Significant Improvement In The Management Of Major Obstetric Haemorrhage With A Rotem Guided Algorithm Using Fibrinogen Concentrate

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Liverpool Women's NHS Foundation Trust

Background


Liverpool Women's

Largest maternity unit in the UK

(used to be – other units may have caught us up now!)

- Total number of women delivered in 2013 were **7983**
- Total caesarean sections were 2060 (~25.8%)
  - Electives – 957
  - Emergencies - 1103

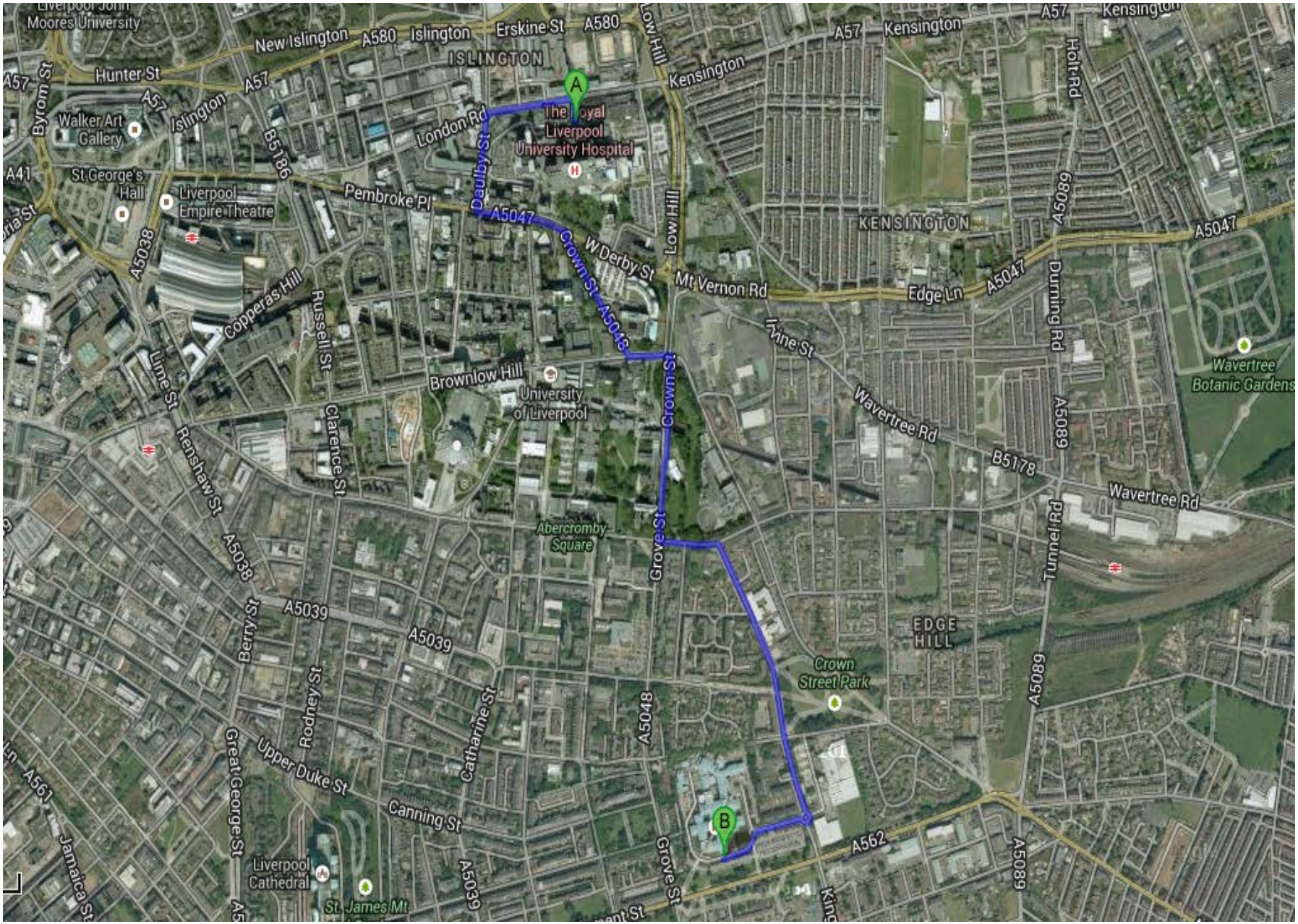
Largest maternity unit in the UK

Handicapped by :

- On site haematology lab **only** available between
  - 0830 hrs and 2100 hrs Monday to Friday, and
  - 0830 to 1300 hrs on Saturday.

- Outside of these hours, our laboratory is at the Royal Liverpool University Hospital, 1.3 miles down the road.

Liverpool Women’s Hospital


A
B
The Royal Liverpool University Hospital
London Rd
Daulby St
Pembroke Pl
A5047
Crown St
W Derby St
Low Hill
Kensington
KENSINGTON
Mt Vernon Rd
Edge Ln
Vine St
Wavertree Rd
B5178
Holt Rd
Dunning Rd
A5089
Wavertree Botanic Gardens
Brownlow Hill
University of Liverpool
Abercromby Square
Grove St
Crown Street Park
EDGE HILL
Tunnel Rd
A562
Canning St
Upper Duke St
Great George St
Rodney St
Berry St
Catharine St
Clarence St
Renshaw St
Lime St
Copperas Hill
Russell St
A5038
A5039
A5048
Liverpool Cathedral
St. James Mt
Jamaica St
Walker Art Gallery
St George's Hall
Liverpool Empire Theatre
Byrom St
Hunter St
New Islington
Islington
Erskine St
A580
ISLINGTON
A57
A41
B5186
A561

‘Tweaks & fixes to cope’

And in April 2011…

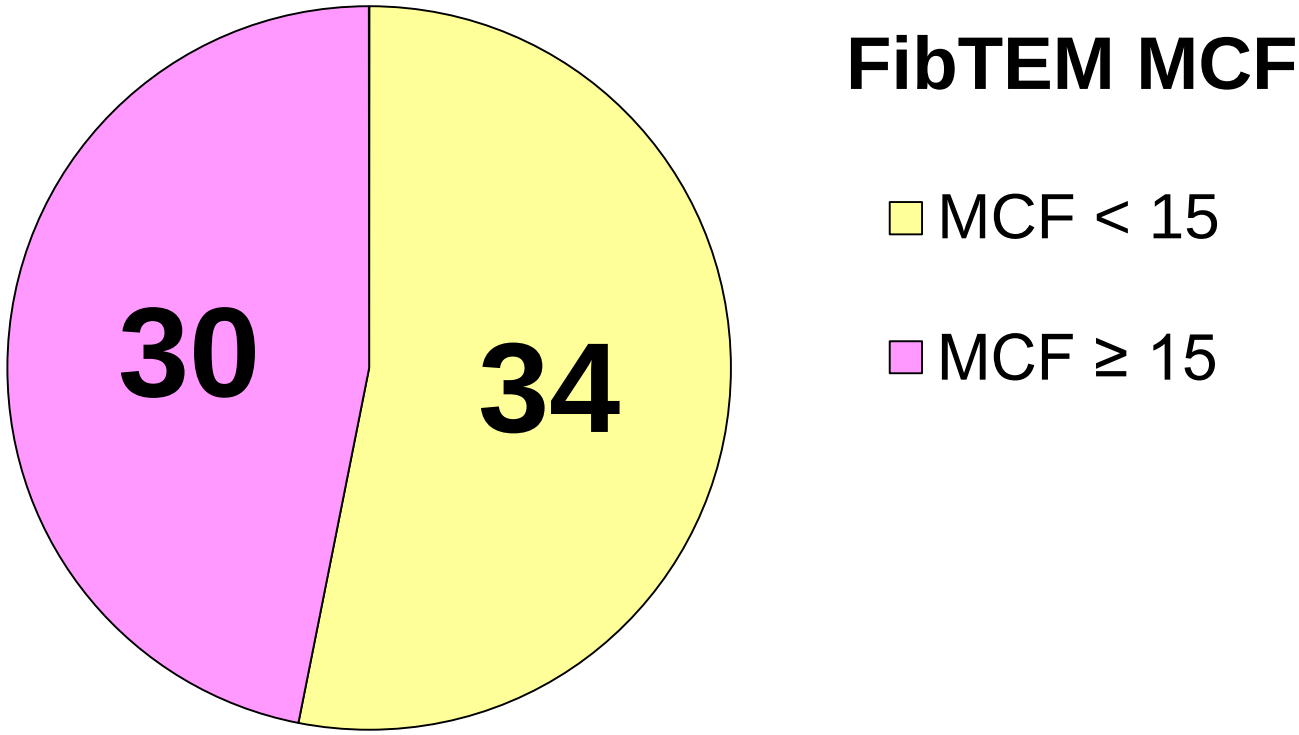
We adopted the NWRTC recommendations for massive haemorrhages

- Requesting ‘shock packs’ with PRCs:FFP: platelets in a ratio of 4:4:1 at the **start** when a massive bleed is diagnosed
- Made it easy to order and obtain blood products for all cases of major obstetric haemorrhage

Also in April 2011,

Interim retrospective analysis

Looking at 64 patients who had already triggered MOH pathway i.e >1500 ml blood loss



Haemostatic impairment in PPH

Varies in severity depending on the cause:

Obstetric complication	Mechanism of haemostatic compromise	
	Dilutional	Consumptive
Trauma	+	+/-
Surgery	++	+/-
Atony	++	++
Placental abruption	+	+++
Placenta praevia/accreta	++	++
Amniotic fluid embolus	+	++++

Can FibTEM be relied on?

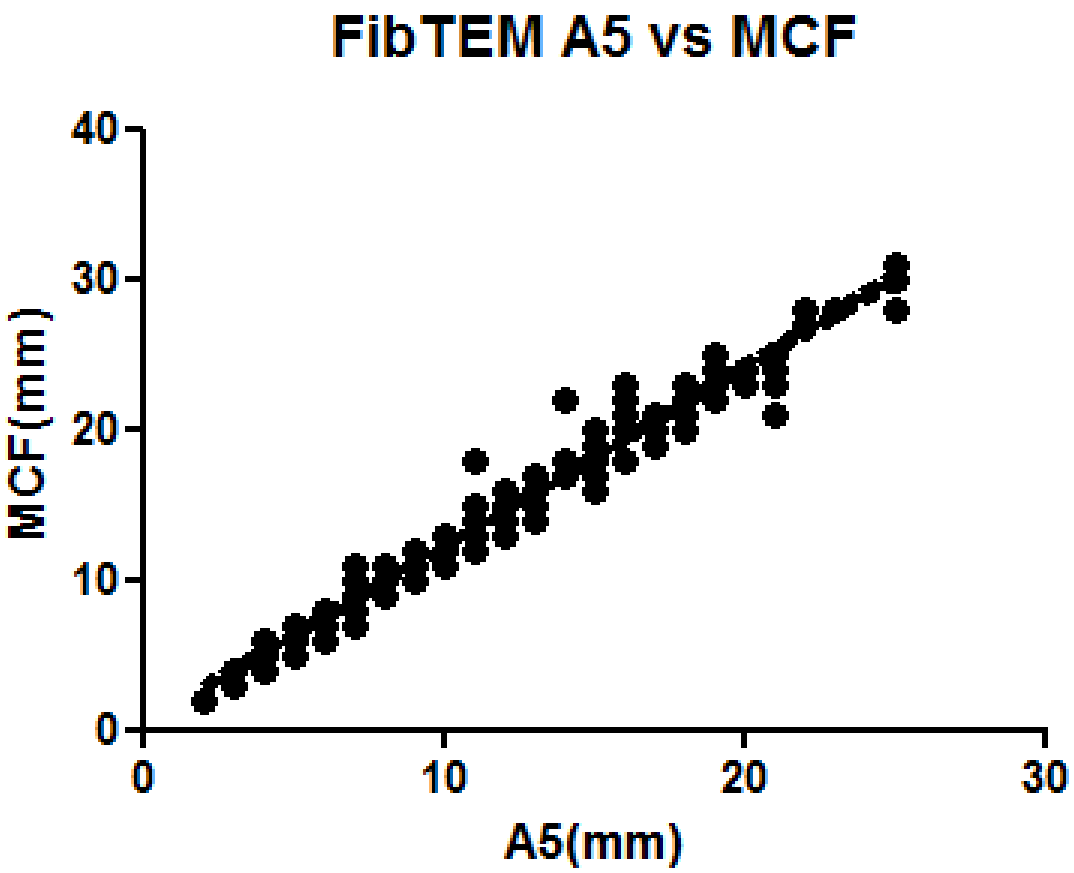
Mean [95% CI] number of units transfused

	Blood	FFP	Cryo	Platelets
MCF < 15	**3.7*** [2.1 – 4.9]**	**2.6 [1.3-3.3]**	**0.9 [0.26-1.3]**	**0.3 [0-0.5]**
MCF ≥ 15	0.8*** [0.2-1.1]	0 [0-0]	0 [0-0]	0 [0-0]

Statistics to show the difference between each group
*P<0.05 ** <0.01 ***<0.001

- However, it takes 30 to 40 minutes to get the MCF value!

- Until then, most algorithms involving ROTEM values used MCF values to guide decision making.



R=0.963, p<0.0001

Evaluation of practice at the end of one year in March 2012 :

- ROTEM **(√)**
  - A reliable ‘point of care’ test for coagulopathy
  - Easily taught & performed even by trainees rotating every 3 months
  - Even better than expected because we could get reliable results in just over 5 minutes!

- Shock packs **(??)**
  - Still needed time for xmatch, defrosting and transport
  - Wastage when ROTEM indicated they were not needed

So we now had a rapid test to confirm coagulopathy!

The rate limiting factor now was the defrosting time for products

There was a ‘new kid on the block’!!

Was only licensed for use in congenital hypofibrinogenaemia

Any other use has to be on a named patient basis.

Expensive at £340 per g

So by July 2012

‘We (too!) wanted it quick & we wanted it now!’

(apologies to Dr Jakob Stensballe or anyone else here from Copenhagen for having pinched your slogan!)

Transfusion Management of Massive Haemorrhage in Obstetrics

Liverpool Women's

Transfusion Lab Tel Number(s)
4127/4627
After 21:00
- RLUH Haem lab via switch

Activate Level 1 transfusion protocol:
Time to receive at clinical area:
-Level 1: 30 mins
-Level 2: 90 mins

•**Emergency O red cells**
- 6 units in blood fridge on DS
-2 units in Gynae theatre

Blood Courier ☎
07717 516 171
Consultant Haematologist ☎
Via RLUH switchboard

>1500 mls and ongoing severe bleeding
or 150 mls/min
Use of emergency O-ve blood
Collapse/Clinical shock
If "LEVEL 1" transfusion protocol is activated

Activate Massive Haemorrhage Pathway (SpR/ST3 and above)

Call for help 2222

'Massive Haemorrhage, Location, Specialty'
Alert emergency response team (including blood transfusion laboratory, portering/transport staff)
Consultant involvement essential
Move patient to HDU when safe to do so

RESUSCITATE
Airway
Breathing
Circulation

Take bloods and send to lab:

XM, FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}
NPT: ABG, ROTEM
and
Order MHP 1

Red cells*	4 units
FFP	4 units
Platelets	1 dose (ATD)

(*Emergency O blood, group specific blood, XM blood depending on availability)

2 packs cryoprecipitate if fibrinogen <2g/l or as guided by ROTEM

STOP THE BLEEDING

Haemorrhage Control
Bimanual compression
Ergometrine 500 micrograms IV
Syntocinon 10 IU IV
& 40 IU infusion
Check placenta and for trauma
Carboprost IM.
EUA
Tamponade
Compression sutures
Hysterectomy

Haemostatic Drugs
Vit K and Prothrombin complex concentrate for warfarinised patients and
Other haemostatic agents: discuss with Consultant Haematologist

Cell salvage if available and appropriate
Consider ratios of other components:
1 unit of red cells = c.250 mls salvaged blood

Give MHP 1

Reassess

Suspected continuing haemorrhage requiring further transfusion
Take bloods and send to lab:
FBC, PT, APTT, fibrinogen, U+E, Ca^{2+}
NPT: ABG, ROTEM

Aims for therapy

Aim for:	
Hb	8-10g/dl
Platelets	>75 x 10^9/l
PT ratio	< 1.5
APTT ratio	<1.5
Fibrinogen	>2g/l
Ca^{2+}	>1 mmol/l
Temp	> 36°C
pH	> 7.35 (on ABG)

Monitor for hyperkalaemia

Order Products:
According to ROTEM
or Order MHP 2

Red cells	4 units
FFP	4 units
Platelets	1 dose (ATD)

request Cryoprecipitate 2 packs if fibrinogen <2

Prevent Hypothermia
Consider Calcium Chloride
Continuous cardiac monitoring

Give MHP 2

Once MHP 2 administered, repeat bloods:
FBC, PT, APTT, fibrinogen, U+E,
NPT: ABG, TEG if available
To inform further blood component requesting

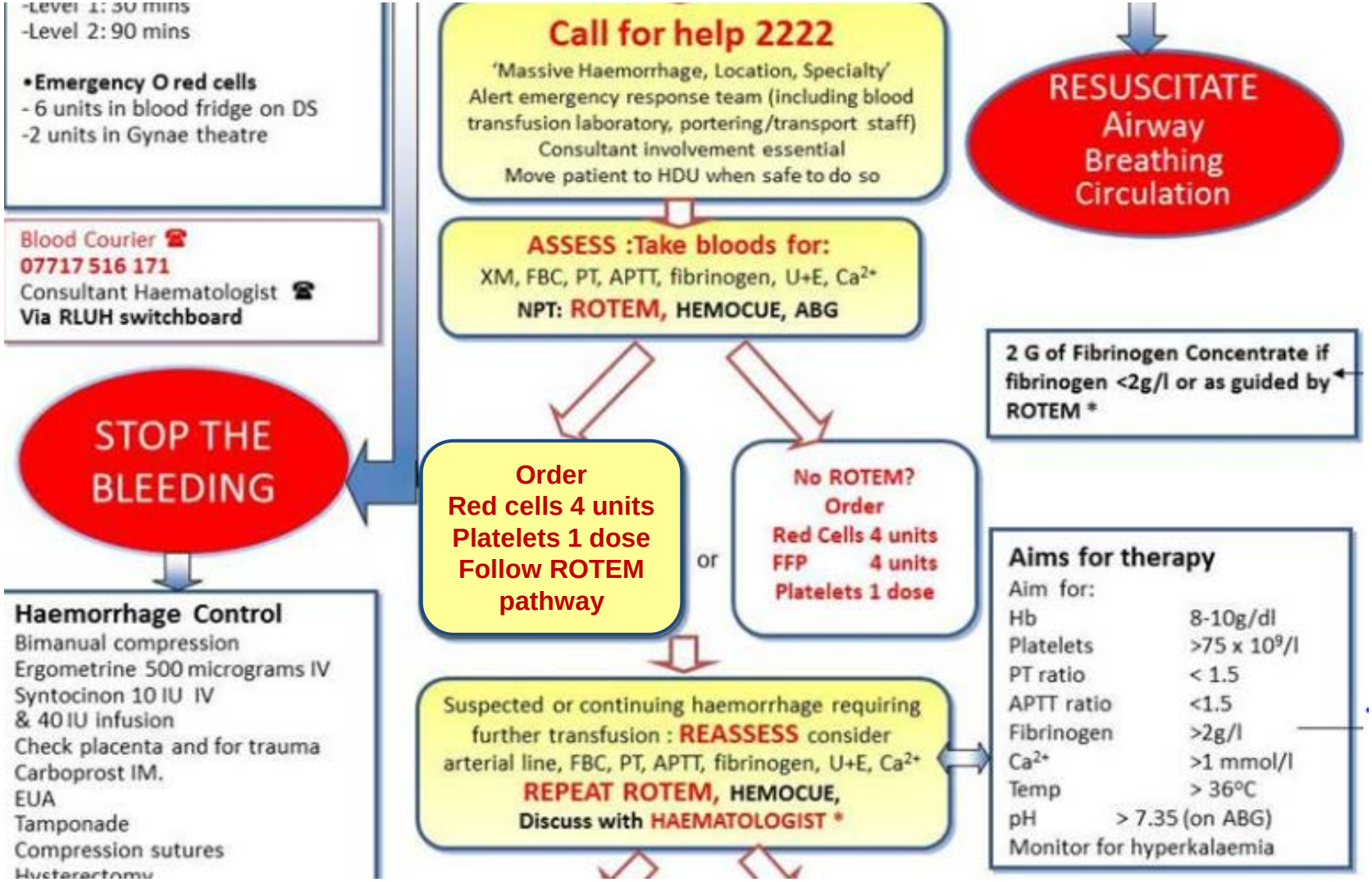
STAND DOWN
Inform lab
Return unused components
Complete documentation
Including audit proforma

Thromboprophylaxis should be considered when patient stable

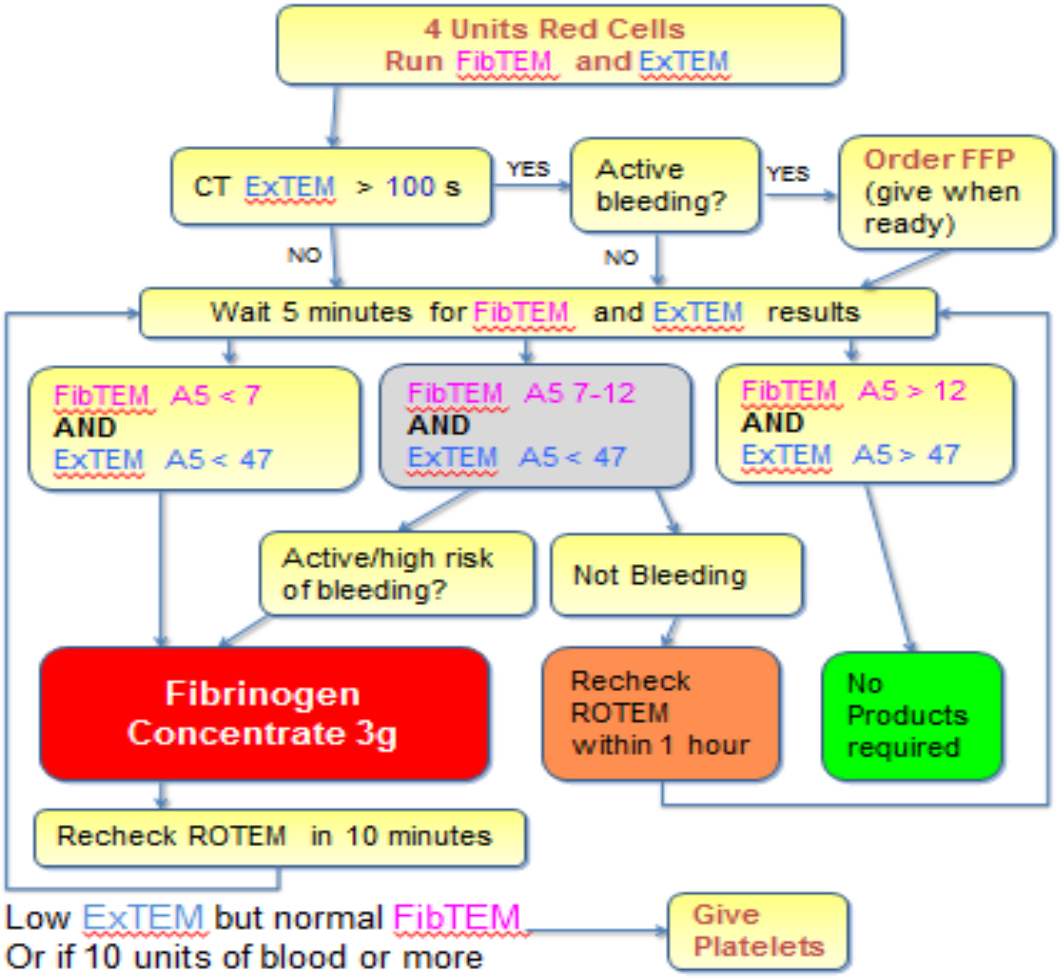
ABG – Arterial Blood Gas
FFP- Fresh Frozen plasma
PT- Prothrombin Time
APTT – Activated partial thromboplastin time
MHP – Massive Haemorrhage Pack
TEG/ROTEM- Thromboelastography
ATD- Adult Therapeutic Dose
NPT – Near Patient Testing
XM - Crossmatch

v1 2011

Changes to Massive Haemorrhage Pathway at LWH



LWH Protocol for Massive **Obstetric** Haemorrhage guided by results from ROTEM



***On agreement between Consultant Anaesthetist and Obstetrician**

NB Always base treatment upon clinical scenario

July 2012

Comparison of 12 months of ‘shock pack’ use with 12 months of ‘fibrinogen’ concentrate use

Outcomes measured during each phase

Blood component requirements	Total number of blood components
	Proportion of patients receiving fibrinogen replenishing products
	Units of Fresh Frozen Plasma
	Pooled bags of Cryoprecipitate
	Total quantity of fibrinogen*
	Number of units of red blood cells
	Number requiring ≥ 6 units of red blood cells
Patient outcomes and complications of blood component transfusion	Intensive care admissions
	Transfusion associated circulatory overload (TACO)
	Transfusion related acute lung injury (TRALI)
	Post-partum hysterectomies
	Death

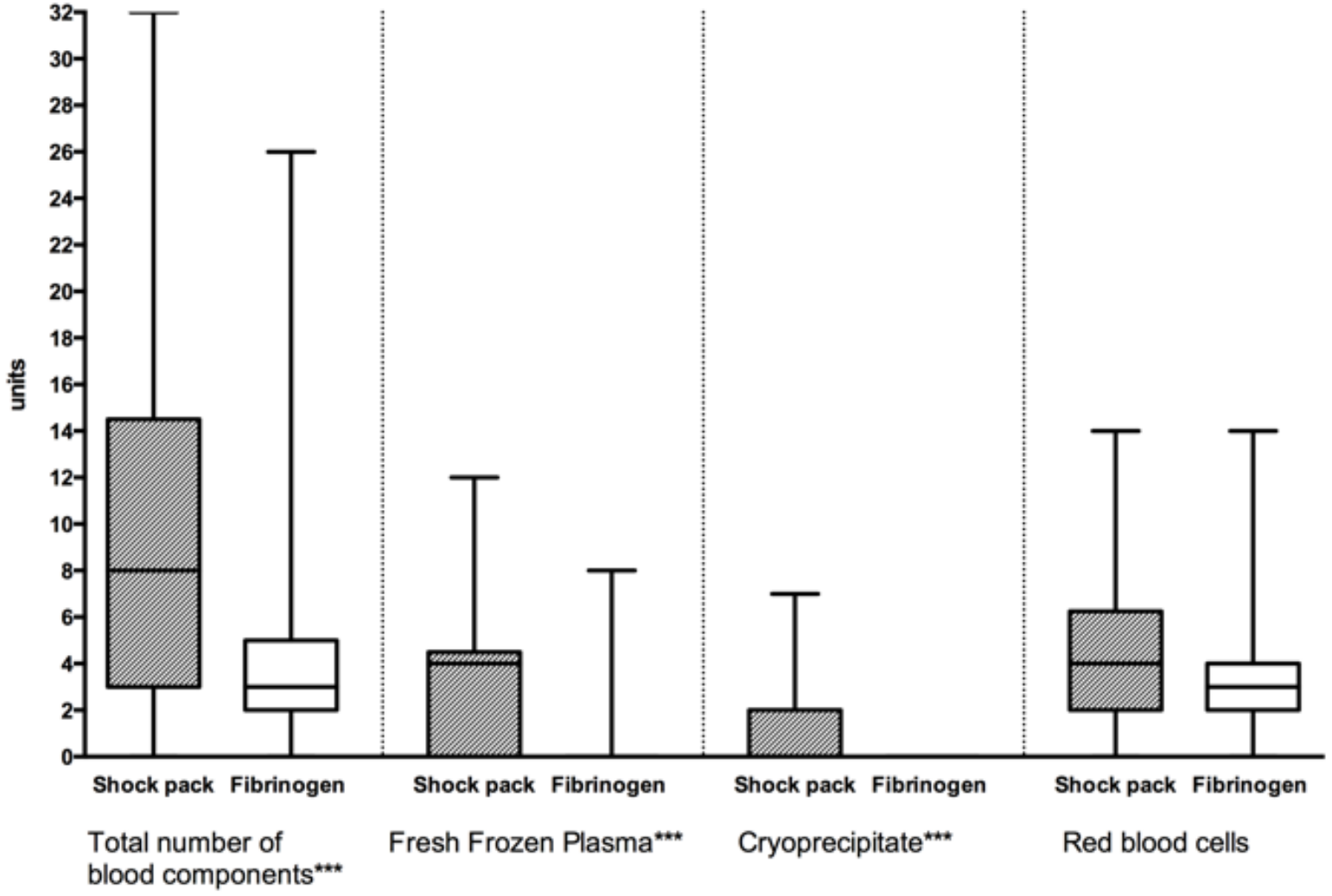
Shock pack(n=42) vs Fibrinogen Concentrate(n=51)

- Patient demographics were similar between the 2 groups

- Age & Parity
- Estimated blood loss
- Obstetric diagnoses

RESULTS

Blood product usage



Red Cell Usage

- Although there was no statistical difference in the median number of units of red blood cells given to each group.

- Patients receiving ≥ 6 units of packed red cells
  - Shock Pack - 12/42 (29%)
  - Fibrinogen – 5/51 (10%) (**p=0.0299)**

Patient outcomes & complications

	Shock Pack (n=42)	Fibrinogen (n=51)	p value
TACO	4 (9%)	0 (0%)	0.0367
ICU admission	4 (9%)	1 (2%)	NS
TRALI	0 (0%)	0 (0%)	NS
Death	0 (0%)	0 (0%)	NS
Post Partum Hysterectomy	6 (14%)	3 (6%)	NS

In summary :

- ?Reduction in post partum hysterectomies not statistically significant but of clinical importance!
- Significant reduction in blood product usage
- Significant reduction (?perhaps elimination) of Transfusion Associated Circulatory Overload (TACO) and need for ITU admission

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With Fibrinogen Concentrate in MOH

- Do a ‘ROTEM’ ASAP – reading in 6 – 7 mins
- Recognise presence of coagulopathy
- Decide if Fibrinogen Concentrate is required
- Immediately available for reconstitution – few mins
- Given to the patient over a few minutes
- Recheck ROTEM after a few minutes
- More Fibrinogen Concentrate if indicated

Total time for all of this ~ 30 minutes!!

With FFP or Cryoprecipitate

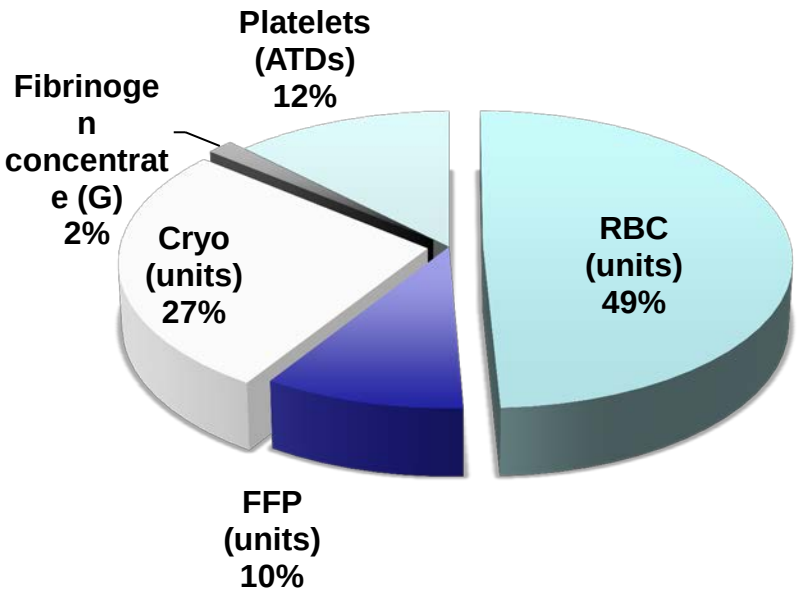
- Need to ring the lab to order it
- Requires defrosting – may take 30 mins on a good day!! Frequently longer!
- ABO matching
- Transportation to the clinical area – staffing issues
- Time for checking blood groups
- Larger volumes take longer to get into patient

But fibrinogen concentrate is more expensive!! Or is it??

		Shock pack n=42		Fibrinogen n=51	
	unit price	total no used	total cost	total no used	total cost
PRCs	121.85	179	21811.2	161	19617.85
FFP	28.46	151	4297.46	50	1432
cryoprecipitate	180.54	66	11915.6	0	0
platelets	196.96	28	5514.88	10	1969.6
fibrinogen concentrate	340	2	680	65	22100
Total spend on blood & blood products			44219.1		45119.45
cost per patient			1052.84		884.7

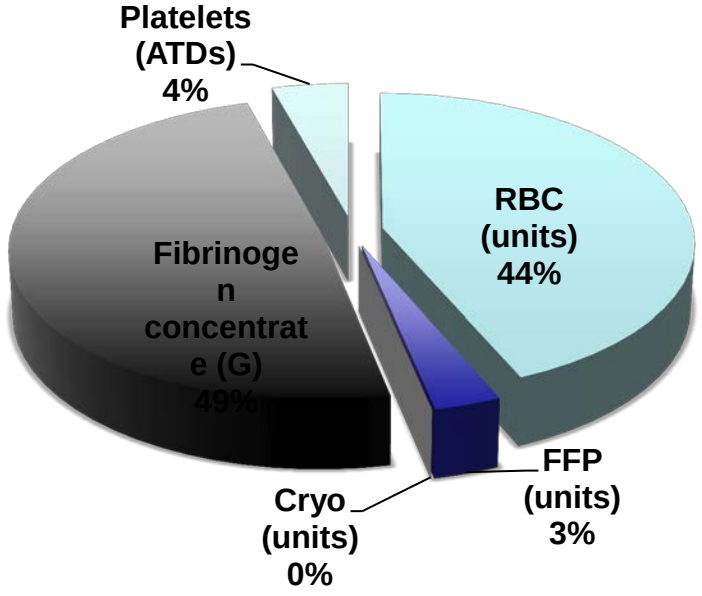
Costs in each group

Shock Pack



Average cost: £1052.84

Fibrinogen



Average cost: £884.52

Difference : £168.32

With a little help from my friends!

- Dr Philip Barclay, Consultant Anaesthetist
- Dr Clint Chevannes, Consultant Anaesthetist
- Dr Anil Bhalla, SpR Anaesthesia
- Dr Iestyn Harrod, Spr Anaesthesia
- Mr Stephen Longman, Haematology Lab manager
- Ms Cristina Dragomir, Transfusion Practitioner

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Thank You all for listening!!!

Average costs per patient

	Shock pack		Fibrinogen	
	Units	Costs	Units	Costs
RBC	4.26	£519.31	3.16	£384.66
FFP	3.60	£102.32	0.98	£27.90
Cryo	1.57	£283.71	0.00	£-
Fibrinogen	0.05	£16.19	1.27	£433.33
Platelets	0.67	£131.31	0.20	£38.62