

COMMENTARY

Good-bye CRRT, here comes SLED? ... not so fast!

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See related research by Schwenger *et al.*, <http://ccforum.com/content/16/4/R140>

Abstract

In the continuing dispute about the superiority of either intermittent or continuous renal replacement therapy for the critically ill, hybrid methods such as sustained low-efficiency dialysis (SLED) combining the advantages of both modalities – that is, excellent hemodynamic stability and low costs – receive growing attention. The study by Schwenger and colleagues is the first randomized trial indicating that there may be no significant difference in survival at 90 days between patients treated with SLED as compared with those treated with continuous veno-venous hemofiltration.

The study by Schwenger and colleagues in a previous issue of *Critical Care* may add some new aspects to the rapid evolution of renal replacement therapies in the critically ill over the last three decades [1]. The first major breakthrough occurred in 1977 when continuous renal replacement therapy (CRRT) was created by the appearance of arterio-venous hemofiltration, with the original intention of fluid removal in unstable patients with diuretic resistance [2]. This approach turned out to also provide detoxification in uremic patients with superior cardiovascular stability compared with conventional intermittent hemodialysis available at that time [3]. With the evolution of pump-driven continuous veno-venous hemofiltration (CVVH), higher ultrafiltration rates and thus doses became achievable, which could be even further augmented by adding diffusion typical for continuous hemodiafiltration.

Triggered by the issue of costs, which are mainly driven by the requirement for sterilized solution bags for substitution fluids or dialysates in CRRT [4,5], the concept of extended daily dialysis was developed using a conventional dialysis machine, with treatment times of

around 8 hours allowing for slower fluid and toxin removal [6]. Next, the invention of a single-batch dialysis system with online dialysate production, providing sustained low-efficiency dialysis (SLED), allowed one to replace expensive and complex dialysis machines requiring operation by dialysis nurses [7], showing similar hemodynamic stability and efficacy in terms of urea removal as CVVH [8].

The well-designed single-center study by Schwenger and colleagues is the first randomized trial investigating the outcome of critically ill patients treated by SLED compared with those treated by CVVH at a dose of 35 ml/kg/hour [1]. Achieving the same survival at 90 days, SLED also showed a tendency towards shorter ICU stays and less ventilation days at significantly lower costs than CVVH. The study has several implications, however. First, in terms of outcome and cardiovascular stability, SLED and CVVH appear to be quite equivalent. Furthermore, since average treatment durations were quite similar for both modalities (14.9 hours vs. 19.9 hours for SLED and CVVH, respectively), the study indicates that convection provided by hemofiltration possibly does not confer significant benefit over diffusion provided by dialysis, which may also be concluded from other trials [9]. Finally, the slightly longer days on ventilation as well as longer ICU stay reported for patients treated with CVVH may reflect a major disadvantage of CRRT requiring patients to be attached to the extracorporeal circuit around the clock, thus limiting early physiotherapy and mobilization. The latter findings, however, were barely statistically significant and definitely require further substantiation.

So finally, we apparently have a well-tolerated, efficient and potentially cheap modality at hand. In times of emerging cost restraints, should this not become the new standard for renal replacement therapy in the ICU?

A closer look at the study still leaves us with some hesitation. First of all, dialysis using a batch dialysis system requires a central dialysate preparation unit in a separate room with significant investments. The proportional costs for a single renal replacement therapy treatment depend on the number of machines in use as well as the number of treatments, and would be much higher for units with lower frequencies. Furthermore,

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insufficient purity of water and contamination of the dialysate have been a reported problem for dialysis units [10].

The second issue is the quite low average filter survival of roughly 20 hours reported for CVVH by Schwenger and colleagues [1] – implicating frequent clotting and filter changes, resulting in increased nursing time for setting up new circuits and enhanced blood loss. This observation was probably due to the unusually high filtration fractions >40% resulting from low average blood flows of 102 ml/minute as well as the use of unfractionated heparin for anticoagulation in the CVVH group. Increasing filter survival applying lower filtration fractions and using low molecular weight heparin for anticoagulation probably would have reduced the costs for CVVH [11]. Furthermore, over the last few years regional citrate anticoagulation has become available for all modes of CRRT and has been recommended by the KDIGO 2012 guidelines [12], making average filter survival >72 hours easily achievable [13,14], reducing blood transfusion requirements [13] as well as providing better biocompatibility and possibly survival [15,16]. Last, but not least, current dose recommendations are considerably lower, with 20 to 25 ml/kg/hour reducing the amount of substitution fluid required. A cost calculation regarding all these aspects would show far less superiority of SLED over CVVH, if any at all.

Therefore, although SLED holds some promise for becoming the new low-cost carrier for renal replacement therapy, we still need further stringent economic as well clinical evaluation of SLED compared with CRRT performed in a current state-of-the-art way before any general changes to treatment patterns can be recommended on solid grounds.

Abbreviations

CRRT, continuous renal replacement therapy; CVVH, continuous veno-venous hemofiltration; SLED, sustained low-efficiency dialysis.

Competing interests

MJ received speaker's and consulting honoraria from Baxter, Fresenius and Gambro.

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