A Novel Rapid Fluid Infusion Device for Patients Experiencing Severe Obstetric Hemorrhage

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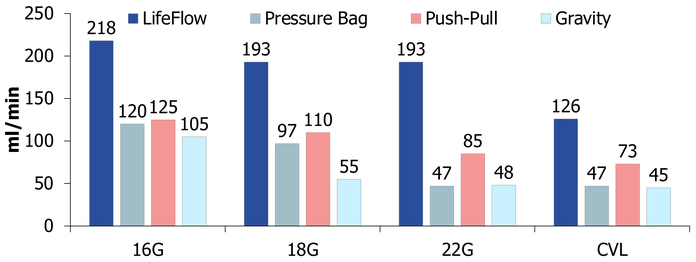
BACKGROUND

- Preventing death from obstetric hemorrhage requires quick recognition and rapid intervention
- Rapid intervention with fluids, blood products and source control can help prevent progression of hemorrhage and hypovolemic shock.
- A manual rapid fluid infuser (RFI), LifeFlow©, was designed to provide rapid fluid delivery of crystalloid and/or blood products and has demonstrated infusion rates up to 4 x faster than a pressure bag (Fig. 1)
- The shock index (SI), the ratio of HR to systolic BP, has been shown to perform well as a screening tool to predict adverse maternal outcomes for obstetric hemorrhage.[1-3]

Fig 1. Comparing infusion rates for crystalloid using various fluid delivery systems



OBJECTIVES

- To describe the use of this RFI for rapid fluid delivery and resuscitation among patients with obstetric-related hemorrhage presenting to a large urban-suburban health care system.

METHODS

- Retrospective cohort of all patients from Jan 2017 - April 2021 with obstetric hemorrhage and received fluid/blood through the RFI
- Urban-suburban health care system with 7 ED's, annual census 260,000, pop. 1.4 million
- Demographic, clinical, outcomes data from SQL query of Epic© EHR
- Descriptive analysis with frequencies, proportions, medians with IQR; Wilcoxon Signed Ranks test for within-patient comparisons of pre- and immediate post-RFI vital signs, including SI

RESULTS

Table 1. Characteristics of patients with obstetric-related hemorrhage receiving fluid and/or blood via RFI

Variable	N=28
Median age (IQR), years; n=25	36.0 (28.1, 37.9)
Race (%)	
White	11 (39.3)
Black	10 (35.7)
Other	7 (25.00)
Diagnosis (%)	
Postpartum hemorrhage	5 (17.9)
Ectopic pregnancy	10 (35.7)
Spontaneous abortion	13 (46.4)
ESI level at triage (%); n=26	
ESI	2 (7.7)
ESI I & II	15 (57.7)
Worst SI Before RFI (%); n=25	
SI > 0.9	16 (64.0)
SI 0.9-1.69	13 (52.0)
SI ≥ 1.7	3 (12.0)
First SI After RFI	
SI > 0.9	10 (35.7)
SI 0.9-1.69	10 (35.7)
SI ≥ 1.7	0 (0.0)
Interventions (%)	
Received blood transfusion	16 (57.1)
Total blood products ≥ 4 IU; n=16	11 (68.8)
Uterotonics	9 (32.1)
Any procedure	15 (53.0)
Laparoscopic treatment of ectopic	7 (25.0)
D & C	2 (7.1)
Hysterectomy	1 (3.6)
Surgical treatment for abortion	5 (17.9)
Unadjusted outcomes	
Median hospital LOS, days	0.59 (0.37, 1.01)
Median ICU LOS, days; n=4	0.71 (0.57, 2.08)
ICU admission (%)	4 (14.3)
In-hospital mortality (%)	0

Table 2. Within patient comparison of vital signs before and after delivery of fluids and/or blood products via RFI

Vital Signs	Before RFI (IQR)	After RFI (IQR)	Median difference (IQR)	P-value
SBP, mmHg	90 (69, 106)	110 (90, 119)	-21 (-37, -5)	0.001
Heart Rate	109 (82, 120)	88 (74, 112)	10 (0, 32)	0.001
Shock Index	0.98 (0.79, 1.37)	0.78 (0.71, 1.03)	0.22 (0.02, 0.53)	0.001
MAP, mmHg	60 (47, 75)	76 (67, 86)	-14 (-23, -6)	0.001

CONCLUSIONS

- Patients with severe obstetric hemorrhage, whose resuscitation included use of the RFI, experienced immediate improvement in SBP and SI.
- This device may offer an additional tool in the rapid response to obstetric-related hemorrhagic shock while arranging for definitive intervention.
- The study findings are limited to descriptive analysis and within-patient comparison.
- Controlled studies are need to compare RFI to standard methods to determine the impact on patient outcomes.

References

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Disclosures

- Mark Piehl is Co-Founder and Chief Medical Officer, 410 Medical
- Valerie De Maio is Senior Scientist, 410 Medical
- WakeMed Health & Hospitals is a shareholder in 410 Medical

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