Clinical Profile:
Trauma (traw’ma) [Gr. trauma, wound]. 1. A physical injury or wound caused by external force or violence. 2. An emotional or psychological shock that may produce disordered feelings or behavior.¹

Traumatized patients with bodily injury or illness require expedient, thorough and advanced critical healthcare. Essential, therefore, is the vital accuracy in hemodynamic measurement of preload to optimize cardiac output and oxygen delivery.² Such assessment has historically been performed using filling pressures [central venous pressure (CVP) and pulmonary artery wedge pressure (PAWP)], due to an assumed correlation with end diastolic volume.³ The Advanced Swan-Ganz catheter with volumetric measurements, right ventricular ejection fraction (RVEF) and right ventricular end diastolic volume (RVEDV), however, offers another method of assessment, which is evaluated herein.

Correlations:
• Correlation #1: RVEDVI and SI/CI
  following volume administration over 30 minutes, changes in CI have been shown not to correlate with RAP or PAWP but did correlate with RVEDVI. In patients with RVEDVI greater than 140 ml/m², the fluid challenge increased RAP and PAWP, and decreased LVSWI.⁴ Discrepancies between PAWP and RVEDVI occurred in more than 50% of patients studied and demonstrated that RVEDVI more accurately predicted preload recruitable increases in CO.² In a study conducted by Karen Safcsak, R.N., et al., it was surmised that the RVEDVI (rather than pulmonary artery occlusion pressure [PAOP]) better correlates with CI in assessing the ventricular preload of surgical, trauma, post shock volume-resuscitated and respiratory failure patients, making RVEDVI “the new gold standard in the assessment of ventricular preload”.⁵ Studies have confirmed the superiority of RVEDVI over RAP as an indicator of RV preload.⁶

• Correlation #2: RVEF and trauma survival
  In trauma patients, survival has been shown to depend upon right ventricular function. In a study of 17 trauma patients, patients demonstrated a decrease in RVEF. In survivors, RVEF improved over 8-12 hours; in non-survivors, RV function continued to deteriorate.⁷

• Correlation #3: RVEDVI and trauma survival, intestinal perfusion and resuscitation
  The results of a resuscitation study by Dr. Michael Cheatham, et al., demonstrated that optimal oxygen delivery and tissue perfusion, regardless of ventricular function, is a more individualized (per patient) method for resuscitation, than utilizing RVEDVI, CVP, or PAOP measurements alone for volume resuscitation.⁸ Trauma patients resuscitated to an RVEDVI of 120 ml/m² have significantly better visceral perfusion than those patients resuscitated to 90 to 100 ml/m² with inotropic augmentation of blood pressure as needed.⁹

  A study by Dr. Chang, et al., showed that RVEDVI of >100 ml/m² = ↑intestinal perfusion, ↓mortality, ↓MOF.¹⁰

Outcome:
It has been recognized that the Advanced Swan-Ganz catheters, combining continuous venous oximetry (SvO2), continuous cardiac output (CCO), continuous right ventricular end diastolic volume (RVEDV), and continuous right ventricular ejection fraction (RVEF) measurements, will yield not only information regarding oxygen consumption and delivery, but will also allow an even better understanding of hemodynamics. A intermittent indication of pulmonary vascular resistance (PVR) and a continuous systemic vascular resistance (SVR) may be used as an index to left ventricular (LV) and right ventricular (RV) afterload when continuous cardiac output (CCO) is integrated with continuous central and arterial pressure measurements.³
Advanced Technology Swan-Ganz Catheter Algorithm

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References:

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