A Lab Big Data Work Success Story:

Combining Lab, EHR, Operations, Financial, and Other Data Now Generating Real-Time Insights to Manage Costs, Improve Outcomes, Collect More Revenue

James Pepoon, Pathology Division Administrator

Joshua Rivera, Pathology Business Operations Director

MOFFITT CANCER CENTER

History of Leadership & Innovation

- Established by the Florida Legislature in 1981.
- Named after H. Lee Moffitt, former Speaker of the Florida House.
- Opened in 1986, quickly earning its NCI-designation through innovative, breakthrough research.
- Received our highest score ever by the National Cancer Institute in 2021.
- In 2021, we celebrated 35 years of providing patient care and hope to countless patients and families.

Our Mission

Since the beginning, our mission has been

to contribute to the prevention and cure of cancer.

A Courageous Trajectory

Cancer won't quit. So we can't settle.

1986
Moffitt Cancer Center Opens

2001
NCI Comprehensive Cancer Center Status Awarded

2006
M2GEN Established

2015
McKinley Outpatient Campus Opens

2019
Advent Health Partnerships Established

2020
Pasco County Property purchased (775 acres)

2022
Ruskin Satellite Announced

2023
Moffitt Community Education Center at Port Tampa Bay Opens

1998
NCI Core Grant Award

2003
Total Cancer Care® Established

2011
Moffitt at International Plaza Opens

2017
South Florida, Clearwater Partnerships Established

2020
Breaking ground on new expansion hospital

2021
Moffitt at Wesley Chapel Opens

2023
Breaking ground on SPEROS FL Campus

2023
McKinley Surgical Hospital Opens

National Recognition

- Once again, awarded the National Cancer Institute's highest designation – Comprehensive Cancer Center.
- Moffitt is the only NCI Comprehensive Cancer Center based in the state of Florida.
- For the sixth consecutive year, Moffitt has been recognized as a leader in Diversity.

NCI Designated Comprehensive Cancer Center

NCCN National Comprehensive Cancer Network®

MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER

DiversityInc TOP RANKED HOSPITALS AND HEALTH SYSTEMS 2023

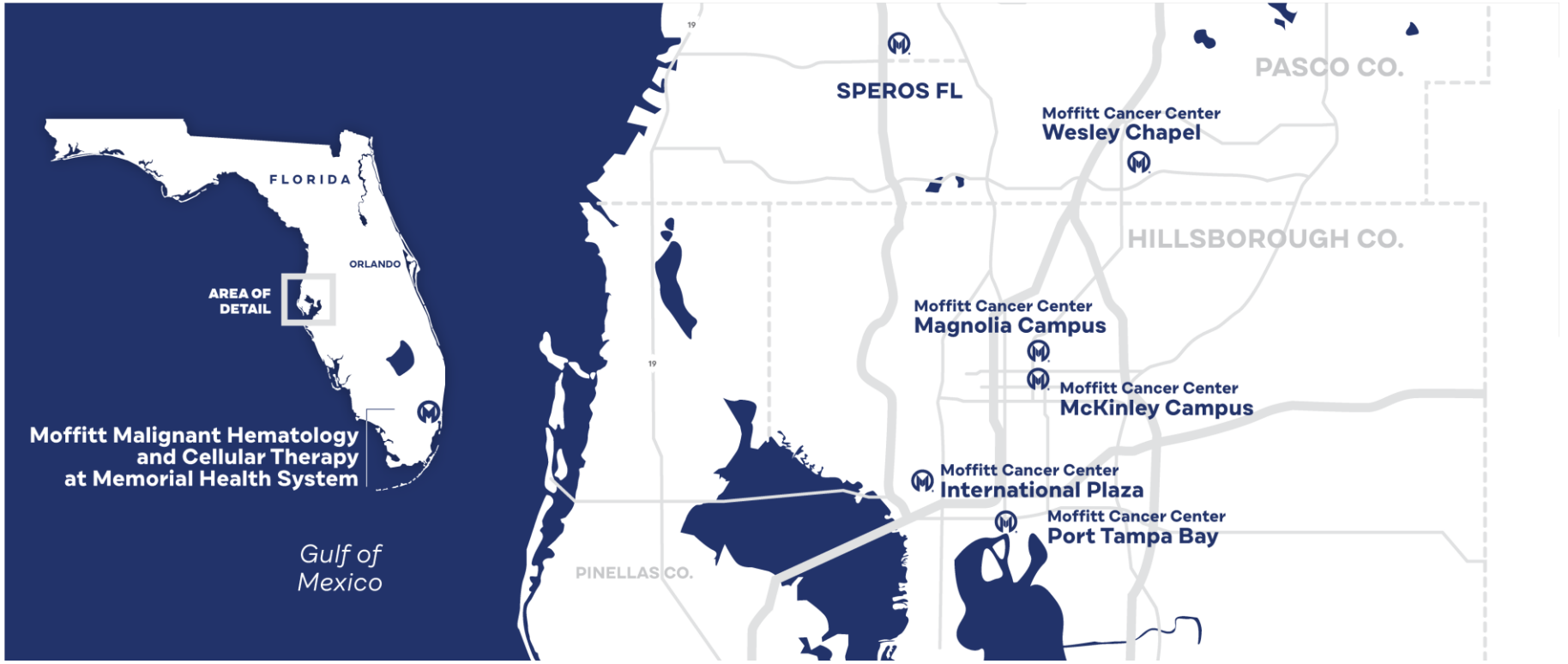
DiversityInc TOP RANKED REGIONAL COMPANIES 2023

AMERICA'S BEST CANCER HOSPITALS 2023 Newsweek statista

BEST AND BRIGHTEST COMPANIES TO WORK FOR IN THE NATION WINNER 2023

Moffitt's Expanding Footprint

We devote more than 3 million square feet to research and patient care.



We've seen patients from:

- 67 Florida Counties
- 50 States
- 130+ Countries

10-Year Campus Plan

SPEROS FL + Moffitt SouthShore

SPEROS FL

This community will become the embodiment of the new digital age of healthcare and a hub for international research and education. The epitome of the next generation of care & research, digitally connected to the community and the world. An epicenter of innovation and a healthcare think tank where thought leaders from around the globe come together. And an anchor where leading edge medicine, pharma, education, research, commerce and wellness intersect.

MOFFITT AT SOUTHSHORE

Moffitt at SouthShore will focus on a robust radiology program enabling many patients to get imaging done quicker and closer to home. The clinic will treat all cancer diagnoses outside of surgical procedures. It will be staffed with three to five multispecialty medical oncologists, working alongside a few specialty medical and surgical. Moffitt at SouthShore also brings an opportunity to expand clinical trials including trials for breast, lung, gastrointestinal and genitourinary cancers and some blood cancers. Nontherapeutic trials and health outcomes and behavior trials or surveys can also be done at the satellite location.

FY2023 Clinical Care By The Numbers

We are helping patients find the right diagnosis, treatment and support — all in one place.

618K+

Outpatient & Screening Visits

89K+

Unique Patients Seen

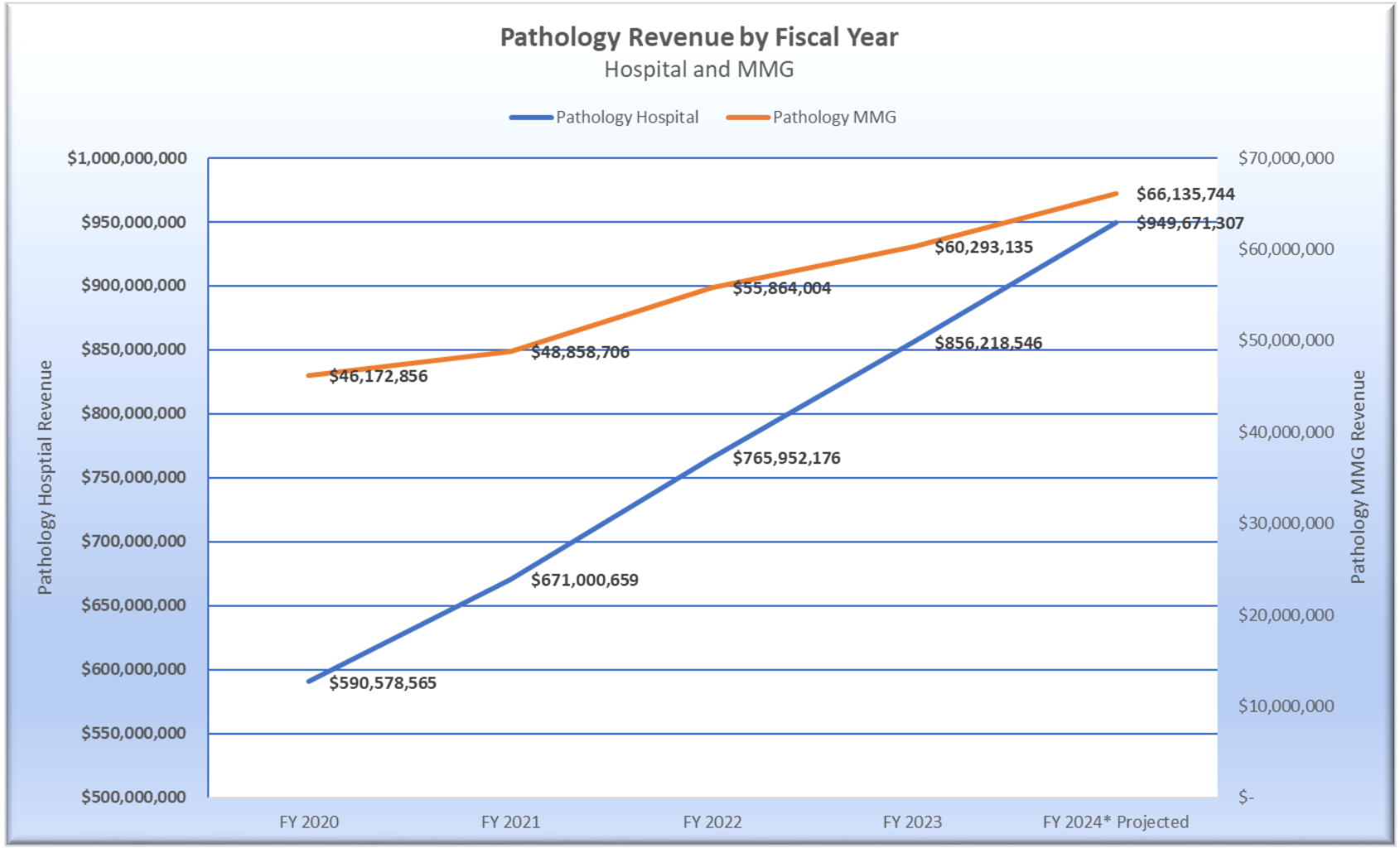
28K+

New Patients

13K+

Surgical Cases

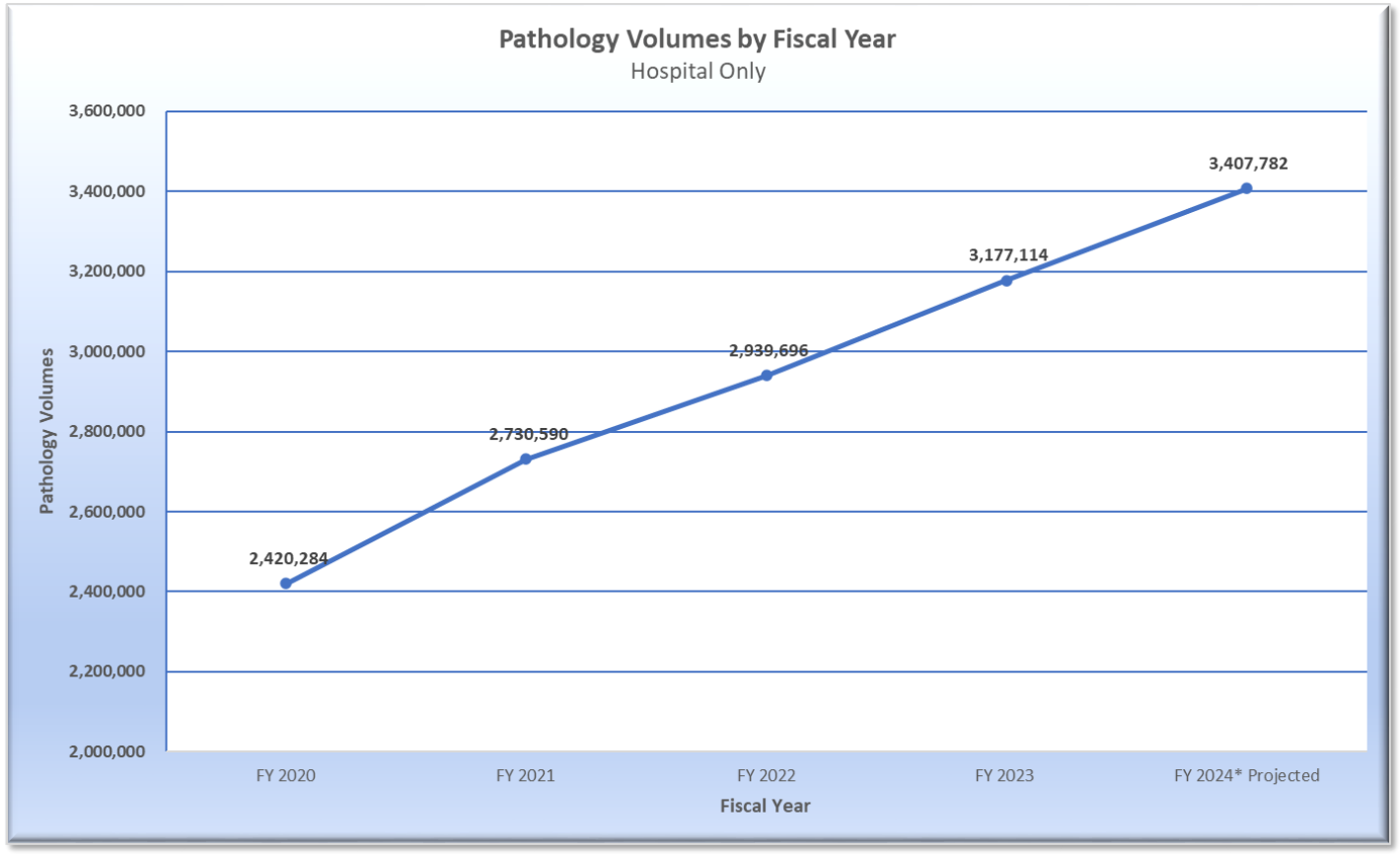
Current State Pathology Division



Cost Center	Section Name
11200	HLA
11201	Chemistry
11202	Microbiology
11203	Cytology
11204	Hematology
11205	Specimen Processing (SP)
11206	Histology
11207	Lab Administration
11208	Blood Bank
11209	Molecular
11210	Flow Cytometry
11211	FISH/Cytogenetics
11212	MIP Lab
11213	Clinical Test Development
11214	MKC Lab
11215	AP Materials Management
11216	MWC
11217	Advanced Analytical & Digital Lab
11218	MMH Clinical Lab
11219	MMH Histology
11221	MMH Cytology
11222	MMH Blood Bank
11223	Pathology Research Services
17012	Hematopathology Prog Admin
17030	Path Anatomic Prog Admin
46012	Hematopathology
46030	Pathology Anatomic

Current State Pathology Division

Volumes



Current State Pathology Business Intelligence
Problem Statement

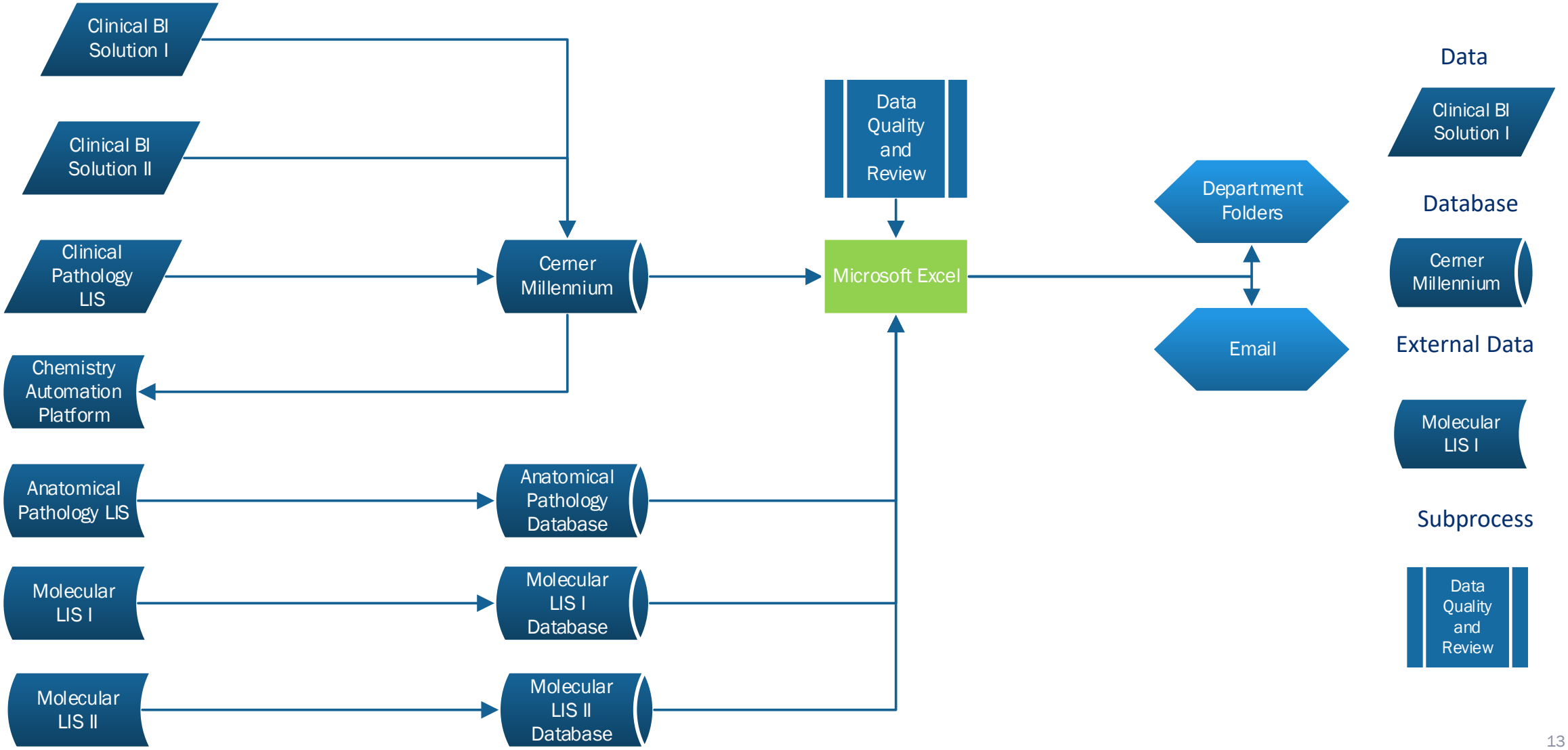
- Pathology currently runs over 170 reports
- Five Main Categories
    - Clinical
    - Financial
    - Quality
    - Research
    - Other
- 14 different sources not including HLA Laboratory (*i.e. Daedulus, Echidna, etc.*)
- Only have 4 of 38 reference labs with interface connectivity
- **All Data analysis is performed in Excel**
    - Limitations in storage, manipulation, reproducibility, and analysis of large amounts of data
    - Manual, inefficient, increased potential for error, quality issues
- **All Data delivered via email or placed on departmental shared drive for requestor or stakeholder to access**
    - No central repository for pathology data
    - Lack of standardization across reports

Current State Pathology Division
Locations

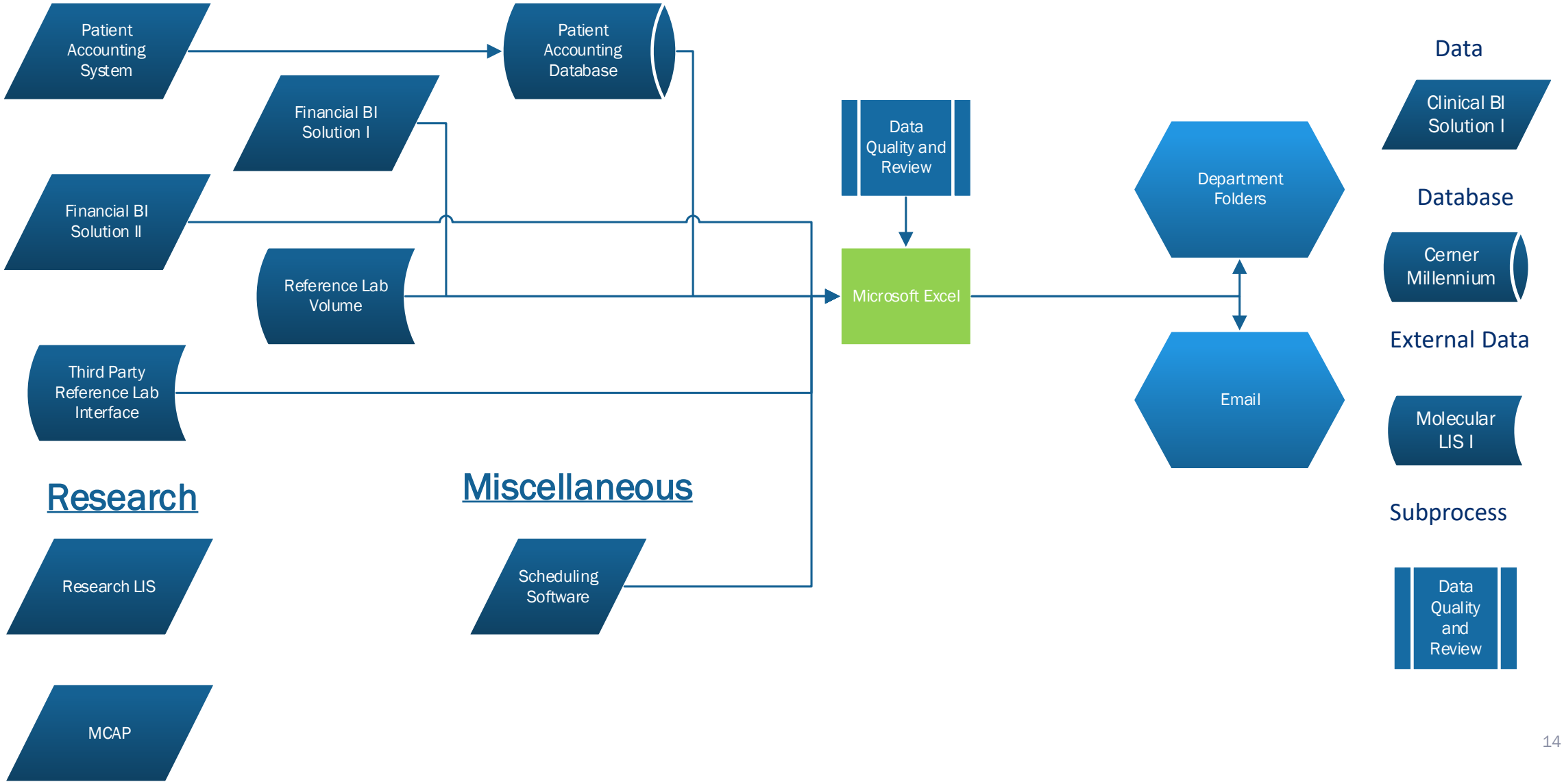
- Laboratory Locations
  - MCC – Magnolia
  - MKC - McKinley
  - MWC – Wesley Chapel
  - MIOMS – Advanced Diagnostics Laboratory
  - MIP – International Plaza
  - MMH – McKinley Hospital

- Future
  - SouthShore 2025
  - Speros 2026

Current State Diagram - Clinical



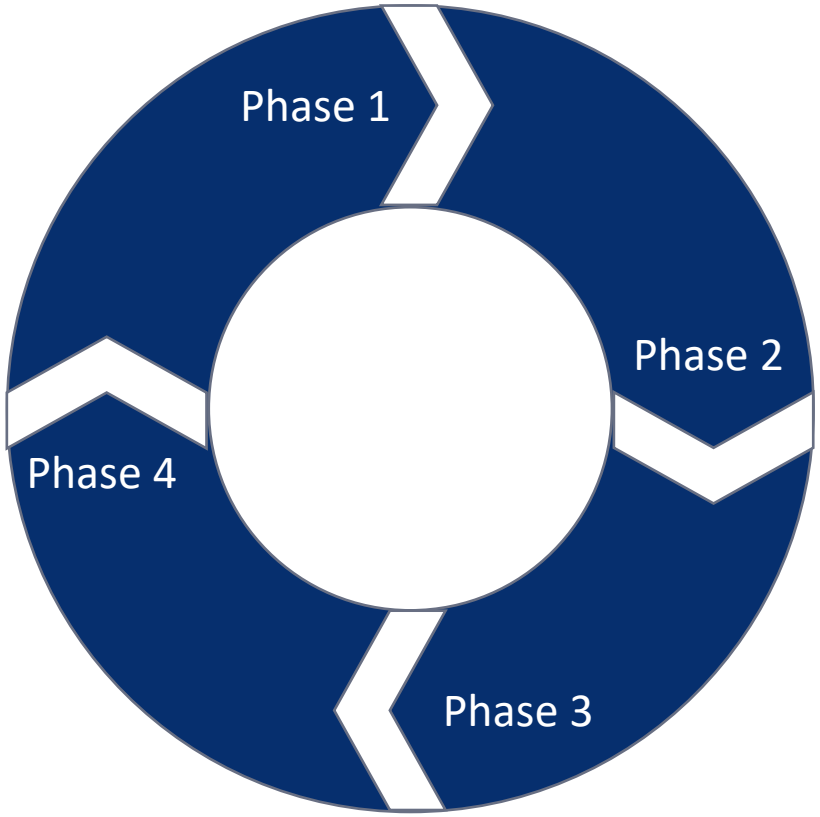
Current State Diagram – Financial, Research, Other



Overview of Future State Strategy

- Foundational Data Infrastructure
  - Data Modeling
  - Data harmonization
- Interface Connectivity
  - Establish interfaces with all reference labs (*Utilization and Clinical data*)
    - Leveraging Atlas or Direct interface connectivity (FSI)
- Automation Software – leverage existing applications within our portfolio
  - Revenue [EMUE]
  - Clinical [HEP]
  - Business [ABBY, Automation Anywhere]
- Smart business systems
  - Automated Inventory Management systems to allow for better cost control and expense analysis
  - Scheduling software to be able automate FTO and FTA processes and resource allocation management
- Pathology Informatics
  - Continued improvement through diagnostic accuracy and informed decision-making
- Digital Pathology
  - Data analysis of complex and large data sets

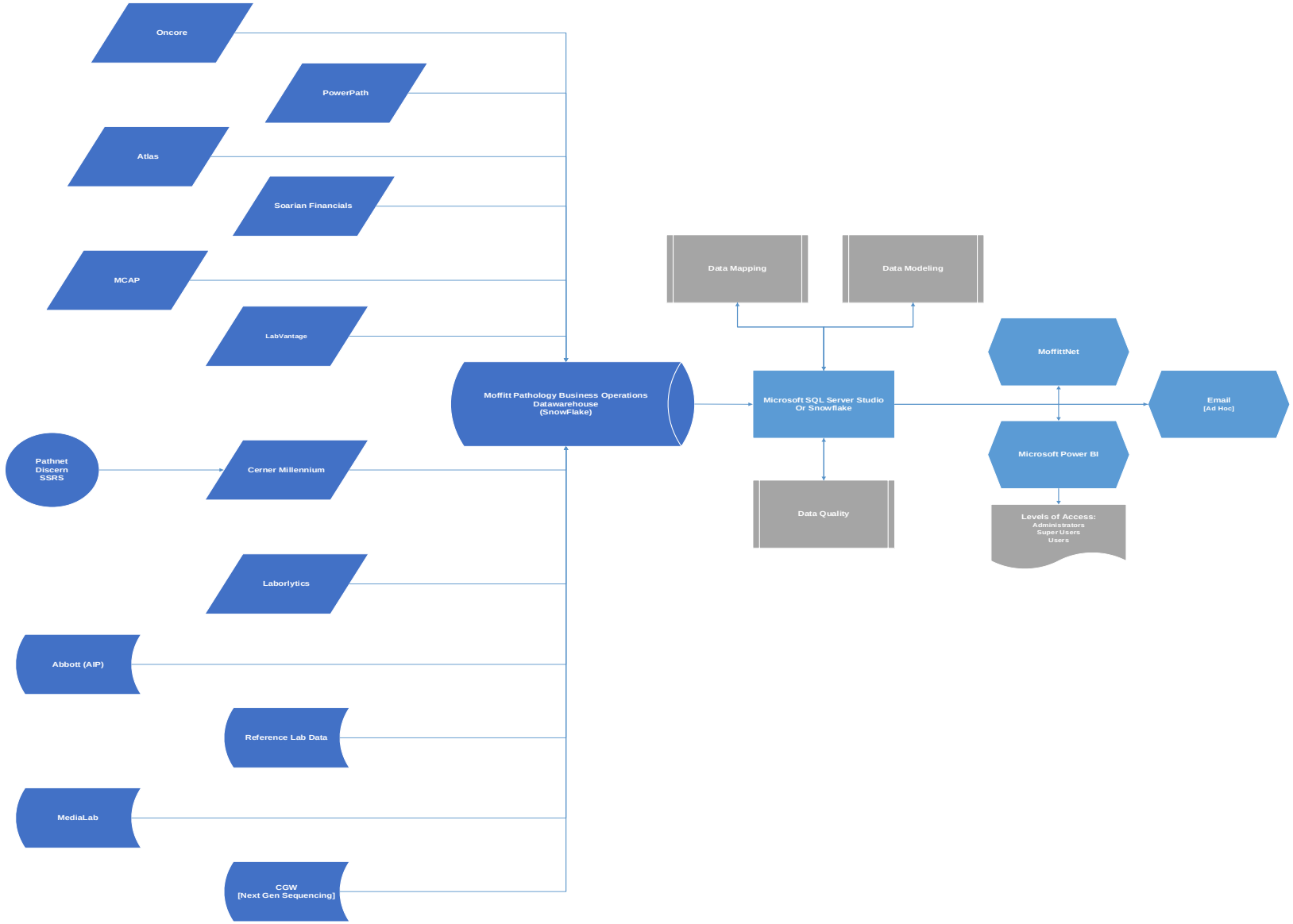
Future State



Multi-Phase approach to deliver a final product

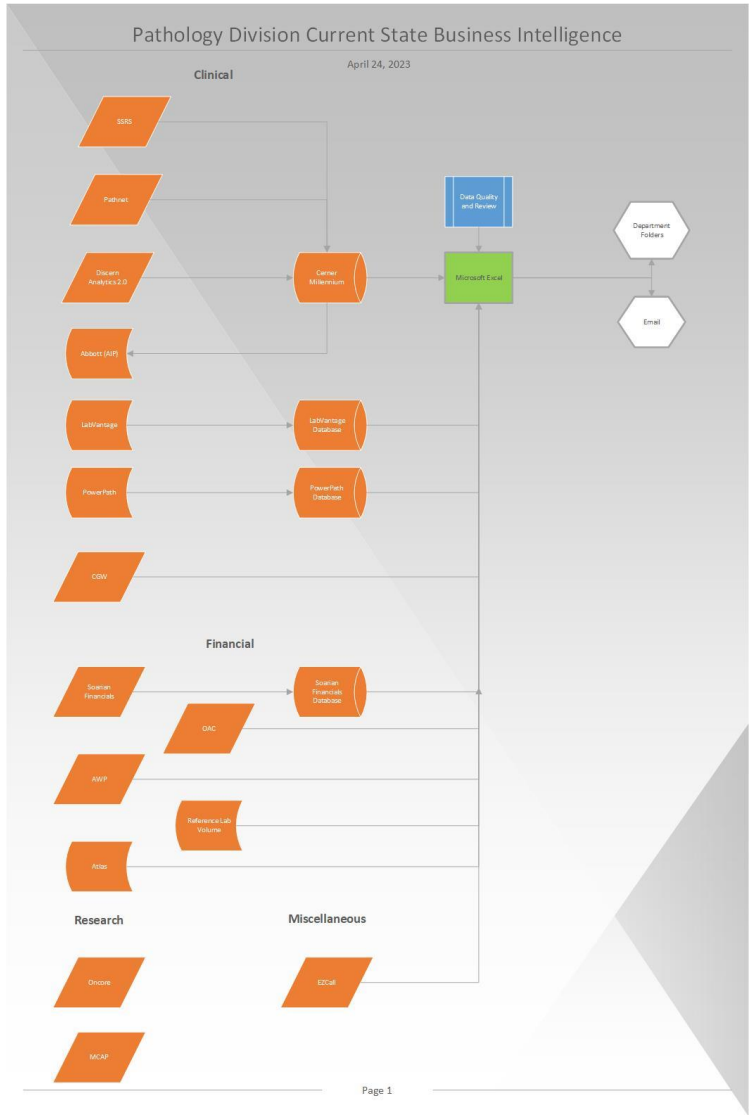
- Phase 1 – Data Collection and Preparation
- Phase 2 – Data Analytics and Visualization
- Phase 3 – Data Model Development, Database Connectivity, Automation, and Performance Management
- Phase 4 – Continuous Improvement

Future State - Diagram

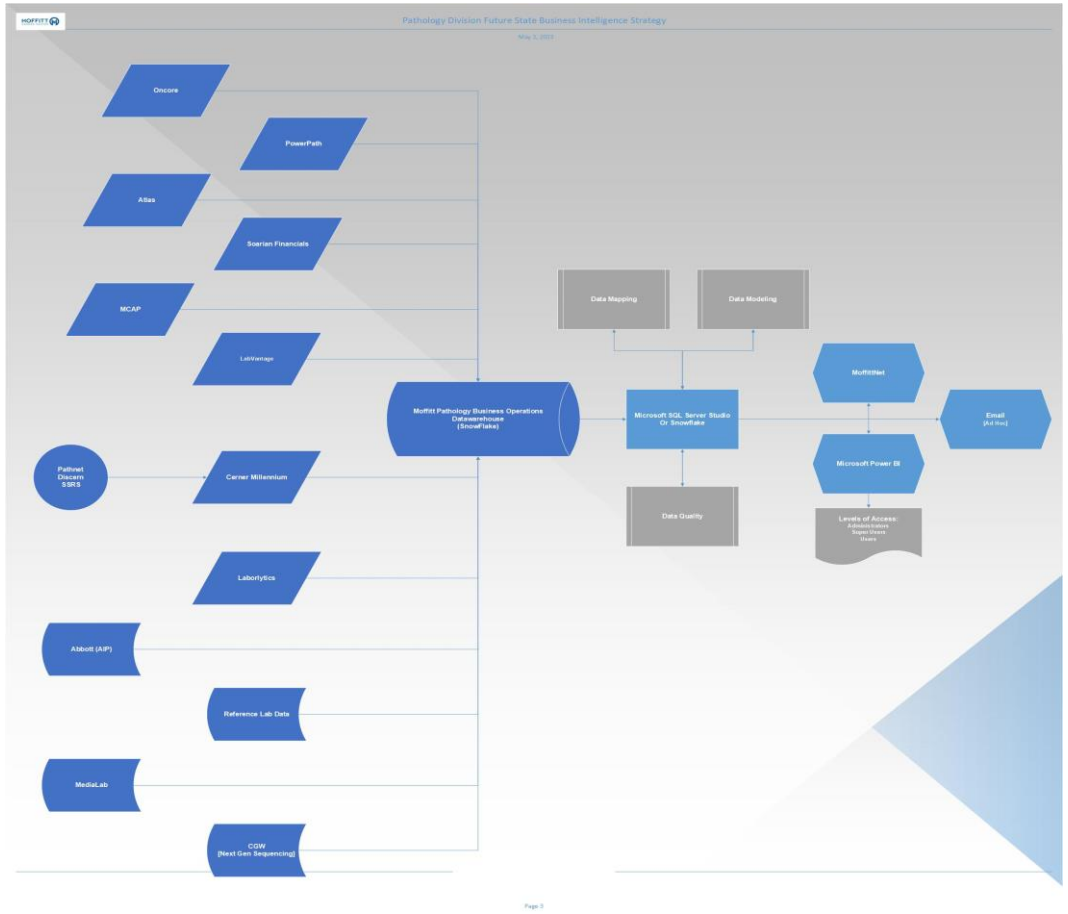


Current State vs. Future State

Current State



Future State



Future State Advantages

- By following this multi-phase approach, the pathology laboratory division can effectively leverage business intelligence to
  - ***Increase*** performance
  - ***Enhance*** patient outcomes
  - ***Achieve*** cost reduction and cost avoidance
  - ***Improve*** Quality and Safety
  - ***Stay*** ahead of the competition
  - ***Create*** scalability
  - ***Comply*** with regulatory requirements

Primary Goals

- Load additional Pathology data into Moffitt Cancer Analytics Platform (MCAP)
- Addition of required business intelligence resources within the Pathology Business Operations team
- Scalable and repeatable approach to data gathering and mining for all pathology data
    - Collection
    - Storage
    - Access
    - Analytics

Overview of Tactical Plan

- Leverage Late Binding Approach
  - Flexibility: Adaptability to changes in data sources or business requirements without requiring extensive modifications to the data warehouse.
  - Reduced Complexity: Elimination of upfront, pre-defined data transformations, resulting in simpler data integration processes.
  - Timeliness: Provides timely access to integrated data, as transformations are performed dynamically at the time of data retrieval.
- Simultaneous Logical Model Build-Out
  - Both the logical and physical data models are developed simultaneously.
  - Data transformations and integrations are performed dynamically as data is accessed or requested by end-users or applications.
  - Benefits include:
    - Faster time to delivery: Allows for quicker implementation as data modeling and integration tasks are executed concurrently.
    - Flexibility: Enables adjustments to the logical model based on evolving business requirements and user feedback.

Impediments & Challenges

- Project Prioritization
- Resource Capacity (Internal and External)
    - Required Partner Collaborators
        - Data Architect, Data Engineer, BI Developer, Project Manager, Data Quality Analyst, Business Analyst, MCAP Product Owner
- Reference Laboratory technology capabilities
- Sequential Logical Model Build-Out strategy
    - Inconsistencies in the data model
    - Increased complexity: Managing simultaneous development of logical and physical models may require more coordination and oversight.
    - Resource constraints: Requires sufficient resources and expertise to execute both tasks in parallel effectively.

Phase 1 : Data Collection and Preparation

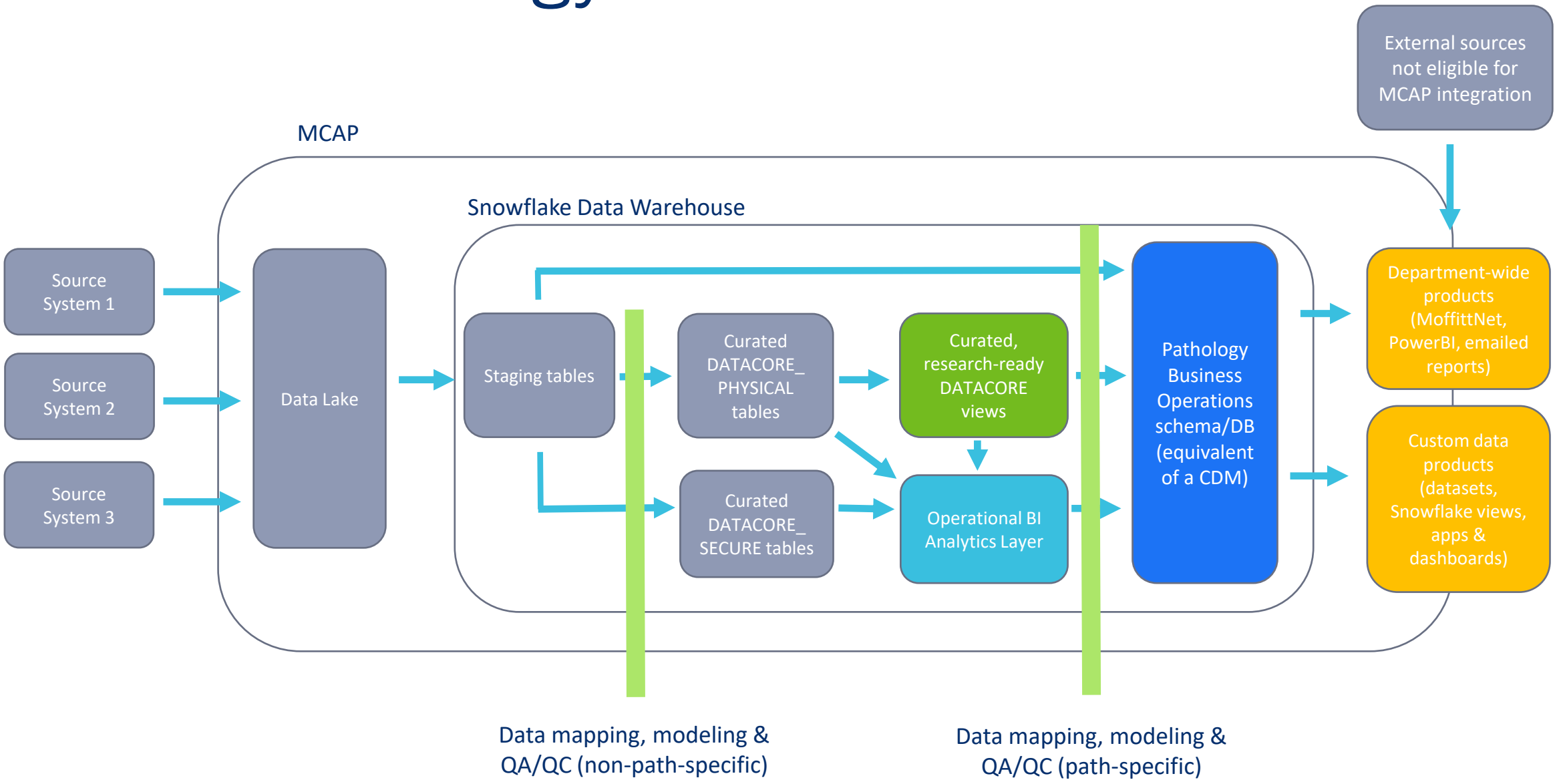
1. Identify all relevant data sources, both internal (e.g., laboratory information systems, electronic health records) and external (e.g., reference laboratory data)
    a) This has been completed ✓
2. Develop data flows between information systems that do not currently exist
    a) Reference slide 13
3. Store the data in a centralized repository, such as a data mart, for easy access and analysis
    a) Leverage existing Database Management architecture, Snowflake
    b) Reference slide 14
4. Clean and standardize the data to ensure consistency and accuracy
    a) Current state processes already established in Excel
    b) Leverage MCAP data that has already undergone (get verbiage from slide 7)
    c) Would be migrated to Snowflake/Microsoft SQL
        i. ***Requires dedicated Pathology Business Intelligence Developer** [New position]*

Phase 1 : Data Collection and Preparation

Information System Database Availability

System	Database Available in Data Warehouse
Cerner Millennium	Yes
Cerner Soarian Financials	Yes
Clinsys PowerPath	Yes
CGW	Partial
LabVantage	No
Atlas	No
Reference Labs	Partial

Path BI Strategy



Phase 2 : Data Analytics and Visualization

- Utilize data analytics tools to uncover insights and trends in the pathology data
  - Currently leveraging Microsoft Excel and PowerBI
- Implement dashboards and reports to visualize key performance indicators (KPIs)
  - Examples
    - Diagnostic accuracy
    - Test turnaround time (TAT)
    - Revenue and expenses
    - Quality assurance
  - Work with Business owners to identify the KPI's for each area
  - **Implementation of single repository for data visualization**
    - In process of migration to MoffittNet, reference slide 16
- Use predictive analytics to forecast future trends and inform tactical and strategic decision-making

Phase 2 : Data Analytics and Visualization
[Completed to Date]

- [Pathology Data Metrics and Analytics Moffittnet Page]

Phase 2 : Data Analytics and Visualization

[Layout]

- Pathology Division
  - ❑ Focused on Revenue and Expenses
- Advanced Diagnostics Laboratory
  - ❑ Clinical Productivity Data by laboratory information system (LIS)

- Pathology Division
  - ChargeMaster with Volumes by CDM_Hospital
  - Pathology Revenue and Usage Trending [*Excel*]
  - Pathology Billables by Cost Center
  - Pathology Billable Test Report [*Excel*]
    - **Note:** Being replaced with Pathology Billables by Cost Center effective July 2023
  - Pathology Year-to-date Revenue [*Excel*]

- Advanced Diagnostics Laboratory
  - Clinical Genomic Workspace [CGW]
    - NGS TAT
    - NGS Volume
  - Cytogenetics Volume and TAT
  - LabVantage Turn Around Times
    - FISH TAT
    - Flow Cytometry TAT
    - HLA TAT
    - Molecular TAT

Phase 2 : Data Analytics and Visualization

[Layout]

- Anatomical Pathology
  - Clinical productivity Data by laboratory information system (LIS)
  - Departmental productivity data

- Anatomical Pathology
  - Anatomic Pathology Charge Volume
  - Anatomic Pathology Completed Case Volume
  - Autopsy Case TAT
  - Grossing Volume
  - Histology Case Progression [*Excel*]
  - Histology ER PR HER2 IHC ISH volume
  - Histo Lab Productivity
  - Materials Management
  - PowerPath Billing Exception Report
  - PowerPath Case Transfer Log Report

Phase 2 : Data Analytics and Visualization

[Layout]

- Clinical Pathology
  - ❑ Clinical productivity Data by Area and campus
  - ❑ Clinical quality assurance data
  - ❑ Clinical benchmark reporting

- Clinical Pathology
  - Blood Bank
    - BB Apheresis Platelets Volume
    - BB Cryo Volume
    - BB Total Plasma Volume
    - BB Random Platelets Volume
    - BB RBC Volume
  - Chemistry
    - Chem - Prechemo/STAT TAT [Detail]
    - Chem - Prechemo TAT data by month [Summary] [*Excel*]
  - Hematology
    - Hemo - Prechemo TAT
    - Hemo - Prechemo Volume
    - Hemo - PT/PTT TAT
  - Moffitt McKinley Hospital (MMH)
    - Chemistry (MMH)
      - MMH_Chem_PTH, HS TROP, LA [*Excel*]
      - MMH_Chem_STAT CMP [*Excel*]
    - Hematology (MMH)
      - MMH_Heme_STAT_CBC [*Excel*]
    - Microbiology (MMH)
      - MMH Micro Molecular Panel Positive Rate [*Excel*]
      - MMH Micro Single test Positive Rate [*Excel*]
      - MMH Micro TAT_COVID,MRSA,CDIF [*Excel*]
      - MMH Micro TAT_RP,GI panel,MEP by PCR [*Excel*]
    - Specimen Processing (MMH)
      - MMH_SP_Specimen Cancellation [*Excel*]

Phase 2 : Data Analytics and Visualization

[Layout]

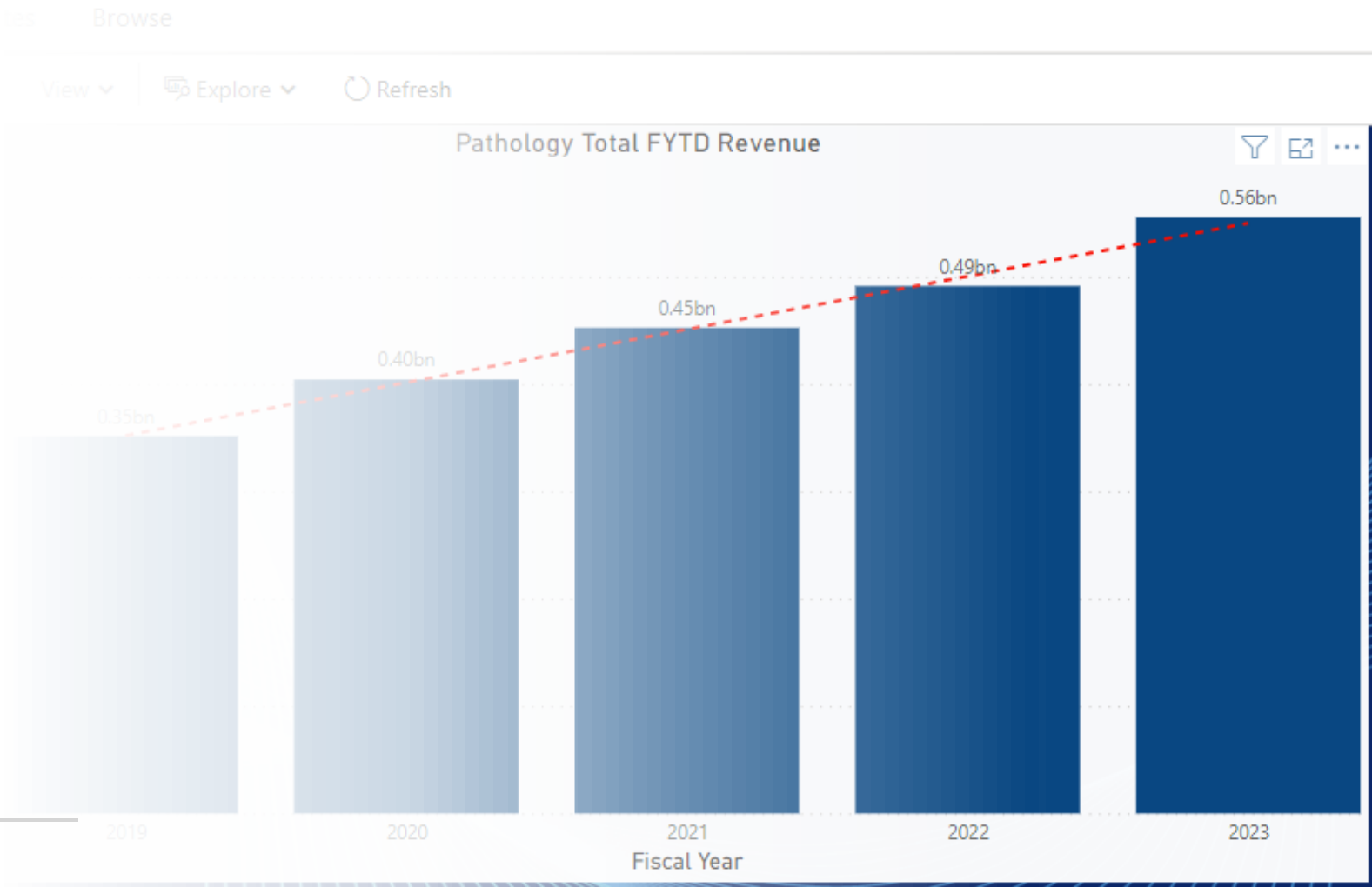
- Precision Medicine
  - ❑ Volumes
- Quality Assurance
  - ❑ Cases with Revisions

- Precision Medicine
  - Precision Medicine Volume

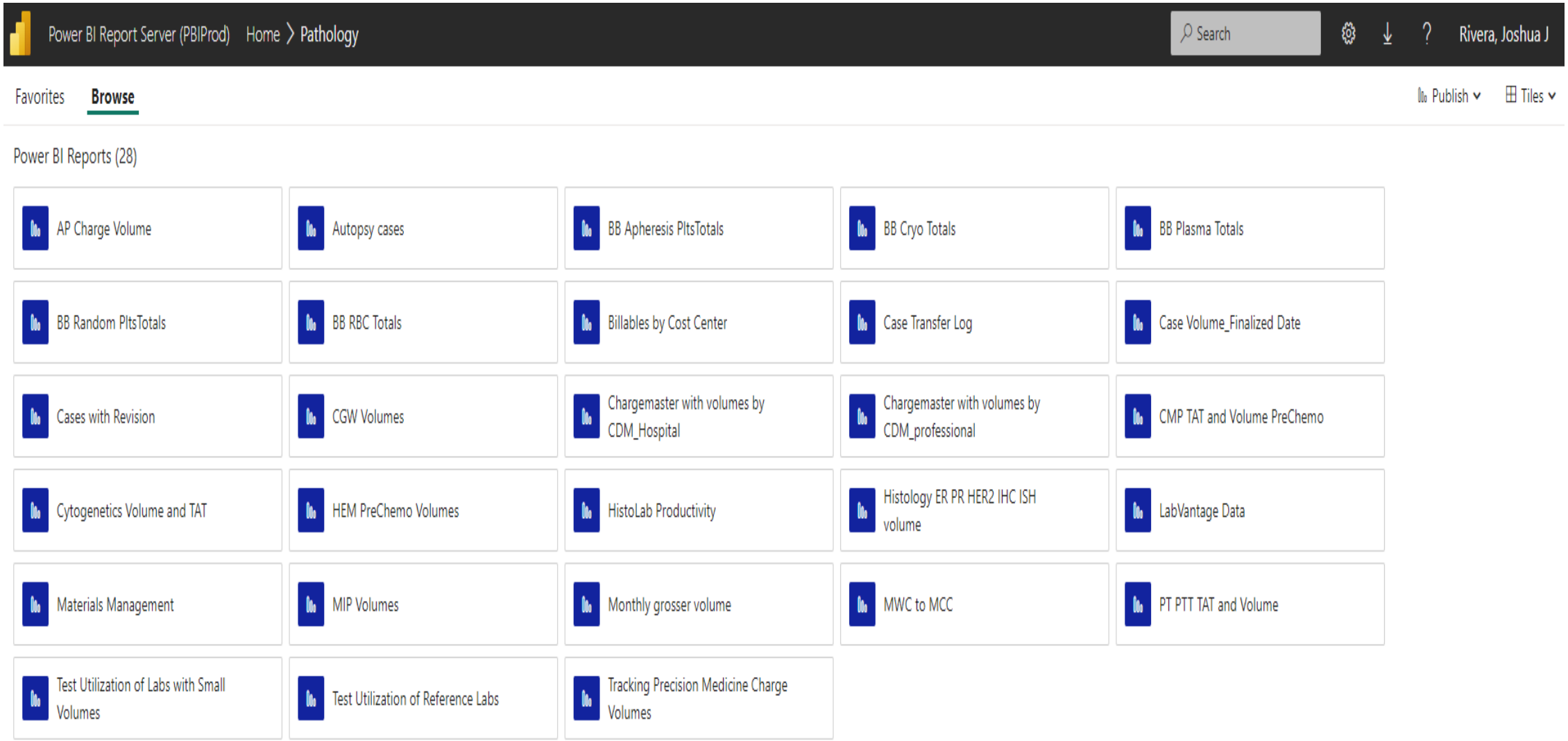
- Quality Assurance
  - Cases with Revisions [*Excel*]

Phase 2 : Data Analytics and Visualization:

Microsoft PowerBI examples

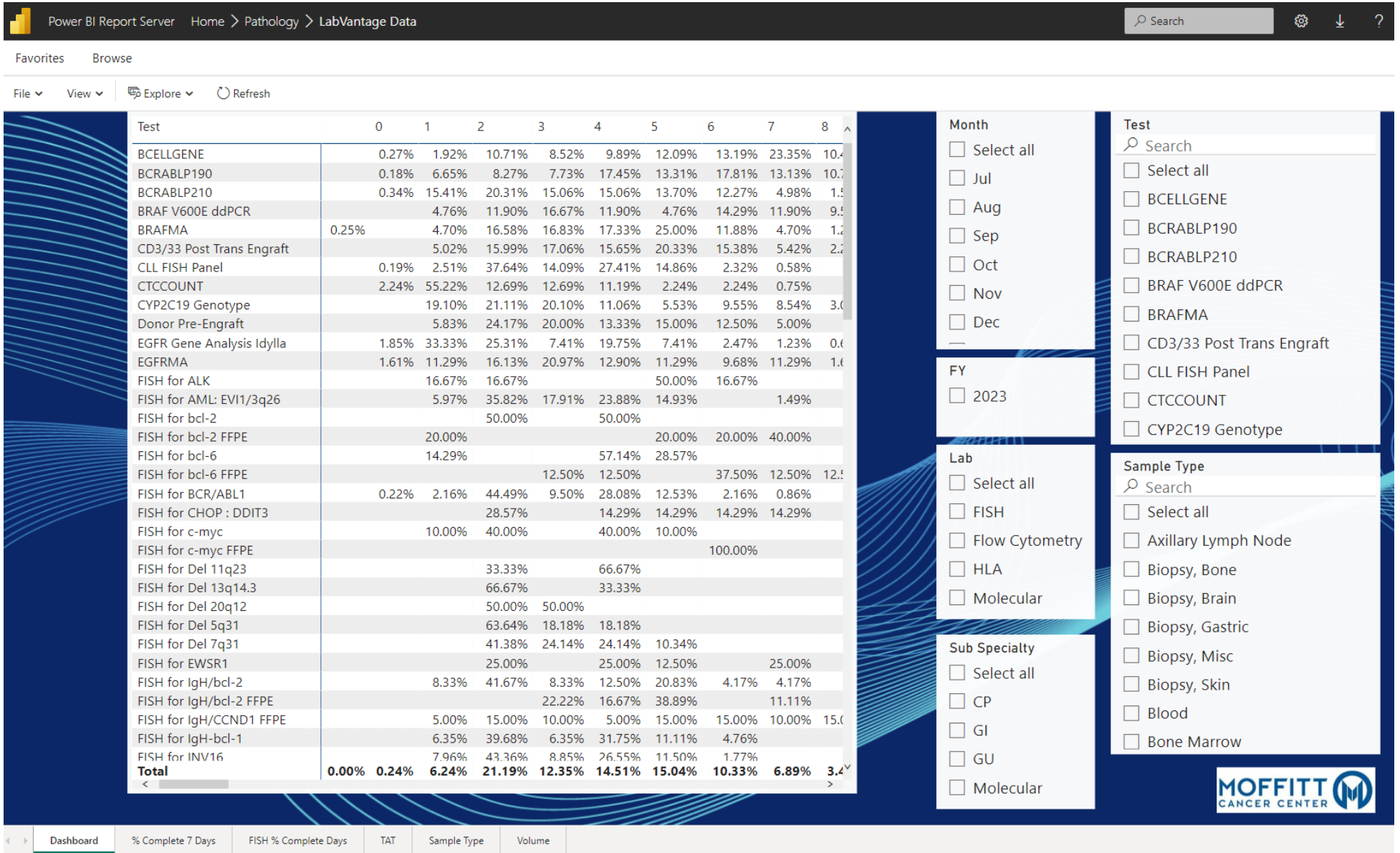


Microsoft PowerBI:
Current Pathology PowerBI Library



Microsoft PowerBI example:

LabVantage Productivity [*Molecular*]

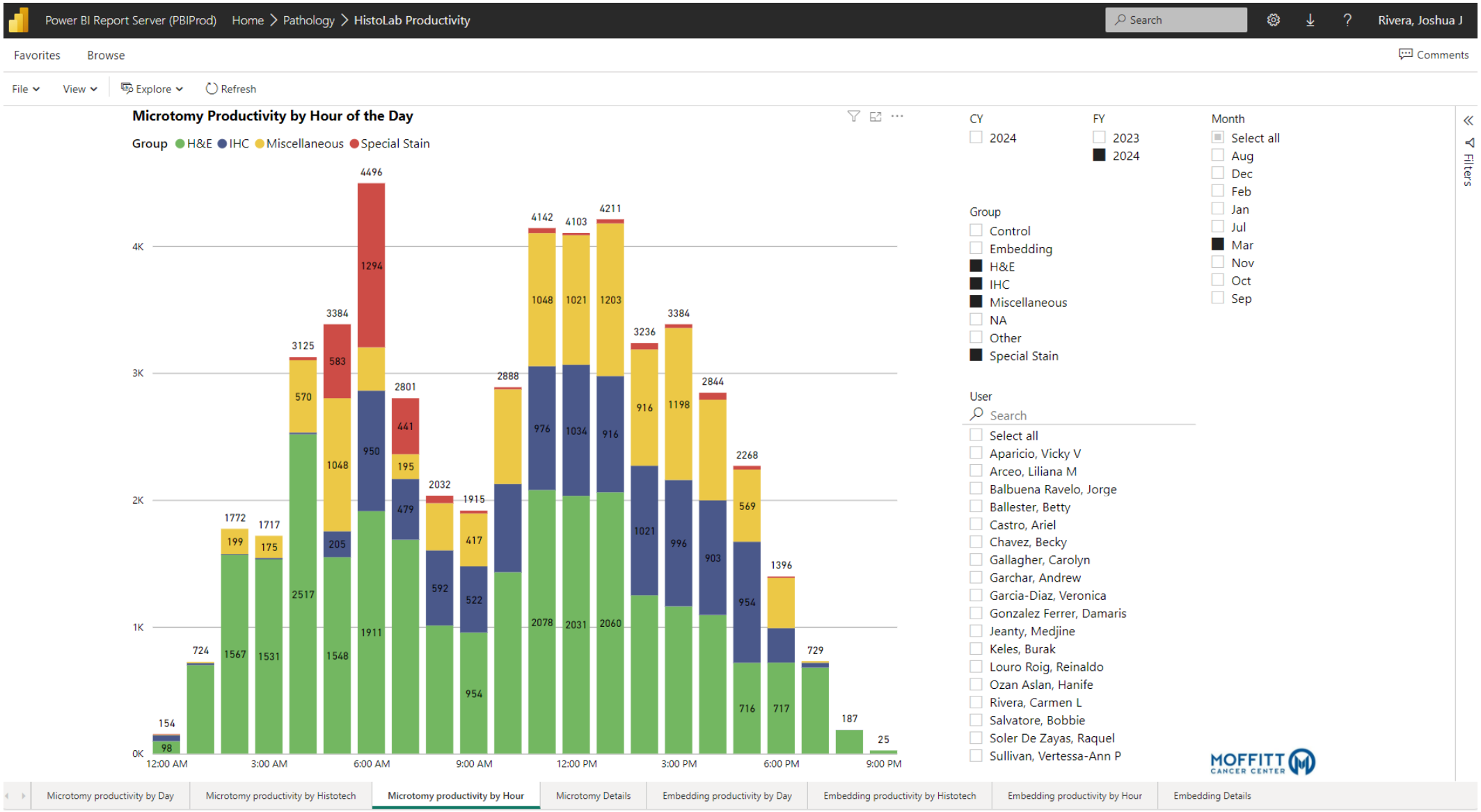


Microsoft PowerBI example:

PowerPath Volume [*Anatomical Pathology*]

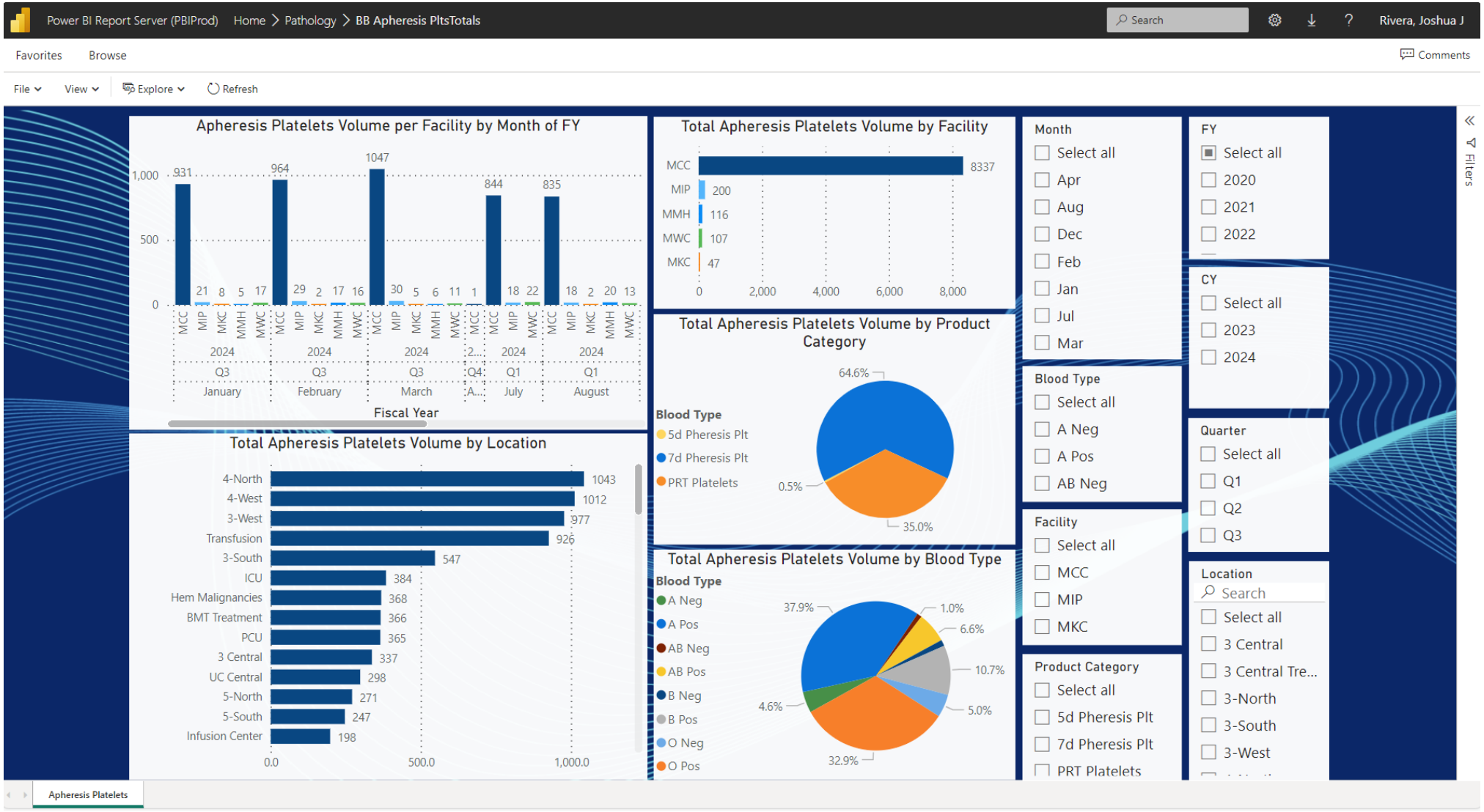
Microsoft PowerBI example:

PowerPath HistoLab Productivity [*Anatomical Pathology*]

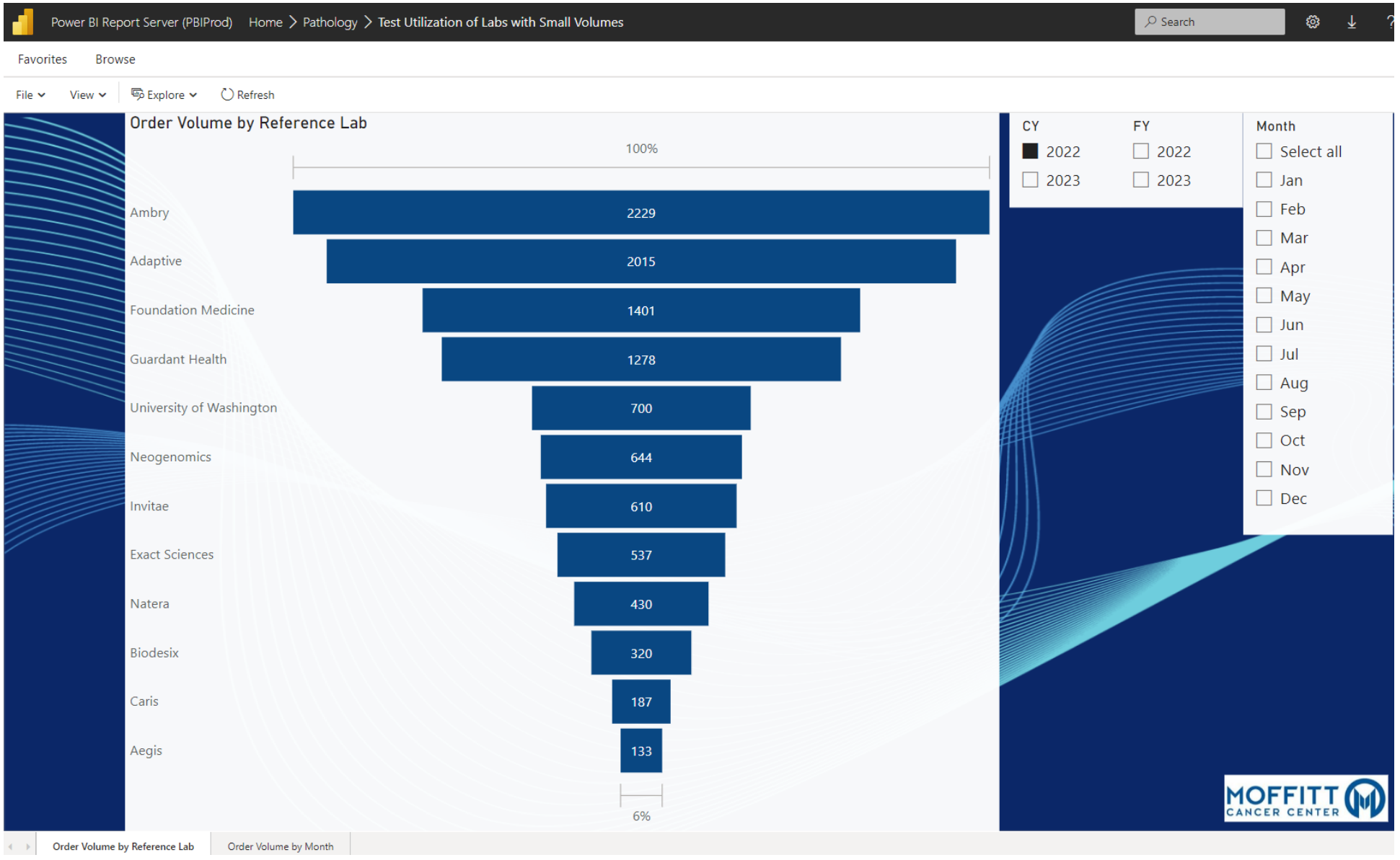


Microsoft PowerBI example:

Blood Bank Apheresis Platelets Totals [*Clinical Pathology*]



Microsoft PowerBI example:
Reference Lab Utilization [*Clinical Pathology*]



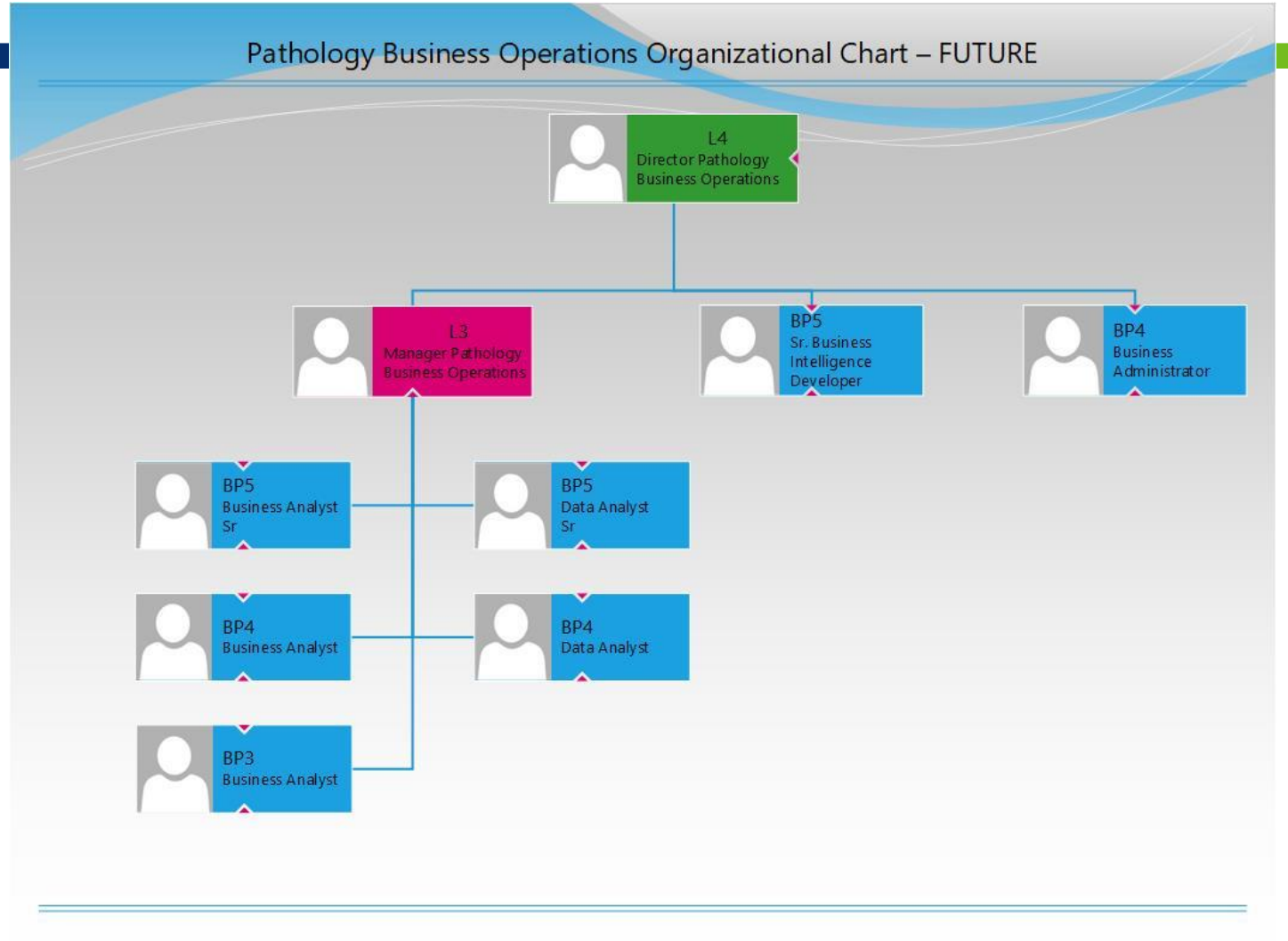
Phase 3 : Data Model Development, Database Connectivity, Automation, and Performance Management

- Create Data Model that encompasses all data sources using a Data Architect
- Create a physical data model that leverages existing models such as the one created for the *Financial Reporting Expansion* project in addition to the new data sources
- Develop key performance metrics and KPIs to track and monitor the performance of the pathology laboratory
    - *Already being established by working with key stakeholders in each area*
- Set up alerts to notify stakeholders of important changes and deviations from targets
    - *Personalized Subscriptions for automated delivery of data*
- Regularly review and analyze performance data to identify areas for improvement
    - *Leverage Monthly Quality Assurance meetings for KPI reporting and issue management*
    - *Dedicated Laboratory Data Management and Analysis meetings*
        - *Stakeholders from Anatomical, Clinical, Molecular, Quality Assurance, Research (Tissue Core)*

Phase 4 : Continuous Improvement [Data Governance through PASC]

- Establish clear data governance policies and procedures that cover data access, use, and security. – In Process
- Assign roles and responsibilities for managing pathology data, including data owners, stewards, and custodians. – In Process
- Define data quality standards and establish processes for monitoring and maintaining data quality. – In Process
- Ensure compliance with legal and regulatory requirements, including data privacy and security laws. – In Process
- Implement a data classification scheme to classify pathology data according to its sensitivity, confidentiality, and criticality. – In Process
- Control access to pathology data based on the principle of least privilege, granting access only to those who need it to perform their job functions. - COMPLETED
- Ensure that data is backed up regularly and that disaster recovery and business continuity plans are in place to protect against data loss or system failure.
- Conduct regular data audits to identify data quality issues, security breaches, and compliance violations.
- Establish a data retention policy that defines how long pathology data should be kept and when it can be safely deleted or destroyed.
- Ensure that all stakeholders understand their roles and responsibilities in maintaining the integrity and security of pathology data, and provide training and education as needed to promote data governance awareness and compliance.

Phase 4 : Continuous Improvement



Phase 4 : Continuous Improvement

- Incorporate feedback from stakeholders, including patients, healthcare providers, and laboratory staff, to identify areas for improvement
- Use the insights gained from data analysis to continuously refine and improve processes, procedures, and technologies within the pathology laboratory
- **Foster a culture of data-driven decision-making and continuous improvement**

Phase 5 – Long Term Pathology BI Future

- Fully integrated data visualization solution that can provide in depth clinical analysis
  - Examples of reports
    - Watchful Test Ordering
    - Duplicate Lab Orders
    - PPID Compliance for Lab Specimen
    - Incorrect Test Combinations Ordered
    - Diagnostic Test Distribution
    - Incorrect Ordering Frequency
    - Physician Sendout Ordering Patterns
    - Physician Ordering benchmarks
    - Diagnostic Trends of Ordered Tests
    - Average Sendount Turn Around Time Volume by Performing Lab

Questions?