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Postoperative acute kidney injury and intraoperative mean arterial pressure variability – a multi-cohort observational study

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Objectives: Clinical evidence for the association between intraoperative mean arterial pressure (MAP) variability and the risk of postoperative acute kidney injury (PO-AKI) in non-cardiac surgeries is rare.

Methods: This study included three distinct cohorts in Korea with different time intervals for recording blood pressure during surgery. Non-overlapping first surgery cases were included, excluding those without creatinine measurements or with preexisting renal failure. The main study outcome was PO-AKI, defined by KDIGO serum creatinine criterion cutoffs, and critical AKI, which merged stage 2 KDIGO PO-AKI and post-AKI death or dialysis within 90 days. Standard deviation, coefficient of variation, variation independent of mean, and average real variability were calculated with measured MAP values.

Results: We analyzed 45,575/3,182,502, 29,724/1,354,820, and 7,435/48,923,796 patients/measured MAP values from the three cohorts, respectively. On discovery analysis, the variability parameters were significantly associated with the risk of the studied AKI outcomes, even after adjusted for duration of significant intraoperative hypotension (MAP < 65 mmHg). An increment of 10 mmHg average difference between the measured MAPs, which were measured at a median interval of 2 minutes, was associated with higher risks of PO-AKI [adjusted OR 1.549 (1.307-1.820)] and critical AKI [adjusted OR 1.566 (1.098-2.211)] events. The above results were similar in the other two validation cohorts, and the average real variability was the most significant variability parameter.

Conclusions: High intraoperative MAP variability is an independent risk factor for the risk of PO-AKI and associated patient-oriented outcomes in non-cardiac surgeries.

Figure 1. Study population

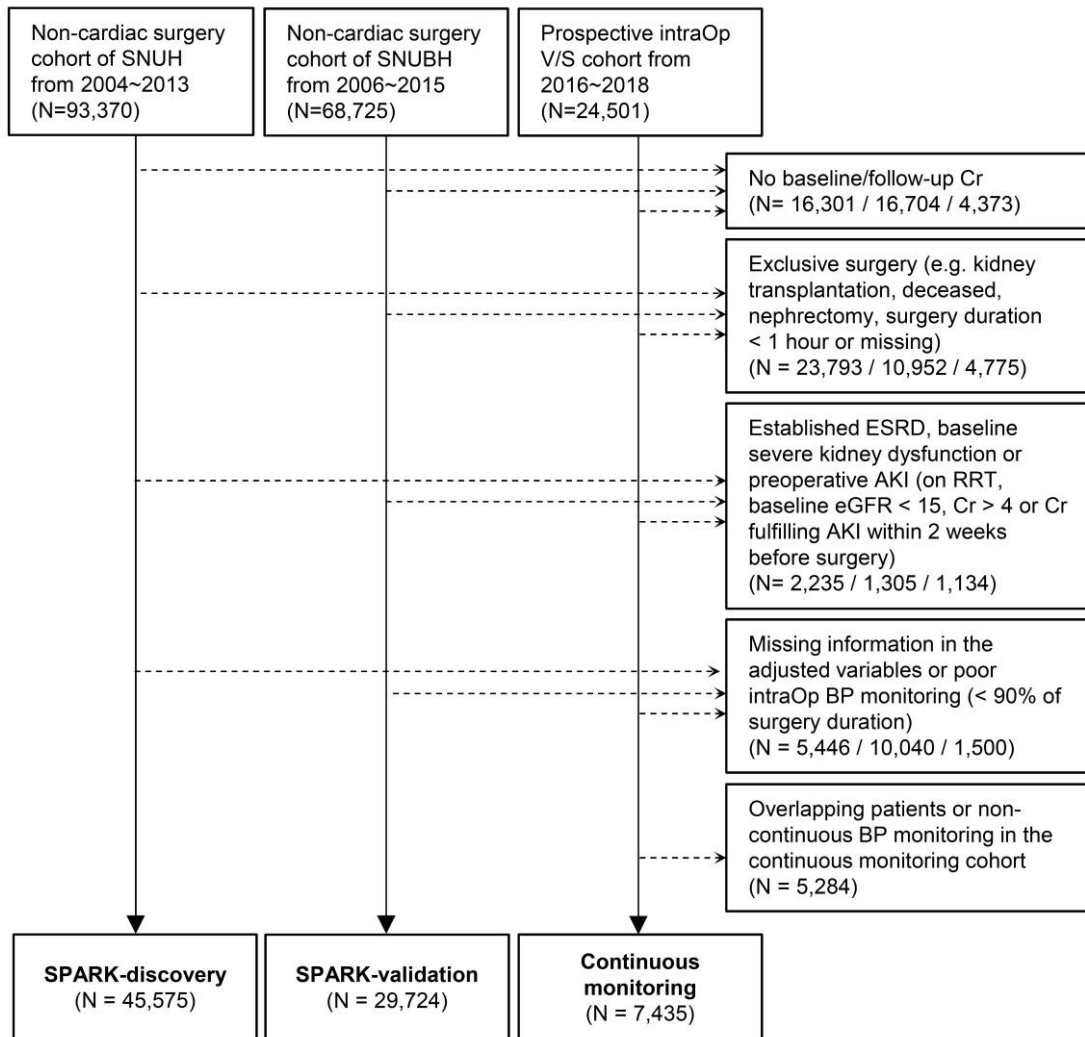


Figure 2. Variability and risk of postoperative AKI

