Esophagectomy

Argos Case Study

Background

Esophagectomy for cancer involves two- or three-phase procedures, such as abdominal, chest and/or neck incisions, is more invasive than other types of gastrointestinal surgery, and is associated with high risk for postoperative morbidity. Because of this risk, perioperative management of circulatory conditions such as hypovolemic hypotension is especially important to avoid postoperative heart complications, anastomotic leak, and conduit necrosis. The addition of continuous cardiac output monitoring provides advanced hemodynamic data that helps the anesthesia and surgical teams manage the patient throughout this high-risk procedure.

Case Presentation

A 58-year-old male with a history of hypertension, diabetes mellitus, and prostate cancer was admitted for a video-assisted thoracoscopic surgery (VATS) esophagectomy. Case started with patient in extreme reverse Trendelenburg with LR infusion to gravity. IM ephedrine 25 mg was administered for long-acting blood pressure control. Gastric dissection contributed to intravascular volume loss and IV bolus ephedrine 10 mg was started to correct the hypotension. Patient was re-positioned to supine and a dual-lumen ETT was placed for the next part of the procedure. The patient had a difficult re-intubation that caused acute hypoxia and a compensatory increase in HR. Patient was re-positioned to left lateral, then the right lung was collapsed to allow access to and resection of the esophagus. After clean margins were confirmed, an end-to-end attachment was made between the residual esophagus and the gastric conduit. Given the high risk of anastomotic leak and conduit necrosis, MAP was carefully monitored, and albumin was given to ensure adequate perfusion because no vasopressors can be given during this time. The pulmonary and vascular challenges present during this type of procedure necessitate vigilance using data provided by the Argos Cardiac Output Monitor.

Clinical Significance

- A PA catheter could not be used. Utilizing a reliable arterial line, the Argos provided the only advanced hemodynamic data
- The Argos showed an increased in SVR following administration of Neosynephrine, which confirmed a vasoconstriction-induced increase in MAP
- The Argos also showed that SV increased 30% following administration of a 250 mL bolus of albumin, indicating the patient was fluid responsive.
- The re-intubation with a dual-lumen ETT presented a challenge resulting in a sympathetic response (increase in HR and MAP).
- Positional changes were a necessary part of the procedure (Reverse Trendelenburg → Supine Flat → Trendelenburg) – As more blood is transferred from the lower body toward the right heart, the Argos shows the SV increases 74% over a period of 25 mins as the patient is moved from an extreme reverse Trendelenburg position to a supine flat position. This could also be interpreted as a slow passive leg raise maneuver which mimics a fluid challenge, and here, the patient was fluid responsive.
- With single-lung ventilation, there is risk of the inadequate oxygenation. Monitoring CO helps determine the ability of the heart to handle the increased cardiac workload from single-lung oxygenation. The Argos confirmed the patient maintained normal hemodynamic status throughout single-lung ventilation.

Conclusion

- The Argos Cardiac Output monitor detected hemodynamic changes in response to positional changes and interventions such as fluids and vasoactive therapy.
- Respiratory complications are most common after esophagectomy, with up to a 60% incidence rate.
  The most severe pulmonary complications include ARDS and ALI, both conditions affected by fluid overload.
  Fluid management guided by the Argos can help mitigate these pulmonary complications.

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Neosynephrine Administration

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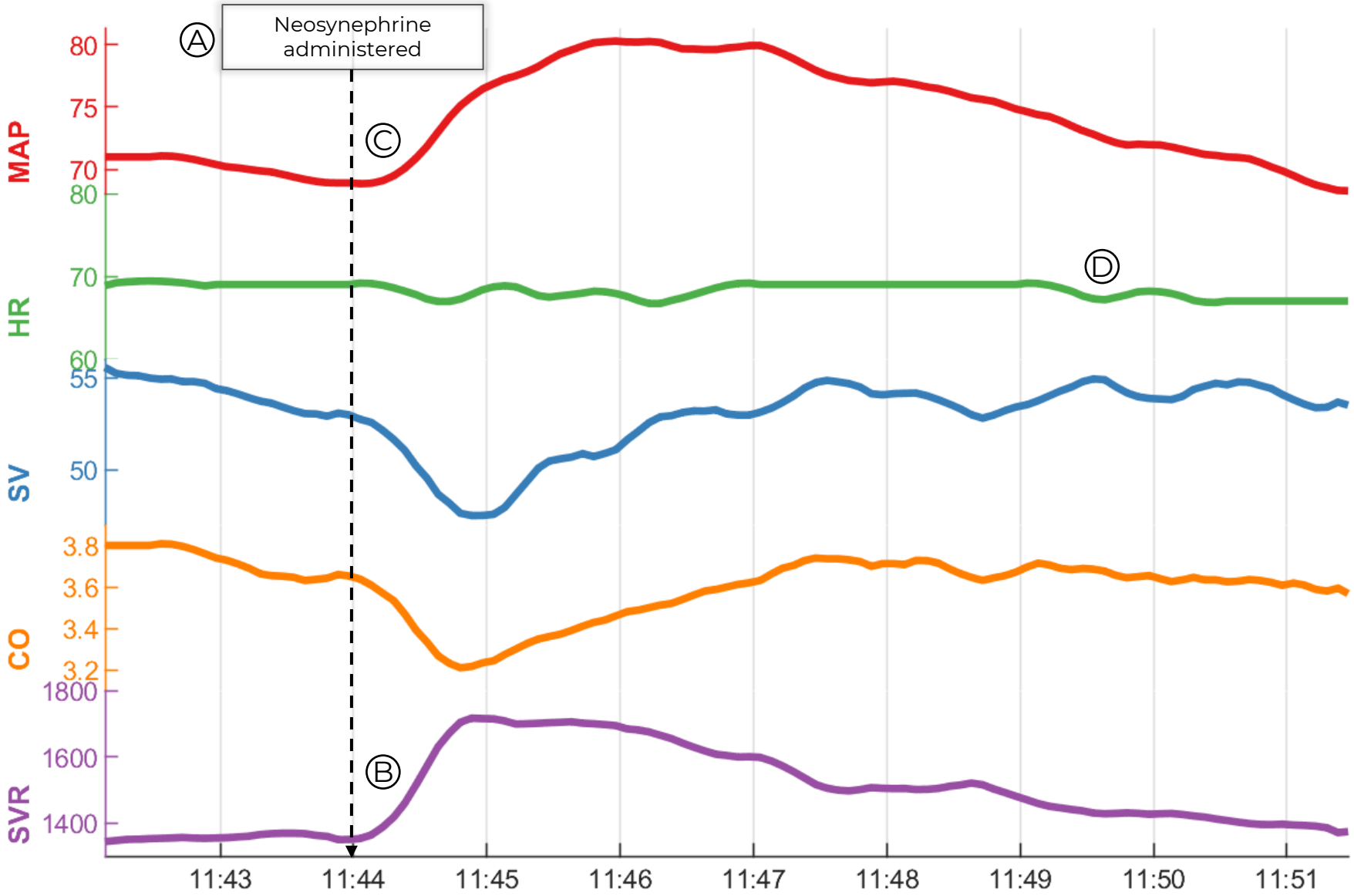

A) Neosynephrine administered to correct hypotension

B) Argos confirms vasoconstriction through sharp increase in SVR

C) MAP increases coinciding with vasopressor administration confirming therapeutic effectiveness

D) HR begins to decrease with normotension

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Ephedrine Administration

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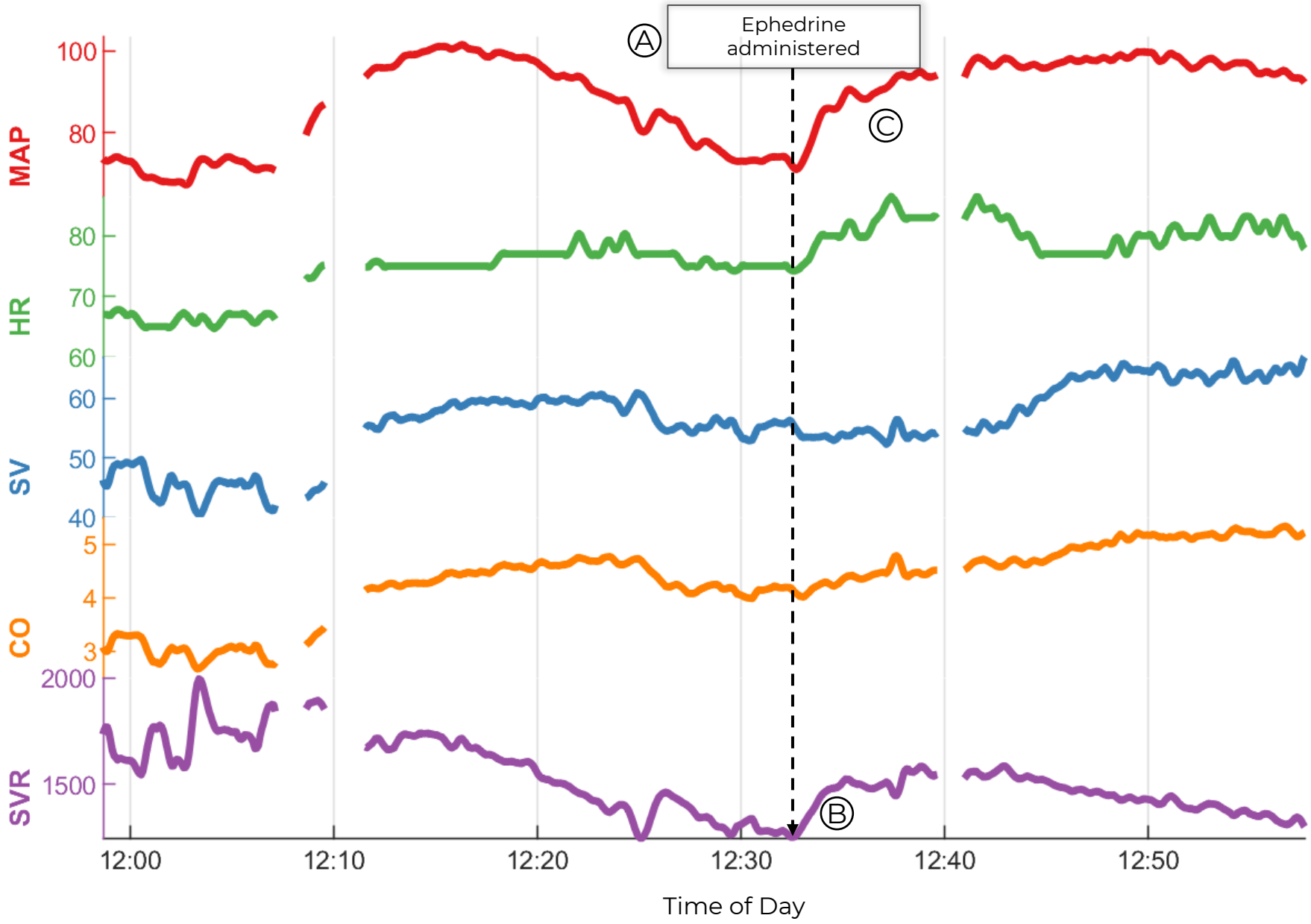

A) Ephedrine (IV bolus) administered to correct hypotension

B) Argos confirms vasoconstriction through sharp increase in SVR

C) MAP increases coinciding with vasopressor administration

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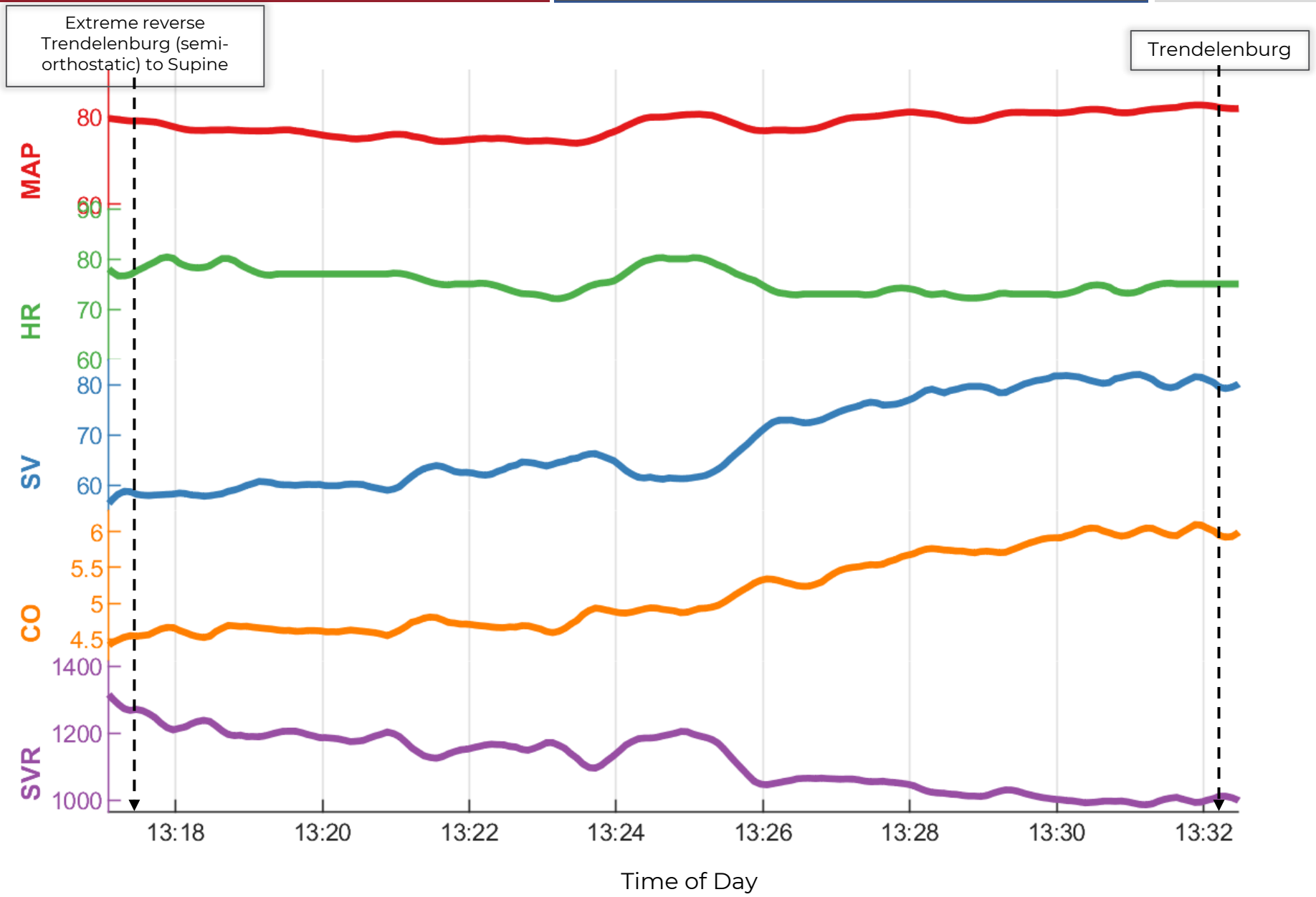

- Argos shows a positional-dependent increase in SV as more blood is transferred to the heart (feet down → flat → head down)
- The change in position from extreme reverse Trendelenburg to Trendelenburg can act as a [gradual] passive-leg raise maneuver to confirm fluid responsiveness

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Difficult Re-Intubation

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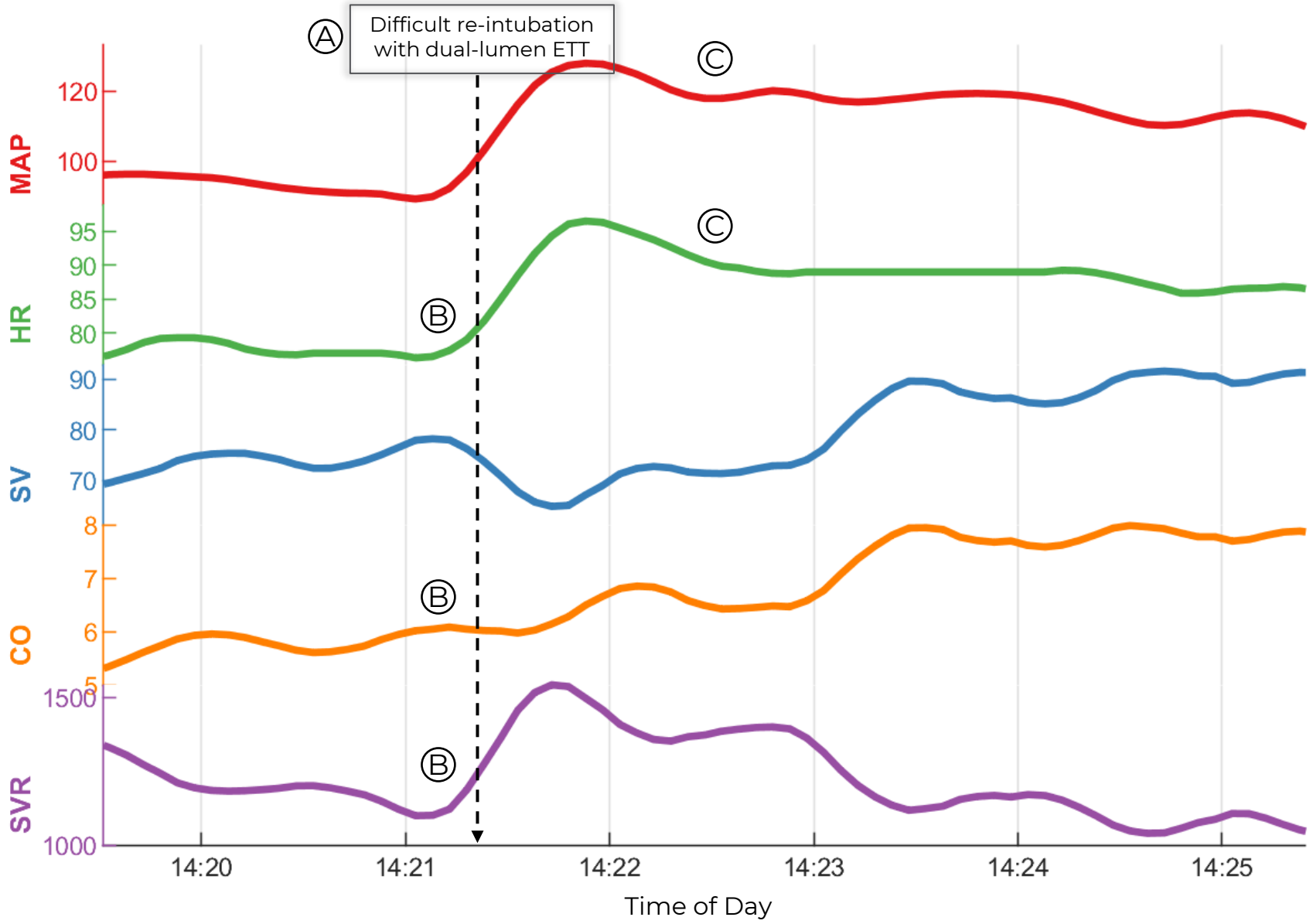

A) Difficult re-intubation with dual-lumen ETT results in a decrease in SpO2

B) Argos confirms a sympathetic response to the re-intubation: increase in MAP and HR, as well as an increased CO and SVR

C) Once patient was adequately ventilated, HR and MAP began to stabilize

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Single-Lung Ventilation

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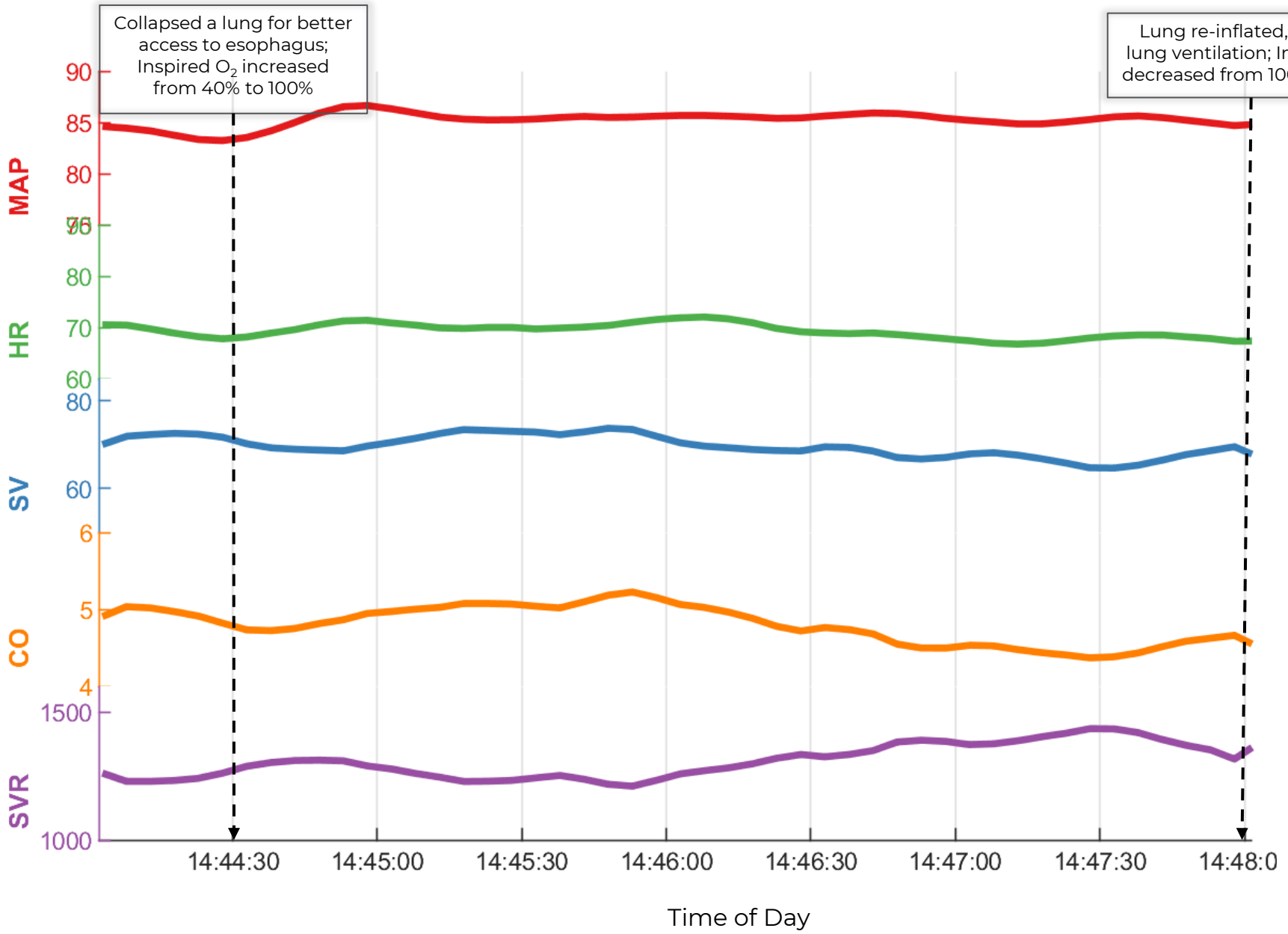

- Argos confirmed that CO was maintained within normal threshold during single-lung ventilation

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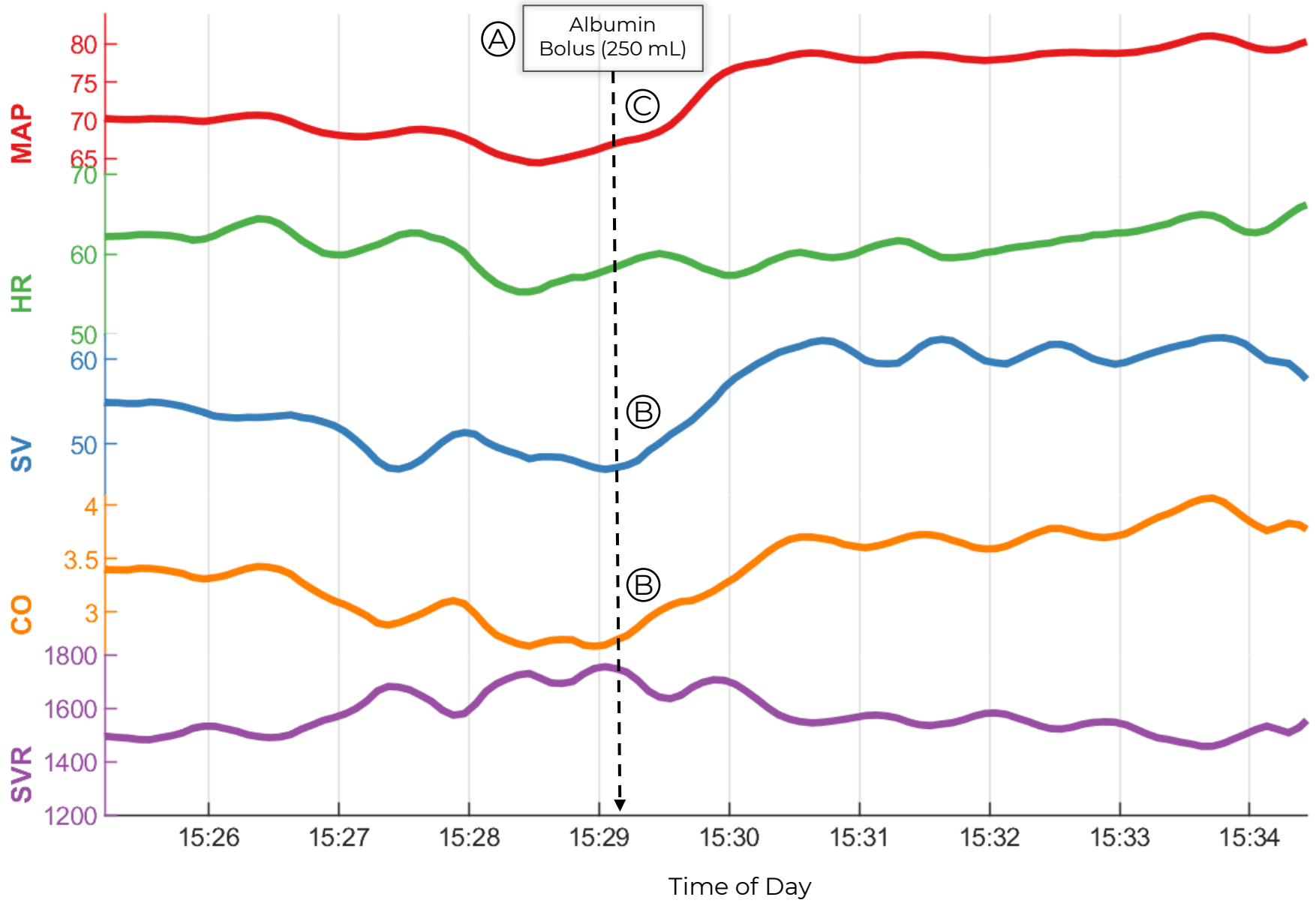

A) Albumin administered to correct hypotension

B) Argos confirms fluid responsiveness through increase in SV and CO

C) MAP increases coinciding with fluid administration confirming fluid responsiveness

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	MAP	HR	SV	CO	SVR
Time within Normal Range	85%	91%	56%	66%	19%
Normal Range	70 – 105 mmHg	60 – 100 bpm	60 – 100 ml/beat	4.0 – 8.0 lpm	800 – 1200 dynes
↓	53	48	44	2.9	789
↑	141	96	94	8.0	2314

MAP and HR was maintained within normal threshold throughout most of the case. Argos helped guide fluid and vasopressor interventions to reach therapeutic targets.