



PRO: CONVENTIONAL CLOTTING ASSAYS

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DISCLOSURES

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TM Consultant to Canadian Armed Forces





ROAD MAP

VET results in MORE transfusions

VET is TOO COMPLICATED

VET isn't going to work for mass casualties

The patient is moving and test "left behind"

Its results are not replicable in proficiency testing

CCT is faster

CCT performed by professionals

CCT performed on robust testing platforms

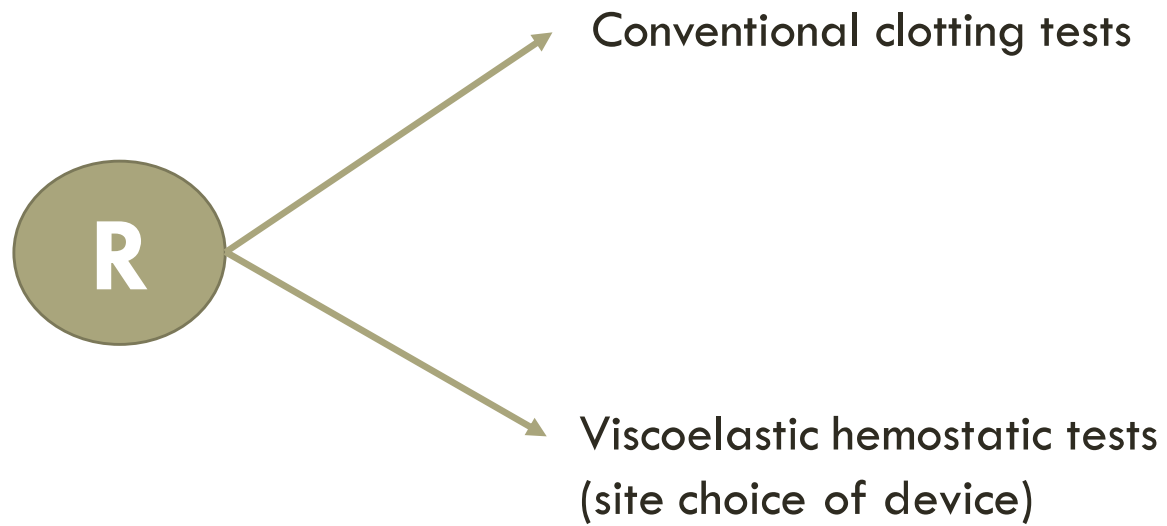
CCT are MUCH cheaper

VET



CCT

ITACTIC



ROTEM**FIBRINOGEN**

If FIBTEM CA5 < 10 mm

Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS

If (EXTEM CA5 – FIBTEM CA5) < 30 mm

Give 1 additional pool of platelets

PLASMA

If EXTEM CA5 ≥ 40 mm **AND** EXTEM CT > 80 s

Give 4 additional units of plasma

TRANEXAMIC ACID

If EXTEM LI30 < 85 %

Give additional 1g tranexamic acid

TEG**FIBRINOGEN**

If FF TEG MA < 20 mm

Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS

If (rTEG MA – FF TEG MA) < 45 mm

Give 1 additional pool of platelets

PLASMA

If rTEG MA ≥ 65 mm **AND** rTEG ACT > 120 s

Give 4 additional units of plasma

TRANEXAMIC ACID

If rTEG LY30 > 10 %

Give additional 1g tranexamic acid

CCT**FIBRINOGEN**

If Fibrinogen < 2 g/L

Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS

If platelets < 100 x 10⁹ /L

Give 1 additional pool of platelets

PLASMA

If INR > 1.2 **AND** Fibrinogen ≥ 2 g/L

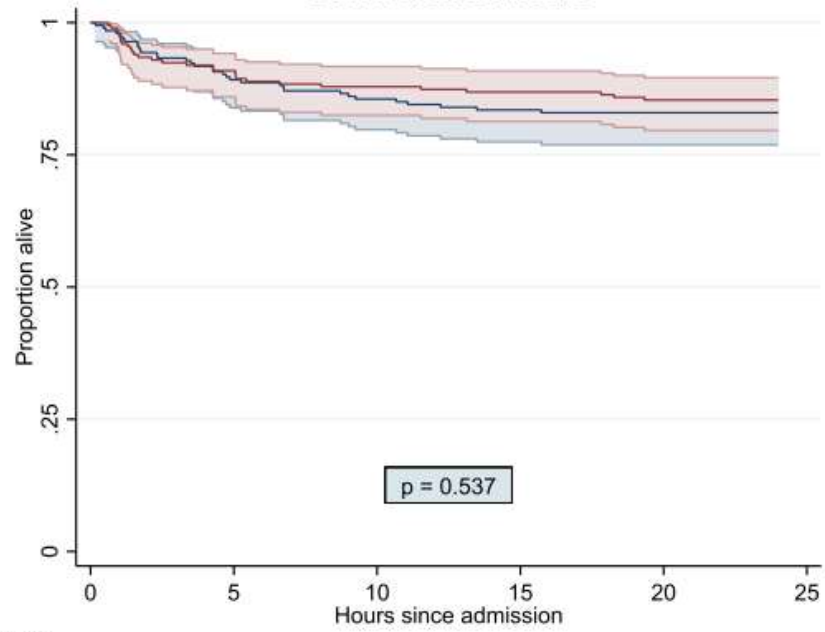
Give 4 additional units of plasma

C**A****B**

CA5 = clot amplitude at 5 minutes, CT = clotting time, LI30 = lysis Index at 30 minutes, FF = functional fibrinogen, rTEG = rapid TEG, MA = maximum amplitude, ACT = activated clotting time, LY30 = clot lysis at 30 minutes

ITT

Survival at 24 hours

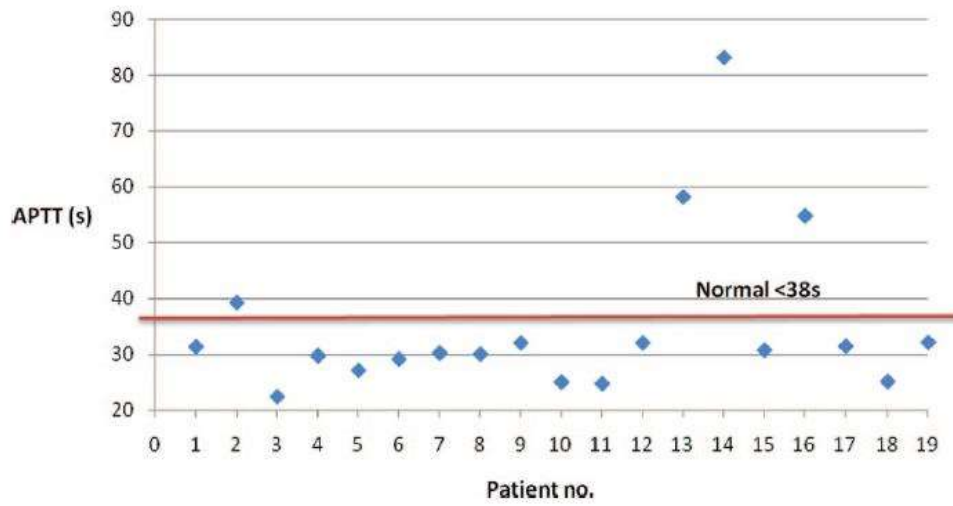


Number at risk		0	5	10	15	20	25
CCT	194	173	165	161	160	0	0
VHA	198	180	174	172	169	0	0

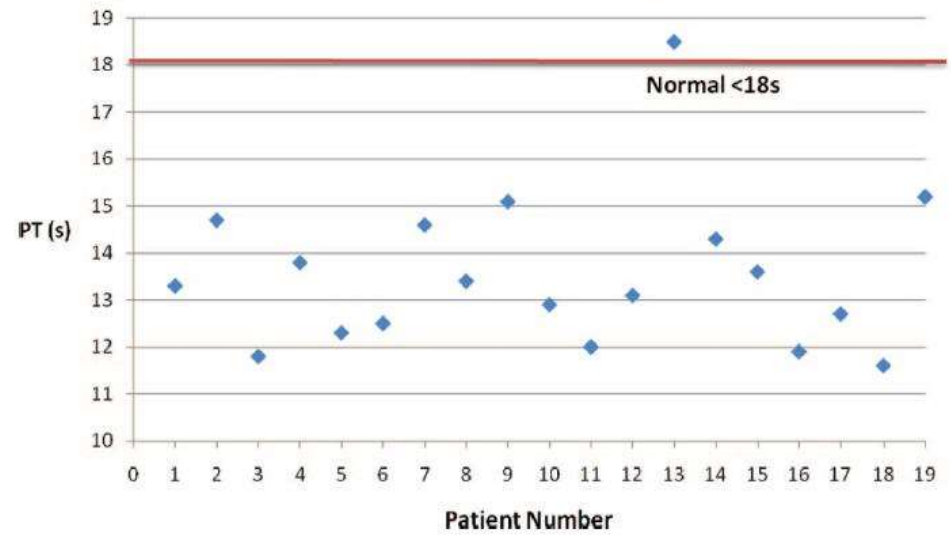
69% of patients in the VET arm received study interventions, 1.8 times more than in the CCT group (time to treatment 3.1 hours vs. 2.7 hours)

Subgroup	% receiving study intervention [^]	Time to 1 st study intervention (mins)	RBCs (units)	FFP/Octaplasma (units)	Fibrinogen equivalent (g)	Platelets (pools)
Injury to 24 hours						
All – Intention-to-treat (n = 396)						
CCT	86/195 (44%)	187 (143-234)	6 (4-10)	7 (4-11)	3 (0-4)	1 (0-2)
VHA	139/201 (69%)**	164 (130-194)*	6 (3-10)	6 (3-10)*	4 (0-4)	2 (1-3)*
Per protocol (n = 313)						
CCT	79/163 (48%)	189 (143-232)	6 (4-11)	8 (4-12)	4 (0-4)	1 (0-2)
VHA	122/150 (81%)**	164 (127-195)*	6 (4-10)	6 (4-10)	4 (0-8)*	2 (1-3)*

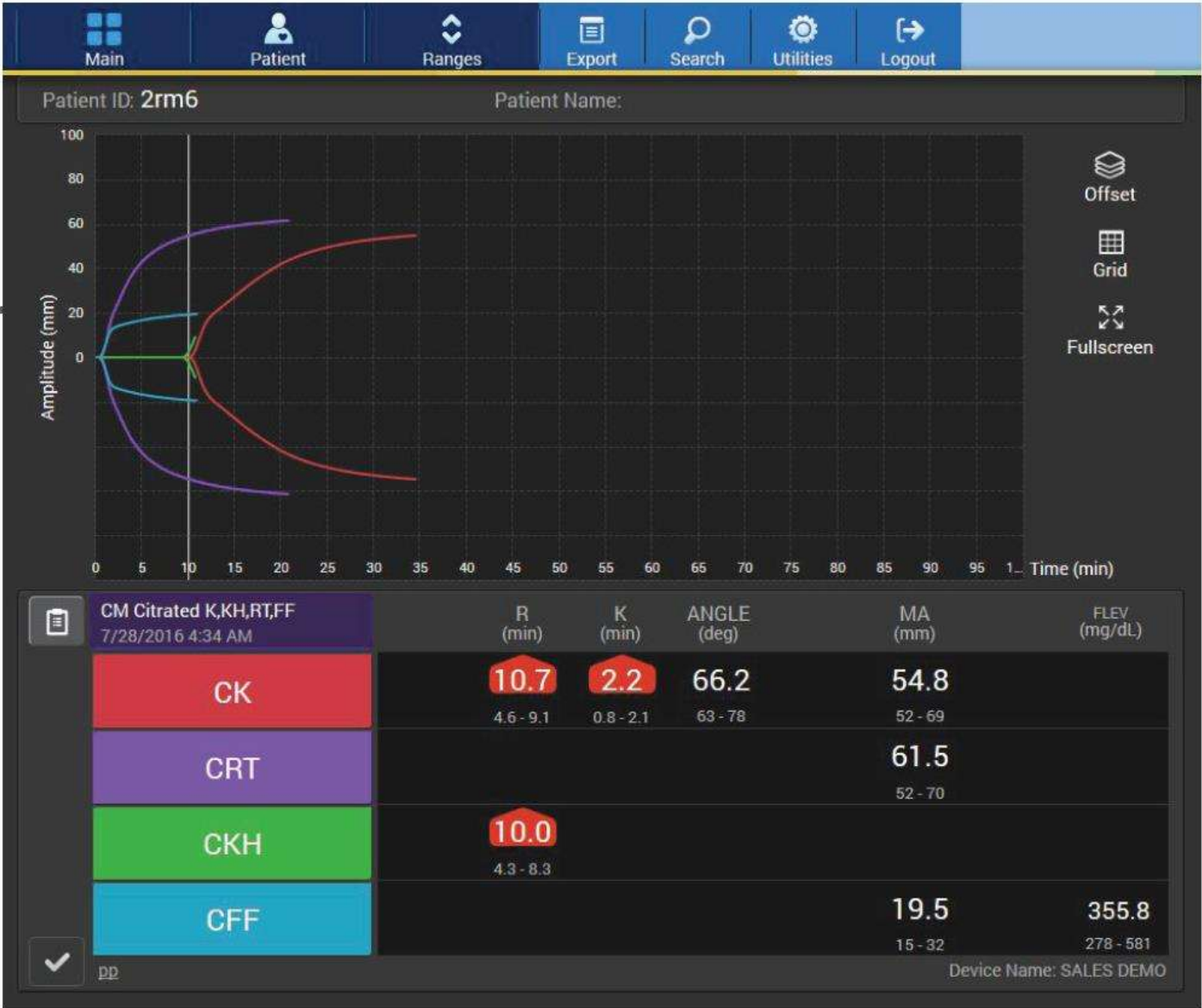
**Activated Partial Thromboplastin Time (APTT)
in MT patients**



Prothrombin Time (PT) in MT patients



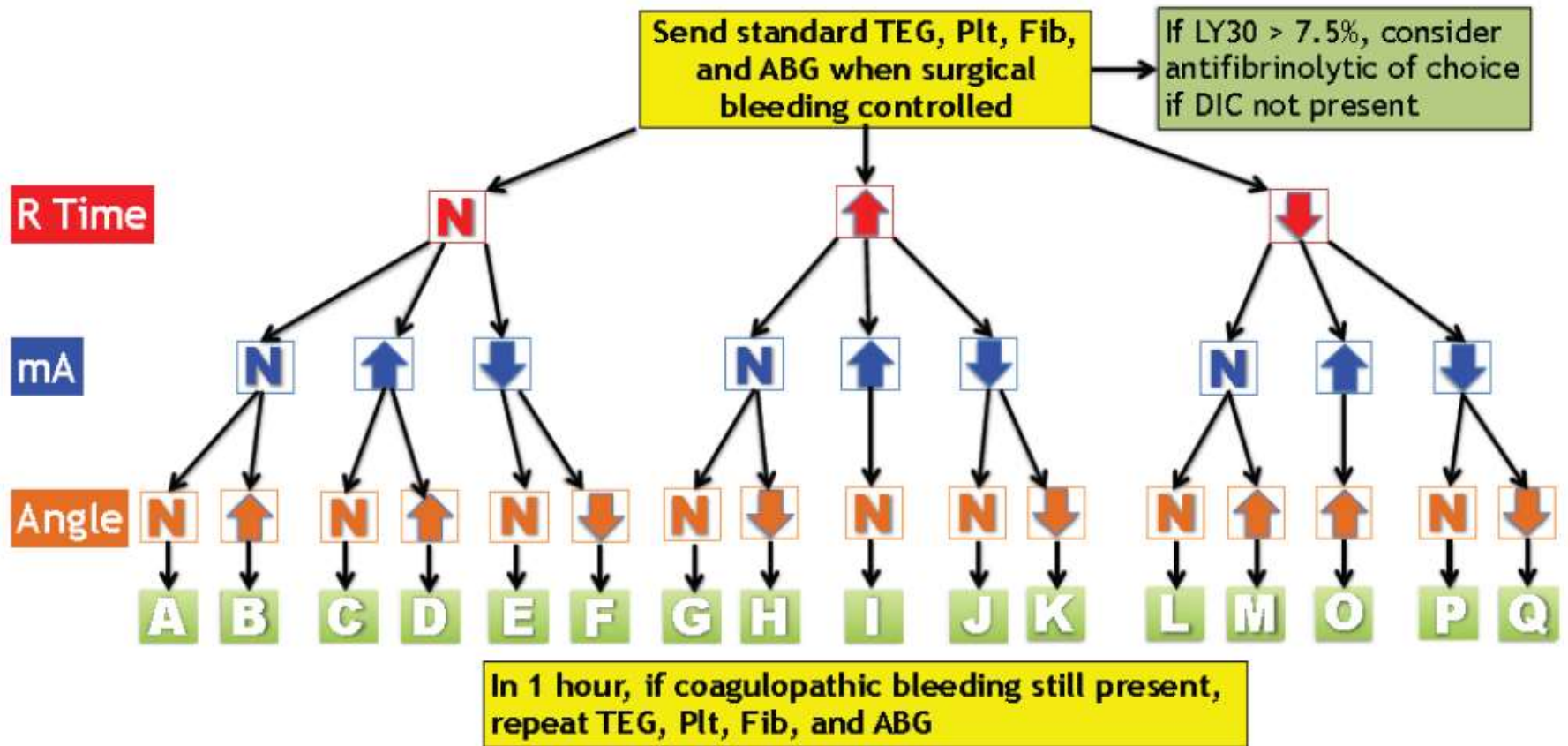
vs. 65% of trauma patients had an abnormal ROTEM curve!



**Too
Complicated**



TEG Therapy Algorithm for Clotting Dysfunction for Trauma



	Plasma (4 units)	Fibrinogen (4 g)	Platelets (1 pack)	Tranexamic acid (1 g)
TEG	rTEG MA \geq 65 mm AND rTEG ACT > 120s	FF TEG MA < 20 mm	(rTEG MA - FF TEG MA) < 45 mm	rTEG Ly30 > 10%
ROTEM	EXTEM CA5 \geq 40 mm AND EXTEM CT > 80 s	FIBTEM CA5 < 10 mm	(EXTEM CA5 - FIBTEM CA5) < 30 mm	LI30 < 85%
CCT	INR > 1.2 AND Fibrinogen \geq 2 g/L	Fibrinogen < 2 g/L	Platelets < 100 x 10 ⁹ c/L	No indication





Rotem Trauma Room



Sandro Rizoli in the ROTEM Lab

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REVIEW

TRANSFUSION

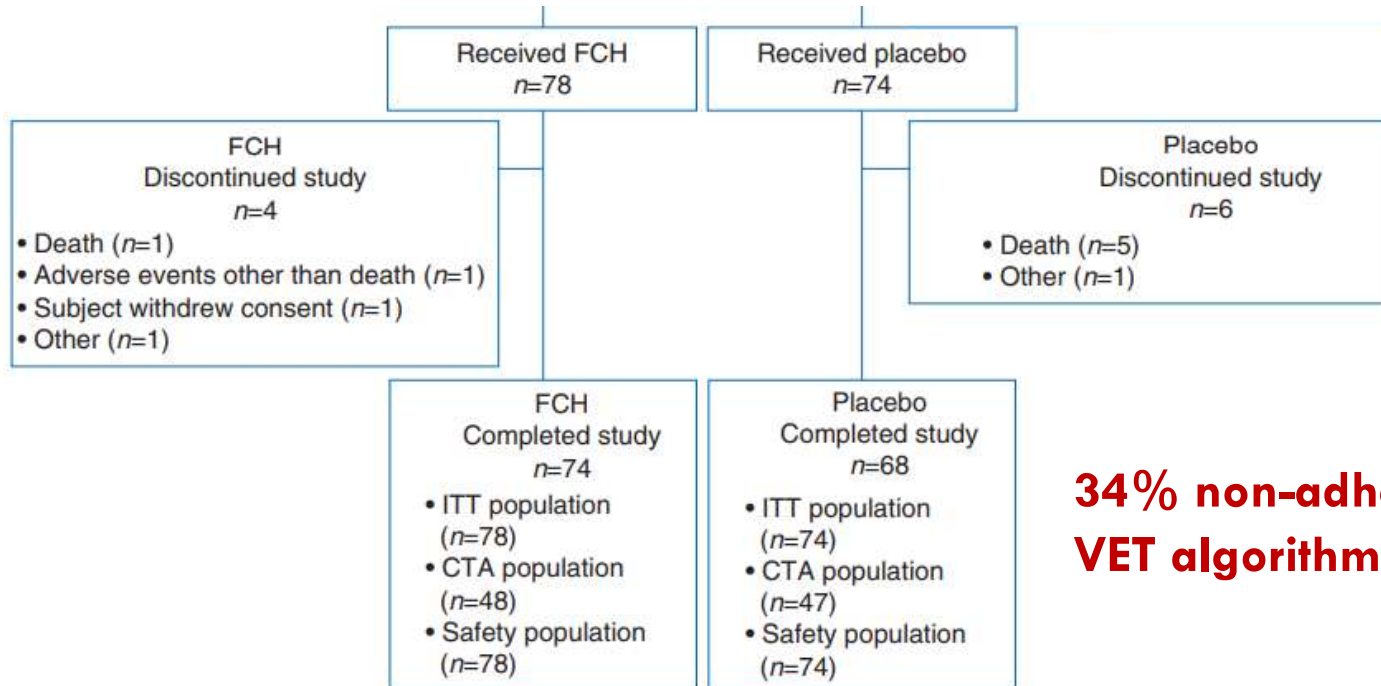
The strengths and weaknesses of viscoelastic testing compared to traditional coagulation testing

Tobias Cohen^{1,2}  | Thorsten Haas³  | Melissa M. Cushing^{1,2} 

AT THE AUTHORS' TERTIARY CARE CENTRE

A retrospective review of ROTEM usage in our institution showed that in nearly 30% of ROTEM orders, the institutional ROTEM-based transfusion algorithm was not followed.³⁶ Lack of adherence to complicated VET transfusion protocols is a significant problem for VET-based clinical trials, most notably recognized in the REPLACE trial³⁷

WE CAN NOT CONSISTENTLY ADHERE TO VET ALGORITHMS EVER IN RCTS



34% non-adherence to VET algorithm!

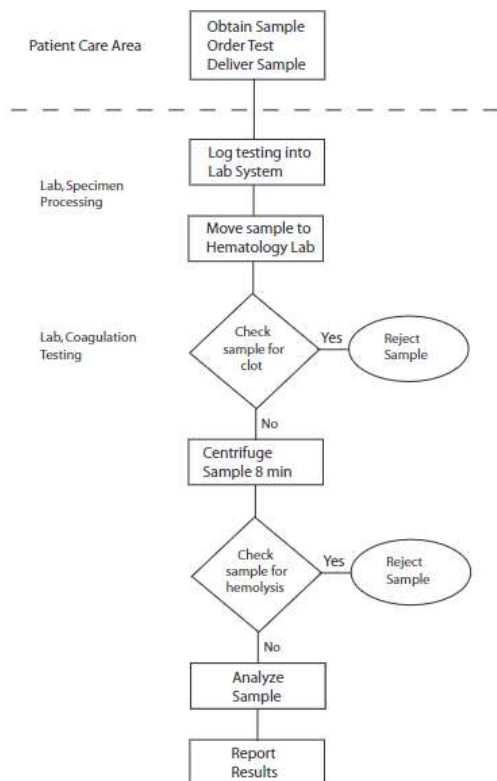
EXTERNAL PROFICIENCY TESTING

Table 3 Rotation Thromboelastometer Results

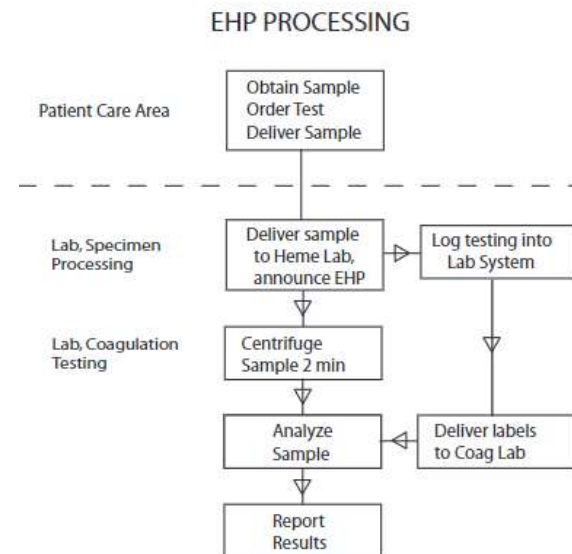
Sample and Test Performed	Parameter	Median	CV	Range of Results
4: Normal sample				
ITEM <i>n</i> = 8	CT sec	143.5	14.5	129–197
	MCF mm	25.5	7.4	22–27
EXTEM <i>n</i> = 6	CT sec	42.5	*119.4 (83.6)	31–360
	MCF mm	26	4.5	24–27

Kitchen DP, et al. Quality assurance and quality control of thrombelastography and rotational Thromboelastometry: the UK NEQAS for blood coagulation experience. *Semin Thromb Hemost.* 2010 Oct;36(7):757-63

YOU CAN SPEED UP CCT



Just for hemorrhages



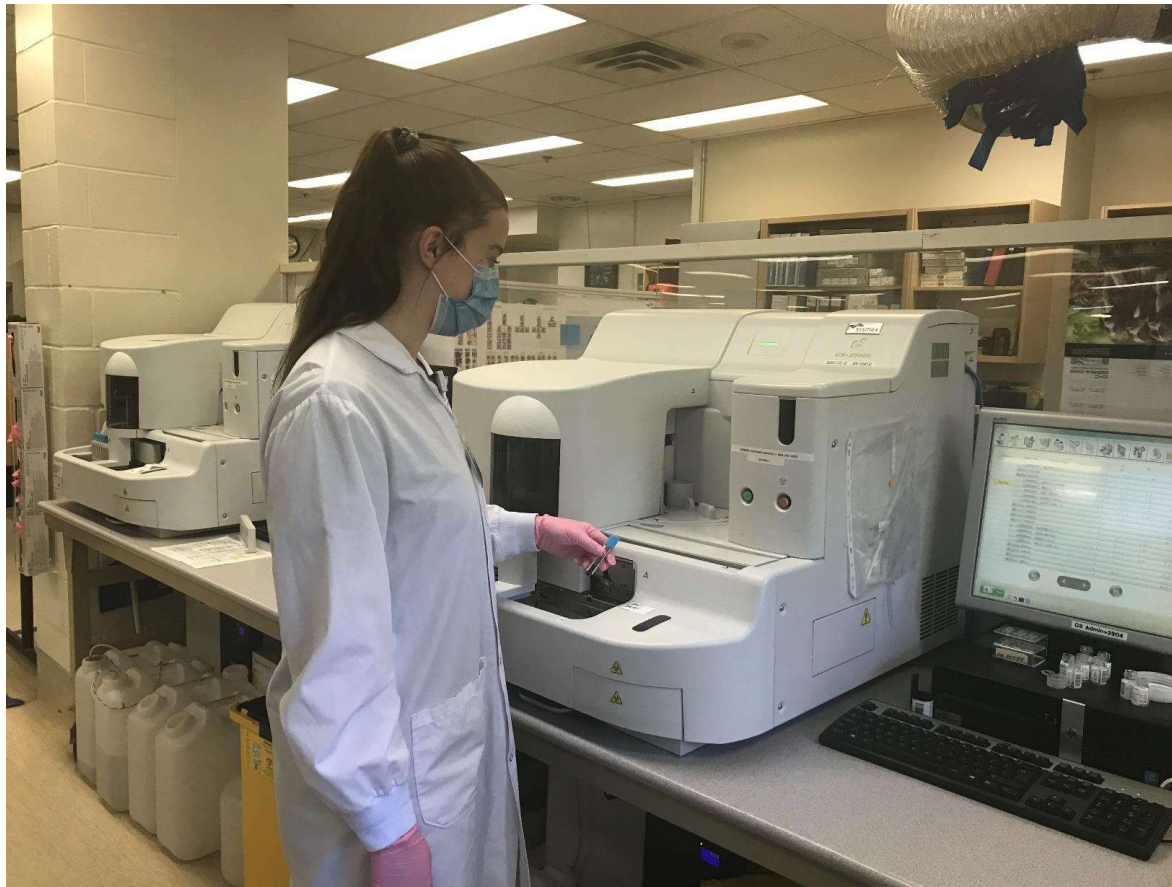
14 ± 3 minutes

Chandler WL, et al. Development of a rapid emergency hemorrhage panel. *Transfusion*. 2010 Dec;50(12):2547-52

THAT IS FASTER THAN ROTEM IN AN RCT

In a pediatric cohort study: **23** vs. 53 minutes (ROTEM vs INR/fibrinogen)

CCT ARE PERFORMED BY PROFESSIONALS



ROBUST TESTING PLATFORMS

Table 5. Effect of Assay Variables on the Bias and Precision of Fibrinogen Assays Among Participants of the 2008 College of American Pathologists Coagulation Survey

Assay Variable	Specimen ^a	Methods, No.	Laboratories, No.	Mean, mg/dL	P Value ^b	CV, %
Reagent type						
Clauss	CGL-07	27	2844	273.3		8.4
	CGL-09	27	2846	274.6		8.6
PT-derived	CGL-07	23	669	303.3	<.001 ^c	11.7
	CGL-09	23	669	304.1	<.001 ^c	12.0
Instrument type						
Mechanical	CGL-07	7	1055	279.1		5.8
	CGL-09	7	1056	280.3		5.6
Photo-optical	CGL-07	41	2448	281.2	.07 ^d	12.5
	CGL-09	41	2449	281.9	.16 ^d	12.5
Reagent/instrument type						
Clauss/mechanical	CGL-07	7	1055	279.1		5.8
	CGL-09	7	1056	280.3		5.6
Clauss/photo-optical	CGL-07	18	1779	271.4	<.001 ^e	10.5
	CGL-09	18	1780	272.5	<.001 ^e	10.8
PT-derived/photo-optical	CGL-07	23	669	303.3	<.001, ^f <.001 ^g	11.7
	CGL-09	23	669	304.1	<.001, ^f <.001 ^g	12.0

CHEAPER

67.00 USD per ROTEM vs. 2.22 USD per EHP

ROAD MAP

VET results in MORE transfusions

Poor compliance with VET algorithms

Doesn't work for mass casualties

The patient is moving away from the result

CVs are unacceptable

CCT are faster!

CCT performed by professionals

CCT performed on robust testing platforms

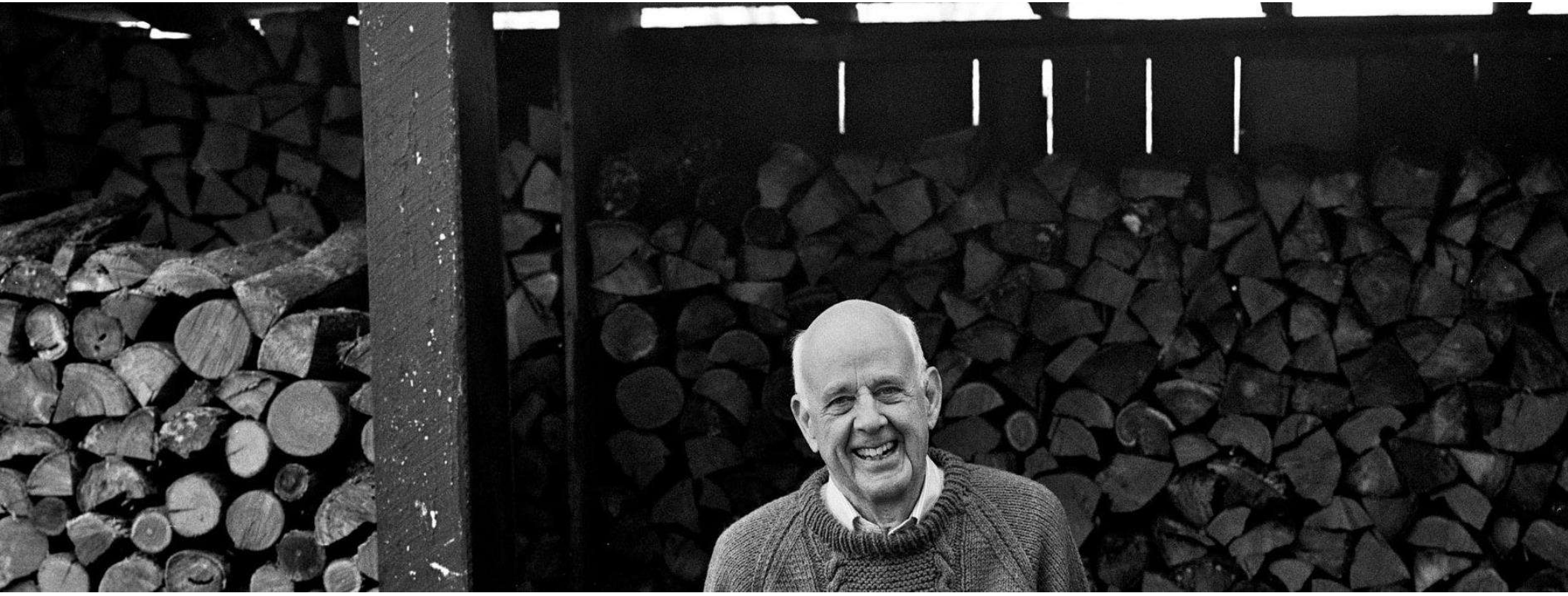
CCT are cheaper



CCT



THANK YOU FOR YOUR ATTENTION |



“When going back makes sense,
you are going forward”

Wendell Berry