



Oxford University Hospitals
NHS Foundation Trust



UCL

Economic value of clinical decision support
allied to direct data feedback to clinicians:
blood usage in haematology

Background

Blood transfusions have been identified as one of the most over-used therapies both in the United States and in England through the 'Choosing Wisely' initiatives, which support evidence-based care to minimize the harms of over treatment.

Aim

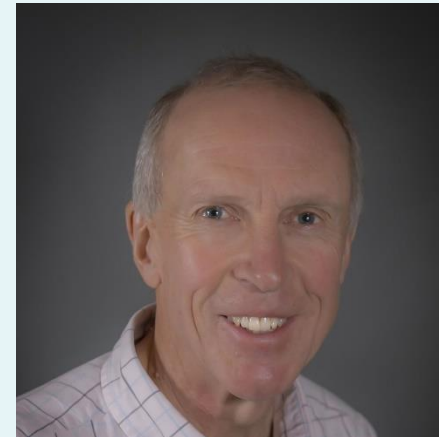
To reduce the volume of blood transfused outside of clinical guidelines.

- Nick Swart, University College London

- Professor Steve Morris, University College London



- Professor Mike Murphy, Oxford University



Contents of this presentation:

1. About the A&F Intervention
2. Interrupted Time Series Analysis
3. Scenario Analysis
4. Difference in Differences Analysis
5. Strengths/Limitations/Questions

The A&F Intervention

Audit

- Clinical Decision Support System
 - Electronic blood ordering system
 - Enter patient clinical characteristics
 - Guidelines-based prompts/alerts

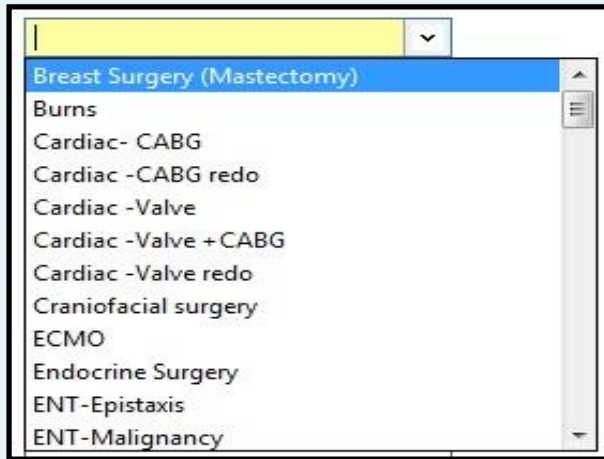
Feedback

- Monthly meetings
 - Junior haematology doctors
 - Transfusion practitioners
 - Haematology Consultant

CDSS system implemented in May 2014, first feedback session end of May 2014.

Intervention

The CDSS

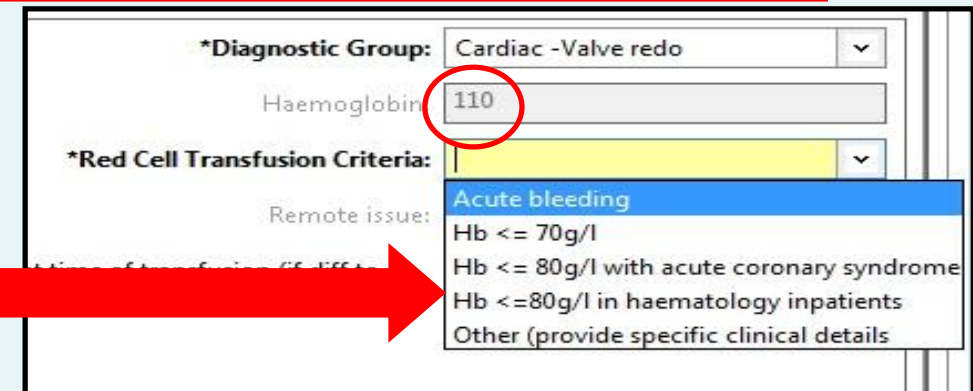


A screenshot of a software interface showing a dropdown menu for diagnostic groups. The menu is open, displaying a list of options: Breast Surgery (Mastectomy), Burns, Cardiac - CABG, Cardiac - CABG redo, Cardiac - Valve, Cardiac - Valve + CABG, Cardiac - Valve redo, Craniofacial surgery, ECMO, Endocrine Surgery, ENT - Epistaxis, and ENT - Malignancy. The 'Breast Surgery (Mastectomy)' option is currently selected and highlighted in blue.

1

Capture the diagnostic group

Automatic capture of the most recent relevant result



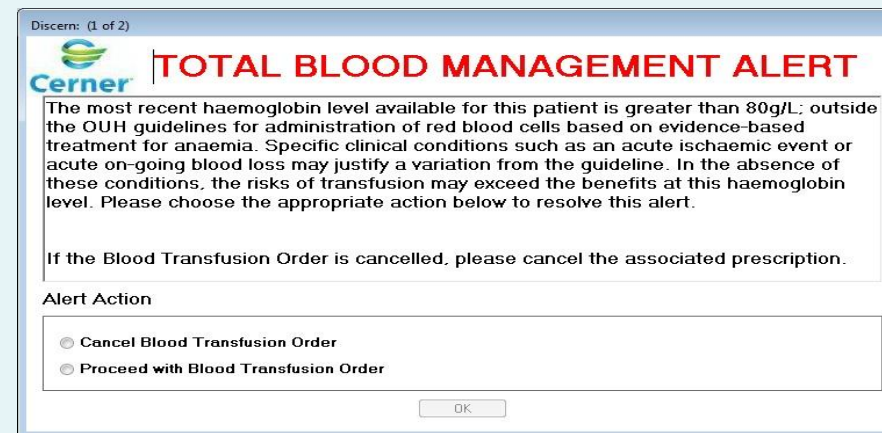
A screenshot of a software form. The '*Diagnostic Group:' dropdown is set to 'Cardiac - Valve redo'. Below it, the 'Haemoglobin' field displays the value '110', which is circled in red. Further down, the '*Red Cell Transfusion Criteria:' dropdown is open, showing a list of options: 'Acute bleeding' (highlighted in blue), 'Hb <= 70g/l', 'Hb <= 80g/l with acute coronary syndrome', 'Hb <= 80g/l in haematology inpatients', and 'Other (provide specific clinical details)'. A red arrow points from the '2' label to this dropdown menu.

2

Select a reason for transfusion

3

Alert if transfusion not justified



A screenshot of a 'TOTAL BLOOD MANAGEMENT ALERT' dialog box. The header includes the Cerner logo and the title 'TOTAL BLOOD MANAGEMENT ALERT'. The main text states: 'The most recent haemoglobin level available for this patient is greater than 80g/L; outside the OUH guidelines for administration of red blood cells based on evidence-based treatment for anaemia. Specific clinical conditions such as an acute ischaemic event or acute on-going blood loss may justify a variation from the guideline. In the absence of these conditions, the risks of transfusion may exceed the benefits at this haemoglobin level. Please choose the appropriate action below to resolve this alert.' Below this, a note says: 'If the Blood Transfusion Order is cancelled, please cancel the associated prescription.' The 'Alert Action' section contains two radio buttons: 'Cancel Blood Transfusion Order' (selected) and 'Proceed with Blood Transfusion Order'. An 'OK' button is at the bottom right.

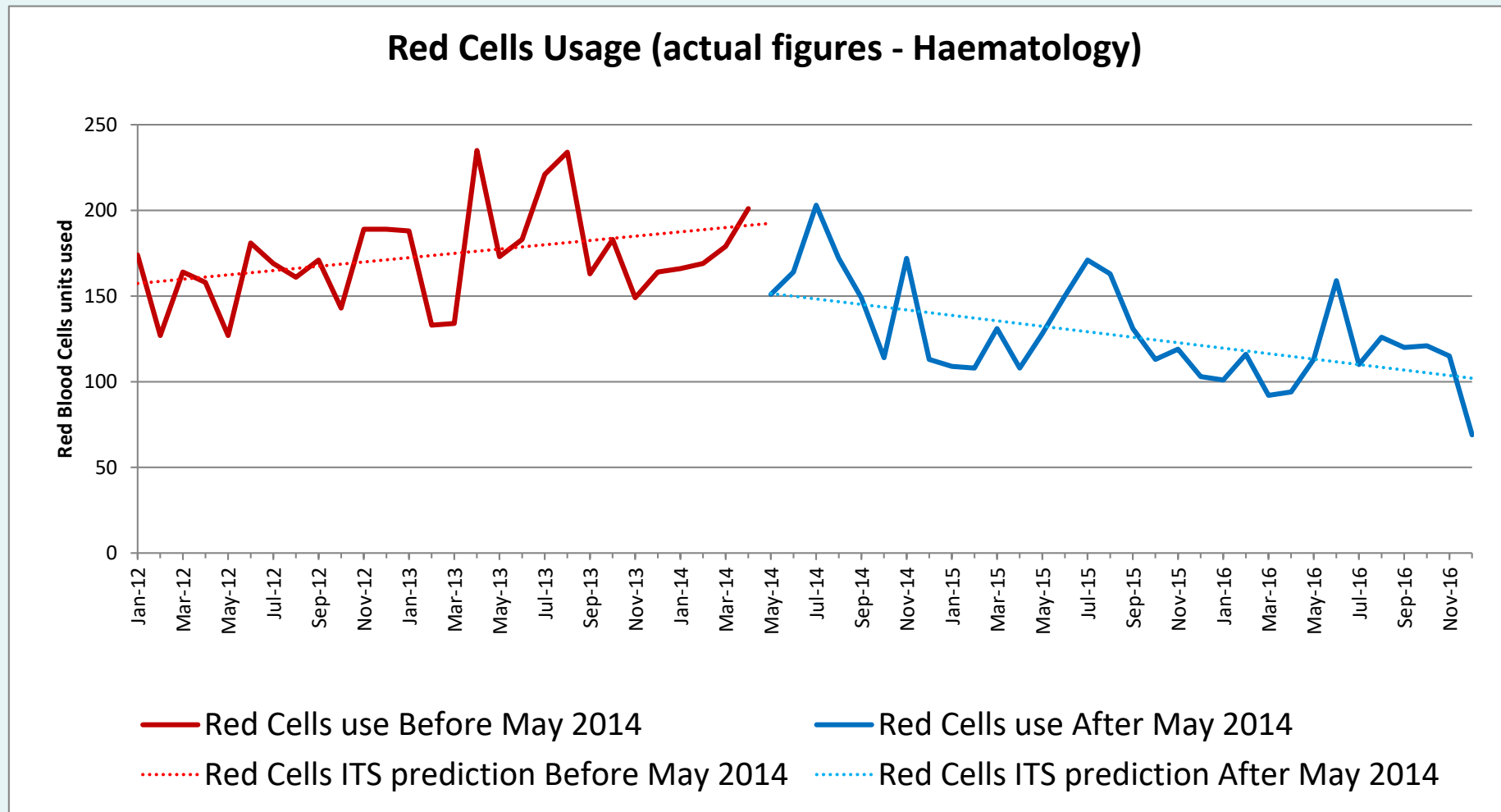
Cost of feedback

Intervention Component	Cost
Meeting costs (1hr per month) <ul style="list-style-type: none">• Core Training doctors x 4• Specialty Registrars x 1• Consultant (senior)	£1,705 per annum
CDSS Training costs (0.5hr once) <ul style="list-style-type: none">• CT1s x 8• ST3s x 4	£115 per annum
Transfusion Practitioner 0.8 FTE	£29,287 per annum
Total intervention cost	£31,109.24 per annum

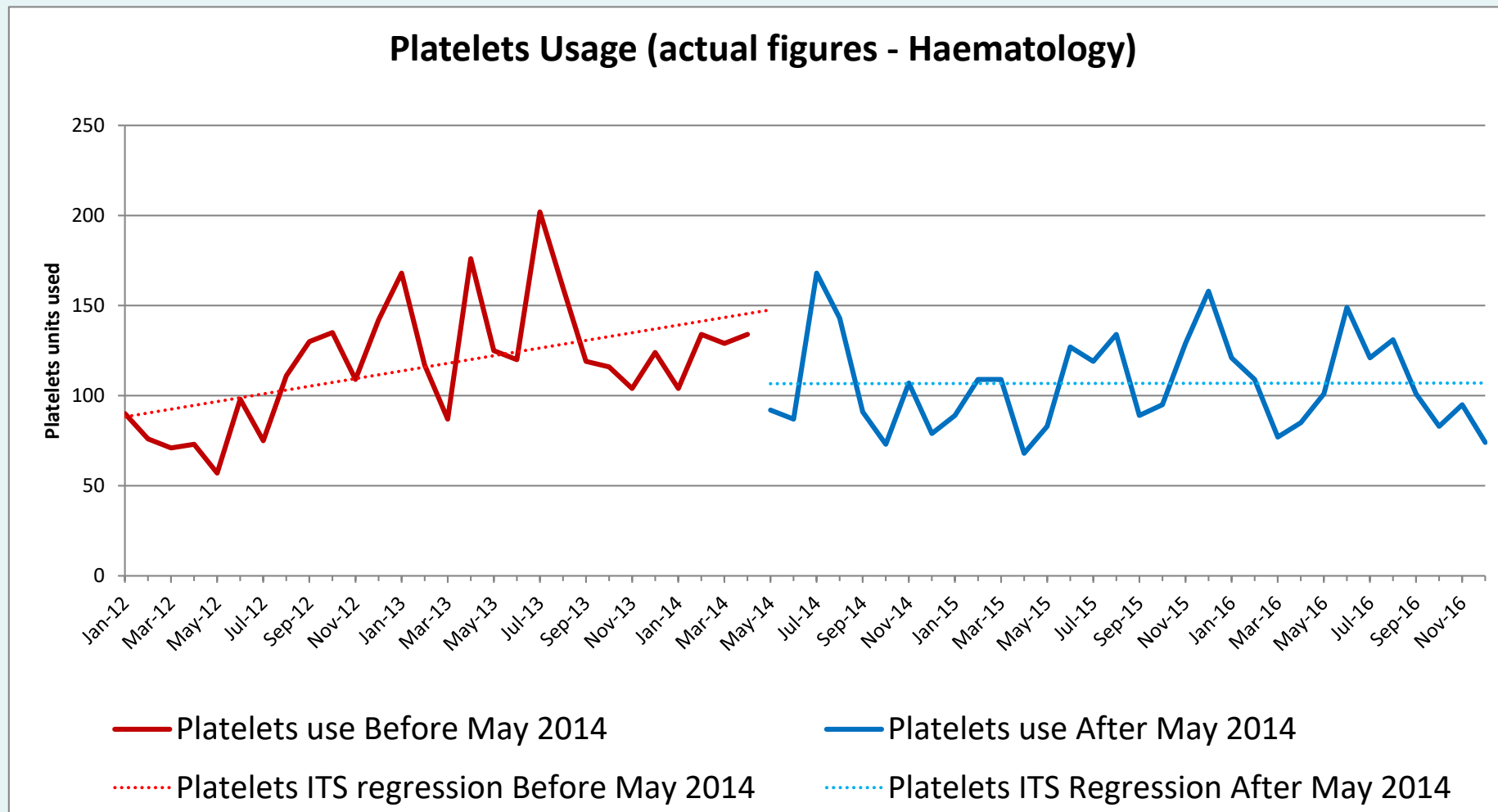
*Nb. The CDSS incurs zero running costs (module on existing EPR system)

Interrupted Time Series Analysis

ITS analysis



ITS analysis



ITS Analysis

ITS Regression Results

Red Blood Cells Units	Value	95% CI
Before slope	1.26*	0.21 to 2.30
After slope	-1.60*	-2.45 to -0.74
Difference	-2.85*	-4.19 to -1.51

Platelets Units	Value	95% CI
Before slope	2.09*	0.78 to 3.40
After slope	-0.03*	-1.10 to 1.04
Difference	-2.11*	-3.81 to -0.42

Model Accuracy

Over-prediction of RBC by 1.1% in Before period; under-prediction by 1.3% in After period

Under-prediction of Platelets by 0.4% in Before period; over-prediction by 0.6% in After period.

ITS Analysis

RBC unit cost £124.46
Platelet unit cost £178.19

	Average monthly Use	Average Monthly Use	Difference
	Before	After	
RBC			
Number of units	174.3	126.8	47.5
Cost	£21,690	£15,777	£5,913
Platelets			
Number of units	116.9	106.8	10.1
Cost	£20,825	£19,034	£1,791

Average annual cost-savings of £61,338

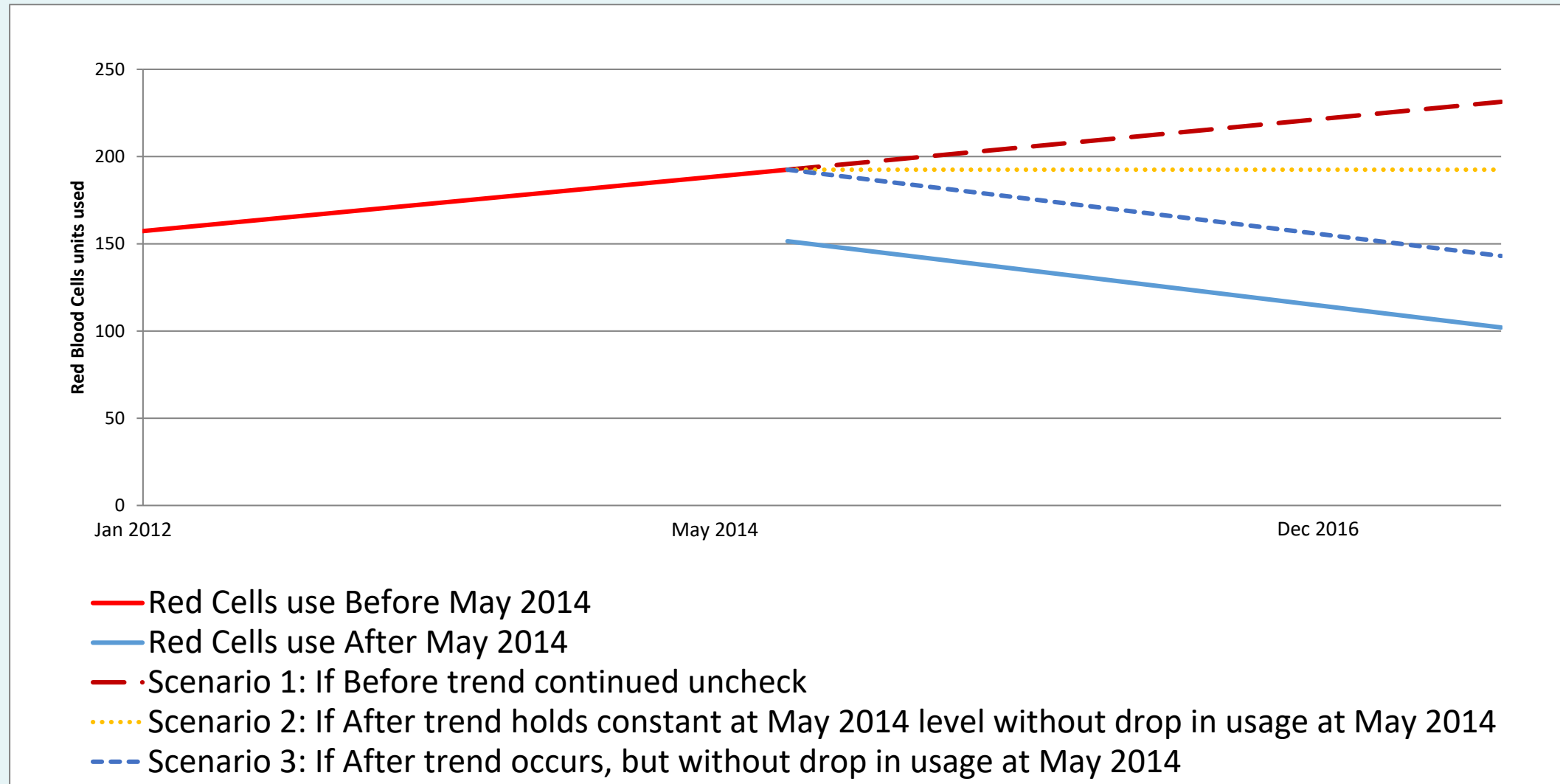
£70,957 (570 RBC units) + £21,491 (121 Platelets units) - £31,109 (Intervention)

Scenario Analysis

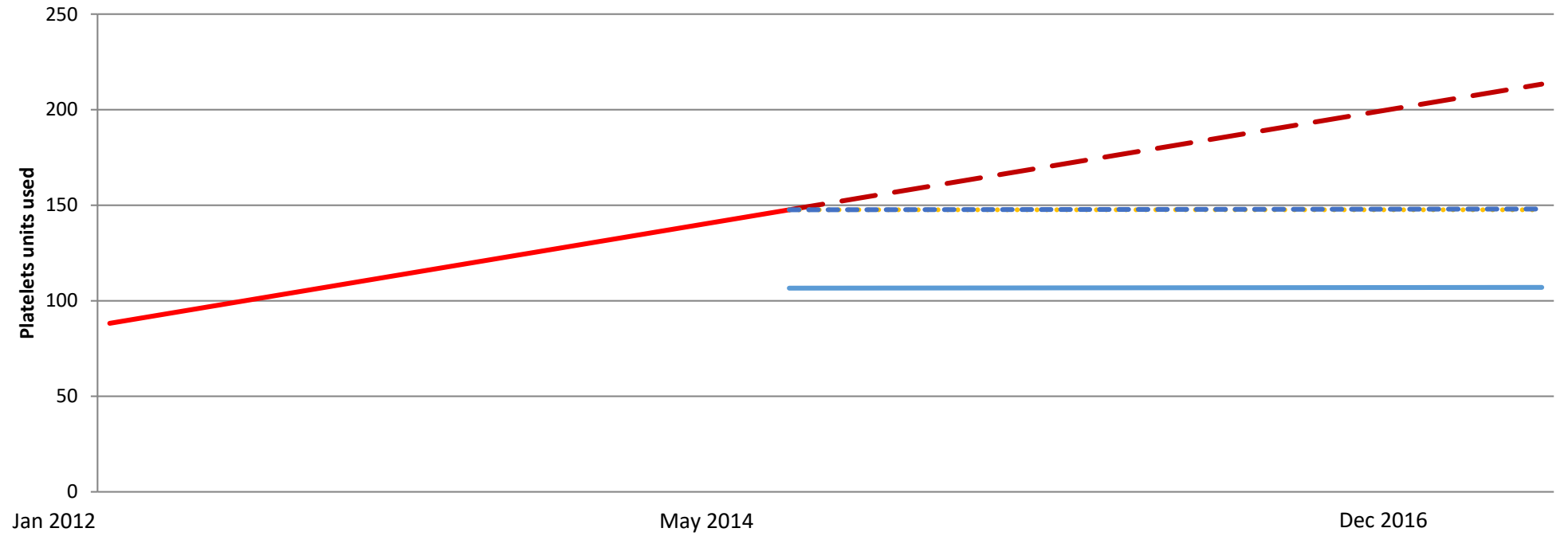
Scenario Analysis

- Scenario 1 – no intervention/continuation of Before trend
- Scenario 2 – blood use stayed constant at May 2014
- Scenario 3 – no drop in usage in May 2014 (step-change)
- Scenario 4 – cost of TP was 0.4FTE instead of 0.8FTE

Scenario Analysis



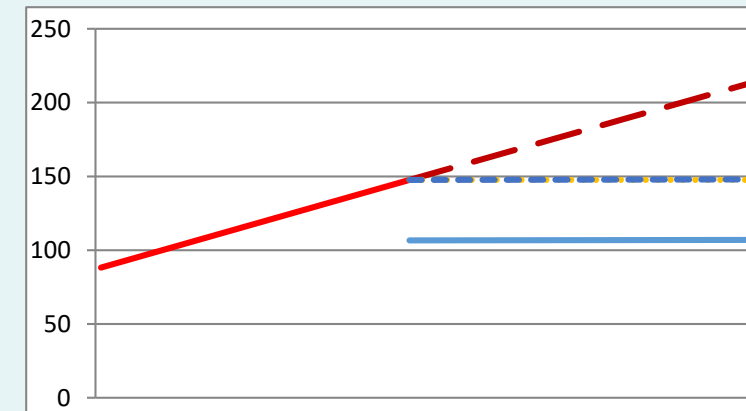
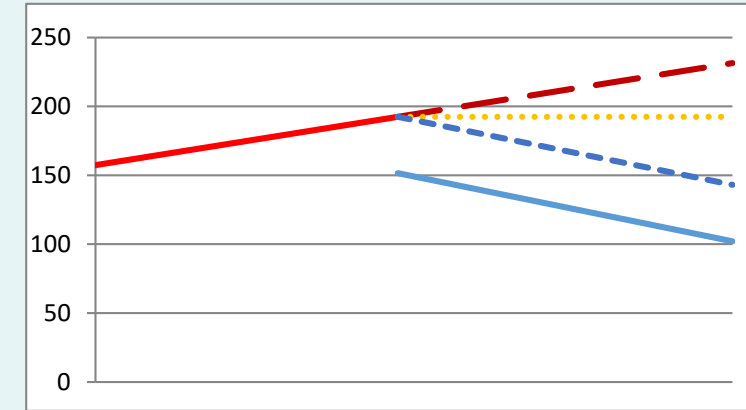
Scenario Analysis



- Platelets use Before May 2014
- Platelets use After May 2014
- - Scenario 1: If Before trend continued unchecked
- ... Scenario 2: If After trend holds constant at May 2014 level without drop in usage at May 2014
- - Scenario 3: If After trend occurs, but without drop in usage at May 2014

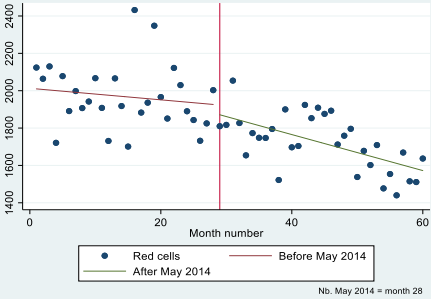
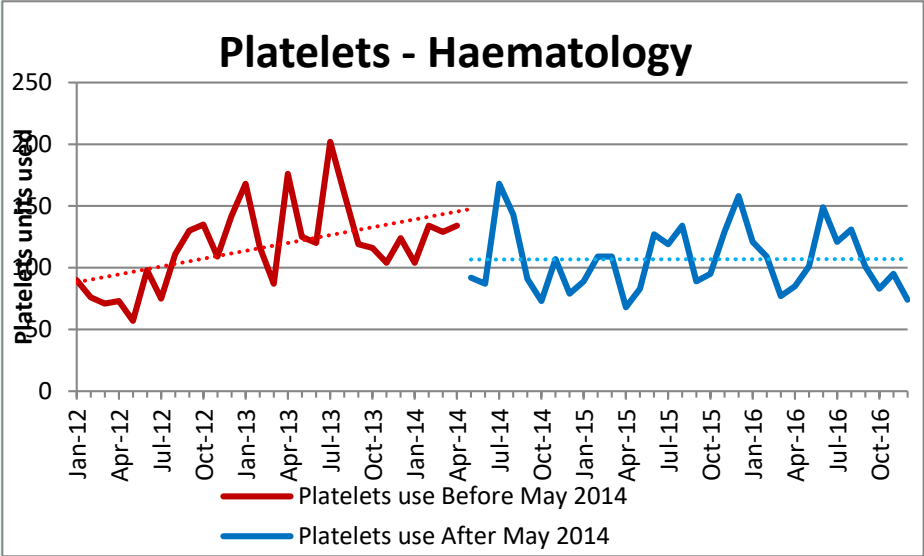
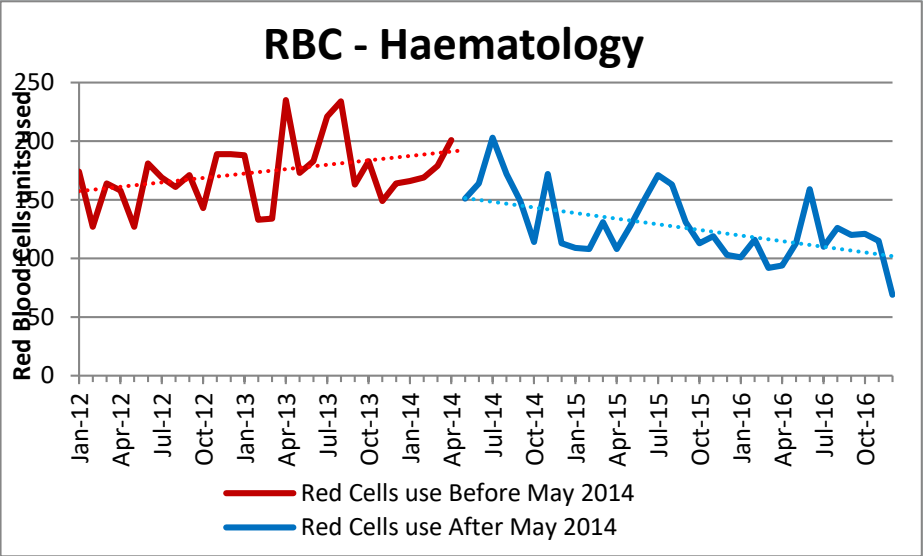
Scenario Analysis

- **Scenario 1** –
 - no intervention/continuation of Before trend
 - Cost savings of £253,632 per annum
- **Scenario 2** –
 - blood use stayed constant at May 2014
 - Cost savings of £154,281 per annum
- **Scenario 3** –
 - no drop in usage in May 2014 (no step-change)
 - Cost savings of £117,769 per annum
- **Scenario 4** –
 - cost of TP was 0.4FTE instead of 0.8FTE
 - Cost savings of £75,984 per annum

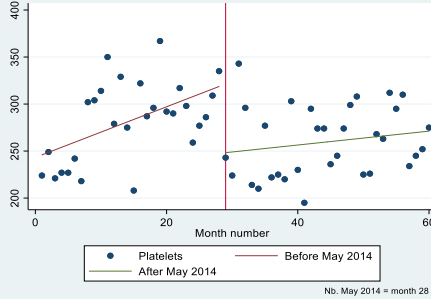


Differences in Differences Analysis

DiD Analysis



RBC - OUH



Platelets - OUH

DiD Analysis

			Average number of units/bed day	SE	p
RBC units per bed day					
Haematology		Before	0.236		
		After	0.176		
		Difference (After - Before)	-0.061	0.01	<.001
The rest of OUH		Before	0.050		
		After	0.041		
		Difference (After - Before)	-0.009	0.01	0.225
		Difference-in-Differences	-0.051	0.01	<.001
Platelets units per bed day					
Haematology		Before	0.161		
		After	0.145		
		Difference (After - Before)	-0.016	0.01	0.046
The rest of OUH		Before	0.007		
		After	0.006		
		Difference (After - Before)	-0.001	0.01	0.896
Difference-in-Differences			-0.015	0.01	0.186

Overview of results

ITS (base case)	£ 61,338.81 per annum
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DiD	£ 48,149.09 per annum
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Scenario 1	£ 253,632.43 per annum
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Scenario 2	£ 154,280.72 per annum
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Scenario 3	£ 117,768.72 per annum
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Scenario 4	£ 75,983.61 per annum
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Limitations & Strengths

Limitations

No control group

No outcomes data (assume reduction = good)

Requires EPR

OUP not an ideal comparator for Haematology → Unusual DiD

Strengths

Multiple methods of analysis (triangulate)

Live data and rapid feedback

Training ripple effect not captured. Roll out system to rest of OUP

Results similar to other studies into CDSS (Goodenough et al 2014; Kassakian et al 2016; Hartley et al 2017)

Questions?

Nick Swart; University College London; n.swart@ucl.ac.uk