

“A COMPARATIVE STUDY ON VARIANCE BETWEEN ESTIMATED AND FINAL BILLING IN CARDIOLOGY AND GENERAL SURGERY DEPARTMENTS AT A TERTIARY CARE HOSPITAL”

Presented by : Dr. Gursimran Kaur

Roll no.: 1714

Guided by : Dr. Mamta Chauhan

INTRODUCTION

- Accurate financial estimation of medical expenses is essential for ensuring transparency, patient satisfaction, and operational efficiency in healthcare settings.
- In tertiary care hospitals, realistic pre-treatment estimates play a key role in building patient trust and maintaining the institution's credibility.
- Despite structured billing systems, a significant variance often occurs between estimated and final billed amounts due to clinical uncertainties such as:
 - i Emergency procedures
 - ii Use of implants
 - iii Changes in length of stay (LOS)
 - iv Fluctuations in pharmacy and investigations
- Cardiology and General Surgery are high-volume, high-cost departments where such variances are more commonly observed.
- This study aims to assess the variance between estimated and final hospital billing and analyse the underlying departmental factors contributing to estimation discrepancies in Cardiology and General Surgery.

OBJECTIVES

- To assess the variance between estimated and final billed amounts in Cardiology and General Surgery departments.
- To identify the major reasons contributing to billing variance.
- To compare estimation accuracy between the two departments.
- To categorize the types and frequency of estimation variance.
- To evaluate the proportion of accurate estimates, defined as variance within $\pm 10\%$.

METHODOLOGY

Study Design

- Retrospective, observational, and descriptive study
- Comparative analysis between Cardiology and General Surgery
- Based on secondary data from billing records

Study Duration

- January 1 to March 31, 2025 (3 Months)

Sample Size & Technique

- Total: 567 patients
 - Cardiology: 291
 - General Surgery: 276
- Sampling: Purposive

METHODOLOGY (Contd.)

Data Collection Tool

- Microsoft Excel sheet with fields for:
 - Department, Payer type, Estimated & Final bill
 - Estimated & Actual LOS
 - Variance category and reason

Inclusion Criteria

- Cash, TPA, and International patients
- Discharged from Cardiology or General Surgery
- Complete estimated and final billing data

METHODOLOGY (Contd.)

Exclusion Criteria

- Emergency-only, daycare, and diagnostic patients
- Incomplete billing records
- PSU and EWS category patients

Data Analysis

- Microsoft Excel used for:
 - a. Variance % calculation and accuracy classification
 - b. Filters and PivotTables for patterns
 - c. Bar graphs and pie charts to visualize trends

RESULTS

Sample Overview

- Total patients analyzed: 567
 - Cardiology: 291
 - General Surgery: 276
- Data included estimated & final bill, and variance reason
- Categorized by variance percentage from estimate

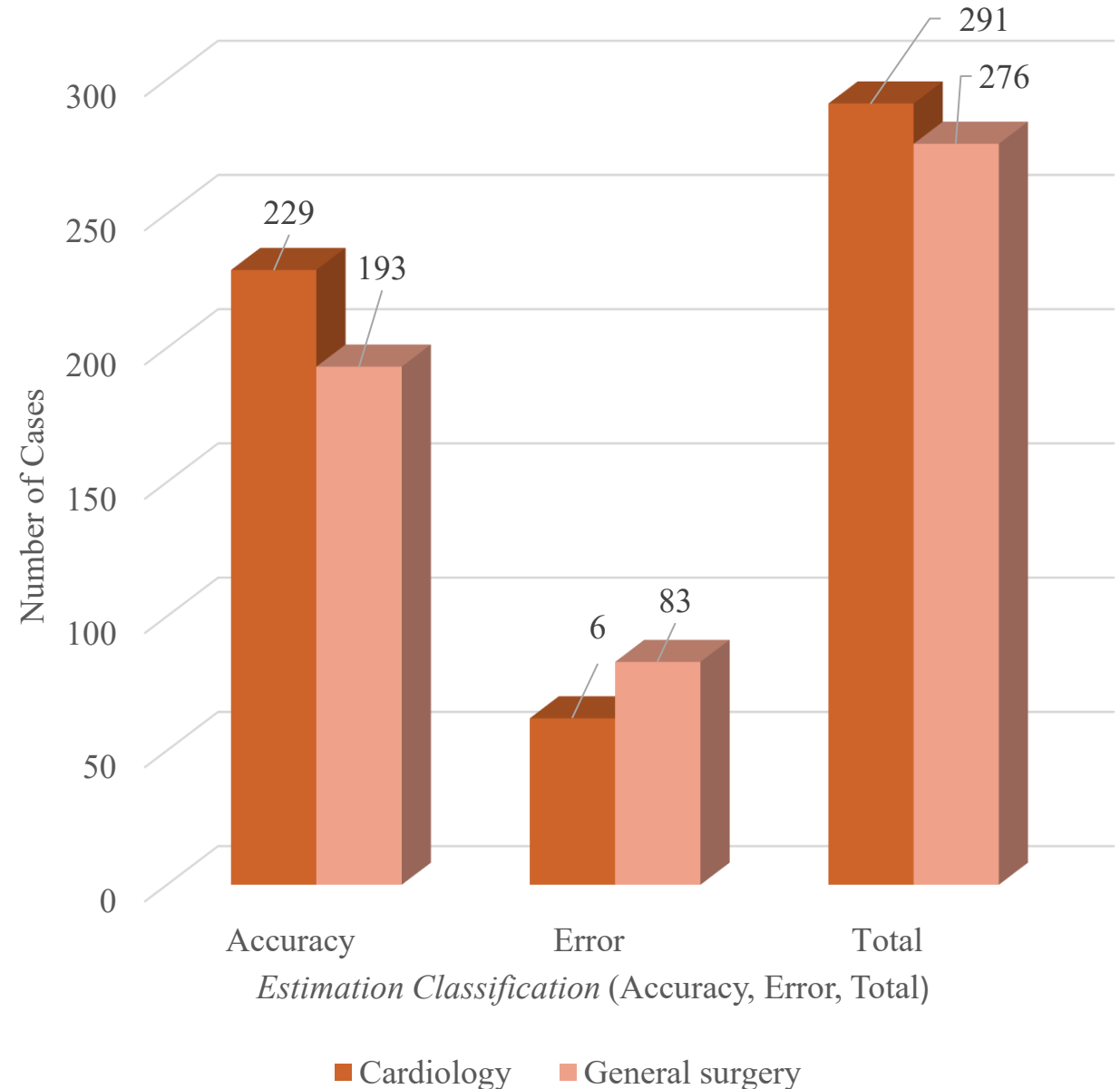
Data Analysis Method

- Microsoft Excel used for cleaning and analysis
- Classified variance as accurate ($\pm 10\%$), under, or overestimated
- Used filters, PivotTables, bar & pie charts
- Trends grouped by department and variance range

Department-wise Accuracy

- Cardiology: 229 accurate, 62 errors (291 total)
- General Surgery: 193 accurate, 83 errors (276 total)
- Cardiology showed higher estimation accuracy and fewer errors

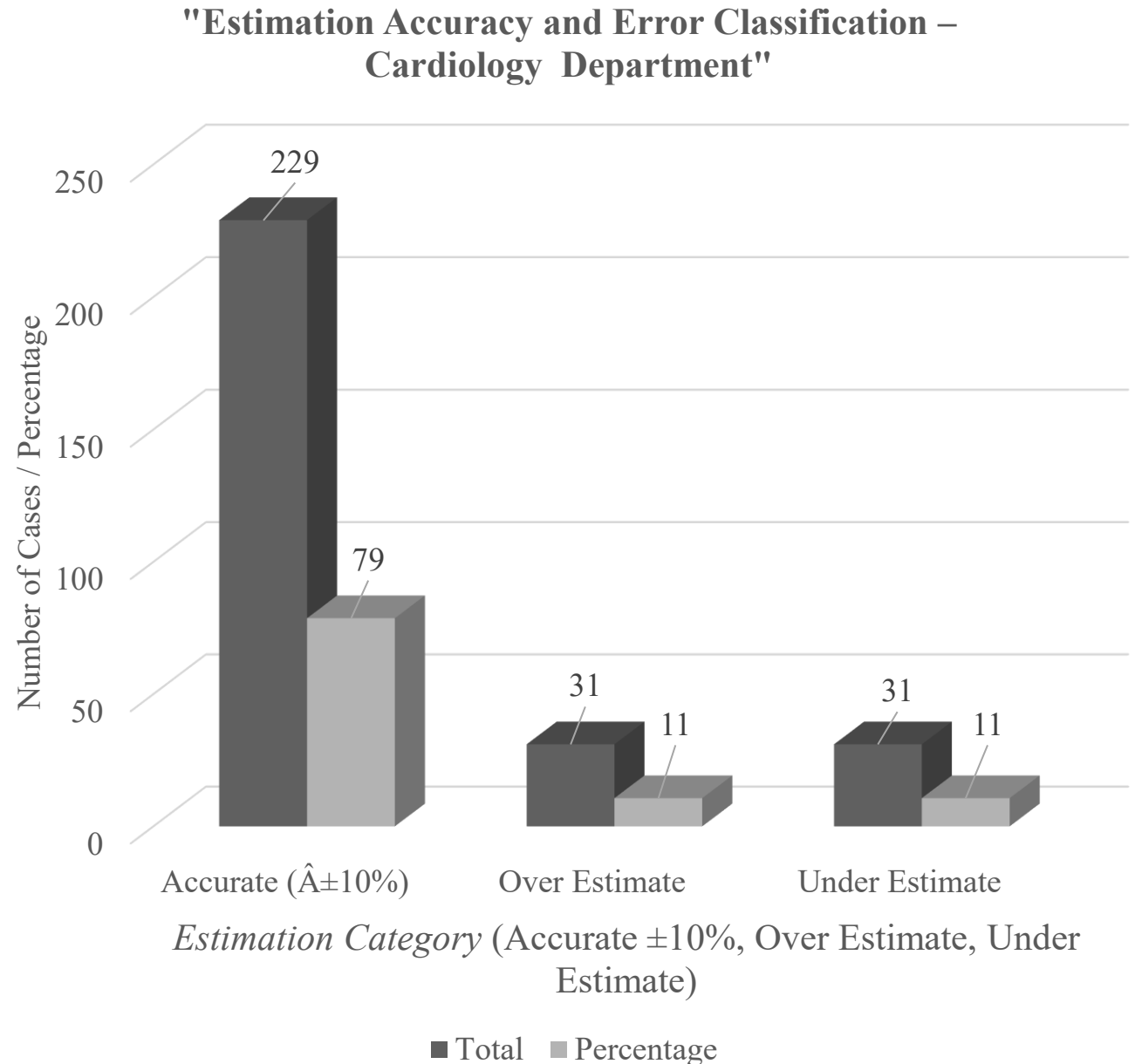
"Comparison of Estimation Accuracy, Error, and Total Cases – Cardiology vs. General Surgery"



Variance Category Distribution

Cardiology:

- 79% accurate
- 11% overestimated
- 11% underestimated

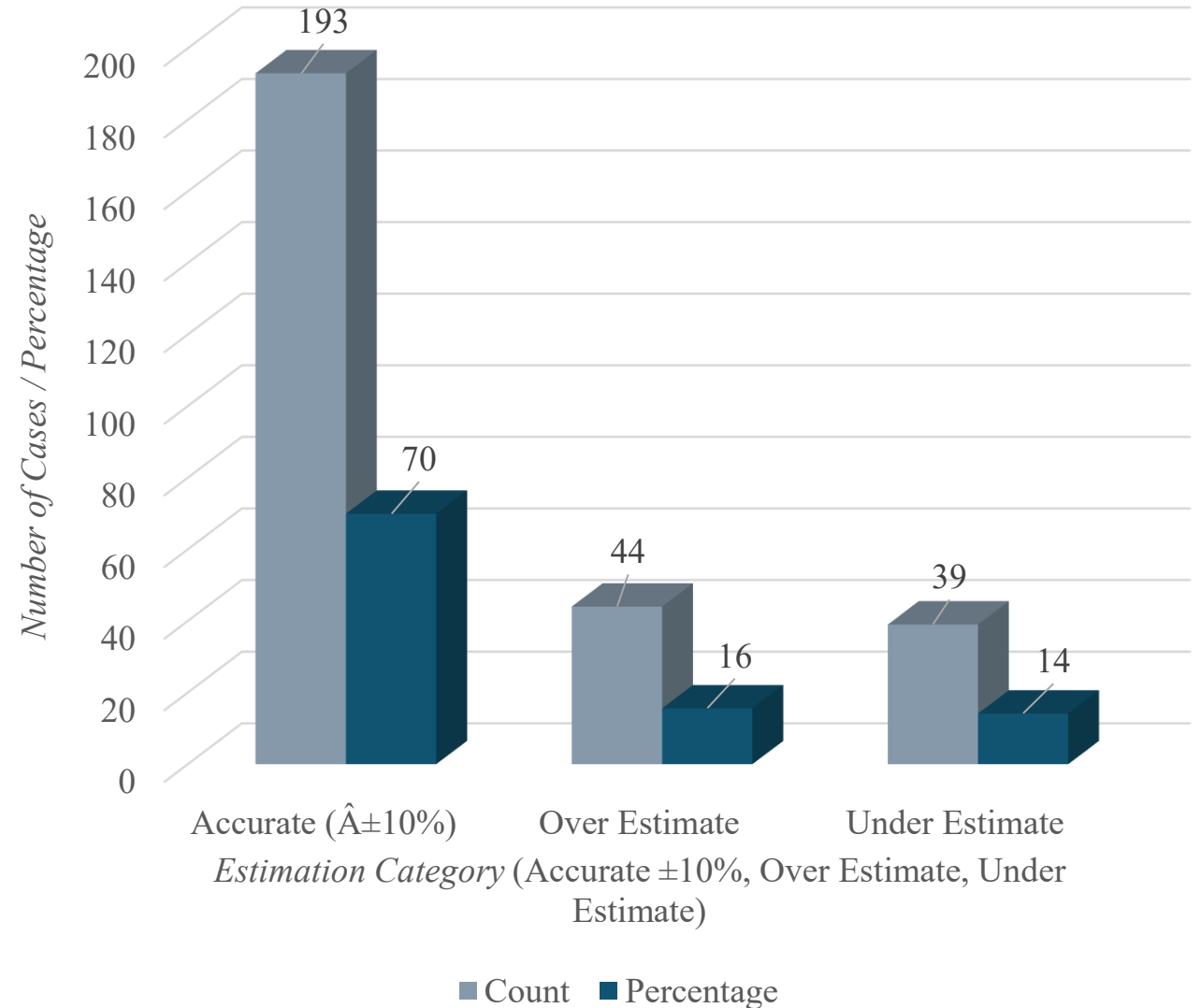


Variance Category Distribution (Contd.)

General Surgery:

- 70% accurate
- 16% overestimated
- 14% underestimated

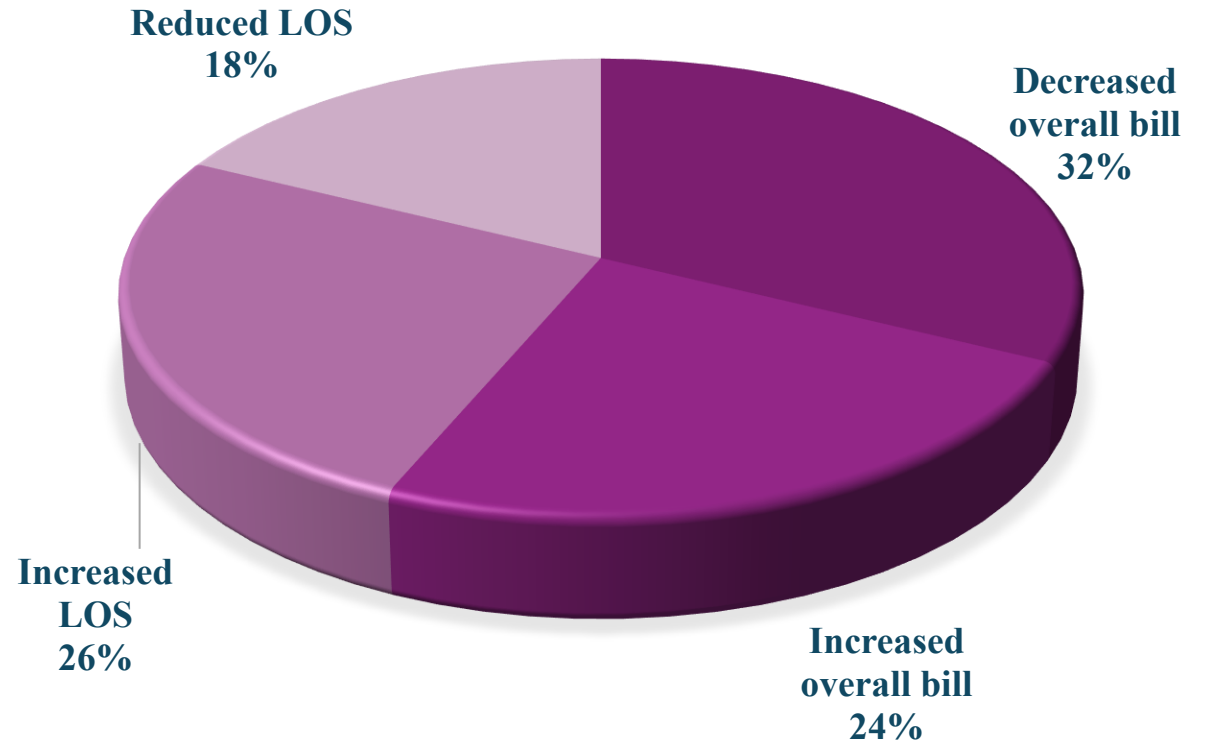
"Estimation Accuracy and Error Classification –
General Surgery Department"



Reason-wise Variance (Cardiology)

- Decreased overall bill – 32%
- Increased LOS – 26%
- Increased bill – 24%
- Reduced LOS – 18%

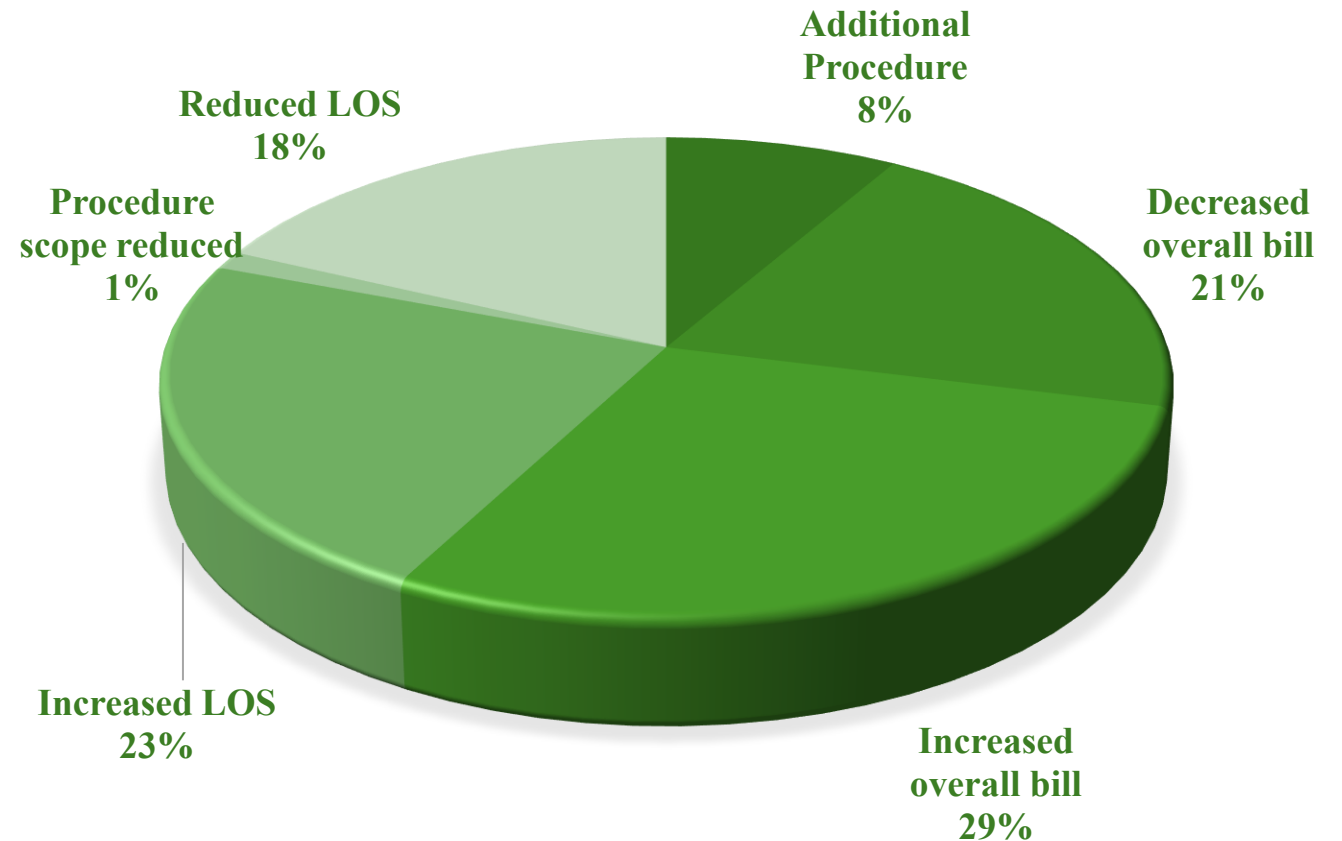
"REASONS FOR ESTIMATION VARIANCE IN
CARDIOLOGY DEPARTMENT"



Reason-wise Variance (General Surgery)

- Increased overall bill – 29%
- Increased LOS – 23%
- Decreased bill – 21%
- Additional procedure – 8%
- Scope reduced – 1%

"REASONS FOR ESTIMATION VARIANCE IN
GENERAL SURGERY DEPARTMENT"



Accuracy Summary

- **Overall accuracy:** 74.4%
- **Cardiology:** 78.7%
- **General Surgery:** 69.9%
- Most discrepancies within $\pm 10\%$, considered acceptable

	Overall	Cardiology	General Surgery
Accuracy	74.4	78.7	69.9

CONCLUSION

- Overall accuracy of financial estimation (variance within $\pm 10\%$) was **74.43%**:
 - Cardiology: **78.69%**
 - General Surgery: **69.93%**
- Most patients fell within **0–10% and N 0–10% variance categories**, indicating good estimation performance overall.
- However, department-specific discrepancies were observed:
 - **General Surgery** had more over- and under-estimations.
 - **Cardiology** had better consistency between estimate and final bill.
- **Key reasons for variance included:**
 - Overestimation: *Increased Length of Stay (LOS), Additional Procedures*
 - Underestimation: *Reduced LOS, Change in Clinical Plan, Under-utilized diagnostics/pharmacy*
 - Implant use and intra-operative changes also contributed in specific cases.

CONCLUSION (Contd)

- The study highlights the **dynamic nature of hospital care** and emphasizes that:
 - Recurring patterns in variance call for **standardized estimation protocols**
 - Improved **documentation** and **interdepartmental coordination** are essential
 - Financial forecasting must remain adaptable to clinical unpredictability

RECOMMENDATIONS

- **Monthly Variance Audits:**
Track department-wise estimation trends to identify and reduce recurring errors.
- **Clinical and Billing Collaboration:**
Encourage joint case reviews for complex or high-risk estimations to improve accuracy.
- **Mid-Treatment Re-Estimation:**
Update estimates after major procedures or if the length of stay exceeds expected duration.
- **Standardized Reason Entry:**
Use dropdown menus in the Hospital Information System (HIS) for consistent reason documentation.
- **Pre-Admission Estimate Verification:**
Ensure estimate is validated and signed by both clinical and billing teams before admission.

RECOMMENDATIONS (Contd.)

- **Staff Orientation and Training:**
Conduct monthly sessions on estimation accuracy, ICD coding, and documentation protocols.
- **Patient Estimate Summary:**
Provide patients with printed and digital copies of estimates showing included and excluded items.

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THANK YOU