The Hong Kong College of Anaesthesiologists

Final Fellowship Examinations

Paper II – Critical Appraisal

4 September 2023 (Monday)

11:30 – 12:10 hours

Article
"Cardiac output monitoring with thermodilution pulse-contour analysis vs. non-invasive pulse-contour analysis" Boisson M, et al (Anaesthesia 2019, 74: 735–740)

Instructions
- There are 8 multiple choice questions in this section, based on the above paper.
- **ANSWER ALL** questions, they carry equal marks.
- For each question, choose the **ONE** best answer and mark this on the answer sheet. If you mark more than one answer, you will receive NO mark for that question. No marks will be deducted for incorrect answers.

1. **Which of the following statement is an accurate description of the study design?**
   A. A randomized comparison of PiCCO with Clearsight for cardiac output measurement.
   B. A case-control comparison of PiCCO with Clearsight for cardiac output measurement.
   C. A crossover comparison of PiCCO with Clearsight for cardiac output measurement.
   D. A cohort comparison of PiCCO with Clearsight for cardiac output measurement.
   E. A database comparison of PiCCO with Clearsight for cardiac output measurement.

2. **In general, precision of a clinical measurement can be expressed as:**
   I. the coefficient of variation of repeated measurements;
   II. the standard deviation of the difference between pairs of measurements;
   III. the standard deviation of repeated measurements within subjects;
   IV. the standard deviation of measurements between patients;

   A. I only.
   B. IV only.
   C. I and III only.
   D. II and IV only.
   E. I, II and III only.

3. **In this study, Cohen's kappa (κ) coefficient for the agreement in change of stroke volume after the fluid challenge, between PiCCO and Clearsight measurements, was 0.79. Which of the following is correct?**
   A. κ has a value that lies between –1 and +1.
   B. The κ statistic describes the concordant change of stroke volume after the fluid challenge between PiCCO and Clearsight measurements.
   C. A positive κ value indicates that an increase in stroke volume measured by PiCCO was associated with a decrease in stroke volume measured by Clearsight.
   D. Approximately 79% of the variation in the change of stroke volume after fluid challenge between PiCCO and Clearsight was due to the difference in measurement methods.
   E. Change of stroke volume after fluid challenge between PiCCO and Clearsight will be misclassified in 79% of the time.

4. **In the abstract, "the bias and precision of stroke volume measurement by Clearsight were …". Bias reported in this study was:**
   A. the magnitude of random error in Clearsight measurement.
   B. the magnitude of sampling error related to the different number of stroke volume measurement between patients.
   C. the average change in stroke volume during repeated measurements.
   D. the mean difference between paired PiCCO and Clearsight measurements.
   E. the standard error of mean of stroke volume measurements by Clearsight.

The following two questions (Questions 5 and 6) are based on Figure 1(a) of the paper.
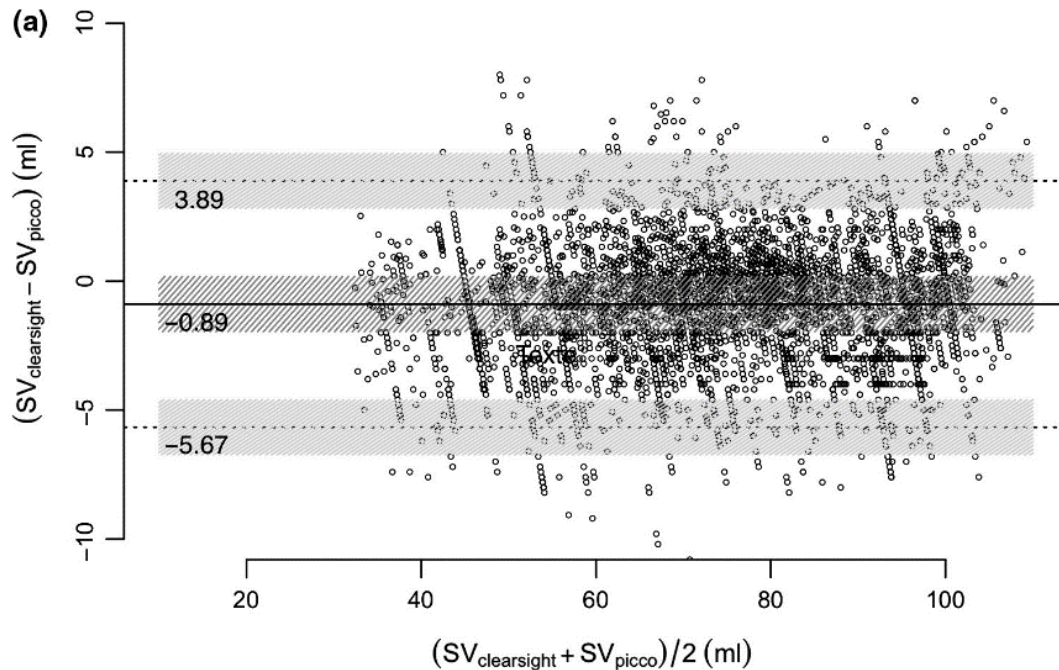
5. **With respect to Figure 1(a) in this paper, which of the following is INCORRECT?**
   A. The mean difference in paired stroke volume measurements between Clearsight and PiCCO was 0.89 ml.
   B. On average, stroke volume measured by Clearsight was lower than PiCCO.
   C. About 95% of the difference between paired Clearsight and PiCCO measurements was between +0.03 ml and -1.42 ml.
   D. The difference in paired stroke volume measurements by Clearsight and PiCCO was similar across the range of stroke volume recorded.
   E. Each of the paired measurements was considered independent to others.

6. **With respect to the difference in the paired Clearsight and PiCCO measurements, which of the following statement is CORRECT?**
   A. The agreed tolerability intervals for stroke volume measurements was 15 ml.
   B. About 1.0% of the readings was more than 3.89 ml
   C. The upper limit of agreement (upper dotted line) was one standard deviation from the mean.
   D. The readings in this plot cannot be considered normally distributed.
   E. The solid line is the median difference in the paired Clearsight and PiCCO measurements.

7. **In Table 2, the median (interquartile range [range]) for stroke volume measurement by PiCCO was 75 (62-88 [32-109]) ml.**

	PiCCO
Cardiac output; l.min^{-1}	5.8 (5.1–6.6 [2.5–10.7])
SV; ml	75 (62–88 [32–109])
SV variation; %	7.8 (5.6–10.4 [1.4–37.6])
Blood pressure; mmHg	
Systolic	100 (89–114 [49–160])
Diastolic	60 (55–66 [28–89])
Mean	75 (69–84 [38–115])

SV, stroke volume.

Which of the following statement is CORRECT?
A. The 95% confidence intervals for stroke volume were 32 – 109 ml.
B. 50% of the stroke volume recorded was between 62 and 88 ml.
C. The patient with stroke volume of 32 ml required vasopressor therapy.
D. Patients with stroke volume > 88 ml must have received several fluid challenges.
E. Stroke volumes outside the range are indication for resuscitation.

8. **Which of the following statement is a correct interpretation of the study?**
A. The results validated stroke volume by Clearsight (test method) against PiCCO (reference method).
B. Non-invasive monitoring of stroke volume by Clearsight provides better outcome after noncardiac surgery.
C. Stroke volume by Clearsight agrees with PiCCO.
D. Stroke volume by Clearsight will lead to change in management in <5% of time during surgery.
E. Clearsight is a useful hemodynamic monitoring tool in open heart surgery.

----- End of Paper -----