

# Reducing inappropriate blood testing in Haematology inpatients: A multicenter quality improvement project

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# Declarations

I do not have any conflict of interest to disclose

# Introduction



Presentation of data from paper ‘Reducing inappropriate blood testing in haematology inpatients: A multicentre quality improvement project’



Discussion on what we can learn from this project, and how it can be applied effectively to local practices.

# Background



**Quality improvement project (QIP)** to reduce inappropriate (clinically unnecessary) blood tests in Haematology Inpatients.



The **aim** for each site was to safely reduce the number of inappropriate blood tests in haematology ward inpatients to as near zero as possible.

# Background

## Rationale:

“human and financial resources are facing excessive demand, a reduction in inappropriate phlebotomy episodes and laboratory blood tests has the potential to save money and staff time. It also reduces the risk to patients from excessive phlebotomy”.



# Background



It is predicted that up to 28% of blood tests are taken inappropriately.



Per 80mL of blood drawn, Hb can fall up to 1g/L



Risks from excessive phlebotomy:

Nosocomial anaemia

Venepuncture associated risks - bruising, bleeding, soft tissue damage, infection.

# Background

## Who performed the study?



UK junior doctors working in the NHS



Junior doctors' up 5 years postgraduate rotate specialty every 4 - 6 months. Haematology noted as an outlier compared for frequency of blood testing



UK doctor grades: Anyone who has not finished speciality training is a 'junior doctor'.

# Background

## Why Haematology Inpatients?

Daily blood testing at all 4 centres

High-intensity chemotherapy or bone marrow transplant patients may require this, but can some tests be safely reduced in this cohort other inpatient cases?

Lack of clinical guidelines for blood test frequency.

Most junior team members order tests and default to multiple tests daily

Culture of 'what to test' e.g., daily LDH tests in one department.

# 4 Centres



St Barts (SB), London  
Haemato-oncology  
Allogenic transplant centre  
2013-2014

Royal Oldham (ROH), Greater Manchester  
General Haematology  
2015-2016



St James's University Hospital (SJUH),  
Leeds  
Specialist and General Haematology  
Allogenic Transplant centre  
2017-2018

Bradford Royal Infirmary (BRI), Bradford  
General Haematology  
Autograft centre  
2018



# Aim

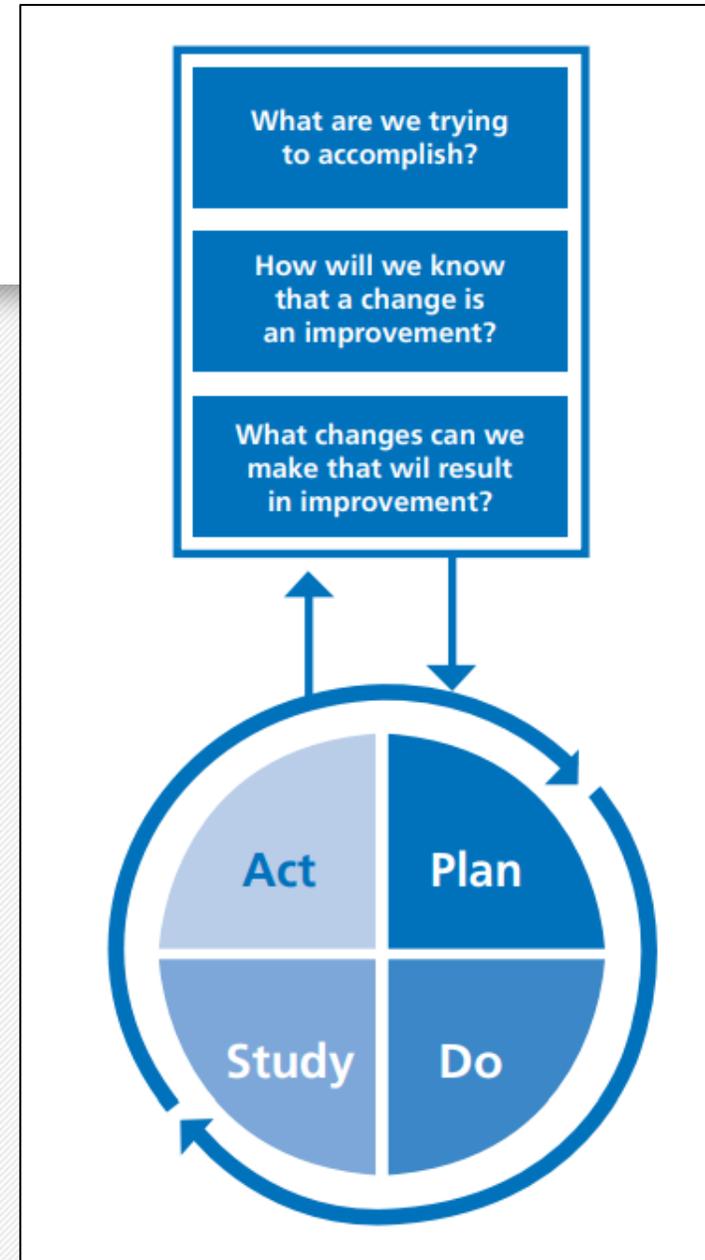
The aim for each site was to safely reduce the number of inappropriate blood tests in haematology ward inpatients to as near zero as possible.



# Methods

## The QIP process:

2 or 3 'Plan, do, study, act' cycles were performed per centre



# Methods: PDSA Cycle 1

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**Baseline Data Collection:** What proportion of routine blood tests performed are inappropriate?

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Data acquisition prior to intervention (blood test schedule).

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St Barts, Royal Oldham and SJUH (non-allogenic transplant patients) participated.

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2-week retrospective period evaluated.

# Methods: PDSA Cycle 2

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**Schedule Implementation:** Does a blood test schedule reduce the number of inappropriate tests performed?

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All centres / departments participated in this cycle

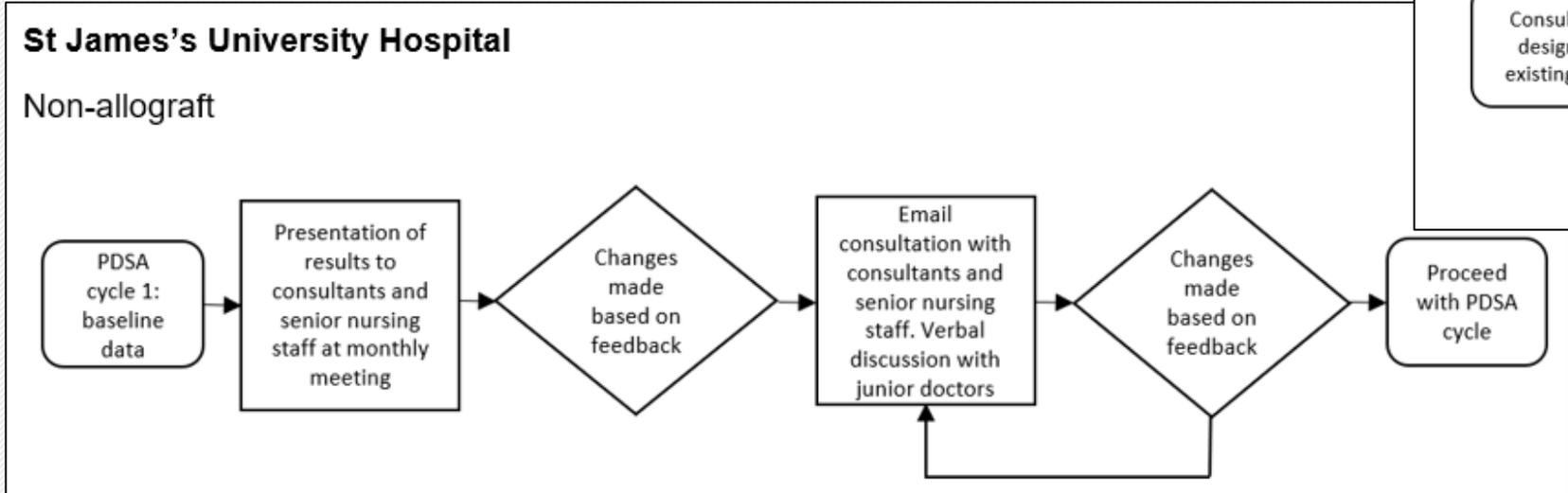
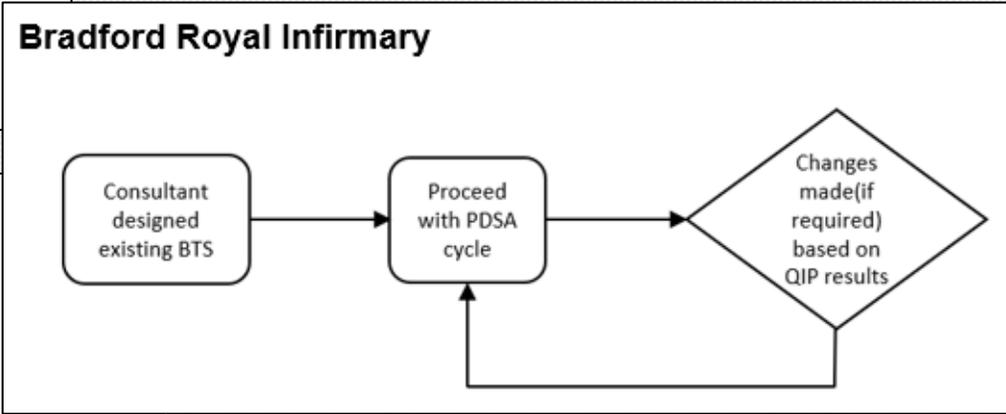
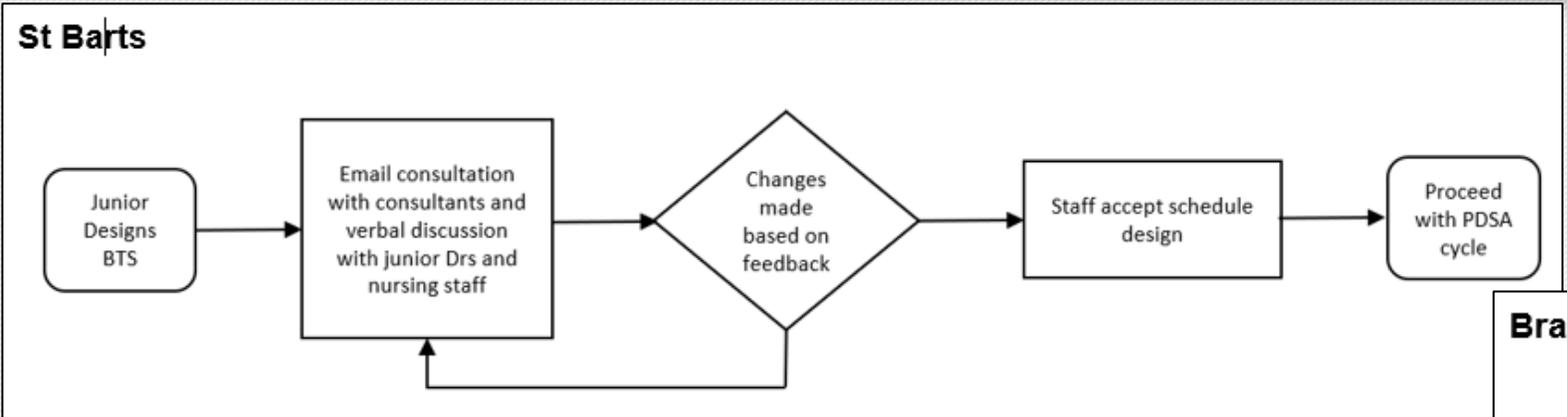
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Where a blood test schedule was not already in place, one was designed specifically for that department.

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# Methods

## CONSULTATION MODELS FOR BLOOD TEST SCHEDULE DESIGN



# Methods

## St James's University Hospital

Intensive chemotherapy and autografts:

Acute Leukaemia or MDS on intensive chemotherapy or aplastic anaemia on ATG, and autograft patients. For example, DA 3+10, FLAG-IDA, myeloma and lymphoma patients receiving autografts. Please ask the specialty registrar if you are unsure. This is chemotherapy associated with significant / prolonged neutropenia.

Blood test	Admission	Day of the Week						
		M	T	W	Th	F	S	Su
FBC	Y	Y	Y	Y	Y	Y	Y	Y
U+E	Y	Y	Y	Y	Y	Y	Y	Y
LFT	Y	Y		Y		Y		
Bone	Y	Y						
Mg	Y	Y						
G+S	Y	Y						
Coag	Y	Y						
CRP	Y	Y	Y	Y	Y	Y	Y	Y

Blood test schedule (BTS) implementation

Schedule in place for 1 week before 2 week prospective data collection

Named person as safety contact

# Methods: PDSA Cycle 3

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**Schedule evaluation:** Are the changes seen by implementation of a blood tests schedule maintained?

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ROH, BRI and SJUH (allogenic transplant) performed cycle 3.

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Intervention: education session 3 months post schedule implementation.

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Evaluation: 2 week prospective data collection

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# Methods: Improving design

Flexibility of QIP model allows optimisation of design

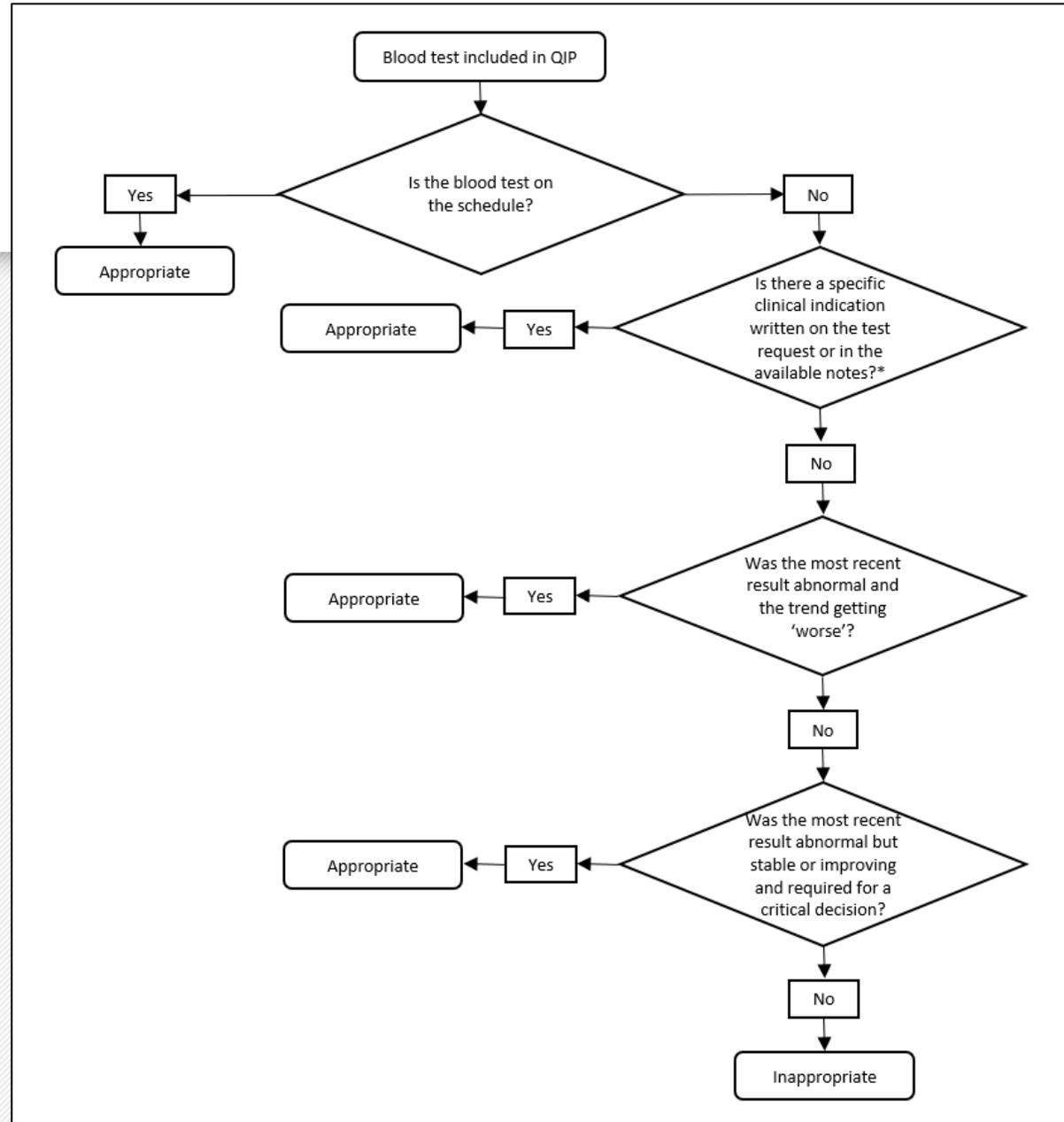
For example:

- Macros in excel tool
- Patient-days ratio takes into account bed occupancy.

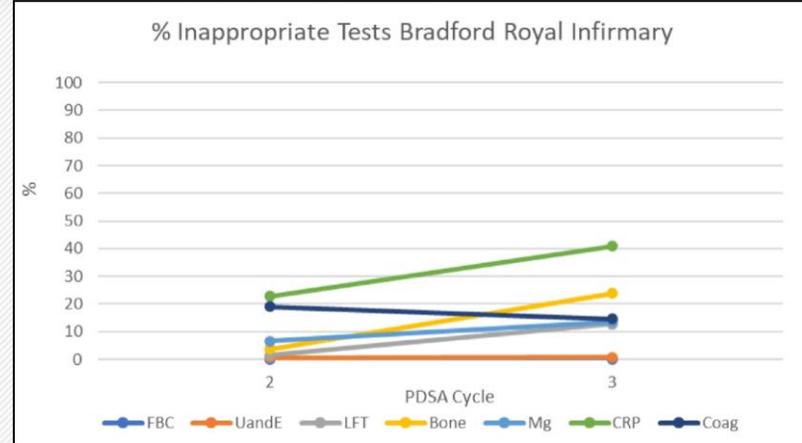
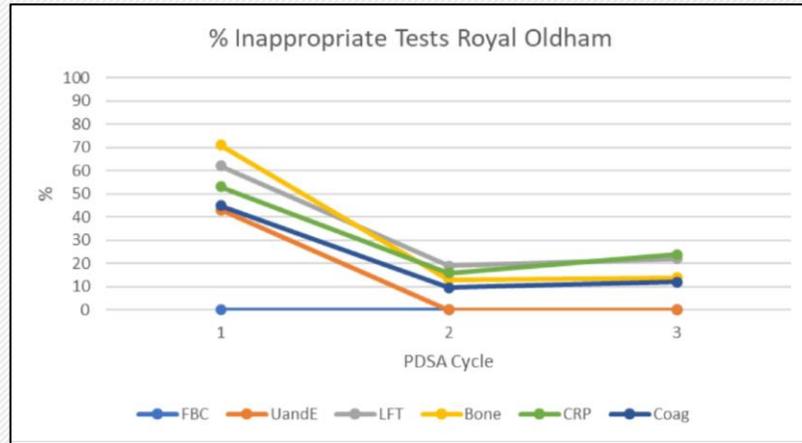
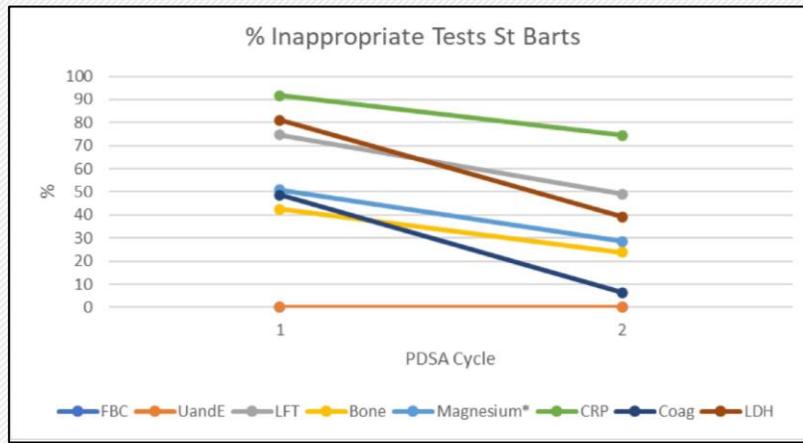
	A	B	C	D		E		F		G		H	
1	Week day	Day	Date	Patient-days		FBC		FBC IA		U&E		U&E IA	
2	M	1	100918	0	3	0	2	0	0	0	2	0	0
3	T	2	110918	0	3	0	2	0	0	0	2	0	0
4	W	3	120918	0	4	0	4	0	0	0	4	0	0
5	Th	4	130918	0	4	0	4	0	1	0	4	0	1
6	F	5	140918	0	4	0	4	0	0	0	4	0	0
7	S	6	150918	0	4	0	4	0	0	0	3	0	0
8	Su	7	160918	0	7	0	7	0	0	0	7	0	0
9	M	8	170918	0	6	0	4	0	0	0	4	0	0
10	T	9	180918	0	6	0	4	0	0	0	3	0	0
11	W	10	190918	0	5	0	4	0	0	0	4	0	0
12	Th	11	200918	0	5	0	5	0	0	0	4	0	0
13	F	12	210918	0	6	0	5	0	0	0	5	0	0
14	S	13	220918	0	4	0	3	0	0	0	3	0	0
15	Su	14	230918	0	4	0	3	0	0	0	3	0	0
16	Total	N/A	N/A	65		55		1		52		1	
17	Ratio no tests:patient days	N/A	N/A	N/A		0.8461538		0.015385		0.8		0.015385	
18						84.615385		1.538462		80		1.538462	
19	Number of patients	0	8										
20	Each test only counted once per day, more than once per day is considered 'non'routine' ie. Will be done for speci												
21													
22	Diagnosis:	Waldenstroms = lymphoma											
23	Leukaemia	Amyloidosis = myeloma											
24	Acute Leukaemia	0	2	APML =									
25	Chronic Leukaemia	0	0										

# Methods

Decision tool: is the test 'appropriate?'



# Results



**PDSA Cycle 1: Baseline**

SB 2,534 tests (45.9% IA)  
 ROH 586 tests (19.1% IA)  
 SJUH 1,012 tests (assessment of IA baseline not applicable as the results were used to inform the schedule design)

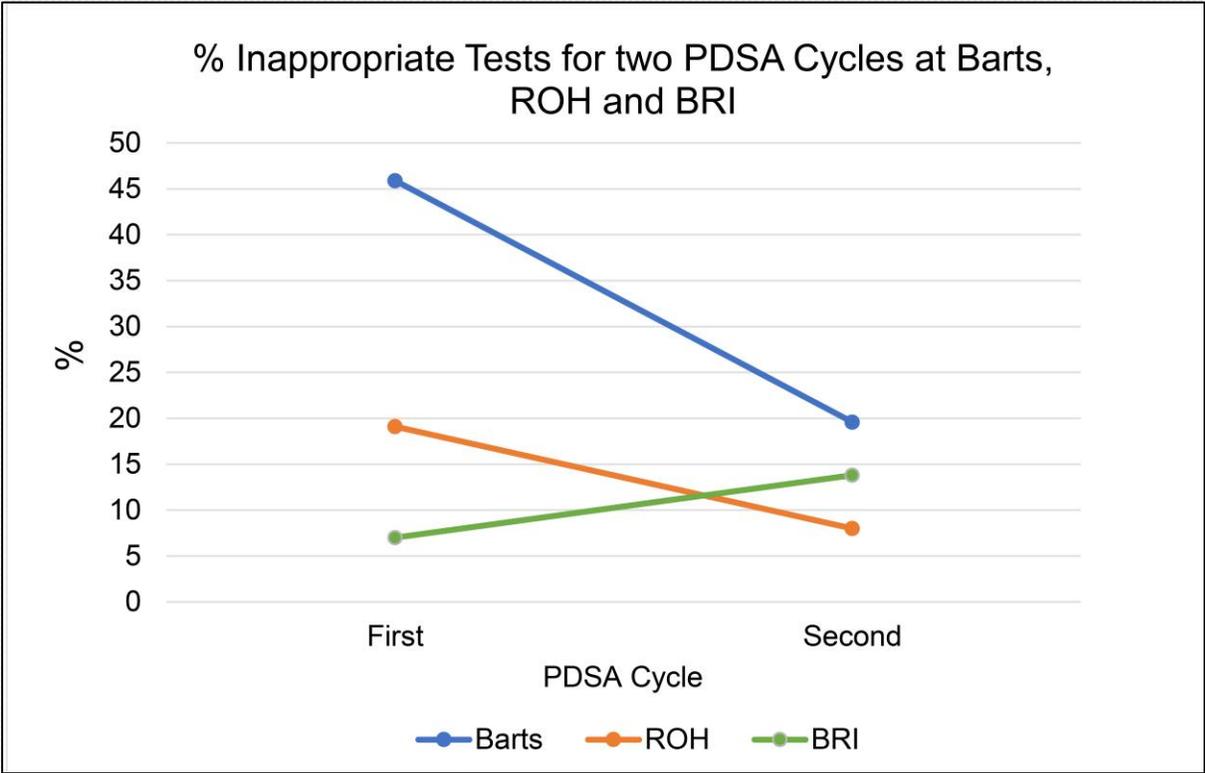
**PDSA Cycle 2: Schedule implementation**

*IA tests:*  
 SB 19.6%  
 ROH 8%  
 SJUH 7.8%  
 BRI (schedule already in place) 845 tests (7% IA).

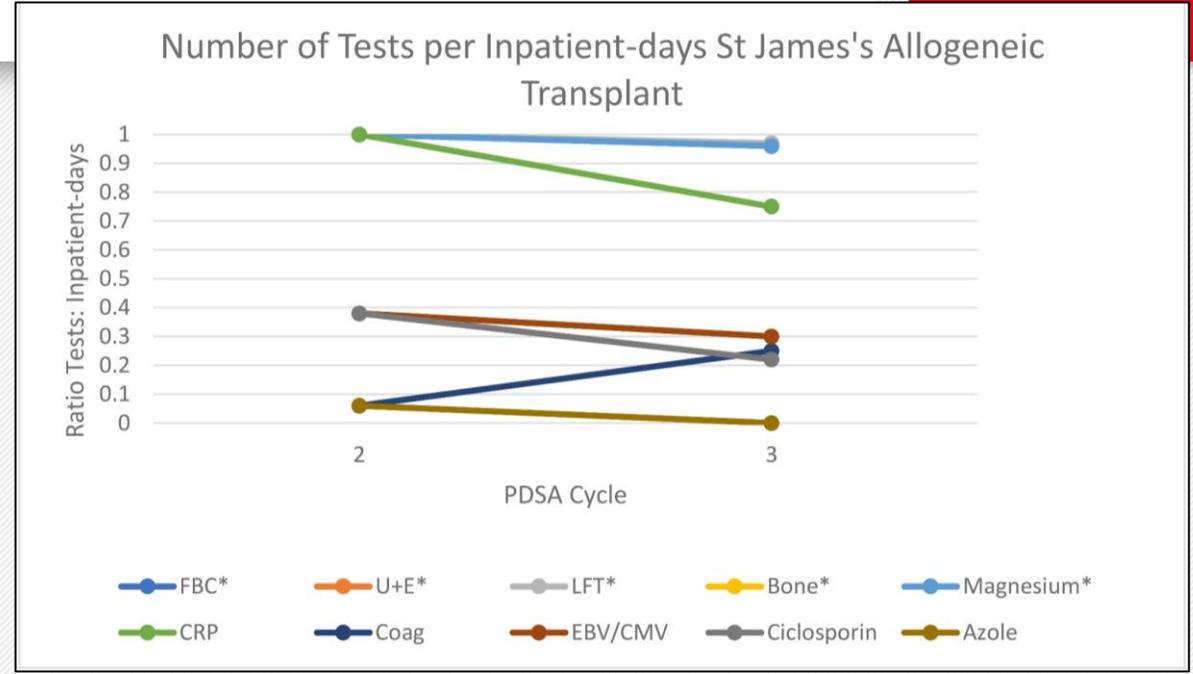
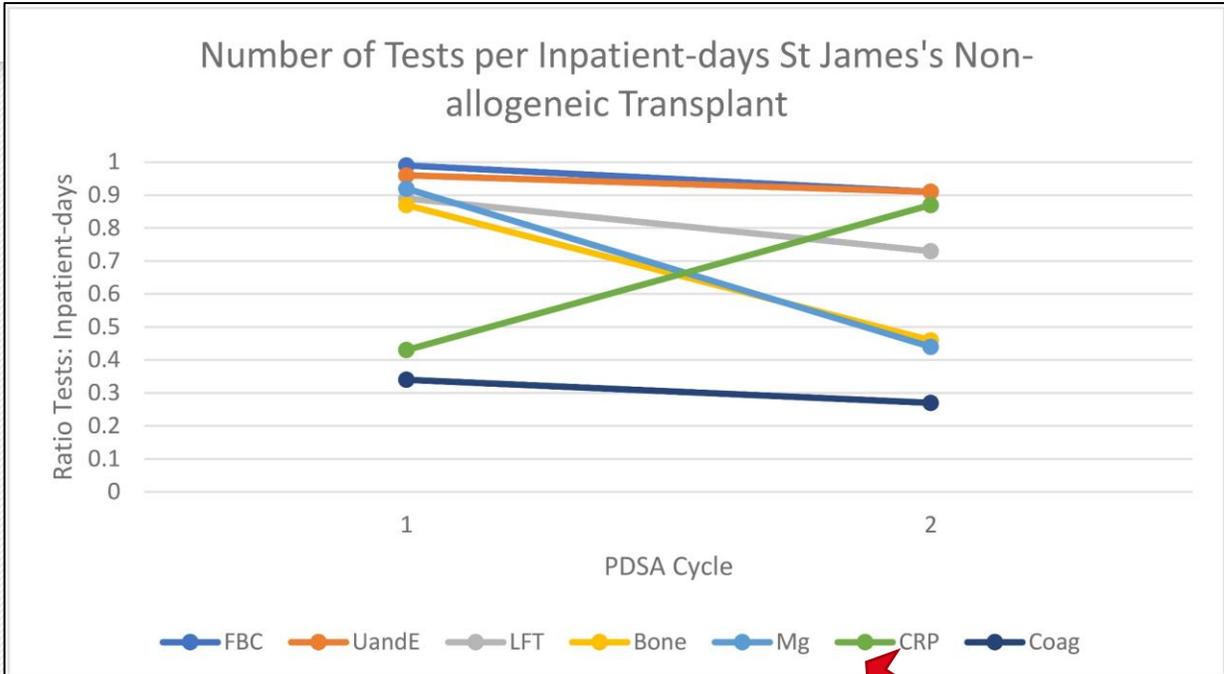
**PDSA Cycle 3: Schedule evaluation**

ROH 10%  
 BRI 13.8%

# Results

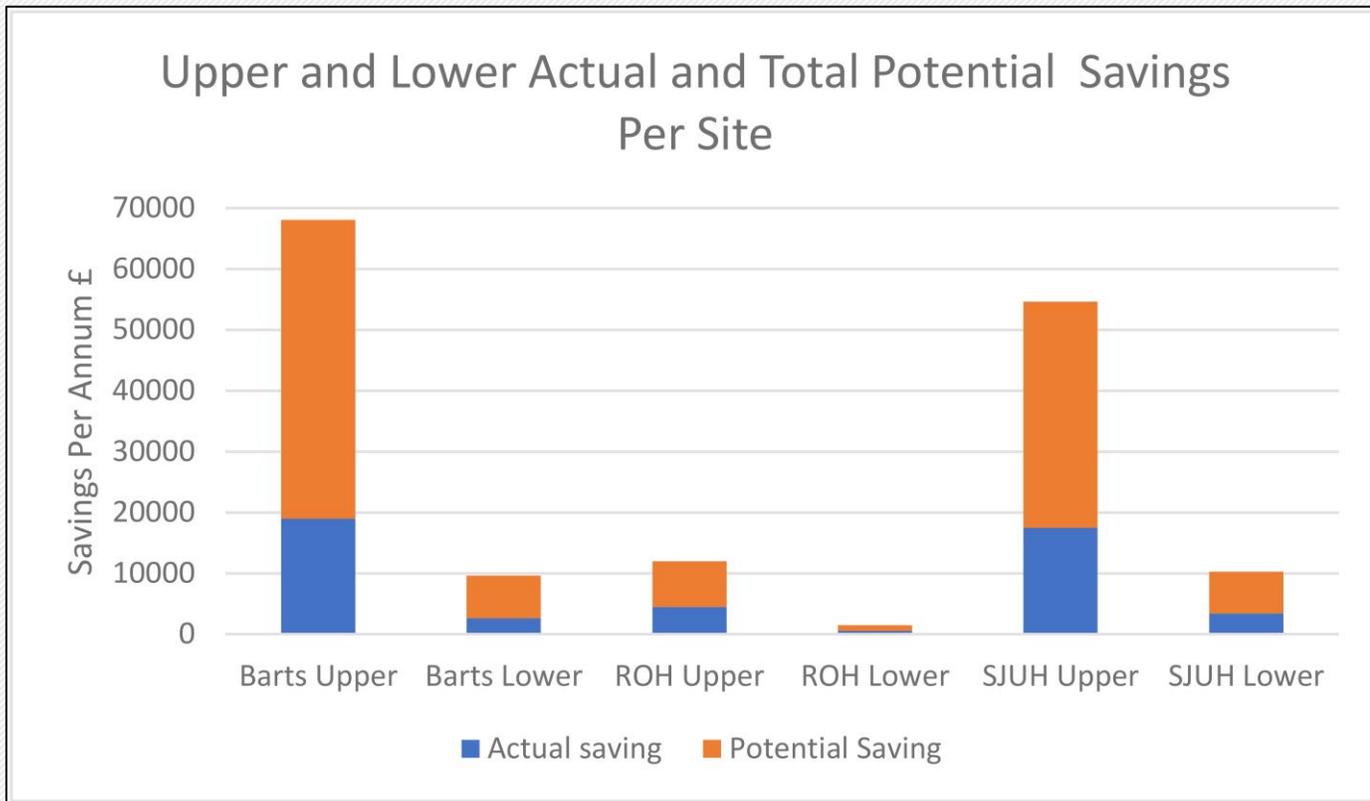


# Results



At SJUH, the average ratio decreased from 0.77 to 0.66 for non-allograft patients.

# Results



The range was £0.23 to £3.43. SJUH costed the lowest value per test overall and SB costed the highest. Fig 4 presents the highest and lowest estimated savings per site. The large variation in savings estimates is due to department size and how the blood tests were costed.

# Discussion



Introduction of a BTS as associated with a reduction in IA testing at every site or sustained low levels of IA testing when a BTS was already in place.



This reduction in IA testing is associated with a cost saving.

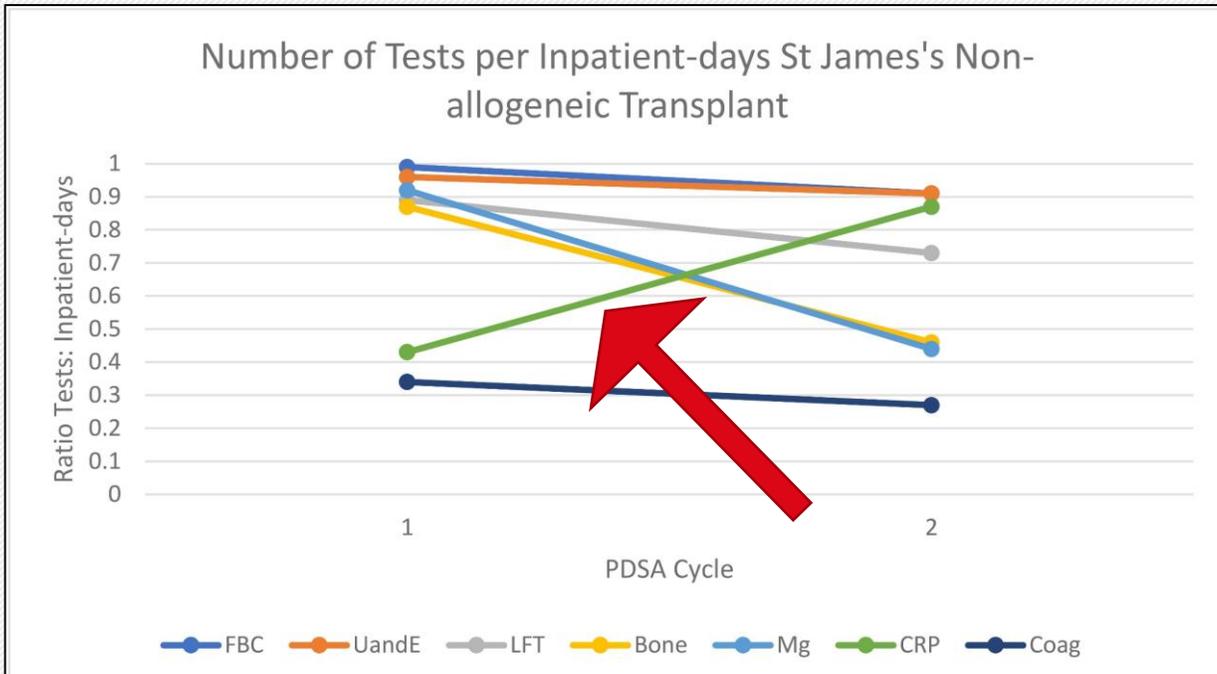


No adverse clinical events (including near misses) or treatment delays occurred as a result of streamlined requesting.



Trends were consistent across 4 sites with a range of inpatient system models. The method could be generalisable to other inpatient settings.

# Discussion



s and results in red circles.

Y	Y		

BTS 'Professor effect'

BRI 13.8%

'Weekend locum effect'

# Discussion: lessons and limitations



Placement and awareness of blood test schedule is critical



Costs difficult to accurately calculate



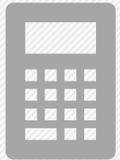
Multidisciplinary involvement: Who will implement the changes?



What is the safety-net i.e additional blood request tick boxes.

# Discussion

## Healthcare economics



Variable costs depending on how each hospital costed blood testing

Cost of transfusion (NHS 2012-2018): £170

Costs of staff time and phlebotomy consumables not calculated

Cost of excess inpatient stays: >£400 per patient per night.

Costs - could use a consistent costing method for estimates e.g., SoECAT values

# Discussion

Post publication thoughts: Sustainability



Regular staff - champions of the BTS schedule process,  
UK: consultants, **physician associates and advanced nurse practitioners**



Regular (rolling) audit



Induction education

# Acknowledgements

## Co-authors

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