Fibrinogen Concentrate in Pre-hospital Care

Fresh Whole Blood in Canadian Forces

LCOL Andrew Beckett MD MSc FACS
Royal Canadian Medical Service

- Faculty Disclosure
- Andrew Beckett – Nothing to Disclose

Objectives

- Describe need in RDCR for the hemostatic adjuncts Fibrinogen Concentrate and TXA
- Describe evidence for use of Fibrinogen and TXA in RDCR
- Describe current Freeze Dried Plasma capabilities and usage

- History
- Logistical reality of far forward setting
- Need for hemostasis adjuncts in Prehospital
- Fibrinogen
- TXA
- Freeze Dried Plasma

Lawrence Bruce Robertson (1885–1923)

Henry Norman Bethune 1890-1939


CANADA

ISSUE

- Most common cause of preventable death in SOF operators is hemorrhage
- 90% of combat prehospital deaths are due to hemorrhage
- 25% of combat prehospital deaths are potentially survivable
- Remote Damage Control Resuscitation strategies may improve survival

Holcomb JB, McMullin NR, Pearse L, et al. Causes of death in U.S. Special Operations Forces in the global war on terrorism: 2001-2004. *Ann Surg.* 2007;245(6):986-991.
Eastridge, 2012

ISSUE

- Supplied component therapy can only be brought for very short missions
- Component therapy availability is limited by logistical and cold chain concerns.
- Only TXA and Crystalloid available to SOF Medics

Boscarino C, Tien H, Acker J, Beckett A. Feasibility and transport of packed red blood cells into Special Forces operational conditions. *J Trauma Acute Care Surg.* 2014;76(4):1013-1019.

NEED

- Require a hemostatic product and protocol to start RDCR far forward.
- Must be portable and not require cold chain.
- Preferably ABO Universal

Goals

- 1 Support clot formation
- 2. Stop Hyperfibrinolysis
- 3. Replace depleted clotting factors

Fibrinogen is very important

- Fibrinogen levels decrease rapidly after traumatic hemorrhage
- Fibrinogen is the first clotting factor to decrease in hemorrhage
- Low fibrinogen levels are associated with increased mortality.
- More aggressive fibrinogen replacement may be associated with improved survival in military trauma

Rourke et al, 2012 JTH

Fibrinogen is very important

- Fibrinogen is necessary for primary and secondary hemostasis
- Hyperfibrinolysis is a key part of the acute traumatic coagulopathy
- Reduced fibrinogen associated with increased bleeding
- Reduced fibrinogen on arrival increases risk of death after trauma
- Extremely low fibrinogen levels are seen in massive post partum hemorrhage and massive bleeding after cardiac surgery

Reversal of trauma-induced coagulopathy using first-line coagulation factor concentrates or fresh frozen plasma (RETIC): a single-centre, parallel-group, open-label, randomised trial

Petra Innerhofer, Dietmar Fries, Markus Mittermayr, Nicole Innerhofer, Daniel von Langen, Tobias Hell, Gottfried Gruber, Stefan Schmid, Barbara Friesenecker, Ingo H Lorenz, Mathias Ströhle, Verena Rastner, Susanne Trübsbach, Helmut Raab, Benedikt Treml, Dieter Wally, Benjamin Treichl, Agnes Mayr, Christof Kranewitter, Elgar Oswald

- Single centre, parallel group, open label trial done at level 1 trauma in Austria
- 100 patients randomized to FFP (48) or Clotting factor concentrates (52)
- 100% of CFC group received Fibrinogen, 16% received PCC
- 52% of FFP group received Fibrinogen

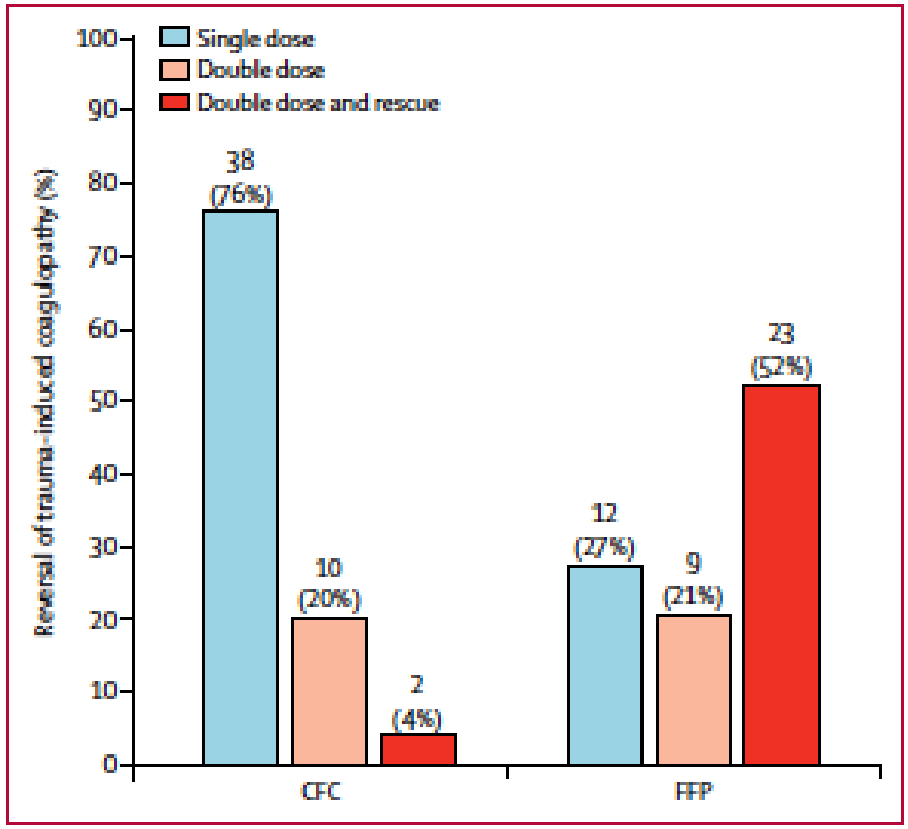

Figure 3: Percentage of patients with reversal of coagulopathy after either single-dose or double-dose study drug administration during the first therapy loop, and percentage of patients needing double-dose and rescue medication during the first 24 h in the intention-to-treat population
CFC=coagulation factor concentrates. FFP=fresh frozen plasma.

Lancet Haematol 2017; 4: e258–71
Published Online April 27, 2017
http://dx.doi.org/10.1016/S2352-3026(17)30077-7

	CFC (n=50)	FFP (n=44)	Estimated difference or odds ratio* (95% CI)	p value
FFP				
Patients†	2 (4%)	44 (100%)	∞ (126·35 to ∞)	<0·0001
Dose (U)	5 (5 to 5)	14 (10 to 14)	−9 (−16 to −2)	0·023
Fibrinogen concentrate				
Patients†	50 (100%)	23 (52%)	0 (0 to 0·10)	<0·0001
Dose (g)	8 (5 to 10)	5 (4·5 to 8)	1 (0 to 3)	0·11
Four-factor PCC				
Patients†	8 (16%)	2 (5%)	0·25 (0·02 to 1·37)	0·098
Dose (IU)	2000 (1875 to 3000)	850 (675 to 1025)	1500 (300 to 4500)	0·046
FXIII				
Patients†	27 (54%)	11 (25%)	0·29 (0·11 to 0·74)	0·0060
Dose (IU)	2000 (2000 to 2500)	1500 (1375 to 2000)	500 (0 to 750)	0·031
Red blood cell concentrate‡				
Patients†	45 (90%)	39 (89%)	0·87 (0·18 to 4·08)	1
Dose (U)	4 (2 to 7)	6 (4 to 11)	−2 (−4 to 0)	0·028
Massive transfusion (U)§†	6 (12%)	13 (30%)	3·04 (0·95 to 10·87)	0·042
Platelet concentrate¶				
Patients†	10 (20%)	21 (48%)	3·60 (1·35 to 10·18)	0·0078
Dose (U)	2 (1 to 4)	2 (1 to 3)	0 (−1 to 2)	0·63

Data are n (%) or median (IQR). CFC=coagulation factor concentrates. FFP=fresh frozen plasma. PCC=prothrombin complex concentrate. FXIII=coagulation factor XIII concentrate. *CFC group minus FFP group. †Binary variables presented with odds ratios. ‡Leucocyte depleted. §≥10 U in 24 h. ¶1 U, 1 apheresis platelet concentrate, or 6 pooled platelet concentrate.

Table 3: **Study drugs and transfusion requirements during the first 24 h after injury**

Lancet Haematol 2017; 4: e258–71
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BJA

British Journal of Anaesthesia 115 (1): 76–83 (2015)

doi: 10.1093/bja/aev134
Advance Access Publication Date 19 May 2015
Clinical Practice

Early cryoprecipitate for major haemorrhage in trauma: a randomised controlled feasibility trial

N. Curry[1,*], C. Rourke[2], R. Davenport[2], S. Beer[1], L. Pankhurst[3], A. Deary[3], H. Thomas[3], C. Llewelyn[3], L. Green[4], H. Doughty[5], G. Nordmann[6,7], K. Brohi[2] and S. Stanworth[1]

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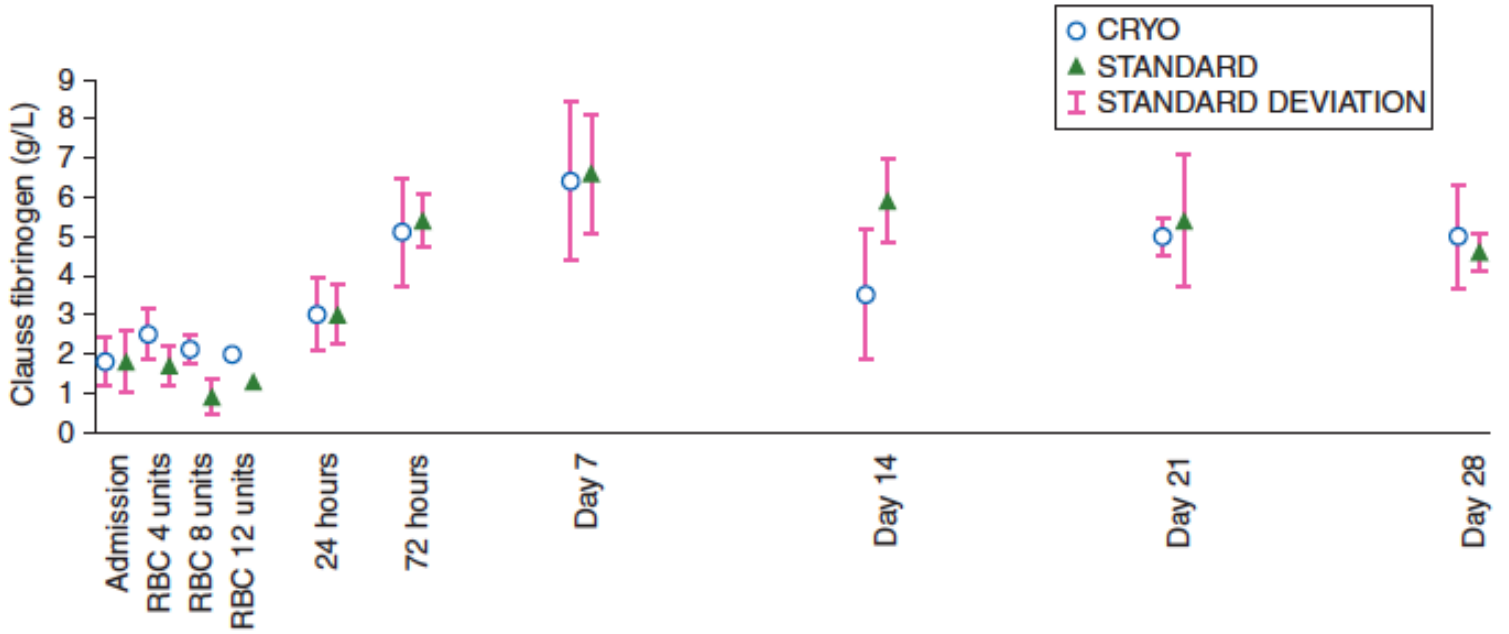

N in CRYO	13	6	3	1	16	15	13	6	5	7
N in STANDARD	15	5	2	1	15	12	10	9	7	8

Fig 2 Comparison of Mean Fibrinogen Concentrations (Standard Deviation) between Study Arms for the Duration of the Trial. Changes of Clauss fibrinogen concentrations were compared using a two way ANOVA with repeated measures for patients in each arm of the trial. No evidence of a difference between changes in mean Clauss fibrinogen concentrations at 24 h and 72 h and the arm of the trial.

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Clinical Practice

BJA

British Journal of Anaesthesia, 117 (6): 775–82 (2016)

doi: 10.1093/bja/aew343
Critical Care

CRITICAL CARE

Fibrinogen in the initial resuscitation of severe trauma (FiiRST): a randomized feasibility trial

B. Nascimento[1,*], J. Callum[1], H. Tien[1], H. Peng[2], S. Rizoli[3], P. Karanicolas[1], A. Alam[1], W. Xiong[1], R. Selby[1], A-M. Garzon[1], C. Colavecchia[1], R. Howald[1], A. Nathens[1], and A. Beckett[4]

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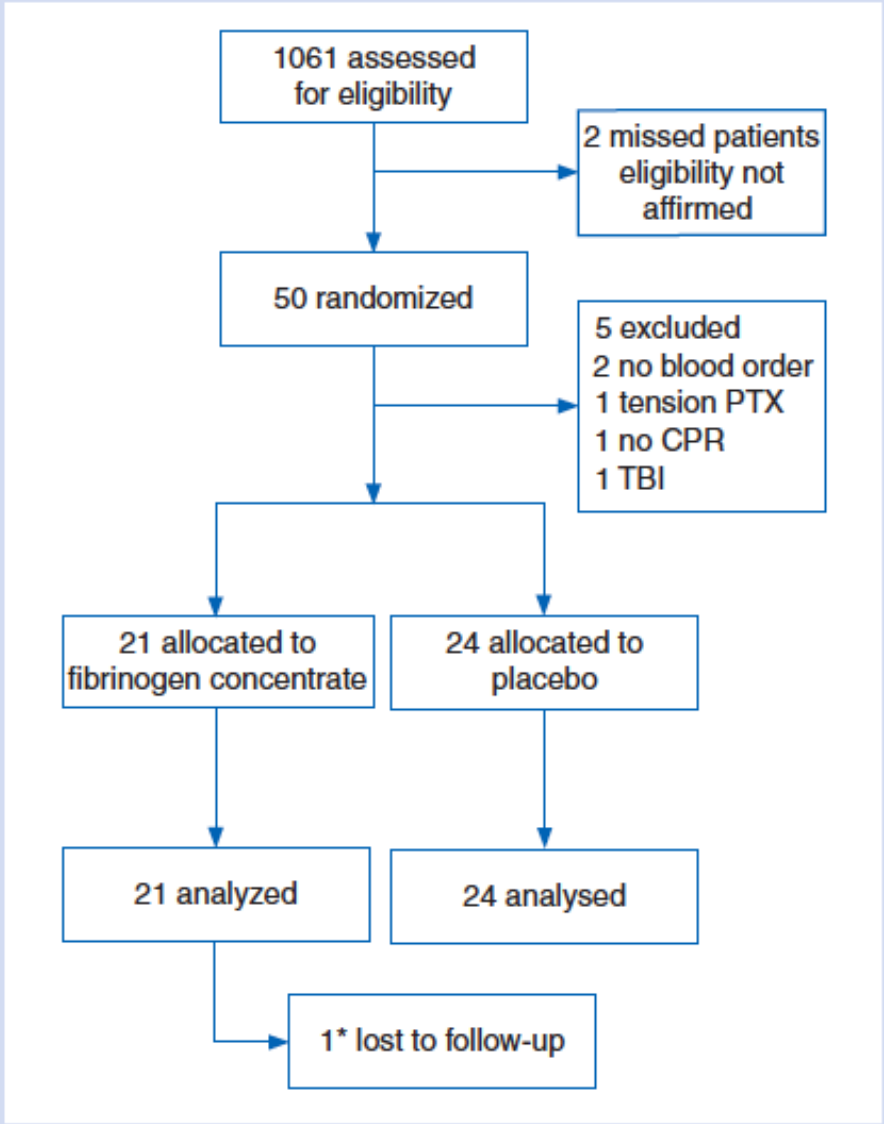

Fig 1 Flow of patients through the rial.
*Lost to follow-up and excluded from outcome at 28 days
CPR, cardio-pulmonary resucitation; PTX, pneumothorax; TBI, traumatic brain injury

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doi: 10.1093/bja/aew343
Critical Care

Table 1 Subject characteristics. N values represent the number of subjects in each group in whom the measured parameter is available. [1]Age difference, $P=0.05$ (non-parametric Wilcoxon Rank Sum Test used); [2]Acute Traumatic Coagulopathy defined by INR ≥ 1.3. FC, fibrinogen concentrate; %, percentage of occurrence; IQR, interquartile ranges; SD, standard deviation

	N	Placebo	N	FC
Age[1], yr, median (range)	24	28 (19–88)	21	48 (19–78)
Sex, male (%)	24	87	21	77
Penetrating type of trauma (%)	24	54	21	52
Time from injury to hospital, min, median (IQR)	24	43 (33–55)	21	44 (30–59)
Injury Severity Score, median (IQR)	24	23 (18–29)	21	25 (19–29)
Glasgow Coma Scale, median (IQR)	24	15 (12–15)	21	15 (14–15)
Systolic Arterial Pressure, mm Hg, median (IQR)	24	99 (82–99)	21	106 (80–144)
Temperature, °C, mean (SD)	15	35 (0.7)	13	35 (1.4)
pH, mean (SD)	15	7.2 (0.2)	14	7.2 (0.1)
Lactate, g L^{-1}, median (IQR)	20	5 (4–8)	20	5 (3–9)
International Normalized Ratio, mean (SD)	22	1.1 (0.2)	19	1.2 (0.3)
Fibrinogen, g L^{-1}, median (IQR)	22	1.9 (1.7–2.4)	19	1.9 (1.6–2.3)
Platelet $\times 10^9$ L^{-1}, median (IQR)	22	254 (200–282)	20	269 (242–314)
Haemoglobin, g L^{-1}, median (IQR)	22	122 (112–144)	20	118 (105–125)
Troponin, g L^{-1}, median (IQR)	19	7 (5–12)	15	8 (5–25)
Acute Traumatic Coagulopathy[2] (%)	22	18	19	26
Fibrinogen <2 g L^{-1} (%)	22	54	19	53

Table 2 Co-interventions and transfusion[1]. Transfusion and crystalloid data are presented as median (interquartile ranges). [1]For the transfusion data, numbers represent units transfused for each product. In our institution, platelets are issued in pools of 4 units (random donor method) or 5 units (apheresis method); and cryoprecipitate is issued in pools of 10 units per adult dose. DVT, deep venous thrombosis; FC, fibrinogen concentrate; RBC, red blood cells; SI, study intervention

	Placebo (N=24)	FC (N=21)	P
Tranexamic Acid, %	96	100	1.00
Vasopressor, %	54	67	0.39
Urgent Trauma Laparotomy, %	42	52	0.47
Orthopaedic Operation, %	42	38	0.81
Angioembolization, %	4	9	0.59
Chemical DVT Prophylaxis, %	83	95	0.35
SI before RBC Transfusion, %	12.5	14.3	1.00
Pre-SI RBC Transfusion	1.96 (1.7–2.4)	1.91 (1.6–2.3)	0.68
Post-SI RBC Transfusion	1.73 (1.3–2.0)	2.71 (2.2–3.4)	0.20
24 h RBC Transfusion	3 (2–4)	3 (2–5)	0.41
24 h Plasma Transfusion	1.75 (1.4–2)	2.73 (2.4–3.6)	0.72
24 h Platelet Transfusion	2.32 (1.9–2.7)	2.81 (2.5–3.6)	0.53
24 h Cryoprecipitate Transfusion	3.5 (2.9–4)	4.0 (3.1–4.6)	0.18

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Critical Care

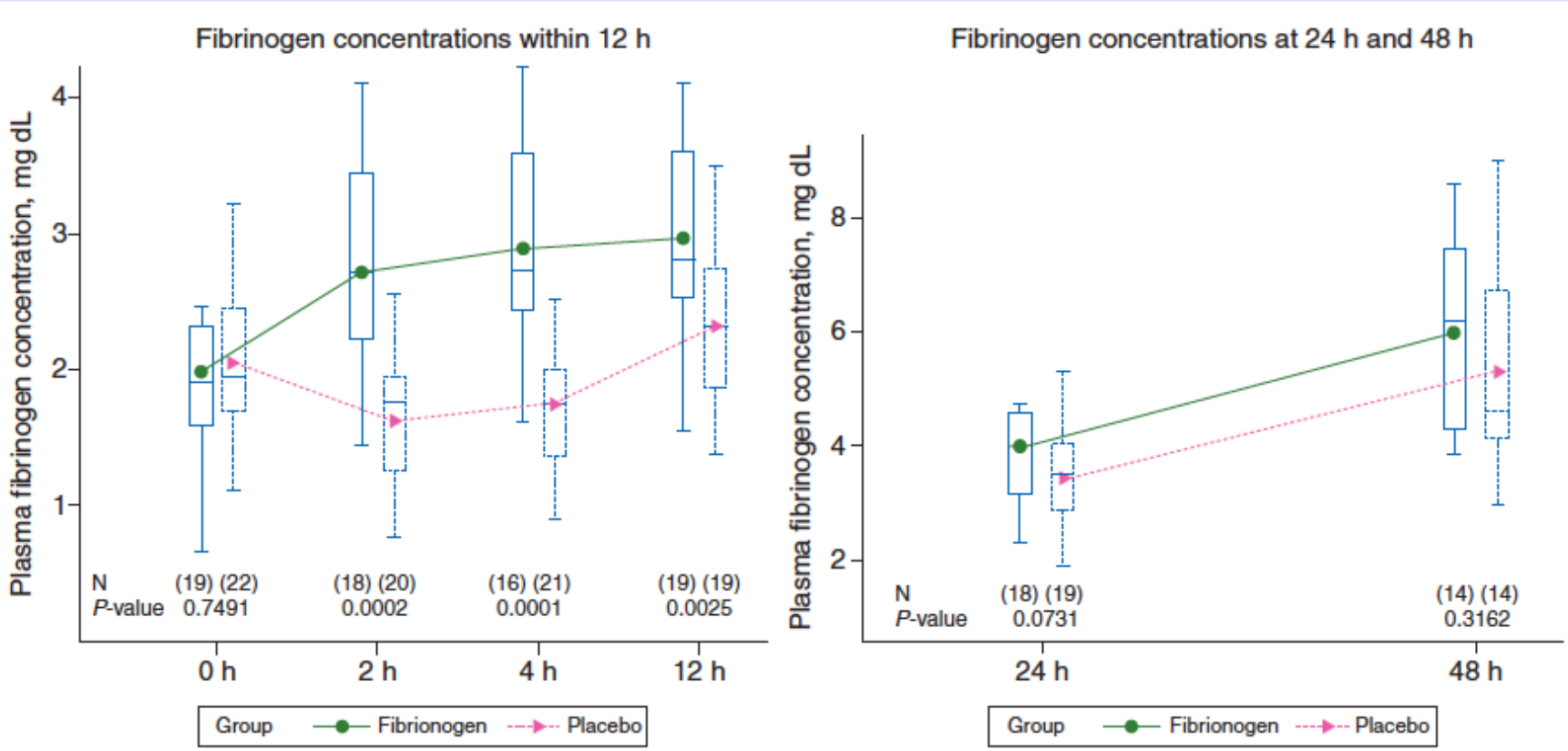

Fig 2 Plasma Fibrinogen Concentrations throughout 48 h of Hospitalization.
Data are presented as means (standard deviation) or median (interquartile ranges)
FC, fibrinogen concentrate

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Table 3 Clinical endpoints. Data are presented as number of positive outcomes over total number of patients assessed per study group, and percentages. Placebo considered reference standard for relative risk calculation. [1]One subject in the FC group died nine days after hospital admission as a result of worsening severe brain injury; in the placebo group, the single death was mostly related to anoxic brain injury after cardiac arrests as a result of initial traumatic bleeding. [2]One study participant was lost to follow-up at day 28. [3]The only death in the trial (in the FC group) that was classified as being mainly as a result of exsanguination occurred in a 61 year-old female with a history of two previous myocardial infarctions. It happened in less than 2 h of hospital arrival after prehospital and in-hospital cardiac arrests after resuscitative efforts were discontinued because of futility. CI, confidence interval; FC, fibrinogen concentrate

	Placebo	FC	Relative Risk	95% CI
All-cause 28-day mortality[1]	1/24 (4.2)	2/20[2] (10)	2.4	−0.2 to 23
Death by exsanguination[3]	0	1/21 (4.8)	NA	NA
Symptomatic Deep Venous Thrombosis	0	0	NA	NA
Deep Venous Thrombosis on Leg Doppler	3/14 (21.4)	2/15 (13.3)	0.62	−0.1 to 3.2
Pulmonary Embolism	1/24 (4.2)	2/21 (9.5)	2.3	−0.2 to 23.4
Myocardial Infarction	0	0	NA	NA
Stroke	0	0	NA	NA
Acute Lung Injury	2/24 (8.3)	0	NA	NA
Acute Respiratory Distress Syndrome	2/24 (8.3)	0	NA	NA
Acute Kidney Injury	2/24 (8.3)	3/21 (14.3)	1.7	−0.3 to 9.3
Multiple Organ Failure	2/24 (8.3)	2/21 (9.5)	1.1	−0.2 to 7.4
Infection	8/24 (33.3)	5/21 (23.8)	0.7	−0.3 to 1.8

Table 1 – Comparison of FFP versus cryoprecipitate versus RiaSTAP.

Comparative variable	FFP	Cryoprecipitate	RiaSTAP
Cost ($)/U	60 [20]	60*	870†
Fibrinogen (mg/dL)	160–200	1700	2000
Infusion volume (mL/U)	250	90	50
Pathogen risk [10]	Possible	Possible	Extremely minimal
Preparation time	20–40 min thawing	10 min thawing	15 min (protocol)
Dosing [10]	Variable (fibrinogen), inconsistent dosing	Variable (fibrinogen), inconsistent dosing	Standardized (fibrinogen), consistent dosing

* Regional blood center.
† Pharmaceutical distributor.

RiaSTAP

- CSL Behring (Canada)
- 1gram/$300
- Approved by Health Canda for congenital afibrinogenemia/hypofibrinogenemia
- Not type specific – ABO Universal

RiaSTAP

- Normal shelf life @ 25^{o}C - 36 months
- Tolerates extremes up to 40^{o}C for 1 month without decreasing shelf life
- Can be rapidly reconstituted for trauma
- Small volume and can be rapidly admistered

CSL Behring Stability Data

Available Product

- RiaSTAP (CSL Behring)
  - Pasteurized Human Fibrinogen (Factor I)

Association for Academic Surgery

In vitro efficacy of RiaSTAP after rapid reconstitution

Jay V. Karri, BS,[a] Jessica C. Cardenas, PhD,[a]
Pär I. Johansson, MD, DMSc, MPA,[a,c] Nena Matijevic, PharmD, PhD,[a]
Bryan A. Cotton, MD, MPH,[a,c] Charles E. Wade, PhD,[a,b]
and John B. Holcomb, MD[a,b,]*

Standard reconstitution time 15 min
Rapid 30 sec of rapid shaking
In vitro assays no difference


Ziploc
RIASTRAP

Investigation of fibrinogen stability after reconstitution for hemostatic resuscitation on the battlefield

Peng, Rhind and Beckett 2017

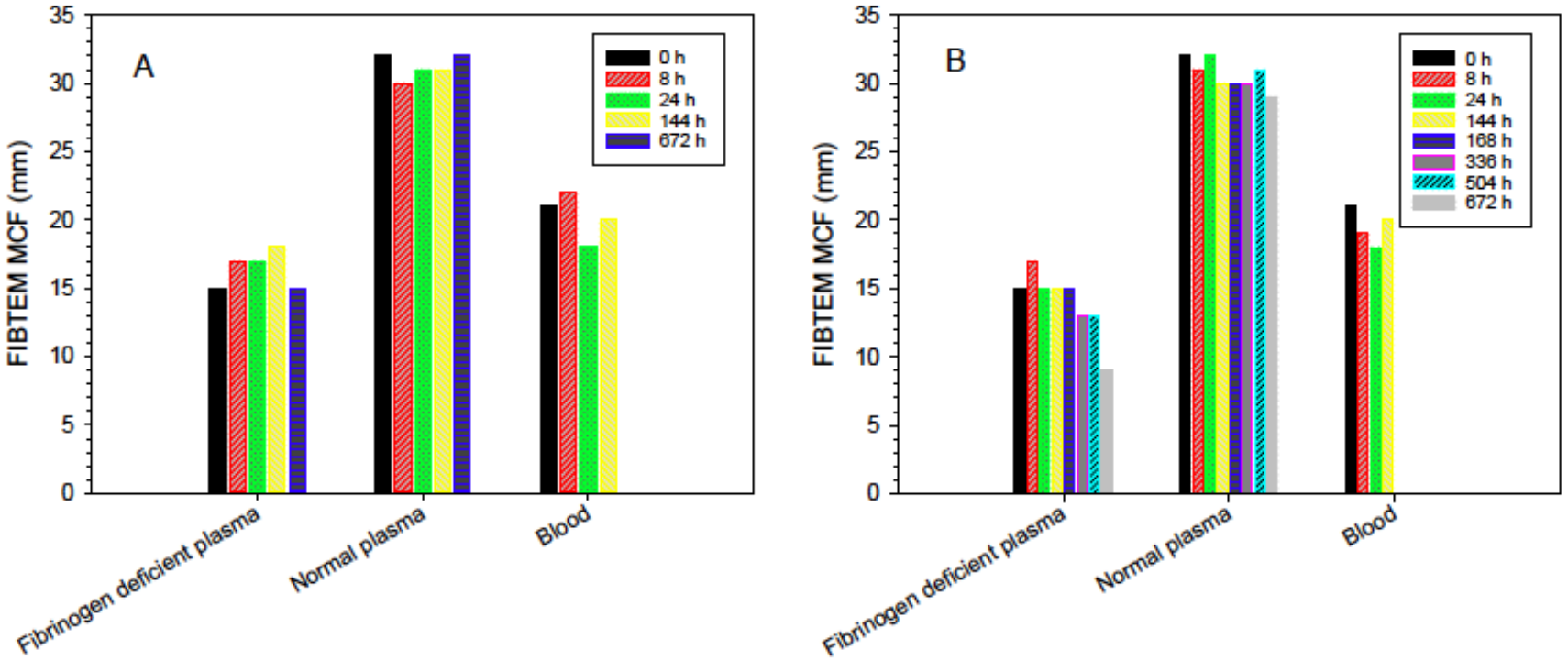


Figure 2: *Effects of storage temperatures (A: -20°C and B: 4°C) for reconstituted RiaSTAP™ on the maximum clot firmness (MCF) of fibrinogen deficient plasma, normal plasma and blood. The plasma and blood were spiked with reconstituted RiaSTAP™ stored at -20°C and 4°C, respectively for different time, and their MCF was measured by ROTEM FIBTEM tests.*

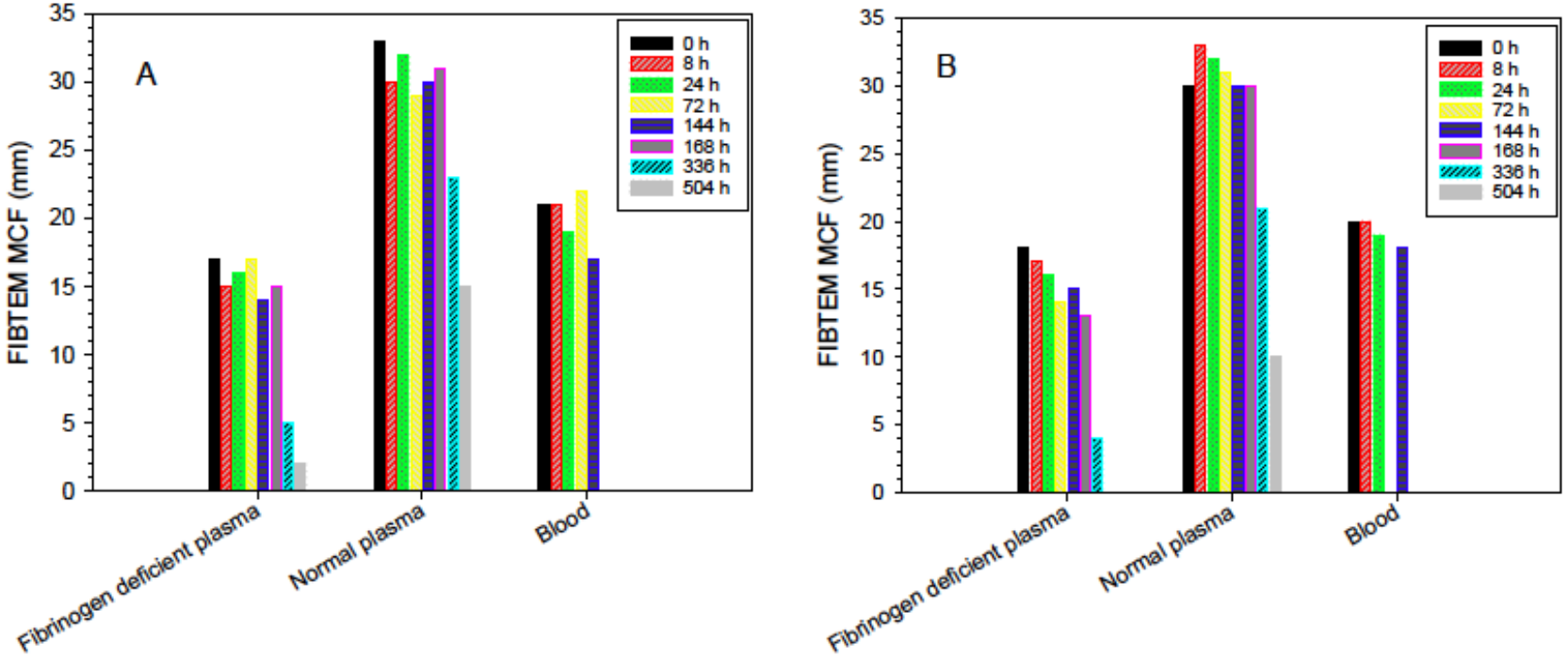


Figure 3: *Effects of storage temperatures (A: 22℃ and B: 22℃ with rocking) for reconstituted RiaSTAP™ on the maximum clot firmness (MCF) of fibrinogen deficient plasma, normal plasma and blood. The plasma and blood were spiked with reconstituted RiaSTAP™ and their MCF was measured by ROTEM FIBTEM tests.*

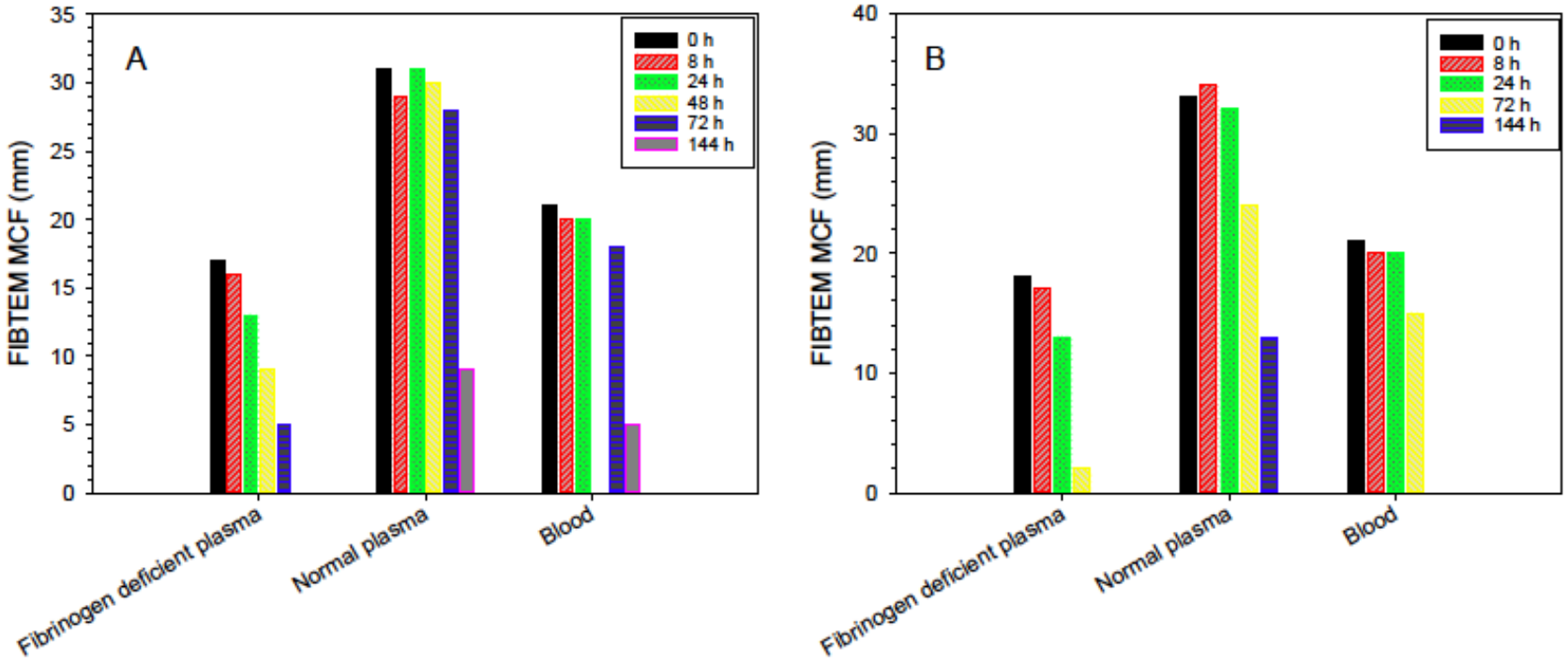


Figure 4: *Effects of storage temperatures (A: 35°C and B: 42°C) for reconstituted RiaSTAP™ on the maximum clot firmness (MCF) of fibrinogen deficient plasma, normal plasma and blood.*

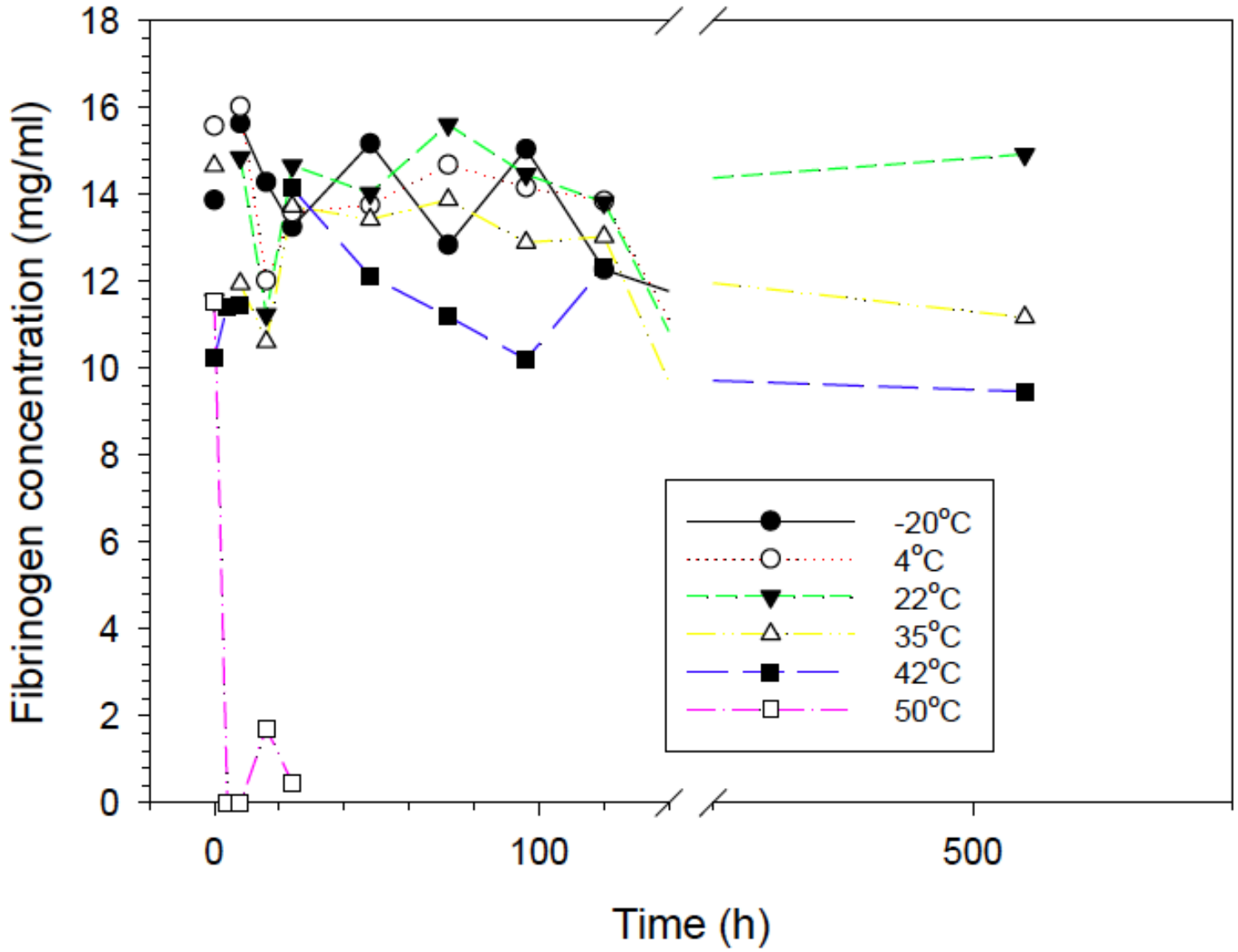
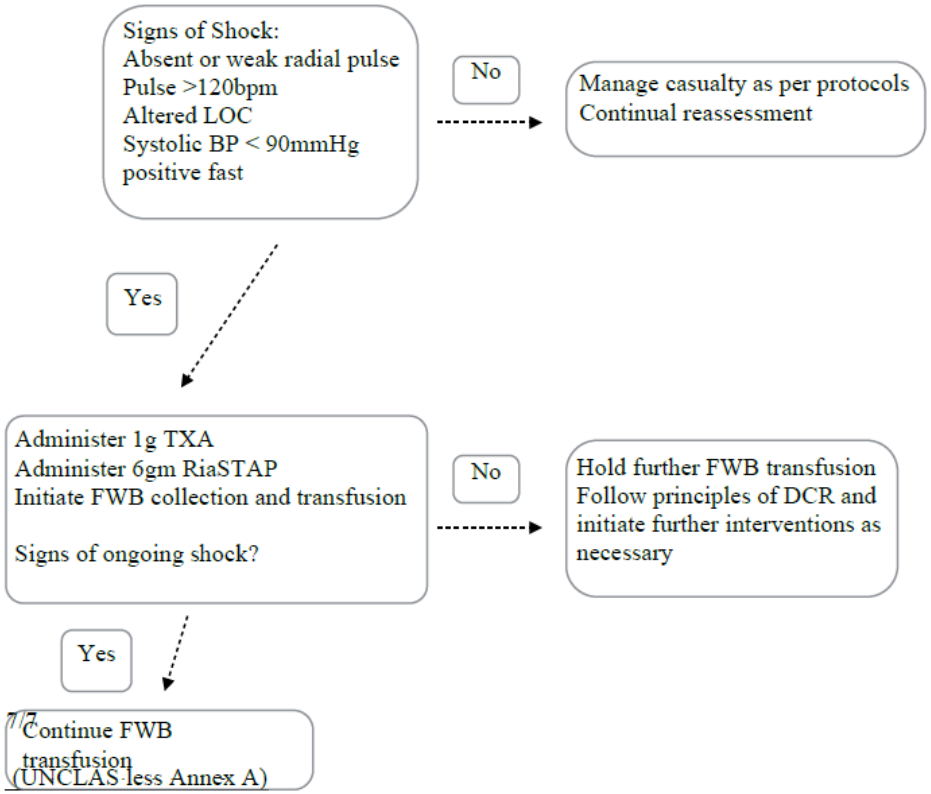


Figure 6: *ELISA fibrinogen concentrations of reconstituted RiaSTAP™ stored at different temperatures over time.*

RiaSTAP use

- Use as part of SOFCOM care provider protocol
- Training with expired product and SMEs
- Use in conjunction with TXA and FWB protocol
- RiaSTAP dose 6 gm IV
  - Equivalent to 10-15 Units of pooled Cryo
  - Use Rapid reconstitution protocol
  - Able to rapidly infuse by IV push

Part of SOFCOM RDCR Strategy



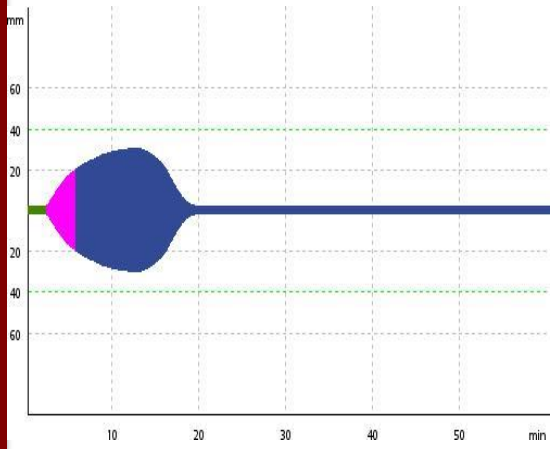
(UNCLAS less Annex A)

Patient 2285

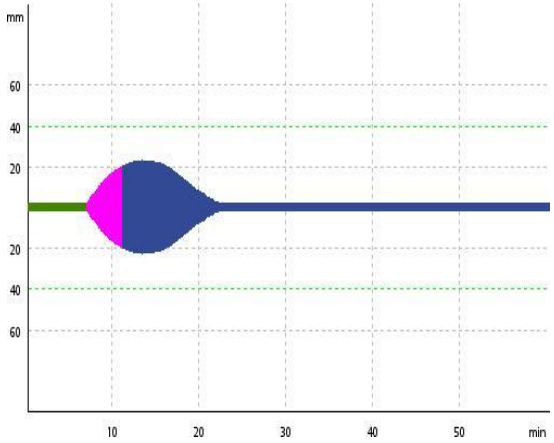
- Patient came in with uncontrolled bleeding due to gunshot wounds.
- Barely had a radial pulse on pickup.

Patient 2285 first sample

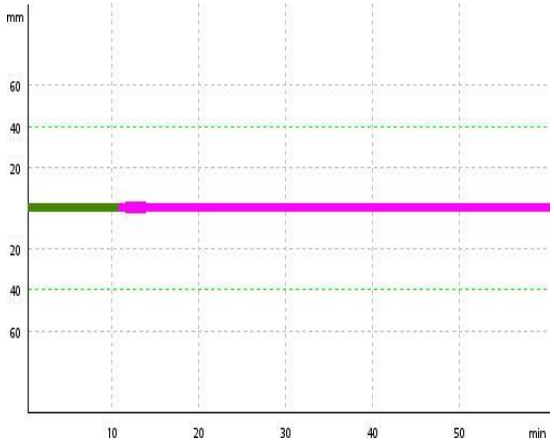
Extem



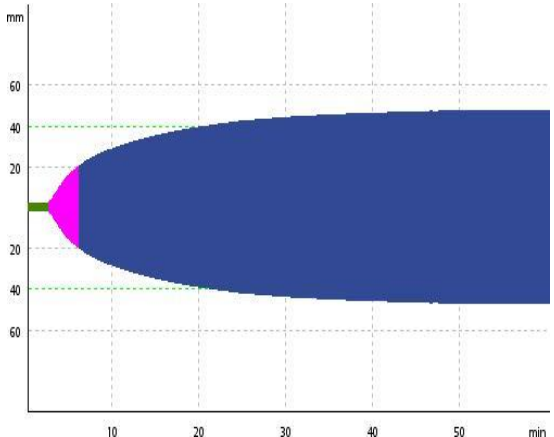
Intem



Fibtem



Aptem

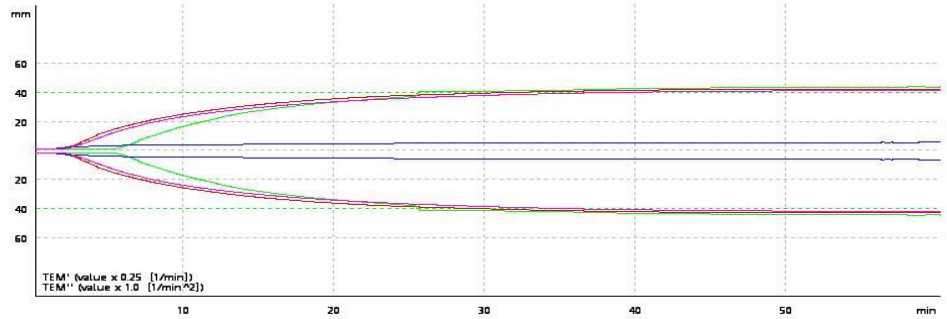


Patient 2285

- Patient shows fibrinolysis on Extem and Intem and no fibrinogen present.
- Aptem confirm the presence of Fibronolysis.

- Patient came in with 146 plt
- At this point the coagulation process is done only with the help of platelets, due to the absence of fibrinogen.

Patient 2285 second sample



EXTEM				INTEM				FIBTEM				APTEM			
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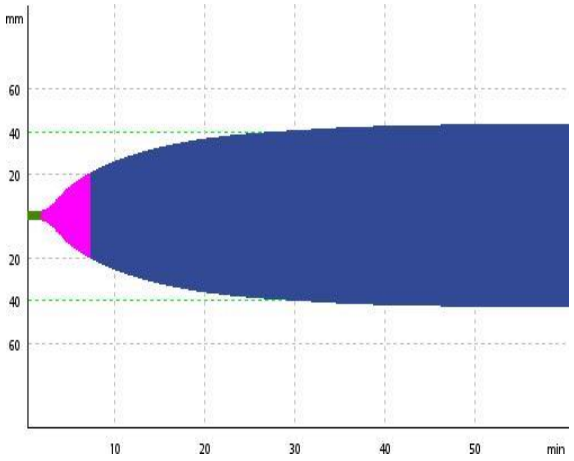
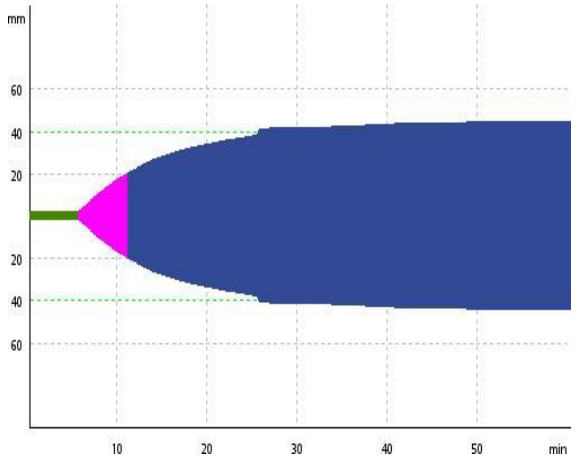
SampleID:				SampleID:				SampleID:				SampleID:			
Name:				Name:				Name:				Name:			
CT	:	100	s	CT	:	327	s	CT	:	91	s	CT	:	129	s
CFT	:	327	s	CFT	:	335	s	CFT	:		s	CFT	:	346	s
α	:	43	°	α	:	43	°	α	:		°	α	:	41	°
A10	:	28	mm	A10	:	29	mm	A10	:	5	mm	A10	:	27	mm
A20	:	37	mm	A20	:	40	mm	A20	:	5	mm	A20	:	35	mm
MCF	:	43	mm	MCF	:	44	mm	MCF	:	6	mm	MCF	:	42	mm
ML	: *	6	%	ML	: *	5	%	ML	: *	0	%	ML	: *	5	%
LI30	:	100	%	LI30	:	100	%	LI30	:	100	%	LI30	:	100	%
LI60	:	100	%	LI60	:	100	%	LI60	:	100	%	LI60	:	100	%
LOT	:		s	LOT	:		s	LOT	:		s	LOT	:		s

Patient 2285 second sample

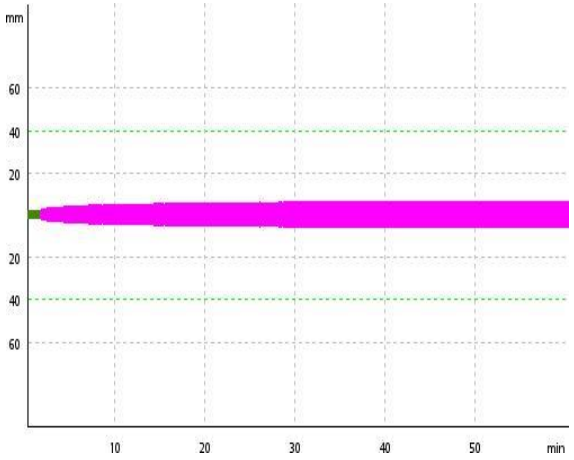
Extem



Intem



Fibtem



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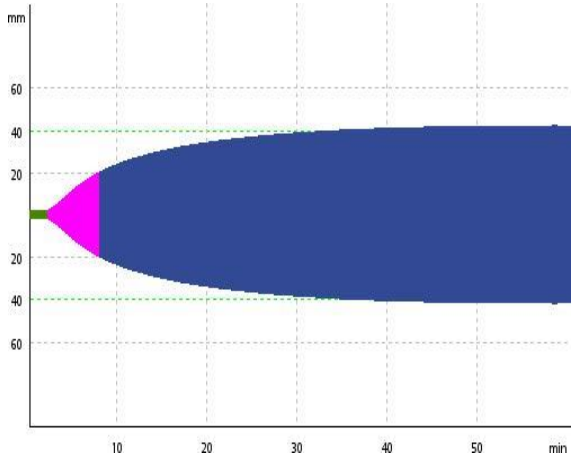
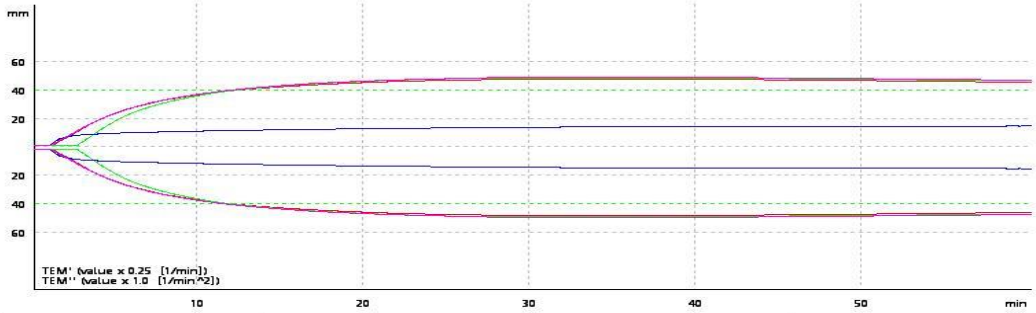


Patient 2285

- Up to that point the patient received:
- 2 unit of Whole blood
- 12 pRBC
- 4 FFP
- 10g Fibrinogen
- No Platelets!

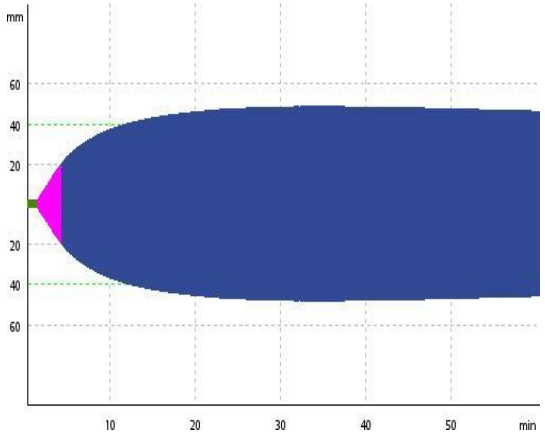
Patient 2285, 11th sample



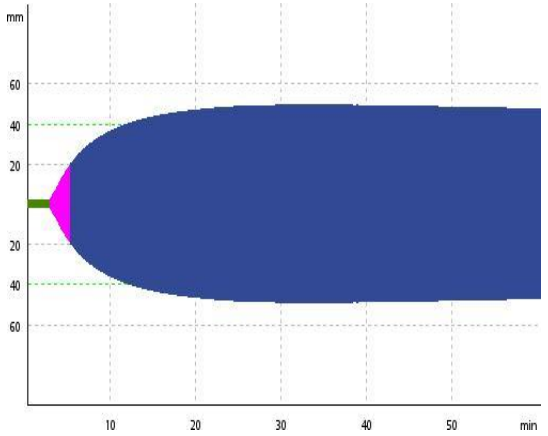
EXTEM 20000			INTEM			FIBTEM			APTEM		
PatientID: 2285-11			PatientID: 2285-11			PatientID: 2285-11			PatientID: 2285-11		
SampleID:			SampleID:			SampleID:			SampleID:		
Name:			Name:			Name:			Name:		
CT	: 77	s	CT	: 165	s	CT	: 66	s	CT	: 70	s
CFT	: 169	s	CFT	: 146	s	CFT	:	s	CFT	: 177	s
α	: 59	°	α	: 63	°	α	: 66	°	α	: 60	°
A10	: 39	mm	A10	: 41	mm	A10	: 12	mm	A10	: 39	mm
A20	: 46	mm	A20	: 48	mm	A20	: 13	mm	A20	: 47	mm
MCF	: 48	mm	MCF	: 49	mm	MCF	: 15	mm	MCF	: 50	mm
ML	: * 7	%	ML	: * 5	%	ML	: * 0	%	ML	: * 6	%
LI30	: 100	%	LI30	: 100	%	LI30	: 100	%	LI30	: 100	%
LI60	: 95	%	LI60	: 96	%	LI60	: 100	%	LI60	: 95	%
LOT	:	s	LOT	:	s	LOT	:	s	LOT	:	s

Patient 2285, 11th sample

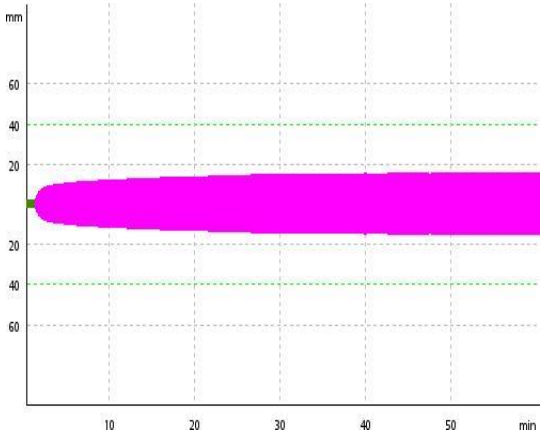
Extem



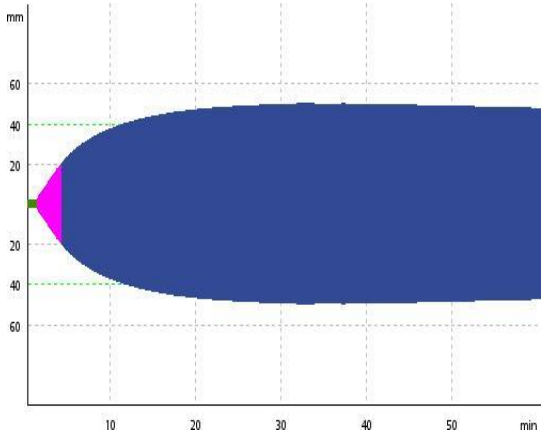
Intem



Fibtem



Aptem



Patient 2285, 11th ROTEM

- In all this patient got:
- 26 PRBC
- 22 FFP
- 3 Whole blood
- 12g Fibrinogen
- No Platelets given!

Summary

- Need for room temperature stable, ABO universal products to start RDCR
  - 1 Support clot formation
  - 2. . Stop Hyperfibrinolysis
  - 3. Replace depleted clotting factors

Summary

- Evidence increasing for Fibrinogen to be used in far forward RDCR settings
- Demand for these products will increase
- Current production will need to increase

Fresh Whole Blood in Canadian Forces

Canadian Blood Services
it's in you to give

RCMS FWB Program in Kandahar 2006-2009 ran with extensive support of CBS based on 2006 MOU

CBS will use its reasonable efforts to provide to the Crown the following services:

(a) screen and test the Crown personnel to determine eligibility to donate blood and blood products;
(b) train a maximum of eight (8) Crown personnel, including registered nurses and medical laboratory technologists, per session to screen and phlebotomize donors; and
(c) provide a listing of Crown personnel who are (i) eligible to donate, (ii) temporarily deferred from donation; (iii) indefinitely deferred from donation and (iv) the basis for and duration of deferral, where applicable, to the Director, Health Services Operations Operational Medicine 2 of the Crown.

Donors were screened by CBS prior to deployment

Rapid HIV/HepB/C on donation

ABO indentical FWB transfusion only

F/U of recipients/donors post transfusion

Background

- Potential Donors can be deferred for:
  - Travel to Malarial Areas
  - Risk factors for infections, such as recent tattoos
  - Vaccinations

Multidisciplinary trauma team care in Kandahar, Afghanistan: Current injury patterns and care practices

Andrew Beckett [a,b], Pierre Pelletier [b,c], Christiaan Mamczak [b,c], Rodd Benfield [b,c], Eric Elster [b,c,d,e,*]

Mechanism of injury Role III MMU Kandahar Airfield 01 October 200
December 2010.

Mechanism	Number of pa
Improvised Explosive Device – no found source	915
Bullet/GSW/firearm	327
Motor vehicle collision	202
Mortar/rocket/artillery wounds	101
Fall	81
Other	75
helicopter crash	68
Rocket propelled grenade	52
Improvised Explosive Device – vehicle borne	38
Machinery/equipment	34
Landmine	31
Burns	26
Improvised Explosive Device – person borne	24
Hand grenade	23
Explosion – not otherwise specified	16
Knife/other sharp object injury	14
Blunt Injury – not otherwise specified	7
Unexploded ordinance detonation	5
Penetrating injury – not otherwise specified	4
Aerial bomb	3
Asphyxia/suffocation	2
Chemical injury	2
Plane crash	1
Submersion/drowning	1
Non trauma/not recorded/unknown	547
Total	2599

Multidisciplinary trauma team care in Kandahar, Afghanistan: Current injury patterns and care practices

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Table 1
Trauma bay patient characteristics 1 October 2009 to 31 December 2010 at MMU Role III Hospital, Kandahar Airfield.

Patient admissions to trauma bay	2599
NATO soldier admissions	1407
Local National admissions	581
Afghan Security Force admissions	312
Civilian contractor admissions	102
Paediatric admissions	197
In house mortality	4.45%
PRBCs transfused	4042
Units FFP transfused	3805
Units platelets transfused	585
Whole Blood transfusions	162
Massive transfusions	127
Trauma computed tomography studies	1400
Triple amputation patients	19

Methods

- We queried the CBS and CFHS FWB program database from 2006-2009, after approval by chain of command and CBS IRB.
- Data comprised of Donor Donation inquiries from eligible donors as well as donors with temporary or permanent deferral codes.
- Demographic data such as age, sex, and previous donation history was collected.

Methods

- ABO/Rh typing on ID discs was compared to data on file to calculate the percent error.
- Deferral codes were unencrypted by CBS specialists and temporary codes were divided into long-term categories (61-730 days) and short-term categories (1-60 days).

Results

	Edmonton	Shilo	Petawawa	Total
Donors	n = 98	n = 227	n = 386	n = 711 **Female n=76 (11%)** **Male n=635 (89%)**
Mean age	35	28	31	31.1

Results

- WBB Donors who previously donated: 262 (37%)
- Military blood group unavailable: 14 (2%)

Results

	Frequency
A+	32%
A-	8.7%
B+	11%
B-	2.1%
AB+	2.1%
AB-	1.1%
O+	36%
O-	7.0%

Results

- **Error on ID discs**: 8 (1.1%)
  - ABO: n = 4 (0.6%)
  - Rh: n = 3 (0.4%)
  - ABO and Rh: n =1 (0.14%)

Results

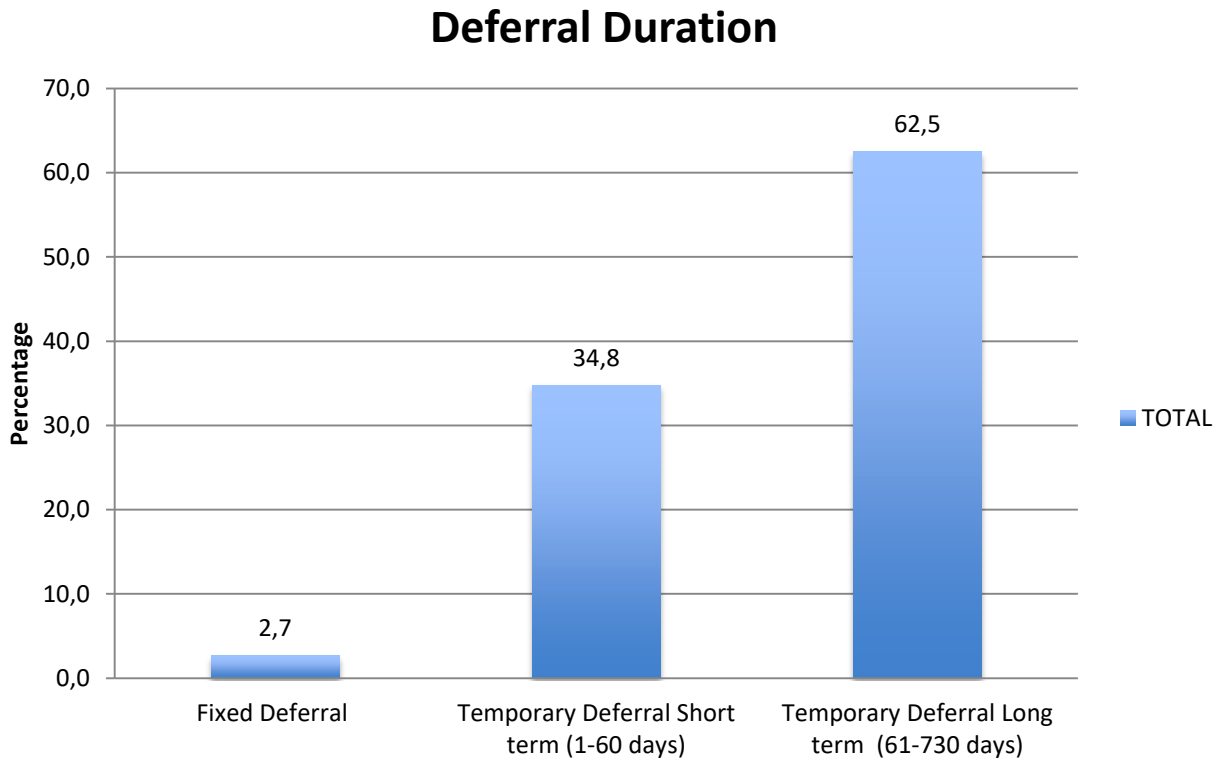
- **Potential donors deferred**: 469 (66%)

Results

	Edmonton	Shilo	Petawawa
Most common reason for deferral	Exposure to Endemic Area n = 11/72 (15%)	Vaccination deferral n = 98/293 (33%)	Vaccination deferral n = 110/414 (27%)

Results

Reason for Deferral	Shilo	Edmonton	Petawawa	TOTAL
56 d temporary donor deferral - hemoglobin	1	8	16	25
180 d temporary donor deferral - Medical - TD Risk	59	7	56	122
900 d temporary donor deferral - medical enquiry	0	0	2	2



: Frequency distribution comparing temporary vs. permanent deferral codes for pooled data from Shilo, Edmonton and Petawawa. Temporary codes falling into both long-term (61-730 days) and short-term (1-60 days) categories.

Discussion

- This is the first report on CFHS WBB Program
- CFHS and CBS conducted a safe WBB program 2006-2009

Overall DCR Concept