# Supplementary File 18: Costing exercise methodology and results

The costs of the intervention were collected from a combination of top-down (gross-costing) and bottom-up (micro-costing) methods, depending on the type and quality of data available. Top-down involved for example, dividing an overall cost by the number of participating staff or sites; bottom-up involved for example, calculating an average cost-per-participating-staff-member-per-site and multiplying up by the number of sites. All costs are expressed in 2017/18 UK pounds. All salary costs used were taken at the approximated midpoint of the NHS 2017/18 salary band. For the purposes of this analysis there were 185 sites in Trial 1 and 194 sites in Trial 2.

The costs given are broken down into:

* Cost of collecting audit data
  + The costs of collecting audit data were divided into cost of time by NHS staff completing audit booklets, and time inputting this data into NHSBT’s online system. The inputting data was further broken down into NHS and NHSBT staff time inputting data.
* Cost of developing and delivering the audit reports
  + (intervention report vs usual report).
* Cost of delivering the Follow-on Support interventions
  + (intervention support vs usual support/no support).
* Cost of extra activity conducted by sites as a result of participating audit.
* Cost of volume of blood transfused.

For each of the analyses (Figure 4), these costs have been aggregated for ease of understanding into:

* The costs of audit components: consisting of the costs of NHS and NHSBT staff time in recording audit data in audit booklets and uploading them on the NHSBT system;
* The costs of the feedback components: consisting of the telephone intervention (both research staff and NHS staff); and the online toolkit (running costs and NHS staff time spent using the toolkit);
* The costs of writing and delivering audit reports: consisting of paid staff time in developing the content of both the standard and enhanced reports and the ‘production’ costs of delivering the audit to all participating sites.

The unit costs presented here are given at site level, and we have attempted to be as clear as possible regarding whether a particular cost applies to a single audit round, or both audit rounds of a given Trial. All costs presented have be rounded to the nearest whole number (where appropriate).

## Parameters 1: Cost of collecting audit data

The total cost of collecting audit data for Trial 1 was £93,841; and for Trial 2 was £110,507. These costs were divided equally between comparison arms in the cost-effectiveness analysis and the uncertainty around these estimates were explored in the probabilistic sensitivity analysis. These estimates were based on data obtained from NHSBT. The data on audit-book completion time was self-reported by clinicians as they completed the booklets. The data on inputting online was drawn from system logs. See tables below.

#### Table 1: Breakdown of costs of collecting audit data for Trial 1

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| Time and cost of completing audit booklets (Trial 1) | | |
| Mean time take to complete audit booklets | 28.4 minutes  (SD = 55.5) | Median time was 27 minutes  (IQR 18;37) |
| Weighted average salary for NHS staff | £38,387 per annum  £0.31 per minute | Based on description of 217 staff who completed booklet |
| Number of patients audited in T1R1\* | 4035 |  |
| Total cost of time spent completing audit booklets T1R1 | £35,211  (SD = £24,450) |  |
| Number of patients audited in T1R2 | 3266 |  |
| Total cost of time spent completing audit booklets T1R2 | £28,500  (SD = £19,790) |  |
|  |  |  |
| Total cost of both audit rounds | £63,711  (SD = £44,240) |  |
| Cost per site | £418  (SD = £290) |  |
|  | | |
| Time and cost of inputting audit booklet data online (Trial 1) | | |
| Mean time taken to enter data online | 25.7 mins for NHS staff (SD = 55.5)  6.8 minutes for NHSBT staff (SD = 3.5) | Median time for NHS and NHSBT was 10 and 6 minutes respectively |
| Weighted average salary for NHSBT staff | £38,726 per annum  £0.31 per minute | Based on records of staff tasked with inputting data |
| Number of NHS entries | 3769 | These are system logs of data being entered, therefore not necessarily 1 entry per booklet |
| Cost to NHS of time spent inputting data | £29,840  (SD = £64,283) |  |
| Number of NHSBT entries | 138 | These are audit booklets returned to NHSBT with data that need inputting online. Postage costs not included. |
| Cost to NHSBT of time spent inputting data | £257  (SD = £423) |  |
|  |  |  |
| Total cost of inputting data online | £30,130  (SD = £64,434) |  |
| Cost per site | £198  (SD = £422) |  |

#### Table 2: Breakdown of costs of collecting audit data for Trial 2

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| Time and cost of completing audit booklets (Trial 2) | | |
| Mean time take to complete booklet | 27 minutes  (SD = 31) | Median time was 19 minutes  (IQR 11;27) |
|  |  |  |
| Weighted average salary for NHS staff | £39,748 per annum  £0.32 per minute | Based on description of 163 staff who completed booklet |
| Number of patients audited in T2R1 | 4098 |  |
| Total cost of time spent completing audit booklets T2R1 | £35,240  (SD = £40,461) |  |
| Number of patients audited in T2R2 | 4098 |  |
| Total cost of time spent completing audit booklets T2R2 | £35,240  (SD = £40,461) |  |
|  |  |  |
| Total cost of both audit rounds | £70,481  (SD = £80,922) |  |
| Cost per site | £464  (SD = £532) |  |
| Time and cost of inputting audit booklet data online (Trial 2) | | |
| Mean time taken to enter data online | 25.7 minutes for NHS staff  6.8 minutes for NHSBT staff | No data available for Trial 2. Therefore Trial 1 values used |
| Number of NHS entries | 4692 |  |
| Cost to NHS of inputting data | £38,465  (SD = £82,864) |  |
| Number of NHSBT entries | 744 | These are audit booklets returned to NHSBT with data that need inputting online. Postage costs not included. |
| Cost to NHSBT of inputting data | £1,560  (SD = £814) |  |
|  |  |  |
| Total | £40,026  (SD = 83,678) |  |
| Cost per site | £263  (SD = 551) |  |

## Parameters 2: Cost of developing and delivering audit reports

The costs presented below represent 2 audit rounds. No data was available on estimating the variance around each of these values. The estimates are based on a combination of minutes from report-writing meetings and training sessions, as well as conversations with AFFINITIE and NHSBT staff on their roles and time spent working

on standard and enhanced reports.

#### Table 3: cost breakdown for developing and delivering the Standard report

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| Writing Group costs |
| Writing Groups meetings | £415 | 800 cumulative minutes.  8 members of group (not all in attendance at every meeting). |
| Additional work done by writing group members | £3,758 | Est. 12 hours per member for 5 paid members of writing group. |
| Additional work done by audit lead | £1,148 | Est. 50 hours  (From consultation with AFFINITIE team) |
|  |
| Production Costs |
| NHSBT Programme director time | £2,295 | Est 82 hours  (Time working on audit feedback for 2 rounds) |
| NHSBT analyst time | £5,356 | 0.5 FTE, 1 year |
| Building audit on NHSBT system | £2,800 | For 2 audit rounds |
|  |  |  |
| Total | £15,773 |  |
| Cost per site | £104 | (76 sites) |

#### Table 4: cost breakdown for developing and delivering the Enhanced report

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| Enhanced Writing Group costs |
| Training writers of audit report | £1,274 | 4-6 members per meeting.  25 cumulative hours |
|  |  |  |
| Cost of time spent at writing groups meetings | £3026 | 11 members of group (not all in attendance at every meeting).  146 cumulative hours |
| Additional work done by writing group members | £2,565 | For 7 paid members of writing group.  Est. 12 hours per member |
| Additional work done by audit lead | £2,213 | Est. 50 hours  (From consultation with AFFINITIE team) |
| Cost of time of AFFINITIE Researcher | £18,512 | 1 years at 0.4 FTE, not including time in training and meetings. |
|  |
| Production Costs |
| NHSBT Programme director time | £2,295 | Est 82 hours  Time working on audit feedback |
| NHSBT analyst time | £5,356 | 0.5 FTE, 1 year |
| Building audit on NHSBT system | £2,800 | For 2 audit rounds |
| Graphic design consultant time | £4000 |  |
| AFFINITIE statistician | £14,980 | .25 FTE medical statistician for 16months.  (Does not include time at meetings) |
| Algorithm development | £2,615 |  |
|  |  |  |
| Total | £59,637 |  |
| Cost per site | £392 | (76 sites) |

## Parameters 3: Cost of delivering follow-on-support programmes

The costs of the telephone support service (TSS) and the online toolkit are both presented below. The estimates for the TSS are based on call logs recorded by the telephone system, and on shift rotas for the research staff responsible for making and receiving calls to hospital staff. No information was available about who the calls were made to, so we have assumed that it was always a Band 7 (mid-point) nurse transfusions practitioner (TP) who was making/answer calls. TSS records contain data on shifts that were either 3 hours in the morning or 2.5hours in the afternoon for November 2015.

#### Table 5: cost breakdown for the Telephone Support Service

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| TSS shifts (Trial 1) |
| Total time on shifts | £2364 | 123 hours of shifts by 3 different researchers, including 24 cumulative hours of training sessions |
| Call logs (Trial 1) |
| NHS staff time on phone | £371  (SD = £268) | 1,264 minutes  (SD = 912) |
| Phone line cost | £12.60 | 0.01p per minute (sourced from City University who provided the service) |
|  |  |  |
| Total | £2,747  (SD = £2,644) |  |
| Cost per site | £36  (SD = £35) |  |
|  |
| TSS shifts (Trial 2) |
| Total time on shifts | £2,951 | 157 hours of shifts by 3 different researchers, including 24 cumulative hours of training sessions |
| Call logs (Trial 2) |
| NHS staff time on phone | £289  (SD = 221) | 986 minutes  (SD = 752) |
| Phone line cost | £9.86 | 0.01p per minute |
|  |  |  |
| Total | £3,273  (SD = £3,179) |  |
| Cost per site | £43  (SD = £42) |  |
| \*All costs rounded to nearest whole number (where appropriate) | | |

The usage cost of the online toolkit are based on system logs, and the development costs are based on consultation with the AFFINITIE and NHSBT teams. The development costs are not included in the economic evaluation as they are one-off costs and not relevant to the ongoing use of the toolkit. The toolkit was made available for both standard and enhanced arms of the trial, and records were kept on the usage level of the toolkit for both arms. We had no data on who was using the toolkit, so we have assumed that the NHS staff member using the online toolkit is always a mid-point Band 7 Nurse Transfusion Practitioner.

#### Table 6: cost breakdown for the Online Toolkit

|  |  |  |
| --- | --- | --- |
|  | Value | Notes |
| Development costs |
| Lead Researcher at 0.4 FTE for 2 years | £37,539 |  |
| Computer Science staff | £70,238 |  |
| Server hire (annual) | £667 |  |
| Total Development cost | £108,444 |  |
|  | | |
| running cost | £667 | server hire cost (annual) |
| Running cost per site | £4.40 | For each of Trials 1 and 2 |
| NHS staff usage – Trial 1 | **Mean (SD)** |  |
| Standard arm average duration of use | 116 minutes  (159) | 2670 minutes logged on across 23 sites |
| cost per site | £14.60  (£18.50) | including running costs |
|  |  |  |
| Enhanced arm average duration of use | 35 minutes  (£51) | 909 minutes logged on across 26 sites |
| Cost per site | £7.90  (£9.50) | including running costs |
| NHS staff usage – Trial 2 |  |  |
| Standard arm average duration of use | 10 minutes  (14) | 220 minutes logged on across 24 sites |
| cost per site | £5.30  (£5.70) | including running costs |
|  |  |  |
| Enhanced arm average duration of use | 19 minutes  (26) | 233 minutes logged on across 15 sites |
| Cost per site | £5.50  (£5.90) | including running costs |

## Parameters 4: Cost of additional activity by NHS staff as a result of receiving audit report

The data on additional activity that NHS staff undertook as a result of receiving the audit reports and interventions was measured as part of an online questionnaire. The questionnaire was primarily qualitative in focus, but included two questions in particular that were relevant to the economic evaluation. These were:

* Q17b. Please estimate approximately how many hours you spent planning your response to feedback. (free text)
* Q20b. Please specify approximately how many meetings the feedback materials were shared/ discussed at. (free text)

The level of missing data was problematic for this analysis, with only a fraction of the 76 sites in each arm responding to the questionnaire after cleaning (standard content arm = 26; enhanced content arm = 22; standard FoS arm = 22; enhanced FoS arm = 23). Furthermore, 18% of Q17b responses were missing and 10% of Q20b. The data for both questions was analysed in Stata15 (StataCorp (2017) Stata Statistical Software: Release 15) using generalized linear modelling (using a gamma distribution).

For Question 17b we assumed the respondent and therefore hours worked was performed by a Nurse TP (mid-point band 7). Regarding question 20b, the composition of these meetings was unknown. However the majority of respondents noted that the meeting the report was shared at was a “Haematology Transfusion Committee” (HTC) or a derivation thereof. Consultation with AFFINITIE team suggested that an HTC would be comprised of a minimum of 3 senior consultants (10 years+), 2 nurse specialists (Band 7), 2 managers (Band 8a) and 2 executive-level managers (Band 8d). We therefore estimated the cost of an HTC meeting would be £284 per hour.

For the purposes of the analysis, we assumed that the costs calculated would apply to all sites (for each trial), since all NHS trusts receive the reports and should have some discussion in the form of an HTC which would likely require some work done on the part of a relatively junior member of staff to prepare and present at this HTC.

#### Table 7: cost breakdown for additional NHS staff activity – Trial 1

|  |  |  |
| --- | --- | --- |
|  | Mean (SE) | Hours spent (SE) |
| Cost of time Nurse TP spent on planning their response to audit report (per site) | | |
| Standard content | £144.56  (£30.36) | 8.2 hours  (1.7) |
| Enhanced content | £166.32  (£35.45) | 9.4 hours  (2.0) |
| Standard FoS | £132.70  (£30.36) | 7.5 hours  (1.7) |
| Enhanced FoS | £178.98  (£35.45) | 10.2 hours  (2.0) |
| Cost of time at meetings the report was discussed at (per site) | | |
| Standard content | £1091.47  (£174.43) | 3.8 hours  (0.61) |
| Enhanced content | £1051.13  (£173.86) | 3.7 hours  (0.61) |
| Standard FoS | £1101.41  (£175.85) | 3.9 hours  (0.62) |
| Enhanced FoS | £1040.62  (£172.16) | 3.7 hours  (0.61) |
| SE = standard error of the mean | | |

#### Table 8: cost breakdown for additional NHS staff activity – Trial 2

|  |  |  |
| --- | --- | --- |
|  | Mean (SE) | Hours spent (SE) |
| Cost of time Nurse TP spent on planning their response to audit report (per site) | | |
| Standard content | £100.10  (£20.05) | 5.7  (1.1) |
| Enhanced content | £89.77  (£18.15) | 5.1  (1.0) |
| Standard FoS | £109.24  (£22.94) | 6.2  (1.3) |
| Enhanced FoS | £83.17  (£15.95) | 4.7  (0.9) |
| Cost of time at meetings the report was discussed at (per site) | | |
| Standard content | £819.88  (£109.09) | 2.9  (0.38) |
| Enhanced content | £852.27  (£114.49) | 3.0  (0.4) |
| Standard FoS | £956.90  (£134.66) | 3.4  (0.47) |
| Enhanced FoS | £726.98  (£92.90) | 2.6  (0.33) |
| SE = standard error of the mean | | |

## Parameters 5: Cost of volume of blood transfused

Data on the volume of blood transfused is presented below. This data was collected at cluster level, and was converted to site level in for this analysis by dividing the volume of blood transfused in each arm by the number of clusters in each arm and multiplying by the number of sites in each arm. For Trial 1 data was only available on the volume of red blood cells (RBC) transfused; for Trial 2 data was available for platelets as well as RBC. The unit cost of RBC and platelets are given “Unit costs” section of the main report. The number of sites is given in the “Budget impact and intervention cost-neutral analysis” section of the main report.

#### Table 9: cost breakdown for volume of blood transfused

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Cost for all sites | SD |  | Mean per site | SD |
| Trial 1 |  |  |  |  |  |
| Standard Content | £90,961,967 | £65,350,799 |  | £492,619 | £353,711 |
| Enhanced Content | £116,022,150 | £83,362,731 |  | £628,189 | £451,178 |
| Standard FoS | £93,619,300 | £63,271,664 |  | £506,982 | £342,474 |
| Enhanced FoS | £103,757,875 | £79,280,997 |  | £561,808 | £429,036 |
| Trial 2 |  |  |  |  |  |
| Standard Content | £130,914,365 | £102,720,804 |  | £675,173 | £529,887 |
| Enhanced Content | £133,779,463 | £110,394,066 |  | £689,873 | £569,421 |
| Standard FoS | £112,903,993 | £88,467,971 |  | £582,805 | £456,528 |
| Enhanced FoS | £119,570,002 | £88,812,870 |  | £617,084 | £458,331 |