Utility of Cell Saver in Trauma Compared to Cardiac Surgery

B Couch, BS, E Kim, MBA, K Shrestha, MBBS, S Dhanasekara, MBBS, PhD, A Sabu-Kurian, BS, S Dissanaike, MD
Texas Tech University Health Sciences Center School of Medicine

Background: While reperfusion of autologous blood using the Cellsaver (CS) device is routine in cardiothoracic surgery, it is still only used intermittently, with a paucity of evidence-based literature, in trauma. We compared the utility of CS in these two distinct populations within the same institution, to explore current status as well as the potential benefit of greater CS use in trauma.

Methods: Retrospective review of CS use at a Level 1 trauma center 2017-2022. Volume of blood salvaged, reinfused, total and allogenic blood transfusion volume were compared between trauma (general & orthopedic) & cardiac surgery cases. Cost of CS deployment & auto-transfusion was compared to cost of allogenic blood from blood bank. Winsorized data was analyzed via Kruskal Wallis tests and $\chi 2$ tests with multiple pairwise comparisons. Family-wise error rate maintained at 0.05.

Table 1. Baseline characteristics and outcomes (Cardiac vs Trauma)

	Cardiac Surgery (n = 1215) median (IQR) /n (%)	Trauma Surgery (n = 325) median (IQR) /n (%)	p-value
Age	64 (14.8)	38.5 (29)	< 0.001
Male Sex	857 (70.6)	245 (75.4)	0.103
Cases w/ successful CS retrieval of blood	1200 (98.8)	310 (95.4)	0.001
Cases w/ successful CS transfusion	1181 (97.3)	239 (74)	< 0.001
Volume of salvaged blood received (ml)	500 (275)	250 (585)	< 0.001
Percentage of CS transfusion from total volume of transfusion*	73.2 ± 31.6	36.8 ± 35.5	< 0.001
Volume of allogenic blood received	0 (600)	650 (1500)	< 0.001
Cases w/ allogenic blood received	546 (44.9)	227 (69.9)	< 0.001
Total transfusion cost	150 (360)	540 (887)	< 0.001
Cost for allogenic blood transfusion	0 (360)	390 (900)	< 0.001

*mean ± standard deviation

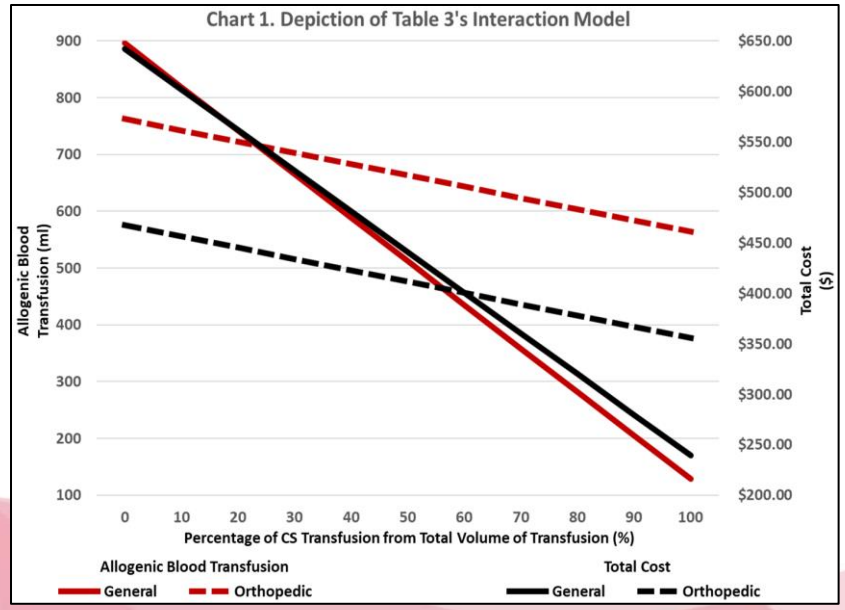
Table 2. Baseline characteristics and outcomes (Cardiac vs General vs Orthopedic)

	Cardiac Surgery (n = 1215) median (IQR) /n (%)	General Surgery (n = 197) median (IQR) /n (%)	Orthopedic surgery (n = 128) median (IQR) /n (%)	p-value
Age	64 (14.75) [a]	39 (38) [b]	26 (37) [b]	< 0.001
Male Sex	857 (70.6)	143 (72.5)	102 (79.7)	0.090
Cases w/ successful CS retrieval of blood	1200 (98.76) [a]	189 (95.9) [b]	121 (94.5) [b]	0.001
Cases w/ successful CS transfusion	1181 (97.28)	145 (74.4)	94 (73.4)	< 0.001
Volume of salvaged blood received (ml)	500 (275) [a]	244 (450) [b]	467 (1066.25) [a]	< 0.001
Percentage of CS transfusion from total volume of transfusion	73.15 ± 31.63 [a]	41.99 ± 39.12 [b]	29.00 ± 27.46 [c]	< 0.001
Volume of allogenic blood received	0 (600) [a]	300 (1400) [b]	900 (1742.5) [c]	< 0.001
Cases w/ allogenic blood received	546 (44.93) [a]	114 (57.9) [b]	113 (88.3) [c]	< 0.001
Total transfusion cost	150 (360) [a]	330 (945) [a]	480 (1047.2) [b]	< 0.001
Cost for allogenic blood transfusion	0 (360) [a]	300 (1400) [b]	900 (1742.5) [c]	< 0.001

*mean ± standard deviate; values with different superscripts in a row are significantly different using post-hoc comparisons with Holm-Bonferroni correction.

Table 3. Interaction model predicting volume of allogenic blood transfusion and total cost related to blood transfusion in trauma group.

	Estimate	SE	t-value	p-value
DV: Total allogenic blood transfusion				
General surgery (Intercept)	895.745	75.264	11.901	< 0.001
Percentage of CS transfusion from total volume of transfusion in general surgery	-7.674	1.313	-5.844	< 0.001
Orthopedic surgery (Intercept)	762.345	118.982	6.407	< 0.001
Percentage of CS transfusion from total volume of transfusion in Orthopedic surgery	-1.983	2.659	-0.746	0.456
DV: Total cost				
General surgery (Intercept)	642.224	47.035	13.654	< 0.001
Percentage of CS transfusion from total volume of transfusion in general surgery	-4.026	0.821	-4.906	< 0.001
Orthopedic surgery (Intercept)	467.573	74.357	6.288	< 0.001
Percentage of CS transfusion from total volume of transfusion in Orthopedic surgery	-1.120	1.661	-0.674	0.501



Results: CS was successfully used in 97% of cardiac and 74% of trauma cases. The proportion of blood requirements provided by CS, compared to allogenic transfusion, was also significantly higher in cardiac surgery. However, there was still net benefit for CS in trauma surgery, with median salvaged transfusion volume of at least one unit, in both general & orthopedic trauma.

Note: CS deployment is $70. CS deployment + auto-transfusion is $150. One unit of pRBC is $210.

Conclusion: The controlled setting of cardiac surgery leads to greater success at retrieving and transfusing salvaged blood than in trauma surgery. However, CS deployment in trauma surgery is feasible in many cases and reduces the need for allogenic transfusion.