

海外招請講演

**[IL(E)17] 海外招請講演17**

座長:稲葉 英夫(金沢大学附属病院救命センター)

Sat. Mar 2, 2019 8:45 AM - 9:35 AM 第5会場 (国立京都国際会館1F Room D)

**[IL(E)17]Volume management in ICU patients**

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【同時通訳付き】

## Institute / Position

Catholic University of Korea, College of Medicine,  
Department of Anesthesiology, Pain and Critical Care Medicine  
Professor

## Education and Certification

1994: PhD (the Graduate School of Catholic University of Korea, College of Medicine)  
1985: MD (Catholic University of Korea, College of Medicine)  
2009: Subspecialty board for critical care medicine (Korean society of Critical Care medicine)  
1989: Professional license of Anesthesiologist (Korean Society of Anesthesiologists)

## Experience

Aug. 1996 - Aug 1997: Research Fellow of the Center of Anesthesiology Research in Cleveland Clinic Foundation (Ohio)  
Mar. 2014 – Feb. 2018: Chairman of the Department of Anesthesiology, Pain and Critical Medicine, Catholic University of Korea, College of Medicine  
Since 1989 to present: Faculty member of the Department of Anesthesiology, Pain and Critical Medicine, Catholic University of Korea, College of Medicine

## Social Activity

President of the Korean Society of Critical Care Medicine (since 2018 to present)  
Vice President of Seoul Medical Association (since 2018 to present)  
Vice President of the Korean Society of Critical Care Medicine (since 2016 to 2018)  
Director of Publication in the Korean Society of Critical Care Medicine/ Editor-in-Chief of the Korean Journal of Critical Care Medicine (since 2008 to 2016)  
Director of Social Communication in the Korean Society of Anesthesiologists (since 2014 to 2016)  
Director of Medicolegal Affairs in the Korean Society of Anesthesiologists (since 2010 to 2012)  
Director of Scientific Affairs in Seoul Medical Association (since 2009 to 2012)

Striking the right balance between under- and over-resuscitation is a key part of volume management. However, assessing the degree of hypovolemia is difficult because of lack reliable clinical parameters. Many patients admitted to intensive care units are hypovolemic with heterogeneous pathophysiology. What fluid, and how much should we give to them? This review is focused on the recent advances and ongoing controversies about volume management in ICU patients.

Under steady state, the sub-glycocalyceal fluid with low oncotic pressure acts as a barrier between plasma and interstitial fluid. The plasma osmotic pressure moves sub-glycocalyceal fluid rather than the interstitial fluid. Theoretically, only 1/4 to 1/5 of the administered crystalloid solution should remain in the blood vessel, but indeed more fluid remains in intravascular space. The glycocalyceal layer is vulnerable to damage in ischemia and hypoxia. Maintaining and restoring the glycocalyx is an important concept of the fluid therapy.

When we judge the patient's volume status, we do not measure directly the plasma volume, instead we make a guess based on various clinical symptoms and parameters. The primary goal of the fluid administration is to restore the preload, but the ultimate goal is to improve the tissue perfusion and oxygen delivery, so the factors that determine the cardiac output and microcirculation should be considered.

The choice of fluid in ICU patients with various pathophysiology should be tailored to the individual condition. Studies have concluded that colloids do not improve survival rates and are not cost-effective. Furthermore, synthetic colloids have been reported to increase the mortality rate and risk of renal failure in patients with sepsis.

In the patients with sepsis, balanced crystalloids may represent the first-line fluid. The synthetic colloids should be avoided because they have been shown more requirement of blood transfusion, renal replacement therapy, and higher prevalence of acute kidney injury and mortality. Albumin may improve outcomes. A reasonable threshold for red cell transfusion is Hb >7 g/dL. Initial IV bolus of 20-30 mL/kg is reasonable however, further fluid administration should be done carefully, and guided by dynamic measures of “ fluid responsiveness.

In patients with hemorrhage, the goal of resuscitation changed from early volume resuscitation to early hemorrhage control. Volume management in hemorrhagic patients should consider three principles, which are permissive hypotension, minimization of crystalloids and one to one plasma platelet to red cell transfusion, along effective damage control.

There are a variety of parameters but no gold standards to determine the volume status of patients. Volume management in ICU patients should be aimed at improving microcirculation, and so the balance between metabolism and oxygen supply. Recent trends follow a restrictive strategy as excess fluid also causes interstitial edema, which interferes with microcirculation and adversely affects patient outcomes. The choice of fluid should take into account the state of glycocalyx. The old idea of administering crystalloids more than four times of depleted plasma volume should be reexamined.