Total	Appropiate use	Indeterminate	Outside guidelines
Total platelets - forecast outturn 16/17	259,800	161,974	18,498	79,328
Adults	233,820	143,788	18,498	71,534
Children	25,980	18,186	-	7,794
Adults - Haematology	151,983	86,502	18,498	46,983
Adults - Non Haematology	81,837	57,286	-	24,551
Total Adults	233,820	143,788	18,498	71,534
Adults - Haematology - Prophylactic	117,635	64,671	9,510	43,454
Adults - Haematology - Pre-procedure	13,678	8,344	2,736	2,599
Adults - Haematology - Therapeutic	15,502	13,487	1,085	930
Adults - Haematology - Unclear	5,167	-	5,167	
Total Haematology	151,983	86,502	18,498	46,983
Adults - Haematology - Prophylactic - Reversible BMF	54,464	39,214	3,268	11,982
Adults - Haematology - Prophylactic - Chronic BMF (non intensive)	54,464	23,419	545	30,500
Adults - Haematology - Prophylactic - Chronic BMF (intensive)	2,646	2,038	-	609
Adults - Haematology - Prophylactic - Unable to classficy	6,061	-	5,697	364
Total Adults - Haematology - Prophylactic	117,635	64,671	9,510	43,454

Note: Clinical audit did not cover non haematology or children (Assumed similar levels)

Appendix 3: Forecast for universal blood groups

Year	O neg RBC vs. total, %	O neg demand.'000	A neg platelets vs. total, %	A neg platelets demand
2016/17	12.0%	183	15.4%	40.2
2017/18	12.1%	177	15.5%	40.2
2018/19	12.4%	176	16.1%	41.6
2019/20	12.6%	177	16.6%	42.9
2020/21	12.9%	177	17.1%	44.2
2021/22	13.2%	177	17.6%	45.5

Appendix 4: Cancelled operations for non clinical reason

Year	Number of cancelled elective operations	Patients not treated within 28 days of cancellation.	Elective admissions	Cancelled operations as percentage of elective admissions
1994/95	48,129	6,161	4,579,496	1.1%
1995/96	54,483	5,959	4,822,123	1.1%
1996/97	52,047	6,830	4,741,314	1.1%
1997/98	50,505	7,250	4,809,500	1.1%
1998/99	56,150	9,380	5,201,502	1.1%
1999/00	60,242	12,421	5,360,283	1.1%
2000/01	77,818	16,454	5,457,536	1.4%
2001/02	81,743	19,087	5,286,086	1.5%
2002/03	67,254	7,972	5,413,638	1.2%
2003/04	66,303	6,270	5,549,737	1.2%
2004/05	68,569	7,920	5,531,716	1.2%
2005/06	60,803	5,611	5,827,653	1.0%
2006/07	52,005	2,930	5,967,013	0.9%
2007/08	57,382	2,973	6,373,393	0.9%
2008/09	63,644	2,849	6,724,159	0.9%
2009/10	62,296	2,258	6,891,674	0.9%
2010/11	58,295	2,114	6,954,241	0.8%
2011/12	63,517	3,115	7,185,194	0.9%
2012/13	64,195	3,167	7,437,814	0.9%
2013/14	64,195	3,167	7,437,814	0.9%
2014/15	71,482	4,513	7,693,033	0.9%
2015/16	74,258	5,078	7,800,867	1.0%
2016/17	80,642	6,021	7,994,223	1.0%