Author’s response to reviews

Title: Pleth Variability Index versus Pulse Pressure Variation for Intraoperative Goal-Directed Fluid Therapy in Patients Undergoing Low-to-Moderate Risk Abdominal Surgery: a Randomized Controlled Trial

Authors:

Sean Coeckelenbergh (secoecke@ulb.ac.be)
Amélie Delaporte (amelie-delaporte@hotmail.com)
Djamal Ghoundiwal (ghoundiwal@gmail.com)
Javad Bidgoli (SEYEDJAVAD.BIDGOLI@chu-brugmann.be)
Jean-François Fils (jean-francois.fils@ars-statistica.com)
Denis Schmartz (Denis.SCHMARTZ@chu-brugmann.be)
Philippe Van der Linden (Philippe.VANDERLINDEN@chu-brugmann.be)

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Author’s response to reviews:

Dear Editor, Dear Reviewer,

Thank you very much for evaluating our text and submitting it to review. Your judicious comments have helped us to further improve our manuscript

Reviewer reports:

Jochen Renner (Reviewer 3): The authors present the data of their study entitled "Pleth Variability Index versus Pulse Pressure Variation for Intraoperative Goal-Directed Fluid Therapy in Patients Undergoing Low-to-Moderate Risk Abdominal Surgery: a Randomized Controlled Trial"
After a power analysis they included a total of 76 patients (ASA I and II patients), randomized into two groups of 38 patients (receiving low risk surgery - mainly laparoscopic), receiving either a GDFT-protocol mainly based on pulse pressure variation (as an invasive variable) or pleth variability index (as a non-invasive variable). Primary outcome was defined as length of stay (LOS) in hospital, which was defined as the number of days from surgery up to the day the surgeon authorized hospital discharge. "Other" outcome variables were defined as total infused colloid, total infused crystalloid, estimated blood loss, diuresis, intraoperative use of phenylephrine, post-anesthesia care unit (PACU) LOS, number of anti-emetics administered at the PACU, post-operative complications, time to first ambulation, and postoperative day 1 pain evaluation using visual analogue scale score. The main finding of this RCT is that both PVI and PPV guided GDFT strategies were equivalent for the primary outcome and kind of secondary outcome variables.

I have some major concerns regarding the importance for the clinical application of the results. To my best knowledge there is no RCT available showing that any GDFT protocol is able to reduce LOS in the hospital and reducing postoperative complications, compared to standard of care in low risk patients undergoing low risk surgery. From this point of view the clinical implementation of any GDFT protocol for this combination must be questioned at all. Presumably, any institutional standard of care protocol might have made no difference - however, this is hypothetic. Estimated blood loss was 100 ml in both groups, totally administered fluids 1000 ml vs 750 ml, indicating that hypovolemia was not a problem at all. Consequently, there were no differences found between the groups, independent of the GDFT protocol. For me, the leading question is not wether a non-invasive variable like PVI can be used interchangeably to an invasive variable like PPV, but rather do we need any GDFT for low risk patients undergoing low risk surgery. Please comment on that and try to incorporate a little more strength to the hypothesis regarding the importance for daily clinical routine.

This is a very important point. Indeed, we seem to be in a “gray zone” where the utility of GDFT in this relatively low risk population may be questionable. A future study, designed for equivalence comparing PVI to standard care, could very well show that this is a confounding factor. Unfortunately, this remains hypothetical and our study was designed to determine if there is a difference between two different GDFT protocols.

As we mentioned in our answer to the previous review, we acknowledge that GDFT may not be of major value in low-to-moderate risk surgery. However the question remains debated. On the one hand, Holte et al. reported that perioperative fluid management could have an impact on postoperative outcomes even in this population, indicating that fluid administration should be
individualized and goal directed (1). On the other hand, Stens et al. compared a restrictive fluid strategy to a non-invasive pulse contour GDFT strategy and showed no difference in outcome in this population (2). There is consequently a “gray zone” in this population regarding the utility of GDFT. We have stated in the abstract that this question still needs to be clarified, added a sentence in the background section to strengthen our hypothesis on clinical impact, and noted this limitation in the discussion.


Please provide references for the threshold values defined - PPV >13% and PVI >15%

We have added those references (ref 11,18 and 19)

How to deal with these threshold values during pneumoperitoneum - discuss the changes in threshold values in the presence of pneumoperitoneum - differences between laparotomy and laparoscopic surgery-

We did not change threshold values during pneumoperitoneum and the GDFT protocols were the same regardless of the use of laparoscopy.
Please show the GDFT protocol as a figure

We have added a figure with the GDFT protocols.

Please mention possible limitations of PVI with respect to changes in perfusion index, especially in low perfusion situation, i.e. low perfusion indices

This is a very important limitation of PVI. If perfusion index is too low, PVI does not predict reliably fluid responsiveness. We have added this limitation in the text. Thank you very much.

Is there any interference to be considered with a radial artery cannulation and the perfusion index and the PVI on the same side?

This is an interesting point. Although radial artery cannulation could hypothetically impact PI and consequently PVI, we have no evidence to show this. Outcome between groups were equivalent and the palmar arch was not incompetent in our patients (Allen test was performed preoperatively in all patients and showed adequate palmar perfusion with radial artery compression).