



Use of EASy and Inferior Vena Cava Ultrasonography Before and After General Anesthesia Can Predict Patient Performance Intraoperatively and Postoperatively

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INTRODUCTION

- Peri-induction hypotension affects 30–50% of surgical patients and worsens postoperative outcomes.
- Common risk tools (e.g., ASA status) rely on static variables and may miss physiologic vulnerability.
- Focused cardiac ultrasound (FoCUS) and IVC ultrasound can rapidly assess ventricular function and volume status at the bedside.
- The EASy exam (Extended Assessment of Sonography in the critically ill) is a ≤3-minute protocol that may identify risk before induction.

AIM

- Evaluate the feasibility of a pre-induction EASy–IVC ultrasound (exam time, image quality).
- Determine whether cardiopulmonary ultrasound phenotypes are associated with peri-induction hypotension.
- Explore whether physiologic ultrasound can support preoperative risk stratification.

METHODS

- 60 adult patients (ASA ≥ III) undergoing non-cardiac surgery (2024–2026) were prospectively enrolled.
- A pre-induction EASy–IVC ultrasound was performed at the bedside (subcostal 4-chamber, IVC long-axis, bilateral anterior lung).
- Exams were performed by anesthesia attendings and PGY-3 residents who completed ≥5 hours didactic + 5 hours hands-on training.
- Exams were timed (goal ≤3 min) and ultrasound findings categorized into ultrasound findings
- Primary outcomes: feasibility (exam time, image quality).
- Secondary outcome: pre-incision hypotension (MAP < 65 mmHg) and its association with pre-induction hypotension,

EASy Exam Duration by Performer (N = 60)						
Median time, mean ± SD, and proportion of exams completed in ≤ 3 minutes						
Performer	No. of exams	Median time (min)	Mean ± SD (min)	Completed ≤3 min (%)	p-value (time) ¹	p-value (≤3 min) ²
Overall	54	3	3.4 ± 1.7	57	–	–
Attending	16	2	1.9 ± 0.7	100	<0.001	<0.001
Resident	38	4	4.0 ± 1.7	39	<0.001	<0.001

¹ Wilcoxon rank-sum test comparing attending vs resident exam duration.
² Fisher exact test comparing proportion of exams completed in ≤ 3 minutes.

Table 1. EASy exam duration metrics (N = 60), including median time, mean ± SD, proportion completed ≤3 min, and statistical comparisons between attending physicians and residents. Six exams lacked timing data due to early workflow issues.

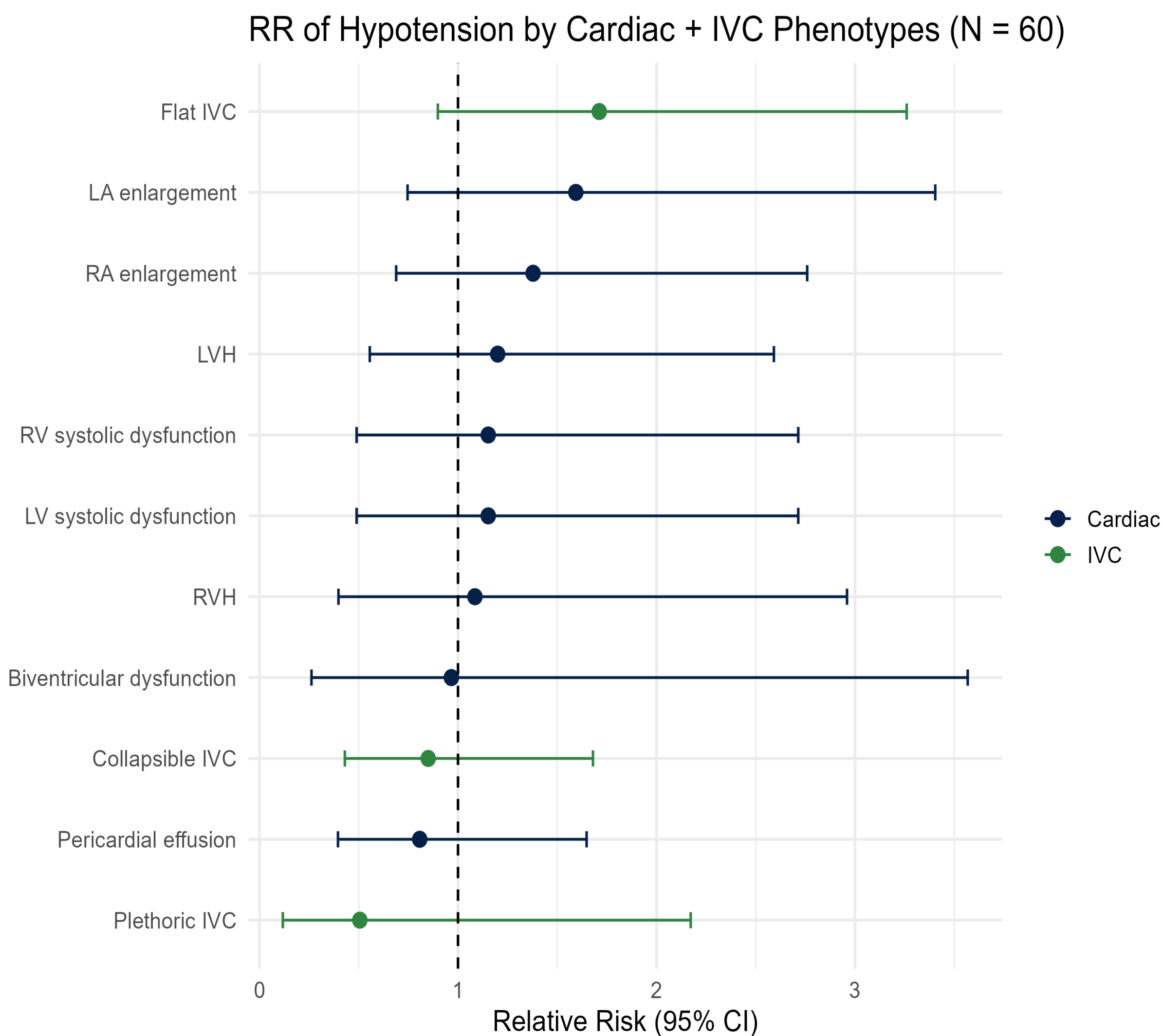


Figure 2: Cardiac and IVC ultrasound phenotypes associated with pre-induction hypotension. Forest plot displaying unadjusted relative risks with 95% confidence intervals for selected cardiac and inferior vena cava phenotypes. Abbreviations: LV, left ventricle; RV, right ventricle; LA, left atrium; RA, right atrium; LVH, left ventricular hypertrophy; RVH, right ventricular hypertrophy.

FIGURES

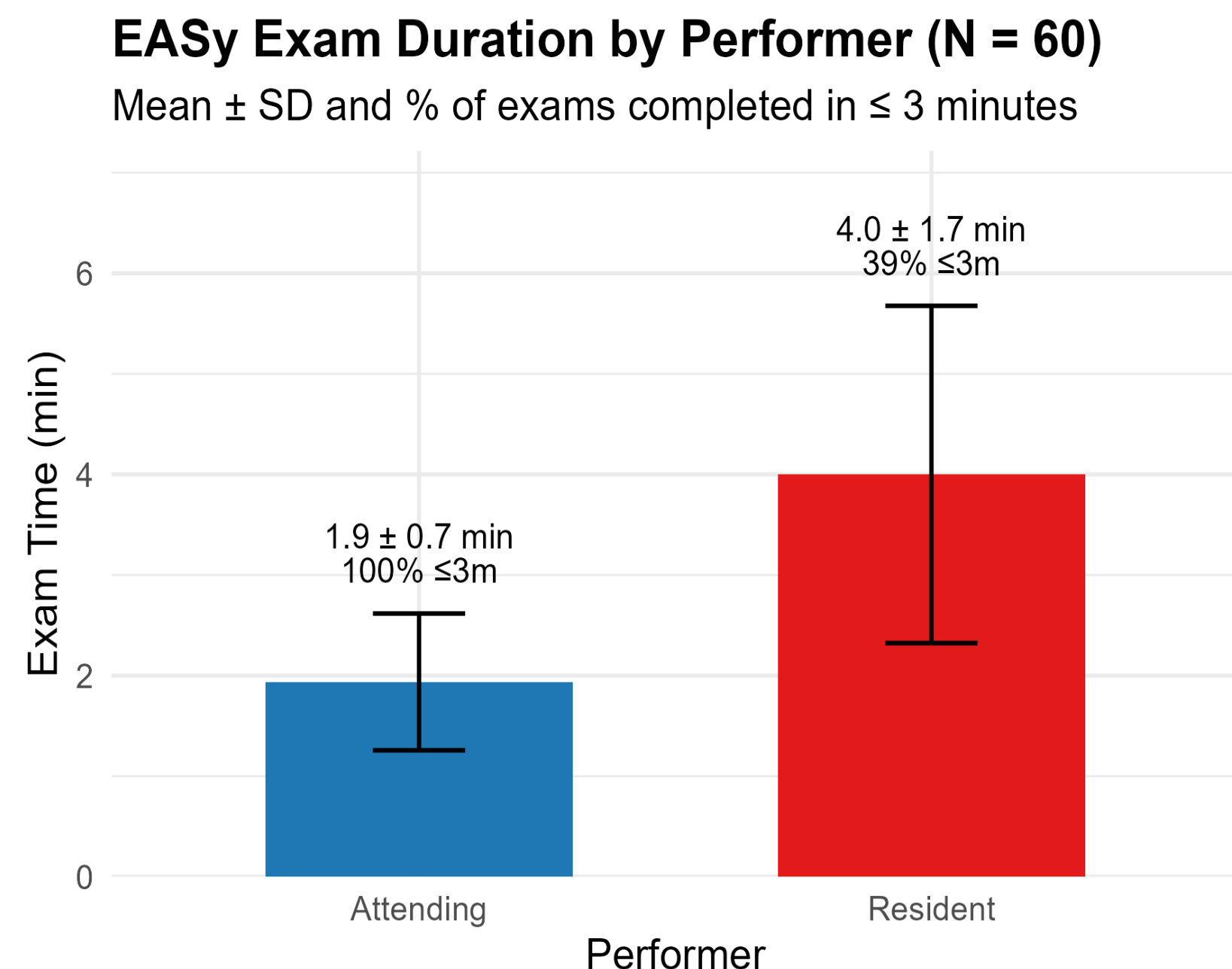


Figure 1. Visual comparison of mean EASy exam duration (±SD) by performer (N = 60). Attending physicians completed exams significantly faster than residents. Six exams were excluded due to missing timing data.

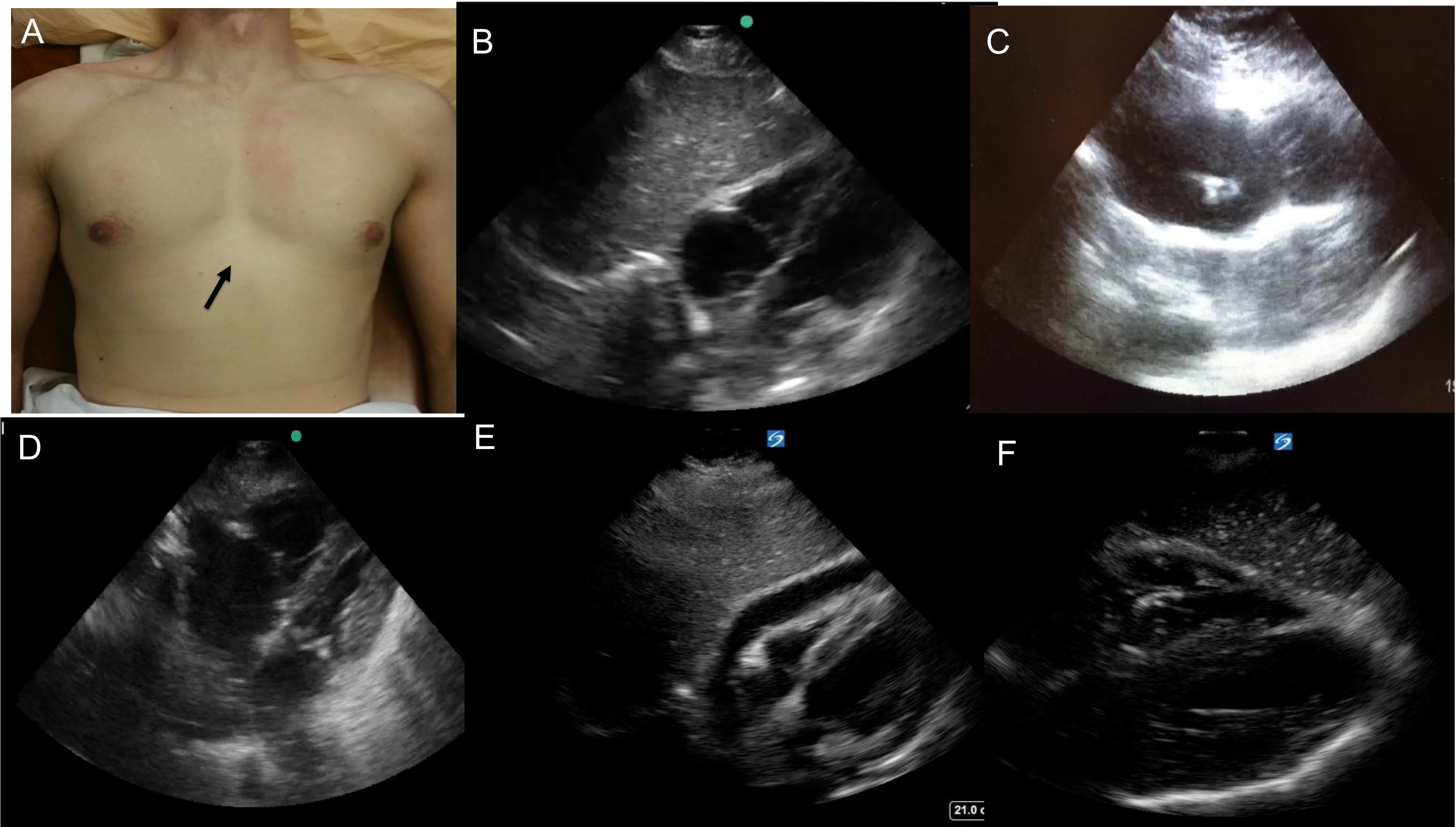


Figure 3: Examples of resident-obtained subcostal ultrasound images used in the EASy–IVC exam. (A) probe placement for subcostal view (arrow), (B) normal heart, (C) clot in right atrium, (D) right ventricular syndrome, (E) pericardial effusion, (F) left ventricular failure

RESULTS

- **Feasibility:** Median exam time: 3.0 min (IQR 2–4).75% of exams had good or adequate image quality.
- **Exam speed:** 57% completed in ≤3 min overall (100% attendings vs 39% residents, p < .001).
- **Hemodynamics:** Pre-incision hypotension occurred in 33% (20/60) of patients.
- **Cardiac & IVC Phenotypes:** Several phenotypes showed higher relative risk trends (e.g., LA enlargement, flat IVC, plethoric IVC).
 - However, none reached statistical significance; confidence intervals were wide due to the sample size.
- **Overall Pattern:** Attending physicians completed exams faster with consistently high image quality.
 - Ultrasound phenotypes may help identify vulnerable patients, but larger samples are needed to confirm associations.

CONCLUSIONS

- The EASy-IVC exam was feasible, with most scans completed in under 3 minutes and adequate image quality in >70% of patients.
- Early ultrasound phenotyping revealed physiologic patterns that may help flag patients vulnerable to peri-induction hypotension.
- These findings support the potential of EASy-IVC as a rapid, bedside tool to augment traditional preoperative risk assessment..

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