

## Blood Component Requirements in Covid - 19 Patients – Preliminary Analysis

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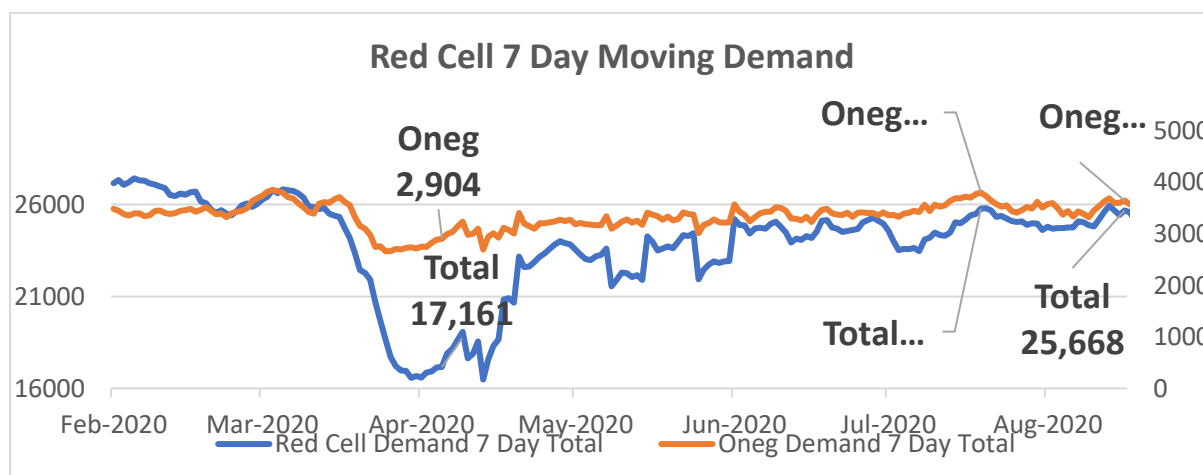
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### Introduction

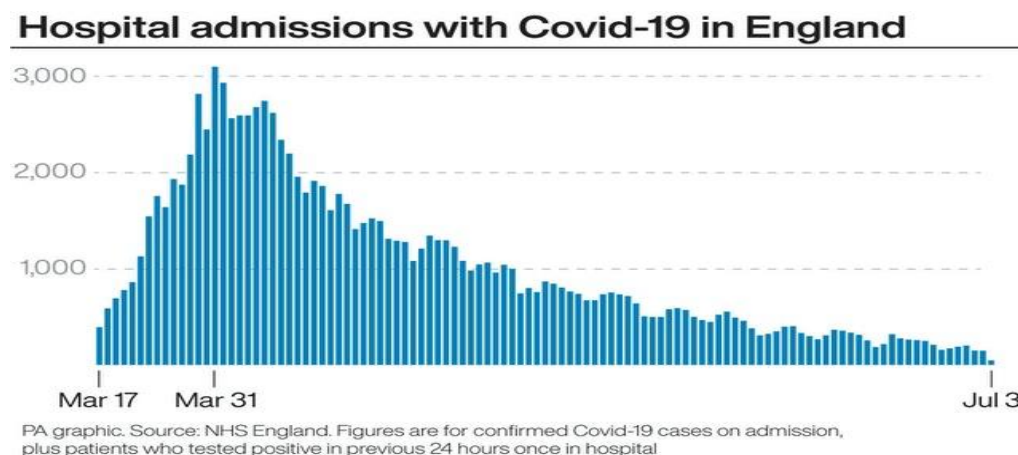
The COVID-19 virus outbreak in England has required NHS Blood and Transplant (NHSBT) and hospitals to respond and mitigate the effects of the pandemic on the supply and demand for blood components. Blood donations fell initially by about 20%. However, this was counterbalanced by an even greater reduction in blood issues to hospitals (Figure 1) due to postponement of elective surgery and the low blood requirements of COVID-19 infected patients. Many hospital blood transfusion laboratories reduced their stock holding of blood to allow for the reduction in blood use and to minimise their wastage. Their demand for blood gradually increased as near normal hospital activity resumed.

Figure 1



To provide further relevant information for this this exercise, the number of admissions of COVID-19 patients over the period of data collection is shown in Figure 2.

Figure 2.



The aims of this study were to determine the following in hospitalised COVID-19 patients: -

- 1) The proportion who received a transfusion.
- 2) The number and type of transfusions received.
- 3) If there was an association with transfusion and the patient's blood group
- 4) Confirm results of previous international studies that blood use in this patient group was minimal

## Methods

In early March 2020, a simple Excel spreadsheet was constructed and distributed to a number of hospitals who volunteered to provide data on the blood requirements of patients with COVID-19. It soon became apparent that an increasing number of hospitals were interested in submitting these data and it was obvious that collating this information via multiple spreadsheets was unwieldy.

As a result, hospitals were asked to submit data via an online data submission system (SNAP surveys ©). SNAP Surveys is a standard data collection tool allowing bespoke interfaces for data entry to be activated online. It is widely used in the NHS and Government.<sup>1</sup>

Data obtained from these two methods of data submission have been analysed separately.

### Dataset: Online Submission

Datasets were downloaded from SNAP. There was a total of 3352 entries. Data were analysed in two groups; those patients receiving ECMO (Extracorporeal membrane oxygenation) and those not receiving ECMO. There were 844 patients receiving ECMO, and 2508 non-ECMO patients of which 1051 were on intensive therapy units (ITUs) with 1457 on the wards.

### Final Dataset After Cleaning

For the purposes of this preliminary report, data were examined for missing items or cumulative data entered as a single submission. These entries have been removed from the analysis as follows:

- For ward and ICU patients, 106 transfusions were excluded where >4 units of red blood cells (RBCs) given as a single transfusion episode likely indicated major haemorrhage unrelated to COVID-19.
- 103 ECMO transfusions involved  $\geq 4$  units of RBCs given as a single transfusion episode

## Analysis

Data have been summarised using simple proportions and totals and analysed in Microsoft Excel © for both the online and spreadsheet submitted data. Excel analytical tools for charts and percentages were used for both online and spreadsheet submitted data

## Results

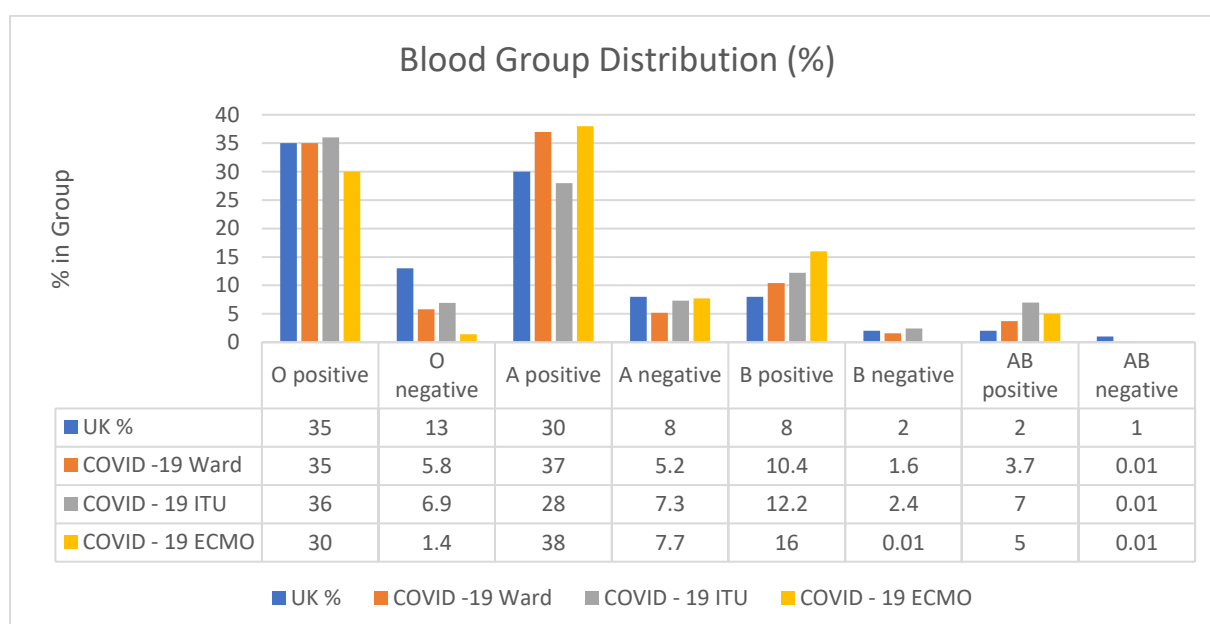
### Demographics

65 hospital sites contributed data. In total, there were 2228 (65%) transfusions to male (65%) and 1106 (35%) to female patients. 18 cases had no gender assigned. In total, 37 data items were missing. Table 1 indicates number and percentage of RBC transfusions on wards and ITUs and the median age and range in both locations. Docherty et al (2020) in a recent analysis of over 16,000 UK COVID-19 admissions found that this comprised 60% male and 40% female patients with a median age of 72 years.<sup>2</sup>

**Table 1**

Gender	Ward	ITU	ECMO	Median Age Ward (range)	Median Age ITU (range)	Median Age ECMO (range)
Female Tx	587/1454 (40.3%)	282/1047 (27%)	236/833 (28%)	72 years (13-101)	57 years (20-85)	40 years (20-72)
Male Tx	867/1454 (59.5%)	765/1047 (73%)	597/833 (71%)	73 years (13-101)	61 years (16-85)	47 years (25-77)

Figure 3 indicates the distribution of blood groups of the transfused patients with COVID-19 infection in this dataset. There were no major differences in the distribution of blood groups between the normal UK population and transfused COVID-19 patients treated on wards, ITUs or with ECMO.



**Ward patients (Figure 4)**

**RBCs**

There were 1291 episodes when RBCs were transfused. These involved the administration of between 1 and 4 units of RBCs. In total, 2017 (median = 1) were given by 61 sites involving 874 patients.

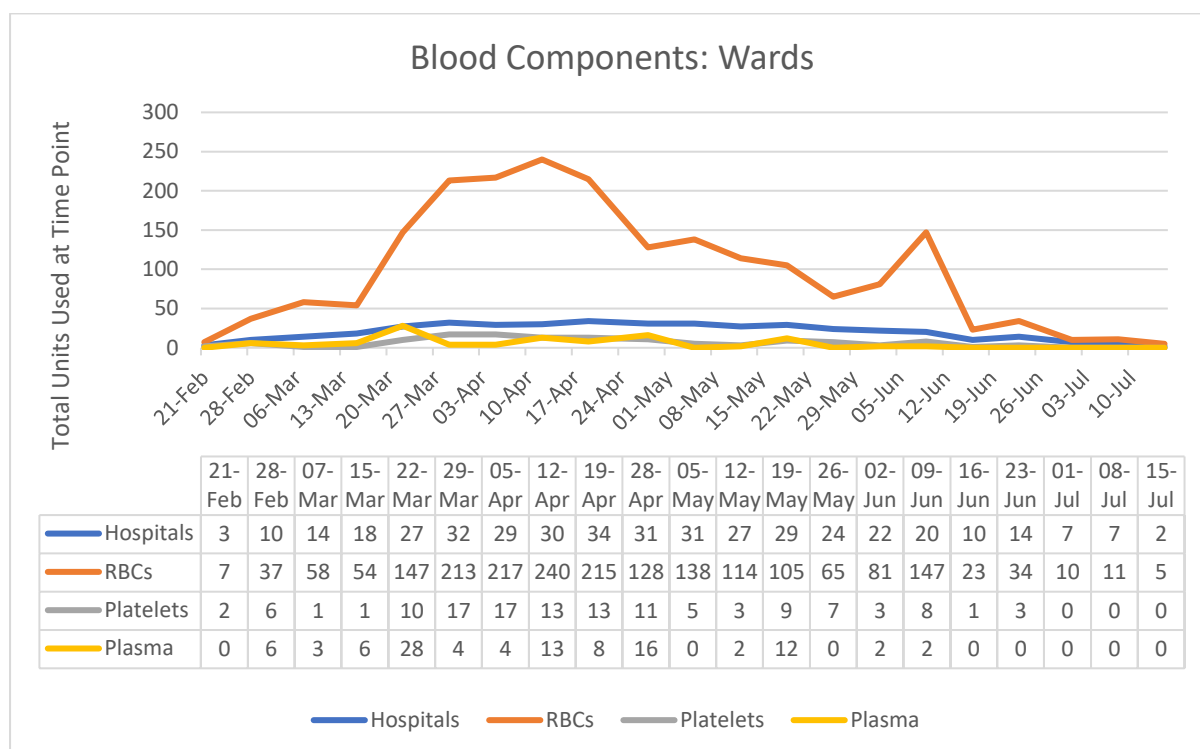
**Platelets**

A total of 130 units of platelets were transfused to ward based patients between February and July 2020 in those sites who submitted data

**Plasma**

106 units of plasma (FFP, Cryoprecipitate, plasma) were transfused to ward based patients between February and July 2020 in those sites who submitted data.

**Figure 4.**



**ITU patients (Figure 5)**

**RBCs**

For ITU patients, there were 932 episodes when RBCs were transfused. These involved the administration of between 1 to 4 units of RBCs. In total, 1304 (median = 1) units of RBCs were given to 459 individual patients at 51 sites. 17 sites accounted for 78% of the patients in ITUs for the data collected over this time period.

**Platelets**

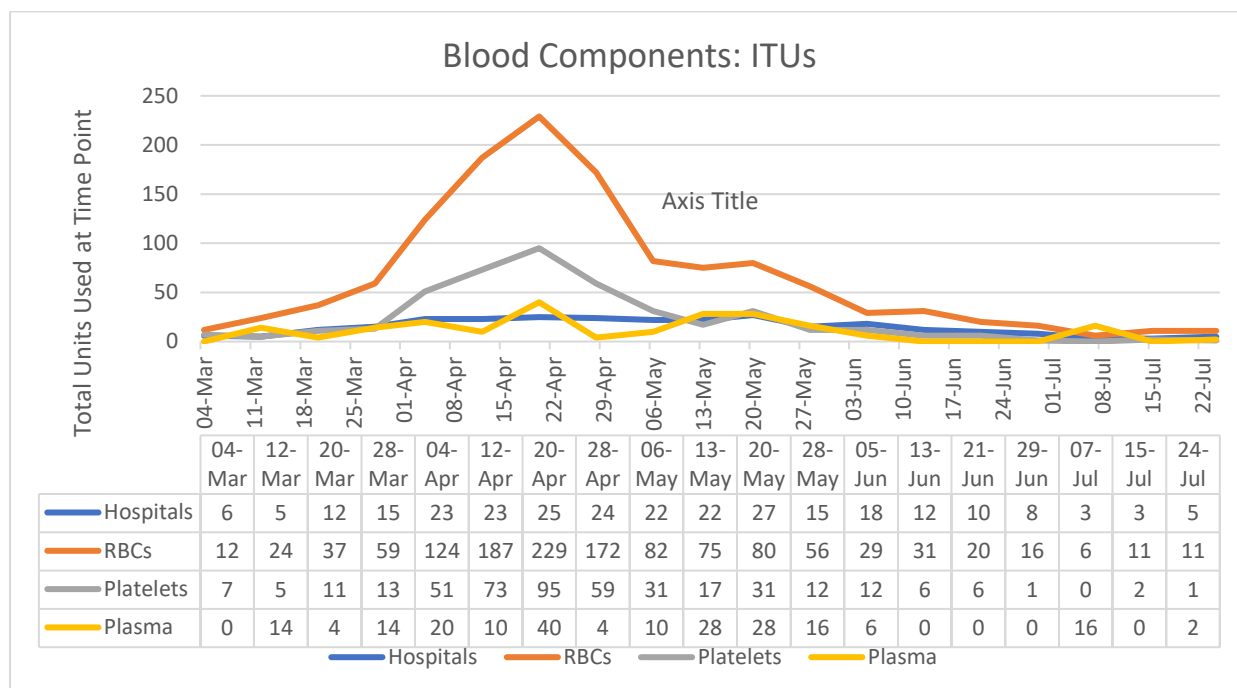
A total of 433 units of platelets were transfused to ITU based patients between February and July 2020 in those sites who submitted data.

**Plasma**

A total of 203 units of plasma were transfused to ITU based patients between February and July 2020 in those sites who submitted data.

Use of components in addition to RBCs is substantially higher in ITU patients than those on wards.

Figure 5.



**Estimate of the proportion of patients who required a transfusion in a selection of sites**

Data regarding COVID-19 bed occupancy was used to provide this estimate. It was found at: <https://www.england.nhs.uk/statistics/statistical-work-areas/covid-19-hospital-activity/>

Table 3 shows the low percentage of COVID-19 patients requiring RBC transfusions at a small number of sites.

Table 3

Site	27/4/20 COVID -19 Bed Occupancy	RBC Tx	%
Norfolk and Norwich University Hospitals NHS Foundation Trust	62	2	3
University College London Hospitals NHS Foundation Trust	94	4	4
Chelsea and Westminster Hospital NHS Foundation Trust	137	5	3.6
The Newcastle Upon Tyne Hospitals NHS Foundation Trust	182	2	1
Royal United Hospitals Bath NHS Foundation Trust	42	3	7
Site	10/5/20 COVID - 19 Bed Occupancy	RBC Tx	%
Royal Preston	65	4	6
Derby Royal	117	1	<1
Doncaster and Bassetlaw NHSFT	104	0	0%
Eastbourne DGH	61	0	0%

## **ECMO Patients**

### **RBCs**

845 red blood cell transfusions were given to patients on ECMO. All of these patients were on ITUs. Some large datasets on ECMO patients have been submitted via spreadsheets and will be collated in the final report. Online submissions were from three principal sites, Papworth Hospital: 418 transfusion submissions; The Royal Brompton Hospital: 286 submissions; and Wythenshawe Hospital: 36 submissions. These represent 87% of ECMO red blood cell transfusions submitted online.

ECMO transfusions at these three sites involved 96 individual patients.

**Table 4 – Number of RBC transfusions in 96 ECMO patients**

<b>Gender</b>	<b>ECMO</b>	<b>Median Age ECMO Patient</b>
Female	236/833 (28%)	40 years (20-72)
Male	597/833 (72%)	48 years (25-77)

The bulk of ECMO patients received 1 unit of RBCs each time but each patient received several units over a protracted period of time. In total ECMO patients accounted for 845/1896 (45%) of the total number of all component transfusions given on ITUs.

### **Platelets**

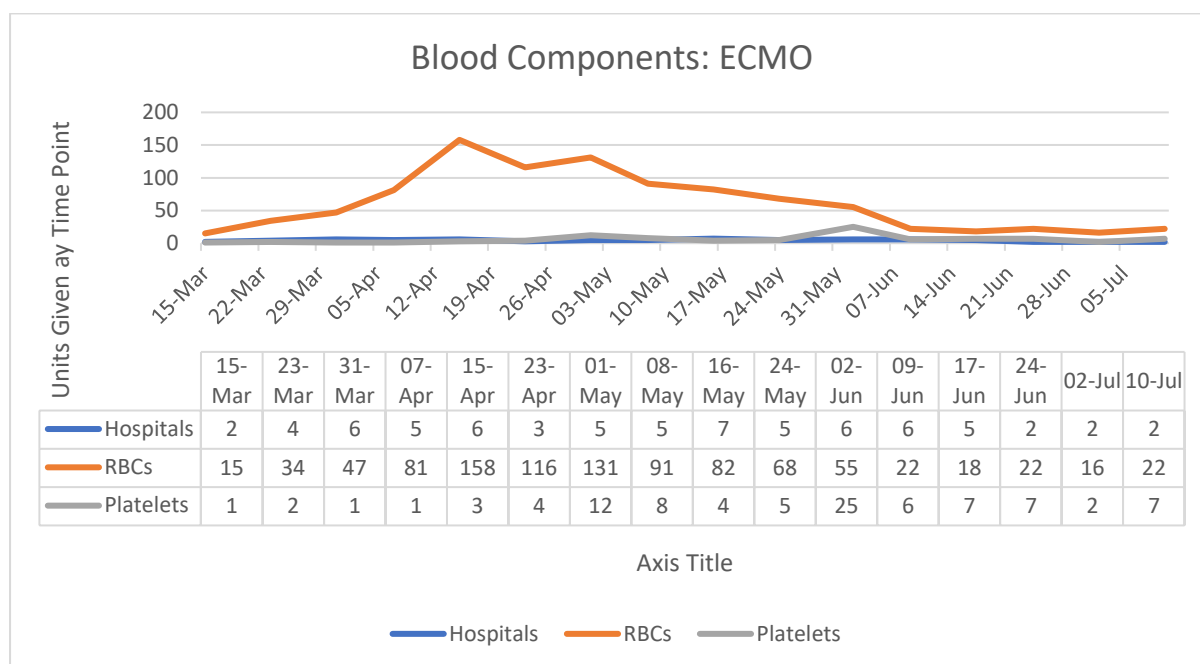
101/845 (12%) of ECMO patients received platelet transfusions. A total of 157 units were given to 36 patients.

### **Plasma**

A total of 923 units of plasma was used in 118 (14%) of patients. 212 units were defined as FFP but the FFP fields were added at a later date. However, annotations indicate that when the FFP data field was not included on the form, that FFP was in fact used. This suggests the bulk of plasma used was FFP. 155 units were specifically defined as cryoprecipitate.

Figure 6 shows the timeline of the use of transfusions of RBCs and platelets., Plasma transfusions were combined (Plasma + Cryoprecipitate + and Fresh Frozen Plasma (FFP) and time lines for plasma administration have been omitted from the chart as a significant proportion of dates were not submitted. The trend however was that plasma transfusions to ECMO patients were higher than the other two areas (wards and ITUs).

**Figure 6**



**Limitations of the dataset**

- Some sites entered details as a cumulative submission of transfusions rather than on separate days making use of this data difficult to analyse.
- Some patients were undergoing elective surgery and some haematology patients received large amounts of components for reasons likely to be unrelated to COVID-19. It was difficult to determine if component transfusions are related to COVID-19 or whether these patients would have received component transfusions regardless of COVID-19.
- No information was available about the clinical need for transfusion and whether the transfusion was appropriate.
- Some aspects of data submission were not submitted (dates) for plasma transfusions making timelines analysis difficult.

**Discussion**

This collection of data regarding blood use for COVID-19 infected patients started as a voluntary exercise in a few hospitals but its existence spread by word of mouth. It rapidly resulted in a considerable demand from other hospitals to participate indicating the appetite amongst hospital transfusion services to work together and learn from each other. This increase in participating hospitals necessitated a change in the method of data collection from the use of single spreadsheets to an online data submission. This report provides an analysis of the data submitted online. In due course, these data will be combined with the data from the hospitals submitting spreadsheets. The difficulty in collecting such simple but important data on blood use from hospitals indicates a need to identify and implement better methodology for doing so. It should be fully electronic; such data would be of value for NHSBT demand planning not only during extreme situations as experienced in the COVID-19 pandemic. This is in line with TRANSFUSION 2024 recommendations, and it will require some resources to develop and implement.

The data on blood use for patients with COVID-19 confirms that their transfusion requirements were small. This low blood use combined with postponement of much elective clinical activity allowed continuation of a sufficient blood supply despite a major reduction in blood donations at the beginning of the COVID pandemic in England. Further analyses are required to determine more precisely the

proportion of COVID-19 patients requiring transfusion. Such data could support future forecasts for demand if admissions with COVID-19 increase in the next few months.

### **Data Submitted Via Spreadsheet**

Some large datasets have been submitted via spreadsheets early on in this survey. At the current time, these are being analysed separately as time lines are difficult to ascertain in some data sets due to the limited amount of data submitted due to COVID pressures and changes in data fields. These data will be included in the final report

### **Future plans**

We are grateful to the hospitals who willingly supplied the information to support this small study. We feel it would be beneficial to continue this data collection and we will work to address some of the limitations outlined in this paper to enable further analysis of the effect of COVID-19 on blood requirements.

### **References**

1] Snap Suveys: [www.snapsurveys.com](http://www.snapsurveys.com)

2] AB Docherty , EM Harrison et al 2020. Features of 16,749 hospitalised UK patients with COVID-19 using the ISARIC WHO Clinical Characterisation Protocol. medRxiv preprint doi: <https://doi.org/10.1101/2020.04.23.20076042>



## Appendix 1 – Sites Submitting Data

Addenbrooke's Hospital  
Alexandra Hospital Redditch  
Birmingham City Hospital  
Blackpool Victoria Hospital  
Calderdale Royal Hospital  
Central Middlesex Hospital  
Chelsea and Westminster Hospital  
Christie Hospital Manchester  
Countess of Chester Hospital  
County Hospital Hereford  
County Hospital Hereford  
Derriford Hospital Plymouth  
Diana, Princess of Wales Hospital Grimsby  
Doncaster Royal Infirmary  
Dorset County Hospital  
Ealing Hospital  
East Surrey Hospital Redhill  
Eastbourne District General Hospital  
Fairfield General Hospital Bury  
Freeman Hospital Newcastle-upon-Tyne  
Frimley Park Hospital Surrey  
Harefield Hospital  
Huddersfield Royal Infirmary  
James Paget University Hospital Great Yarmouth  
Lincoln County Hospital  
Liverpool Heart and Chest Hospital  
Macclesfield District General Hospital  
Manchester Foundation Trust  
Norfolk and Norwich University Hospital  
Northumbria Specialist Emergency Care Hospital  
Northwick Park Hospital Harrow  
Papworth Hospital  
Pilgrim Hospital Boston  
Queen Elizabeth Hospital Birmingham  
Royal Brompton Hospital  
Royal Derby Hospital  
Royal Devon and Exeter Hospital ( Main Wonford site)  
Royal Preston Hospital  
Royal Surrey County Hospital Guildford  
Royal United Hospital Bath  
Royal Victoria Infirmary Newcastle-upon-Tyne  
Russell's Hall Hospital Dudley  
Sandwell General Hospital West Bromwich  
Scarborough General Hospital  
Southampton General Hospital  
Southmead Hospital  
St. Peter's Hospital Chertsey  
St. Richard's Hospital Chichester

Stepping Hill Hospital Stockport  
The James Cook University Hospital Middlesbrough  
The John Radcliffe Hospital  
The Queen Elizabeth Hospital Kings Lynn  
The Whittington Hospital  
Torbay Hospital Torquay  
University College Hospital (London)  
Watford General Hospital  
West Suffolk Hospital Bury St. Edmunds  
Weston General Hospital  
Wexham Park Hospital Slough  
William Harvey Hospital Ashford Kent  
Worcestershire Royal Hospital  
Worthing Hospital  
Wythenshawe Hospital Manchester

### **Additional Sites Submitting Via Spreadsheets**

Chesterfield Royal Infirmary  
University Hospitals Derby  
Princess Alexandra Hospital Harlow  
Macclesfield DGH  
Royal Bolton Hospital  
Musgrove Park Hospital  
Rotherham DGH  
Warrington and Halton NHSFT  
Bradford THFT  
York THFT  
East Sussex (Eastbourne) NHS Trust  
Royal Oldham Hospital  
Bradford THFT  
London North West  
Royal Free Hospital  
South Tees Hospital FT  
Ashford and St Peters NHSFT  
Royal United Hospitals Bath