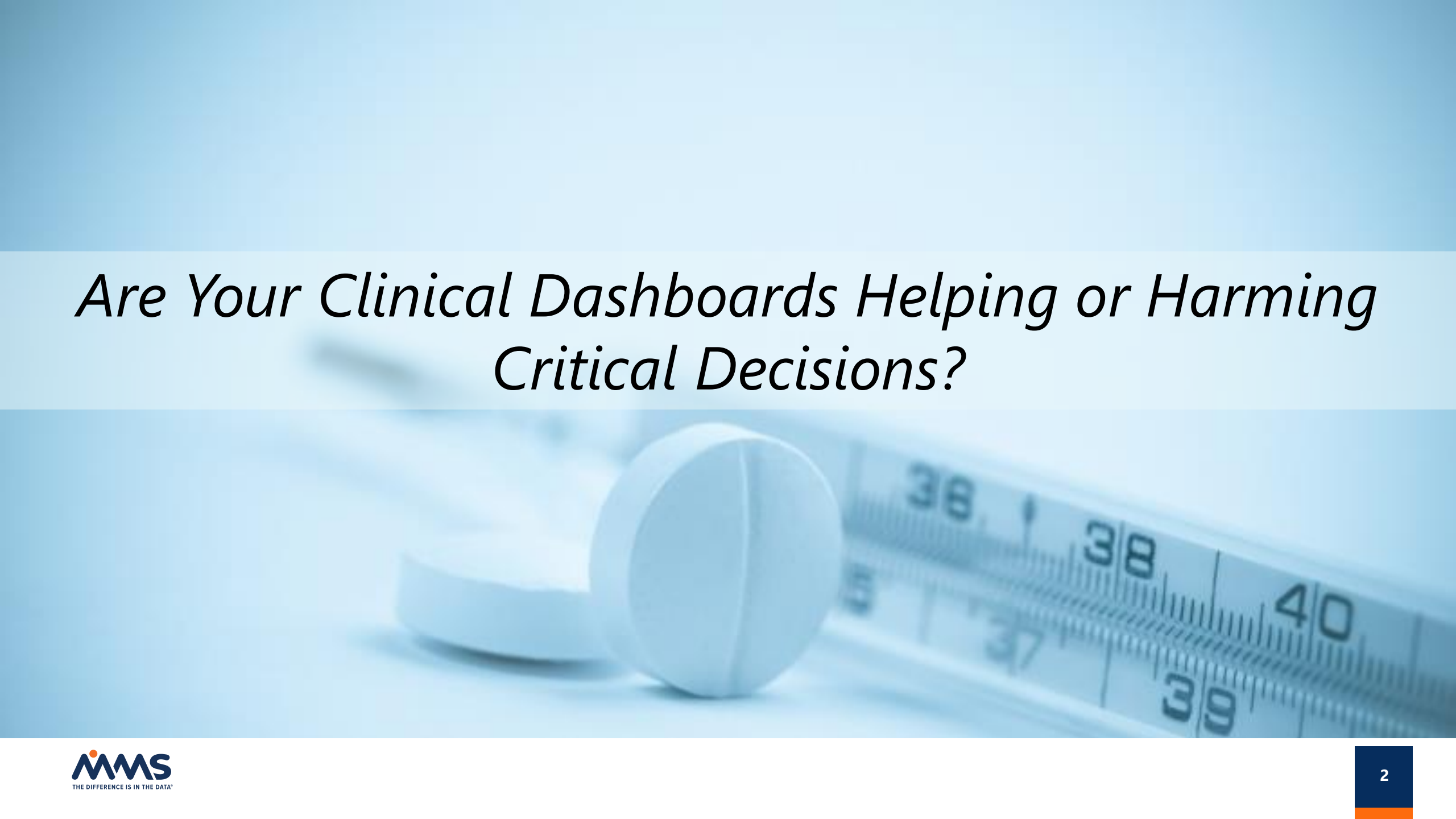




Ensuring Data Integrity: A Three Step Approach to Clinical Dashboard Validation

PowerBI Validation in Clinical Data Analysis

R. Meckstroth, K. Wenzel



Are Your Clinical Dashboards Helping or Harming Critical Decisions?

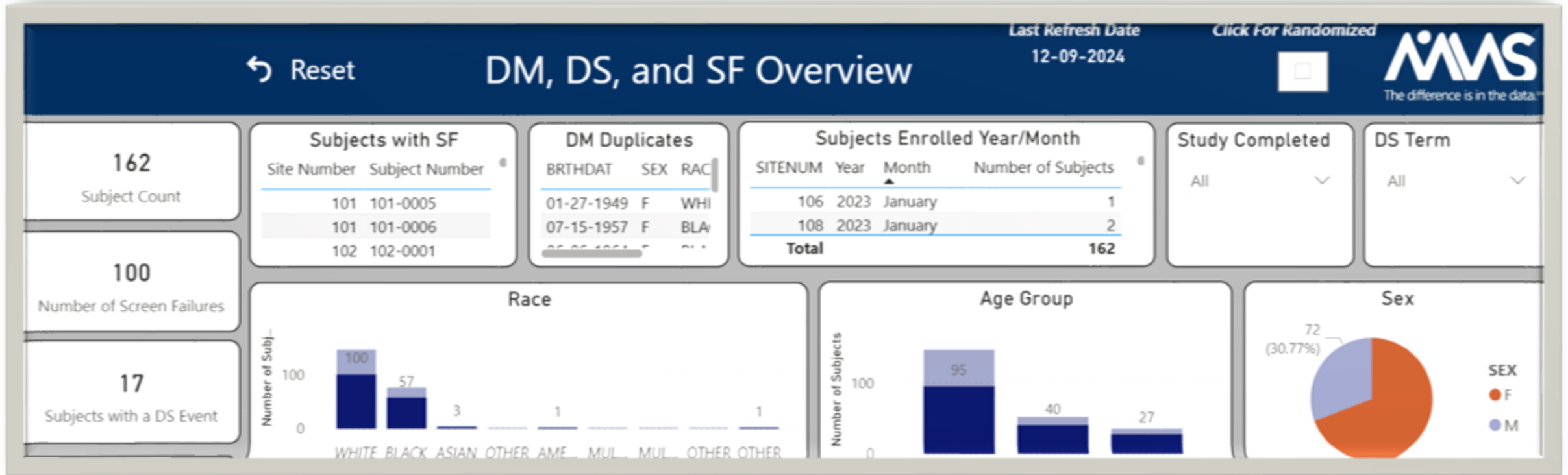
Four Critical Concerns in Clinical Dashboard Validation

- **Trust & Accuracy** - Dashboards must reliably reflect the latest data and avoid misrepresentation.
- **Real-Time Updates** - Immediate availability upon data refresh is essential for timely decisions.
- **Interactive Insights** - Beyond static TLFs—filters and dynamic visuals must be validated for correctness.
- **Lack of Standard Practices** - The industry still lacks established validation frameworks, creating pitfalls.



Why Validation Is Difficult

- Interactive in Nature
- Hard to repeat
- Time Consuming
- Hard to randomize
- Labor Intensive – person to drive dashboard, person to verify



A background image showing various pieces of laboratory glassware, including Erlenmeyer flasks, graduated cylinders, and test tubes, some containing liquids. The image is faded and serves as a backdrop for the text.

Validated dashboards support better data integrity and clinical decisions

Ensuring Dashboard Quality



“Fit for purpose”

Usability & Intuitiveness

Performance & Responsiveness

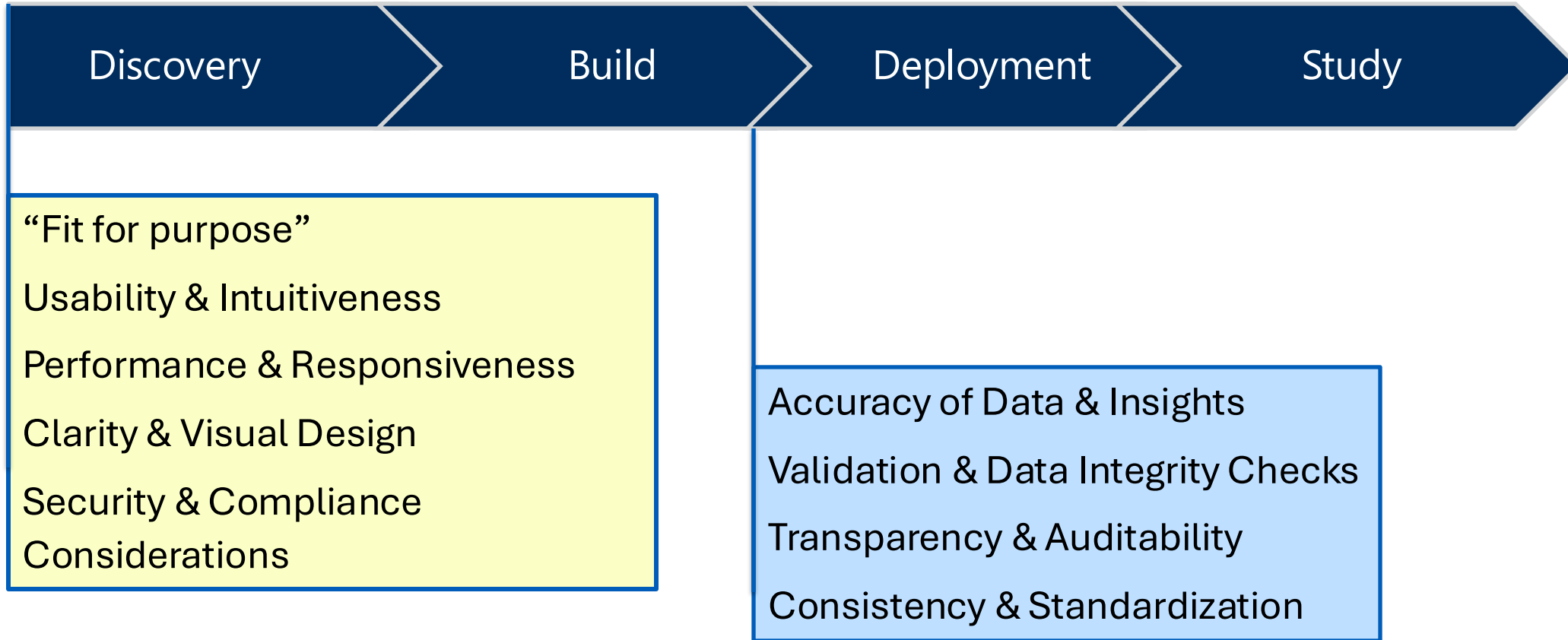
Clarity & Visual Design

Security & Compliance

Considerations

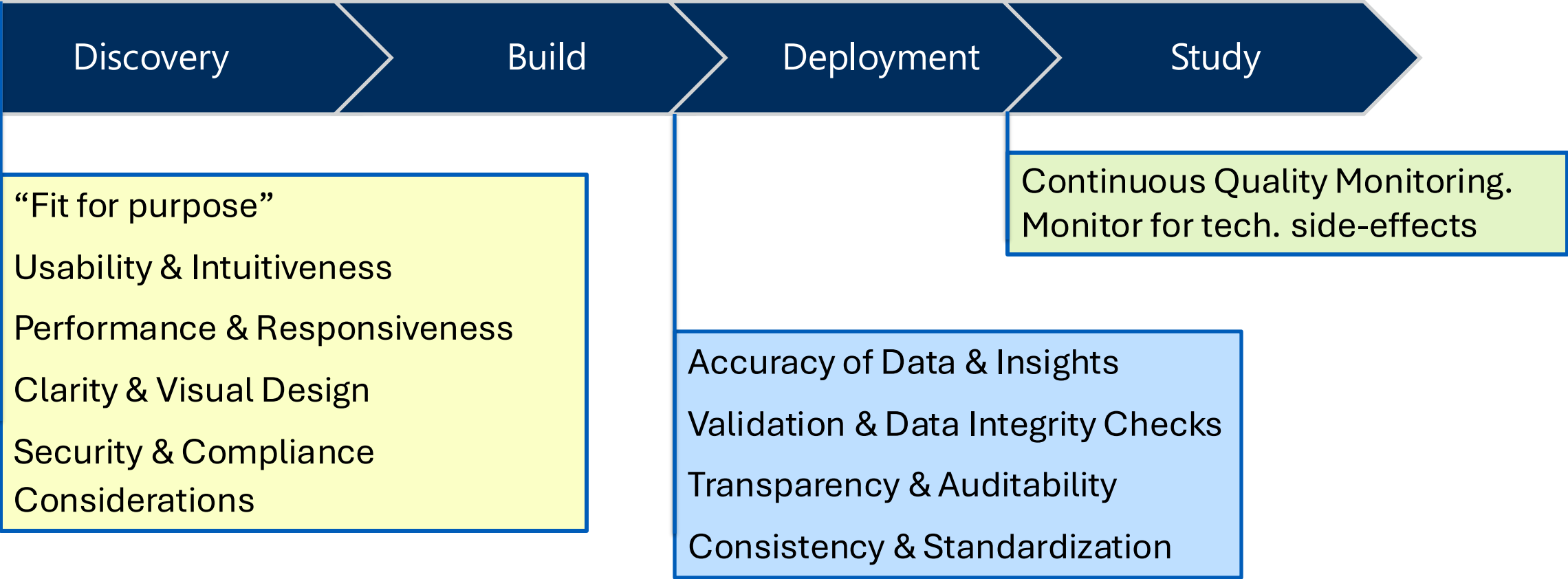
Validated dashboards support better data integrity and clinical decisions

Ensuring Dashboard Quality



Validated dashboards support better data integrity and clinical decisions

Ensuring Dashboard Quality



Validated dashboards support better data integrity and clinical decisions

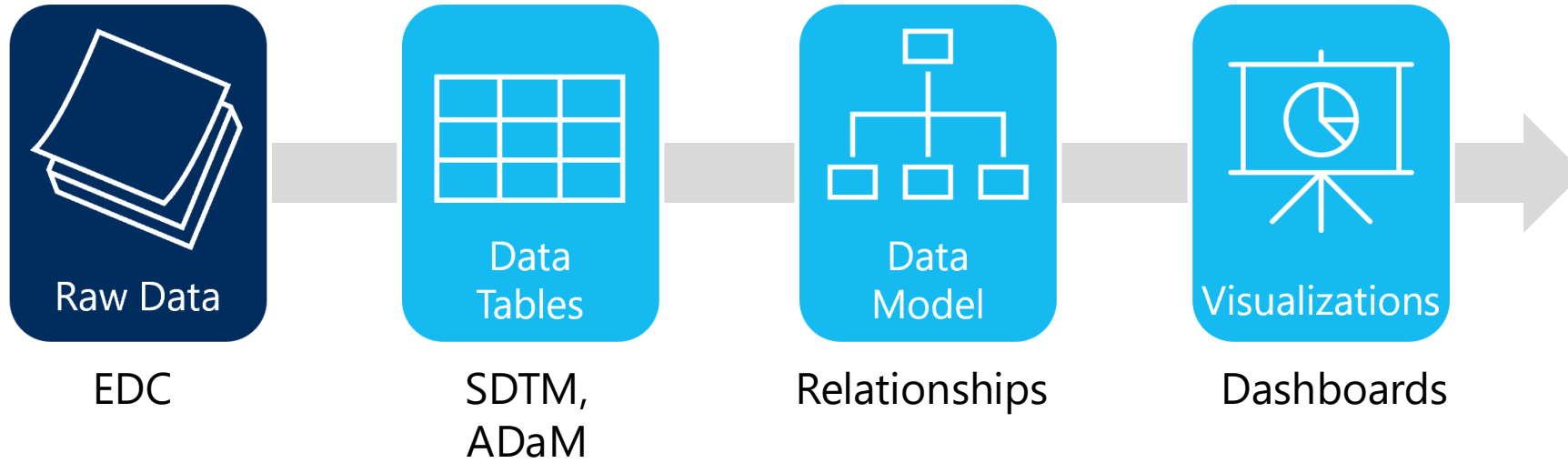
Make your Dashboards Easier to Validate – Design Principles



Best practices for effective clinical dashboards

- Keep computation in the dataset (minimize complex calculations in visuals)
- Leverage previously validated data (e.g., SDTM or ADaM)
- Focus on validated Microsoft-supplied statistics in PowerBI
- Label Dashboard Elements
- Keep dashboards and relationships focused and simple

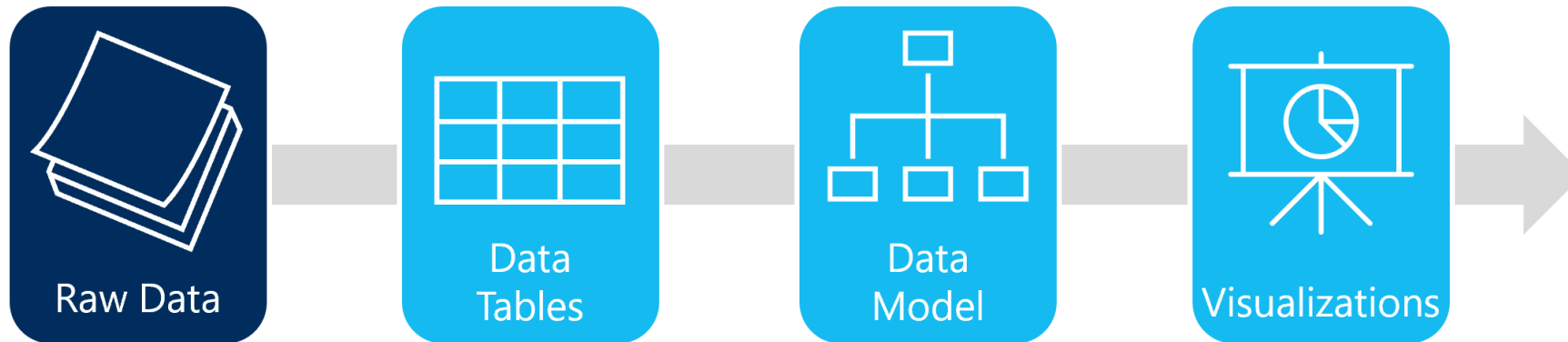
Key Components of a Dashboard



Key Components

1. Data source
2. Underlying Relationship Model
3. Filters and Features Across the Application
4. Dashboards Comprised of Individual Visualizations

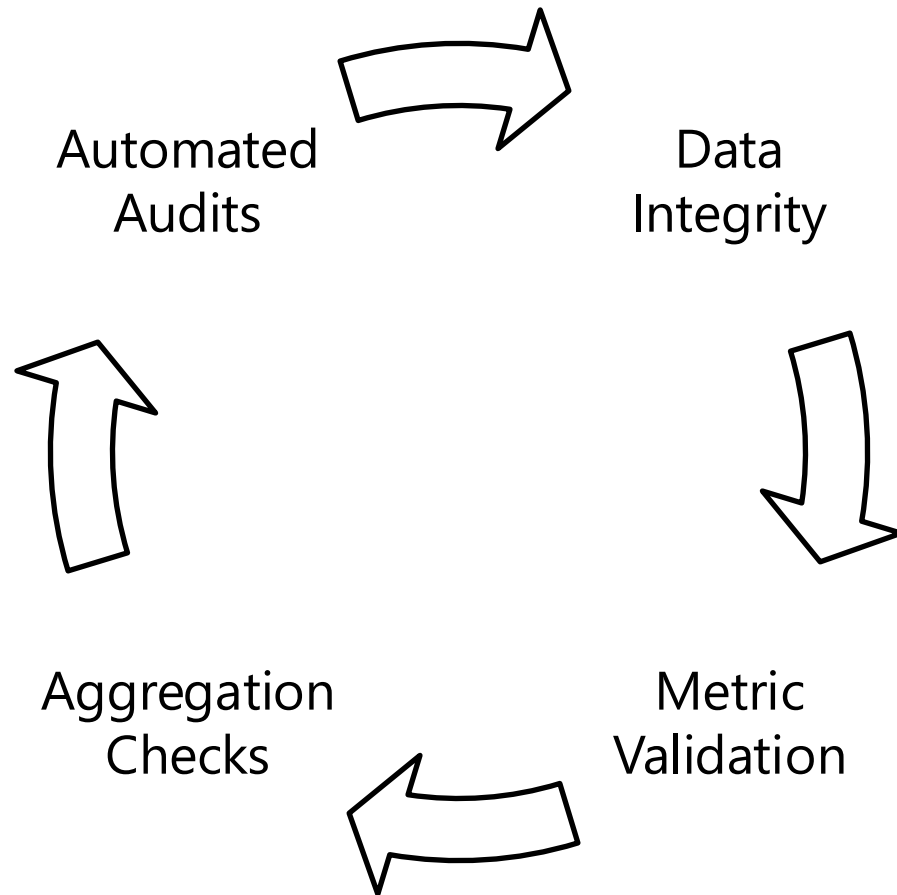
Dashboard Validation



Validation Approach

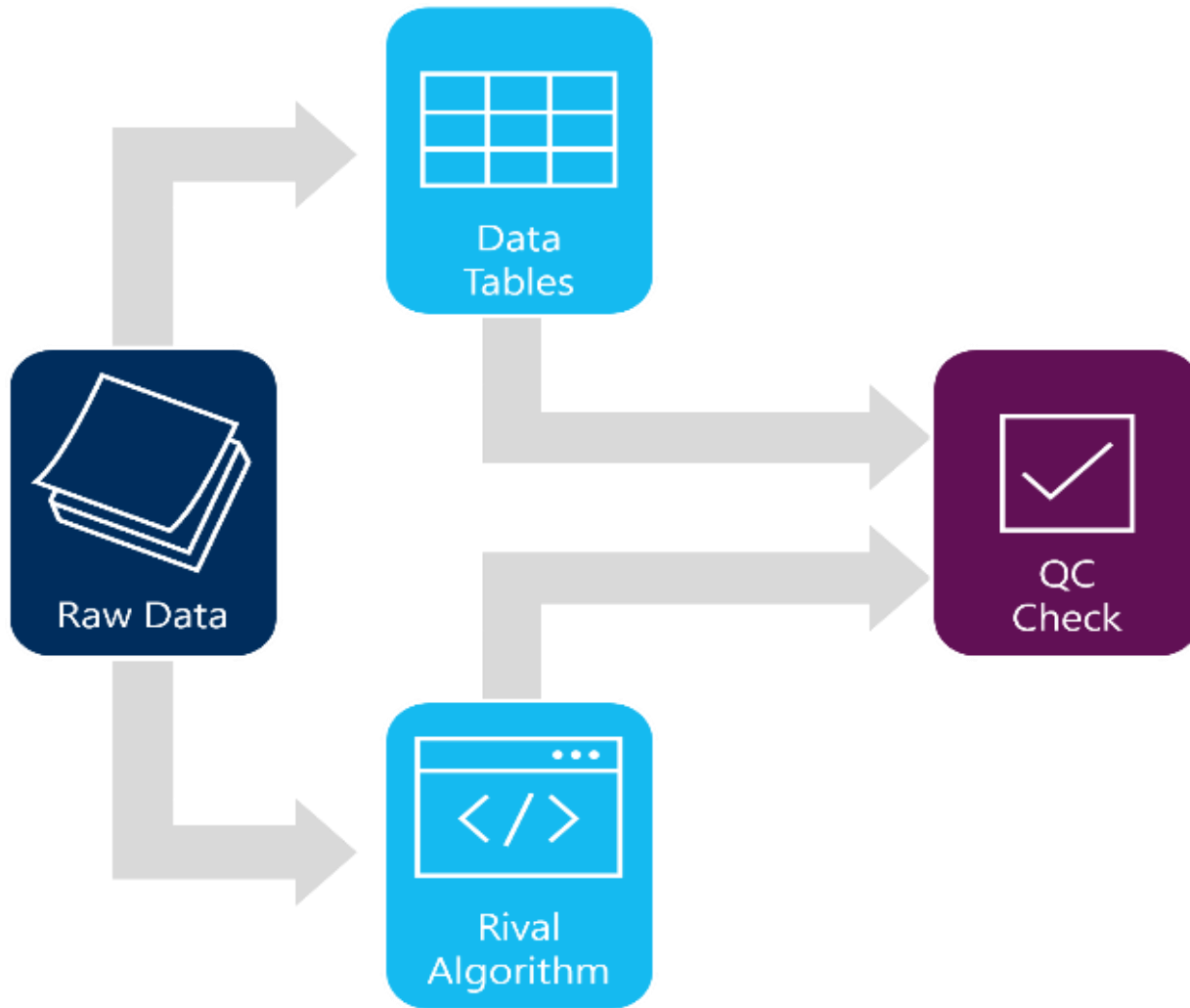
1. Three step approach.
2. Test from left to right.
3. If step fails, no need to continue testing until fixed.
4. Independently verify results.

Validating Dashboard Accuracy



- **Data Integrity** – Ensure raw data matches dashboard outputs and is complete.
- **Metric Validation** – Recalculate key metrics and verify filters.
- **Aggregation Checks** – Confirm summaries align with patient-level data.
- **Automated Audits** – Use scripts and anomaly detection for continuous monitoring.

Rival Program Validation

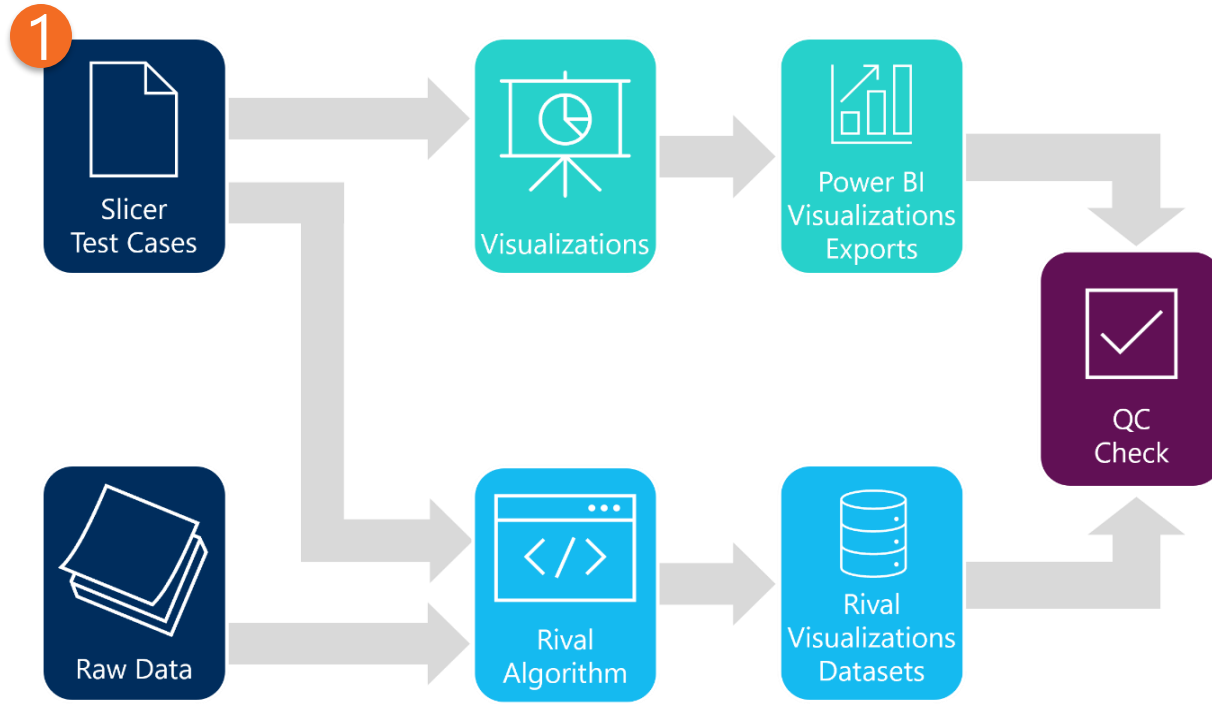


Rival Programming for Validation:

A technique that replicates dashboard software's processes (e.g., PowerBI) to detect inconsistencies and ensure accuracy.

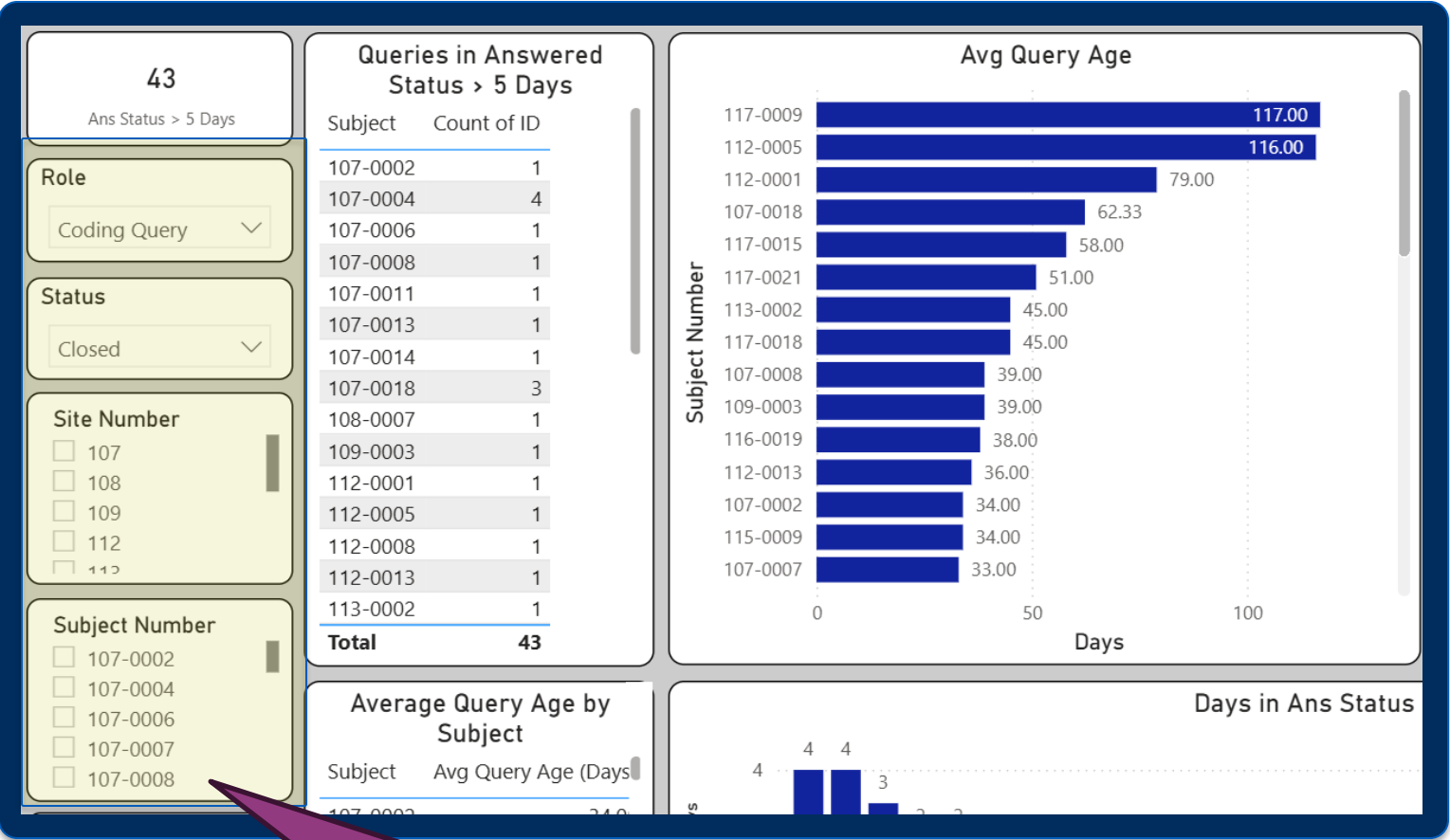
Python as the Preferred Tool: Python's powerful data manipulation libraries make it the top choice for building rival programs to automate and enhance dashboard validation

Methodological Approach



1 Build Test Cases Based on Slicer Selections

Building Test Cases



Test cases built from slicer selections.

Test Cases Randomly Generated

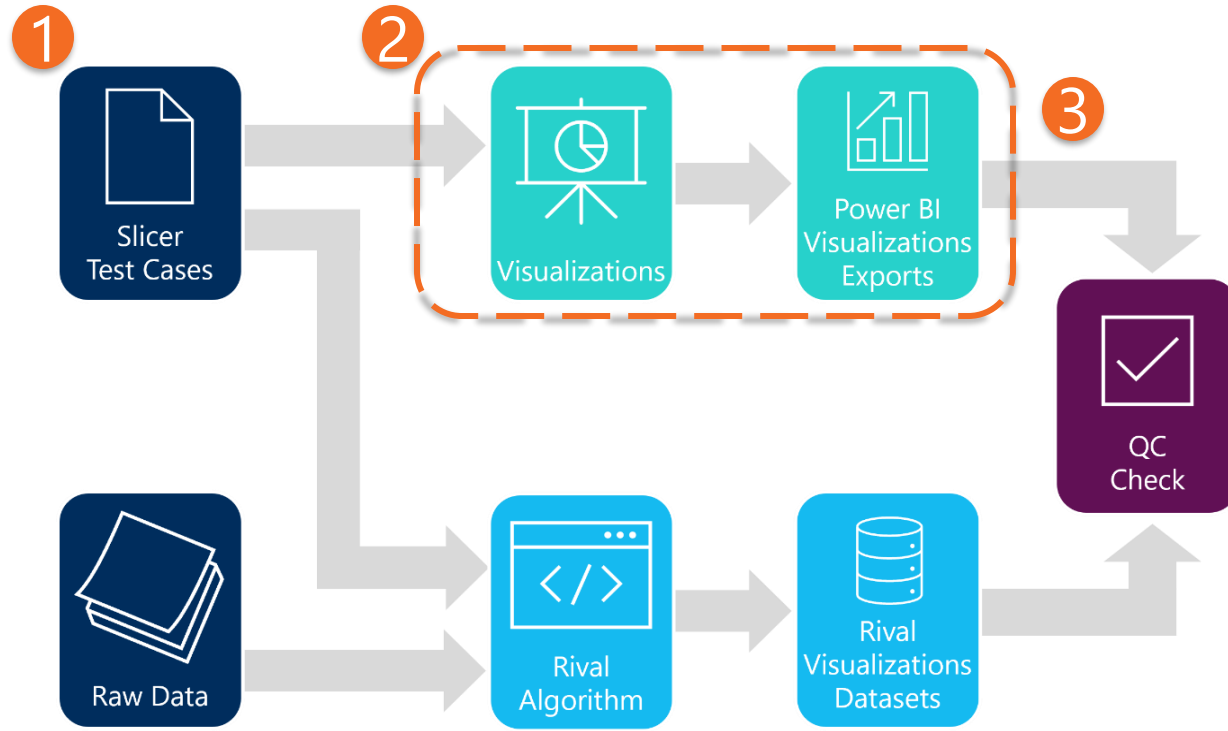
Test Case 1:
Role: Coding Query
Site Number: 107, 112
Subject Number: 107-0008

Test Case 2:
Role: Coding Query

...

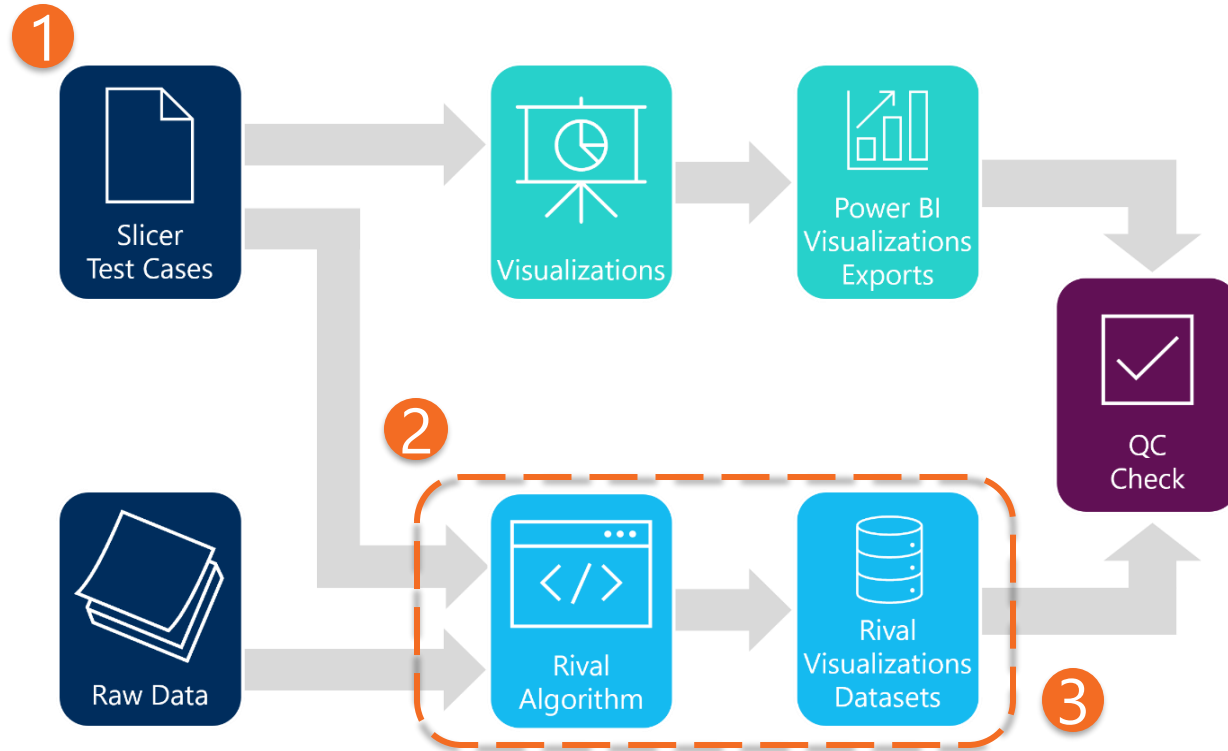
Test Case n:
Status: Closed
Site Number: 107, 108, 210, 221

Methodological Approach – Dashboard Results



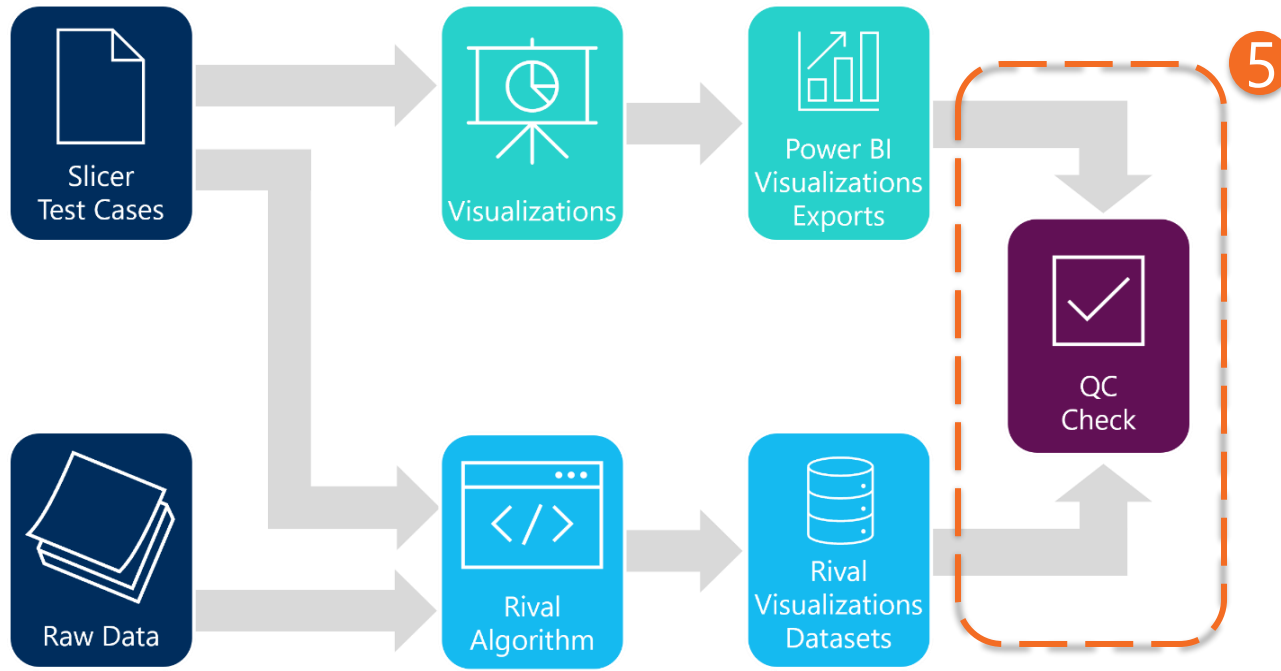
- 1 For Each Test Case
- 2 Automatically select slicers
- 3 Export visualization data
 - Queries in Answered Status
 - Average Query Age

Methodological Approach – Rival Program



- 1 For Each Test Case
- 2 Filter raw data
- 3 Export summarized data
 - Queries in Answered Status
 - Average Query Age

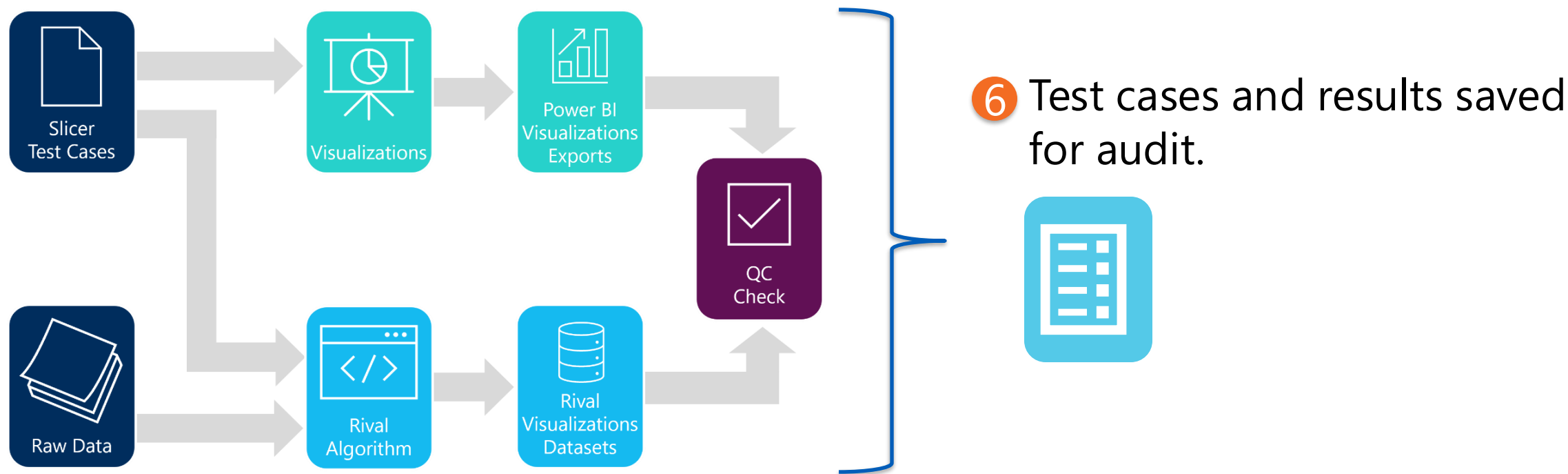
Methodological Approach - Comparison



5 For each test case, compare results

- Queries in Answered Status
- Average Query Age

Methodological Approach - Documentation



Conclusion

Importance

Need for validation is paramount

No room for error

Validation is time consuming

Challenges Faced

Constraints & obstacles during validation

Dashboard “black box” operations

Complex multi-tool architecture

Areas for Future Improvement

Further optimize performance

Expand framework (e.g., calculated tables)

Validate other dashboard types/outputs

Questions?

Visit us at our booth to learn more!



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