

# Learning Curve For A Robotic Assisted Minimally Invasive Direct Coronary Artery Bypass Program At A Rural Academic Tertiary Care Center

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## Abstract

- RA-MIDCAB may allow for safe treatment of high-risk patients, often yielding outcomes better than predicted by STS risk score.
- We evaluate the longitudinal clinical outcomes of RA-MIDCAB at a rural tertiary care center.

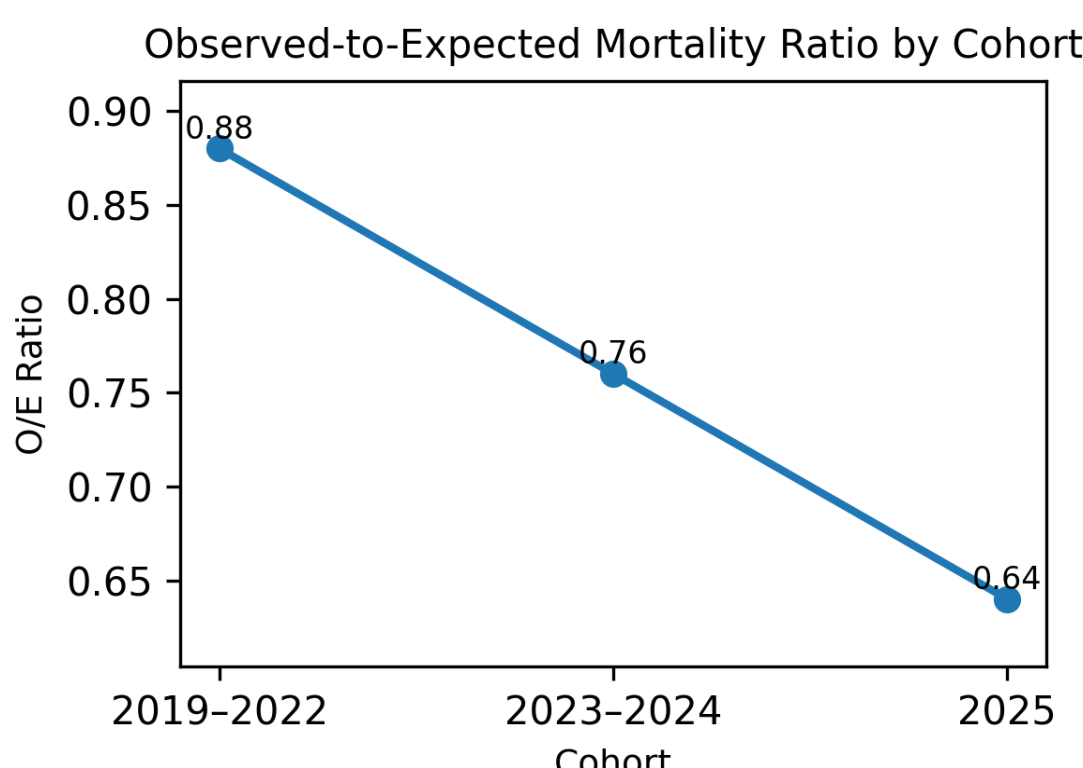
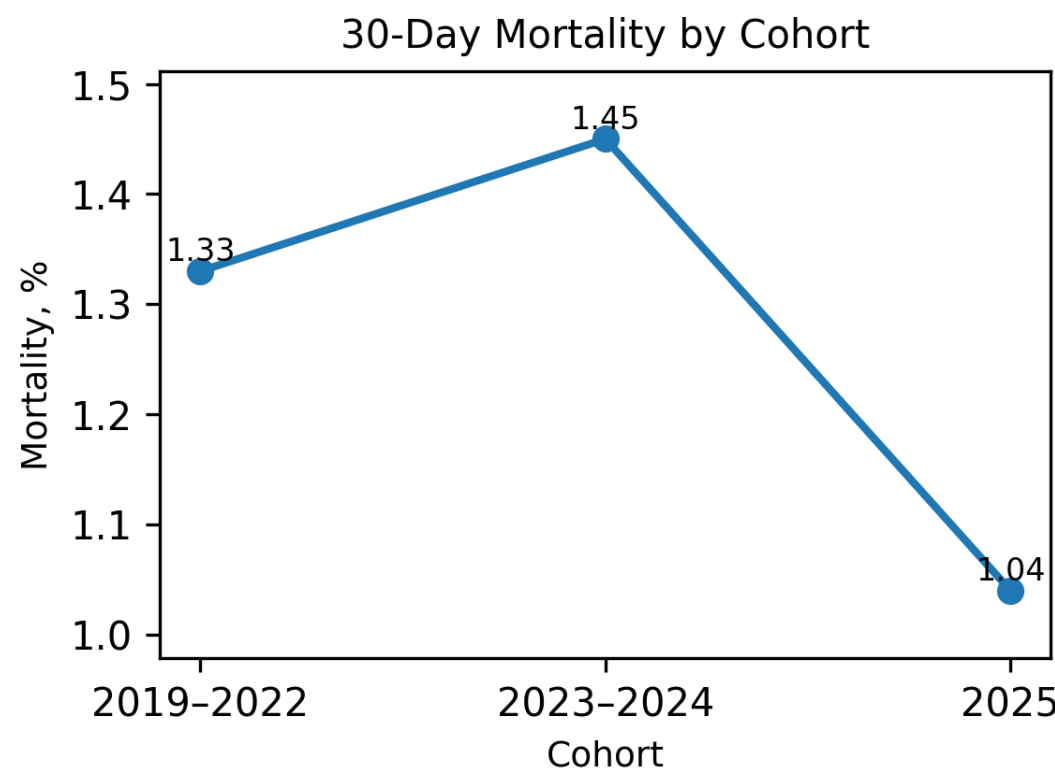
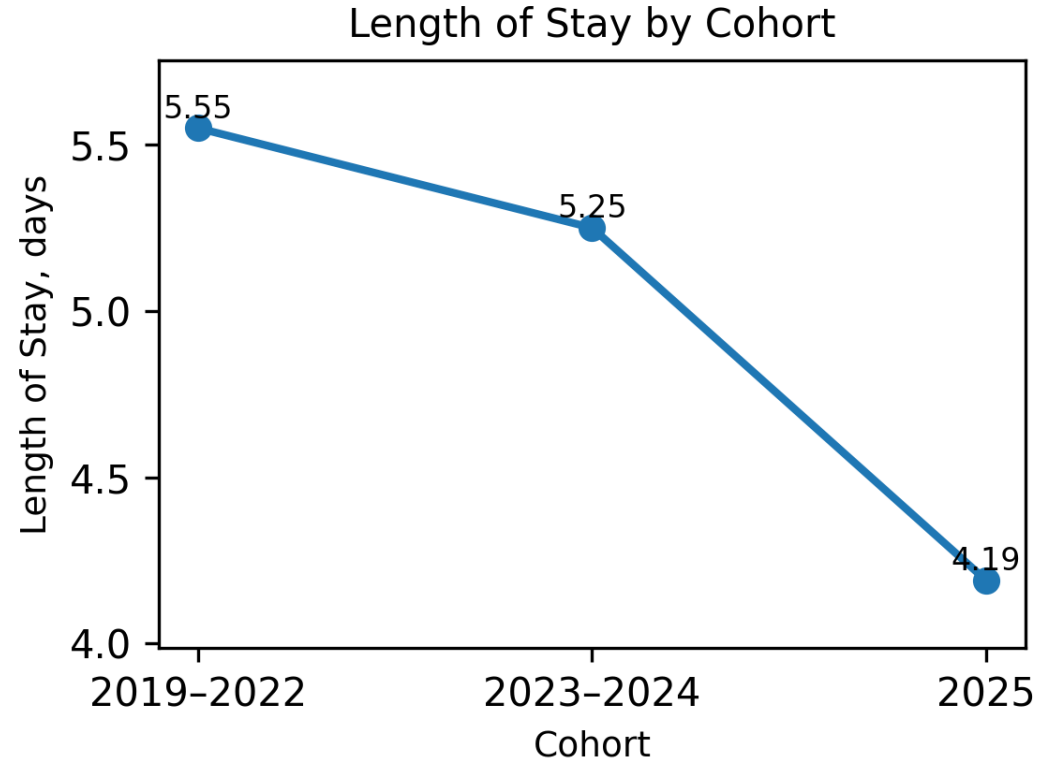
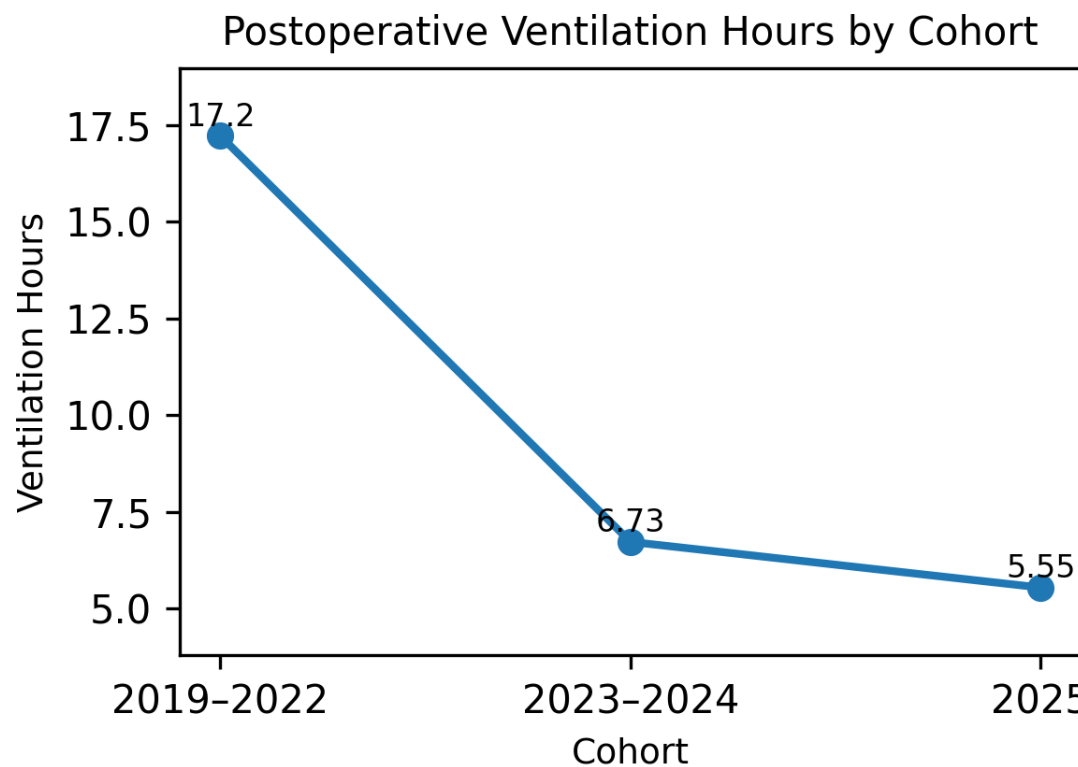
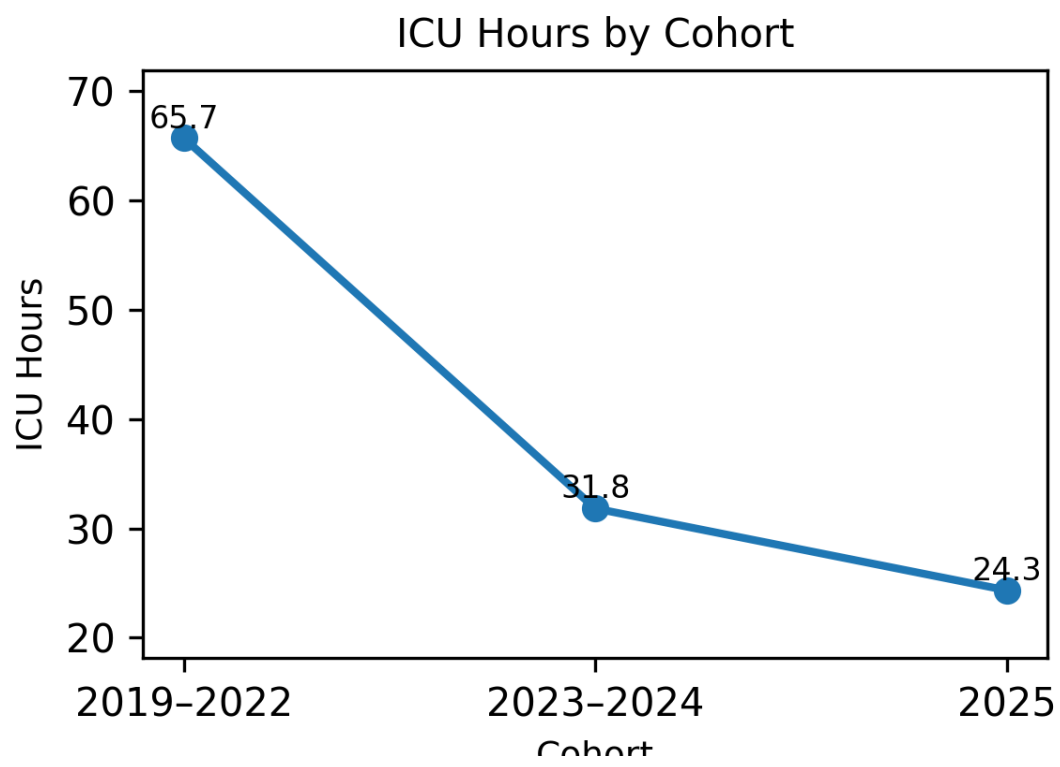
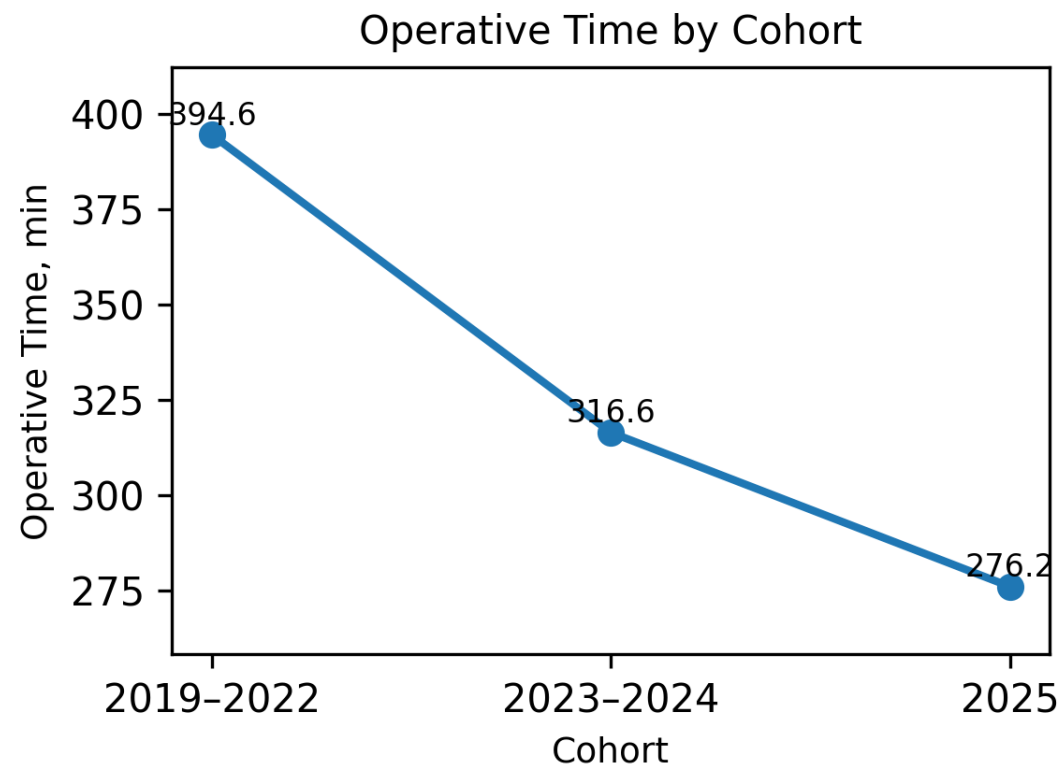
## Introduction

- RA-MIDCAB is becoming increasingly common at tertiary academic centers with outcomes equivalent to traditional CABG.
- There exists little data on changes in outcomes of an evolving RA-MIDCAB program as experience is gained.
- We present an evaluation of longitudinal changes in operative efficiency and clinical outcomes during the maturation of a RA-MIDCAB program at a rural academic tertiary care center.

## Materials & Methods

- Retrospective analysis performed on 240 patients who underwent RA-MIDCAB procedures between 2019–2025.
- Grouped into cohorts based upon years
  - Cohort 1 (75 cases; 2019–2022)
  - Cohort 2 (69 cases; 2023–2024)
  - Cohort 3 (96 cases; 2025).
- Outcomes assessed included operative time, ICU hours, postoperative ventilation duration, conversion to sternotomy, readmission, perioperative complications, and mortality.
- Observed-to-Expected mortality ratios were calculated to evaluate performance relative to STS predictions.

| Cohort                    | OR Time (Minutes) | ICU hours | Postoperative ventilation time (hours) | Length of Stay | 30-day Mortality (%) | O/E Ratio |
|---------------------------|-------------------|-----------|----------------------------------------|----------------|----------------------|-----------|
| Cohort 1 2019–2022 (n=75) | 394.6             | 65.7      | 17.2                                   | 5.6            | 1.3                  | 0.88      |
| Cohort 2 2023–2024 (n=69) | 316.6             | 31.8      | 6.7                                    | 5.3            | 1.5                  | 0.76      |
| Cohort 3 2025 (n=96)      | 276.2             | 24.3      | 5.6                                    | 4.2            | 1.0                  | 0.64      |
| Overall (n=240)           | 324.8             | 39.6      | 9.5                                    | 4.9            | 1.3                  | 0.75      |



## Results/Outcomes

- Cohort 1-3 notable differences:
  - Operative time (394.5 minutes to 276.2 minutes)
  - ICU hours (65.7 hours to 24.3 hours).
- From Cohorts 1-3:
  - 30-day mortality remained low at 1.33%, 1.45%, and 1.04%
  - O/E ratios decreased from 0.88 to 0.64 (exceeding STS expected outcomes)
- Intra-Operatively:
  - Conversion to sternotomies (6.7%, 8.7%, 6.2%)
  - Blood transfusions (2.7%, 13.0%, 6.2%).
- Post-operatively,
  - Blood transfusions (9.3%, 10.1%, 5.2%)
  - Atrial fibrillation (8%, 23.2%, 12.5%), and
  - Length of stay (5.6 to 4.2 days).
- These trends were observed irrespective of case urgency.

## Conclusion

- RA-MIDCAB can be safely implemented at a RTCC despite higher risk patient populations.
- 30-day mortality remained low with decreasing percentages despite an increase in high- risk patients in later cohorts.
- An overall conversion rate of 7.1% compares favorably to a historical benchmark of 10%.
- Increasing operative volume was associated with significant improvements in operative and perioperative efficiency without compromising outcomes.

## References

