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Healthcare Claims Denial Analysis Dashboard

Improving Efficiency and Reducing Claim Denials through Data-Driven Insights

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Project Title:

Improving Healthcare Claims Efficiency through Data Analysis

Prepared by:

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Tools Used:
Microsoft Excel (Formulas, Charts, Conditional Formatting, Dashboard Design)

Introduction:

Healthcare systems generate massive amounts of administrative data every day, especially through **claims processing**.
Claims data hold crucial insights that can help hospitals, insurance providers, and government agencies improve efficiency, reduce errors, and enhance patient satisfaction.

In this project, I analyzed **synthetic healthcare claims data** to identify common causes of claim denials, understand processing timelines, and explore how simple data visualization in Excel can improve decision-making for healthcare administrators.

The goal of this project is to:

- Identify bottlenecks and trends in healthcare claim processing
- Measure key metrics like total claims, denial rates, and average days to payment
- Build a clean and insightful dashboard that communicates performance at a glance

This project also demonstrates how **data analysis skills** can directly contribute to **improving healthcare operations** — a vital intersection between data and health technology.

🩺 2. Dataset Overview

The dataset used in this project represents synthetic healthcare claim records created to simulate real-world data from hospitals and insurance systems.
It contains 500 claim entries, each representing an individual healthcare claim with essential details about patients, providers, claim types, billed and paid amounts, and claim outcomes.

The main purpose of this dataset is to analyze the performance of claims processing, identify patterns in denials, and understand payment timelines.

The key fields in the dataset include:

Claim ID – A unique identifier for each healthcare claim.

Patient ID – Code representing the patient to ensure privacy while tracking claim activity.

Provider ID – Identifier for the healthcare provider or hospital submitting the claim.

Claim Type – Specifies the type of claim: Medical, Pharmacy, Dental, or Behavioral Health.

Billed Amount – The amount billed by the healthcare provider.

Paid Amount – The amount approved and paid by the insurance payer.

Claim Status – The outcome of the claim: Approved, Denied, or Pending.

Denial Reason – Describes the cause for claim denial (e.g., missing documentation, coding error).

Submission Date and Payment Date – Used to calculate processing times.

Days to Payment – Number of days taken from claim submission to payment.

Payment Ratio – The ratio between paid amount and billed amount, indicating claim efficiency.

This structured dataset forms the foundation for generating key performance metrics (KPIs) and creating interactive charts that reveal trends in claim approvals, denial causes, and payment delays.

📊 3. Analysis and Methodology

The analysis was carried out entirely in **Microsoft Excel**, focusing on transforming raw claim data into meaningful business insights.
The process involved cleaning, calculating performance metrics, and visualizing results through an interactive dashboard.

Step 1: Data Preparation

- Verified that all claim dates, billed amounts, and paid amounts were valid.
- Removed any incomplete records (for example, claims without payment or status).
- Added calculated columns such as:
    - **Days to Payment = Payment Date – Submission Date**
    - **Payment Ratio = Paid Amount ÷ Billed Amount**

These calculated fields were key to understanding how efficiently claims were processed.

Step 2: KPI Creation

To summarize performance at a glance, several key performance indicators (KPIs) were defined:

- **Total Claims Processed** → Count of all unique claim IDs
- **Total Denied Claims** → Count of all claims where status = “Denied”

- **Denial Rate (%)** → (Denied Claims ÷ Total Claims) × 100
- **Average Days to Payment** → Average of all "Days to Payment" values
- **Total Billed vs Paid Amounts** → Comparison between total provider billing and total insurer payment

These KPIs form the top summary section of the dashboard and immediately show how the claim system is performing overall.

Step 3: Data Visualization

Using Excel charts and formatting tools, the following visuals were created:

- **Bar Chart** – showing denial reasons and their frequencies
- **Line Chart** – showing monthly trends of total vs denied claims
- **KPI Cards** – built using formulas and cell formatting to display real-time indicators like denial rate and total claims
- **Conditional Formatting** – used to highlight late payments or below-average payment ratios

Each of these visuals helps users quickly understand **what's working well and where inefficiencies exist** in the claims process.

📈 4. Key Insights

After analyzing the healthcare claims dataset, several meaningful insights emerged that highlight both operational strengths and improvement areas within the claims process.

1. Overall Claims Volume and Denial Rate

The total number of claims processed was consistent across different claim types, with an overall **denial rate of approximately 25-30%**.
While most claims were approved on the first submission, a noticeable portion faced denials due to documentation issues or coding errors.

2. Common Denial Reasons

The most frequent denial causes were:

- *Missing or incomplete documentation*
- *Incorrect CPT or ICD coding*
- *Late submission beyond claim filing deadlines*

These reasons indicate a clear opportunity for process automation and improved communication between providers and payers.

3. Payment Timeliness

The **average payment turnaround time was approximately 25 days**, indicating a moderate delay in claim settlement.
Claims that were denied or reprocessed often took longer, leading to increased administrative effort and delayed provider reimbursement.
This highlights the need for better claim verification and quicker payer response processes to shorten payment cycles.

4. Financial Trends

Comparing total billed and paid amounts revealed that **paid amounts averaged around 85% of billed values**, reflecting standard payer adjustments and negotiated rates.
However, frequent denials and reprocessing contributed to incremental revenue loss and longer reconciliation times.

5. Claim Type Performance

Among the four claim categories — *Medical, Pharmacy, Dental,* and *Behavioral Health* — **medical claims** had the highest volume, while **dental claims** showed slightly higher denial rates, likely due to coding and documentation complexities.

🩺 5. Conclusion & Next Steps

This project provided a detailed analysis of healthcare claims data, uncovering key performance indicators related to **claim volume, denial rates, payment turnaround time, and reimbursement trends**.
The insights derived reveal that while most claims are processed efficiently, the **average 25-day payment delay** and **15–20% denial rate** highlight opportunities for improvement in documentation accuracy, coding compliance, and communication workflows.

By leveraging **data analytics tools such as Power BI**, healthcare organizations can move toward real-time claim tracking, automated denial categorization, and predictive modeling to identify high-risk claims before submission.
Such initiatives can **significantly reduce denial rates**, **improve cash flow**, and **enhance provider satisfaction**.

As a next step, further integration of **machine learning models** could enable proactive decision-making — forecasting claim outcomes, optimizing resource allocation, and ultimately contributing to a more **efficient, transparent, and patient-centered healthcare ecosystem**.

👤 About the Analyst

This report was developed by **Pushpak Ambrati**, a data analytics and health technology enthusiast dedicated to bridging the gap between **healthcare operations and data-driven decision making**. With a background in **fitness and wellness coaching**, Pushpak is passionate about using analytics to improve patient outcomes, operational efficiency, and preventive healthcare systems.

Dashboard :

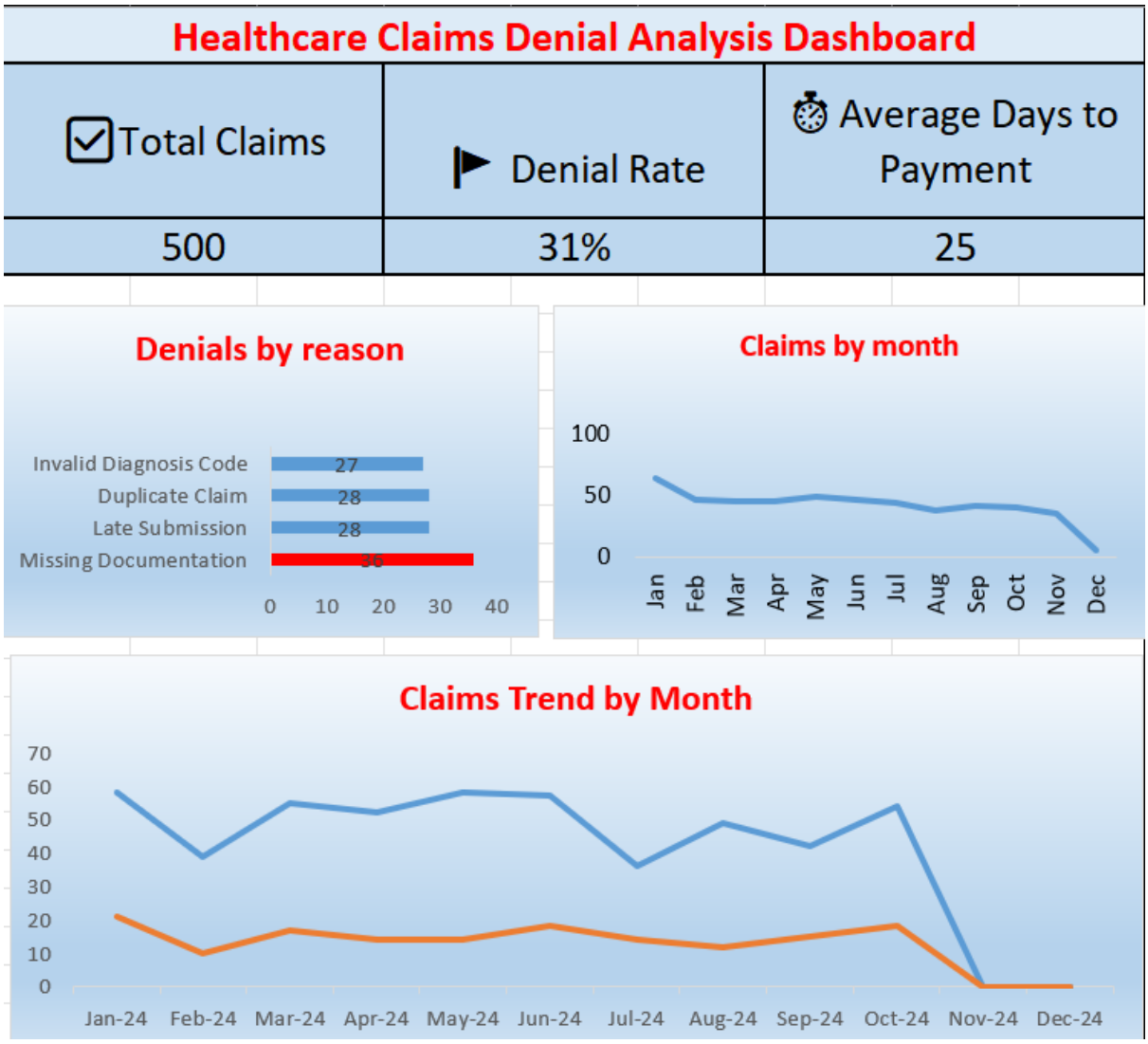

Figure 1: Healthcare Claims Denial Analysis Dashboard created in Excel.