# CASE STUDY:

# Minimally Invasive Case Study
# Trauma, Motor Vehicle Accident

## INTRODUCTION

With new minimally invasive monitoring tools available such as the Edwards FloTrac sensor the monitoring of cardiac output is easy to apply. However, no monitoring tool will impact outcome unless it is combined with a treatment algorithm. A simple algorithm was developed to be used with this minimally invasive technology. The following is an example of the application of this algorithm in a trauma patient.

**Clinical Events**

| | |
|---|---|
| Patient Details: | 18-year-old male |
| Medical History: | No previous medical history known |

## CASE NOTES

An 18-year-old male was involved in a motor vehicle accident with a prolonged extraction by emergency rescue personnel. The patient displayed shock and stupor on evaluation at the scene and was immediately intubated. Systolic blood pressure was 70 with a heart rate of 160. Abdomen was firm and pelvic fracture, including left iliac wing, was identified. Upon presentation to the Emergency Department an arterial line with a FloTrac sensor was initiated showing a stroke volume index (SVI) of 14ml/m$^2$ and a stroke volume variation (SVV) of 40-45%. The patient was resuscitated by the trauma team with aggressive volume replacement using packed red blood cells (PRBC) and crystalloid infusion and brought immediately to the operating room. While in the operating room the patient received 12 units of PRBC and 14 liters of NaCl. The patient underwent a splenectomy and superior mesenteric vein repair. Intra-operatively the patient was monitored with traditional parameters (ECG, $SpO_2$, $EtCO_2$, and arterial pressure). In addition the FloTrac sensor and Edwards Vigileo monitor were used for continuous SVI and SVV assessment. Target values of an SVV<13% and a SVI of 45ml/m$^2$ coupled with Simplified Physiologic Protocol (Figure 1) was used intra-operatively and in the ICU. After 2 hours in surgery the patient was brought to the ICU.

Post-operatively the patient continued to be volume resuscitated with 23 liters of NaCl and 16 units of PRBC guided by SVI and SVV on the Vigileo monitor using the Simplified Physiologic Protocol (Figure 1). SVI maximum was 66ml/m$^2$. Chest exam was diffusely abnormal with $PaO_2/FiO_2$ ratio < 200. Furosemide was then used according to the protocol (Figure 2). The patient was discharged to a step down unit with no end organ failure on post-op day two.

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## Simplified Physiologic Protocol

*Developed by W.T. McGee, MD, MHA, Tufts University Medical School*

*Figure 1*

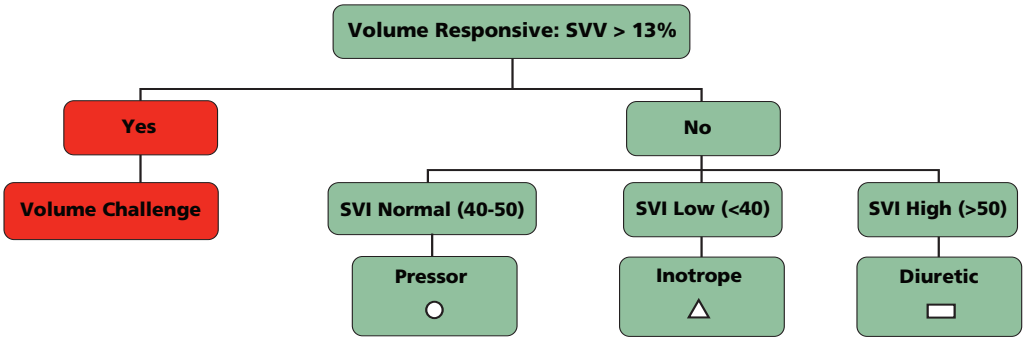
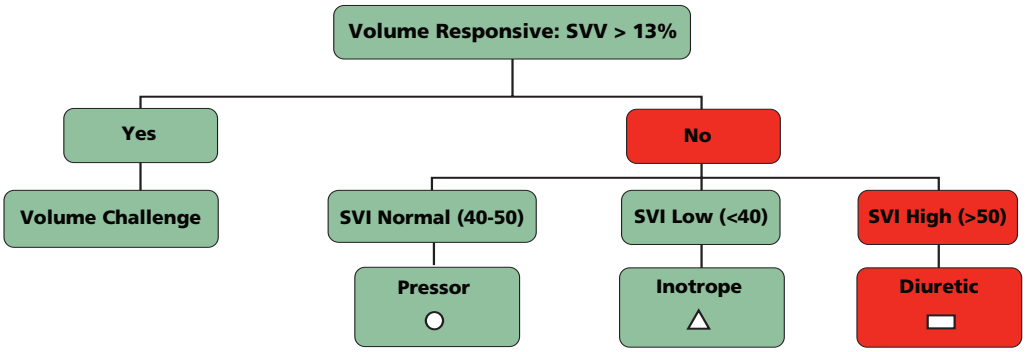



*Figure 2*






*Possible Therapeutic Considerations Based on Clinical Findings*

| | | |
|---|---|---|
| ○ **Pressor**<br>In the appropriate clinical setting (i.e.,hypotension without bradycardia) | △ **Inotrope**<br>No further response to volume (i.e., SVI does not improve) clinical pulmonary congestion and/or hypotension | ▭ **Diuretic**<br>Volume overload (ie., clinical pulmonary congestion and high A-a gradient) |

## DISCUSSION

Physiologic goal-directed resuscitation using a simplified treatment algorithm to guide both aggressive volume replacement and ultimately diuretic therapy resulted in the successful treatment and discharge of this severely injured young man with shock and acute lung injury.

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This case study follows a Simplified Physiologic Protocol developed by Dr. William McGee at Baystate Medical Center. Edwards Lifesciences does not endorse the use of any particular protocol, but rather recommends that each institution evaluate all viable treatment options and determine the best clinical protocols for their institution and patient population.

William T. McGee MD is a paid clinical consultant for Edwards Lifesciences.

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