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Costs difference between hemodiafiltration with unfractionated heparin versus hemodialysis with regional citrate anticoagulation

Norddine Zeroual, Philippe Gaudard and Pascal H Colson

One of the advantages of citrate regional anticoagulation (cRA) in continuous renal replacement therapy (cRRT) could be reduced costs when compared to systemic anticoagulation with unfractionated heparin (UFH), but detailed analyses are missing. Therefore, we designed an observational, retrospective study to analyze the specific costs of two main cRRT modes, continuous veno-venous hemodialysis (CVVHD) with cRA to hemodiafiltration (CVVHDF) with UFH. We have collected data to compare specific costs of cRA CVVHD to UFH CVVHDF sessions, performed in the intensive care unit (ICU) over eight consecutive months. The cost of each cRRT session was calculated by the sum of costs related to disposable materials and dialysis solution, nursing workload (NW) using a detailed analysis of nurse actions dedicated to cRRT,[1] and biological controls related to cRRT, then reported to the session duration to get hourly costs.

Fifty-one patients were treated by cRRT, cumulating 211 cRRT sessions, out of which 113 CVVHD and 26 CVVHDF were analyzed. The CVVHD sessions lasted longer, 63 h (41; 69) vs. 39 h (23; 58) for CCVHDF ($p < 0.001$) but was more expensive than CVVHDF with an hourly cost of 24.3€ (22.6; 26.9) vs. 17.9€ (16.7; 22.7), respectively ($p < 0.0001$). For both techniques, the main cost is related to disposable materials (47% and 59% for cRA CVVHD and UFH CVVHDF circuits, respectively). The higher cost of the cRA CVVHD circuit and solutions is roughly compensated by the repeated use of UFH CVVHDF circuits and the higher dialysis dose. NW consisted in roughly 20% of session cost, without significant difference between the two techniques. However, the NW distribution is very different between the two techniques: very concentrated around the iterative connection and reconnection of the circuits for UFH CVVHDF, whilst more regularly distributed on biological controls for cRA CVVHD.[1] These aspects may impact the nursing plan which may have related costs not taken into account in the study. The major difference between the two techniques is biological monitoring of anticoagulation, significantly higher for cRA CVVHD (35% vs. 19%), reaching 8.7€/h (7.6; 9.5) vs. 3.2€/h (2.5; 3.5) for UFH CVVHDF ($p < 0.001$). Since ionograms were collected at similar times whatever the techniques, they have no direct influence on cost difference. Interestingly, the coagulation monitoring, namely ionized calcium (iCa) dosage, is potentially a modifiable budget line contrary to the two other expenditure areas. Spacing or even discontinuing the monitoring of post-filter iCa does not seem detrimental in terms of efficiency and safety.[2–4] Moreover, it may reduce also the nurse time dedicated to blood sample management.[1] Reducing the frequency of biological control by adjusted and individualized monitoring may help to decrease significantly the cRA CVVHD biological cost.

Declaration of conflicting interests

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