2023DQACONFERENCE

DQA
DENTAL QUALITY ALLIANCE®

MOVING PAST DISRUPTION TO IMPROVE ORAL HEALTHCARE

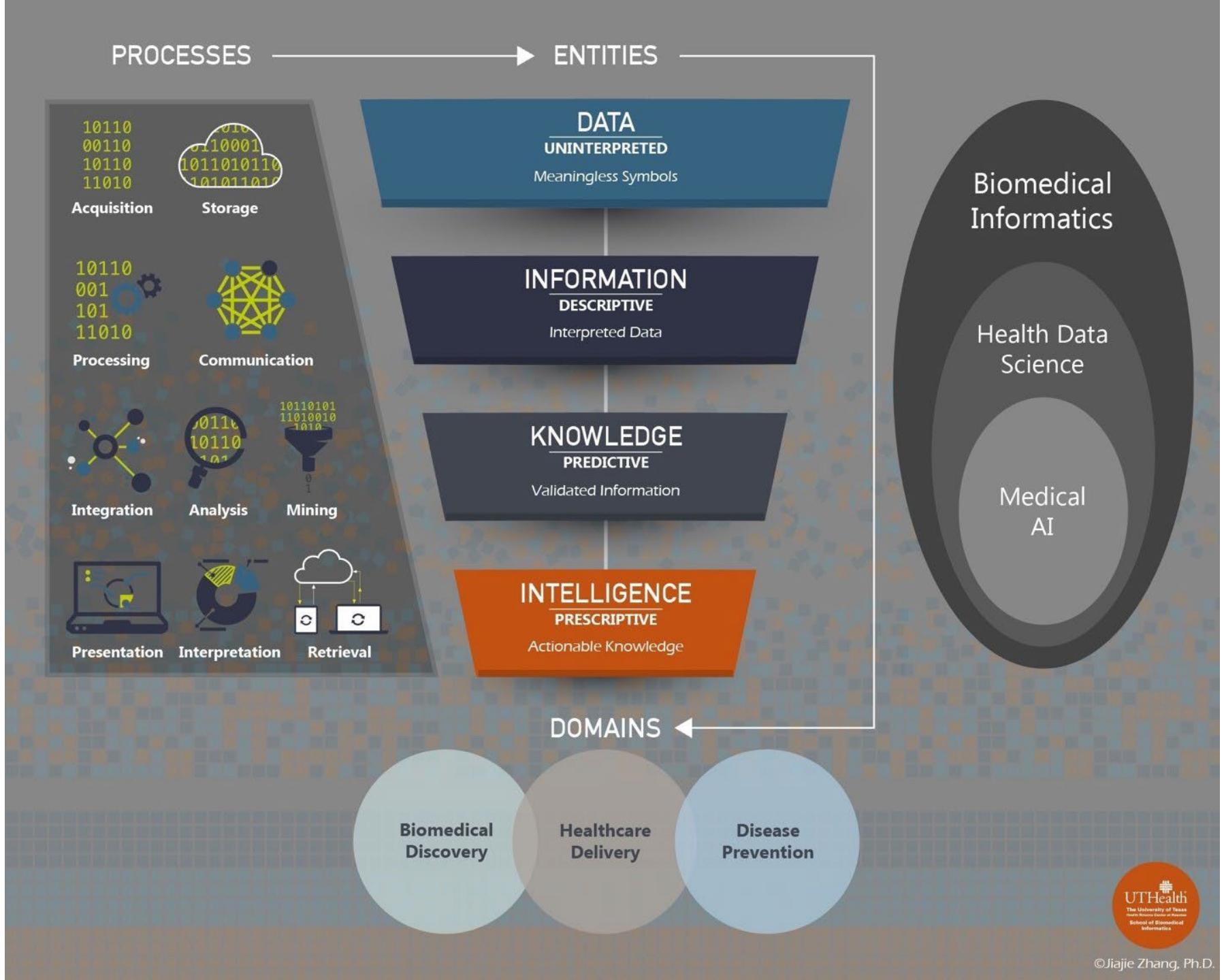
Learning from data in dentistry

Muhammad F Walji PhD

UTHealth Houston
School of Dentistry
Texas Center for Oral Healthcare Quality and Safety

Disclosures

- Muhammad F Walji has no relationships to disclose.


PROCESSES
ENTITIES
Acquisition
Storage
Processing
Communication
Integration
Analysis
Mining
Presentation
Interpretation
Retrieval
DATA
UNINTERPRETED
Meaningless Symbols
INFORMATION
DESCRIPTIVE
Interpreted Data
KNOWLEDGE
PREDICTIVE
Validated Information
INTELLIGENCE
PRESCRIPTIVE
Actionable Knowledge
Biomedical Informatics
Health Data Science
Medical AI
DOMAINS
Biomedical Discovery
Healthcare Delivery
Disease Prevention
UTHealth
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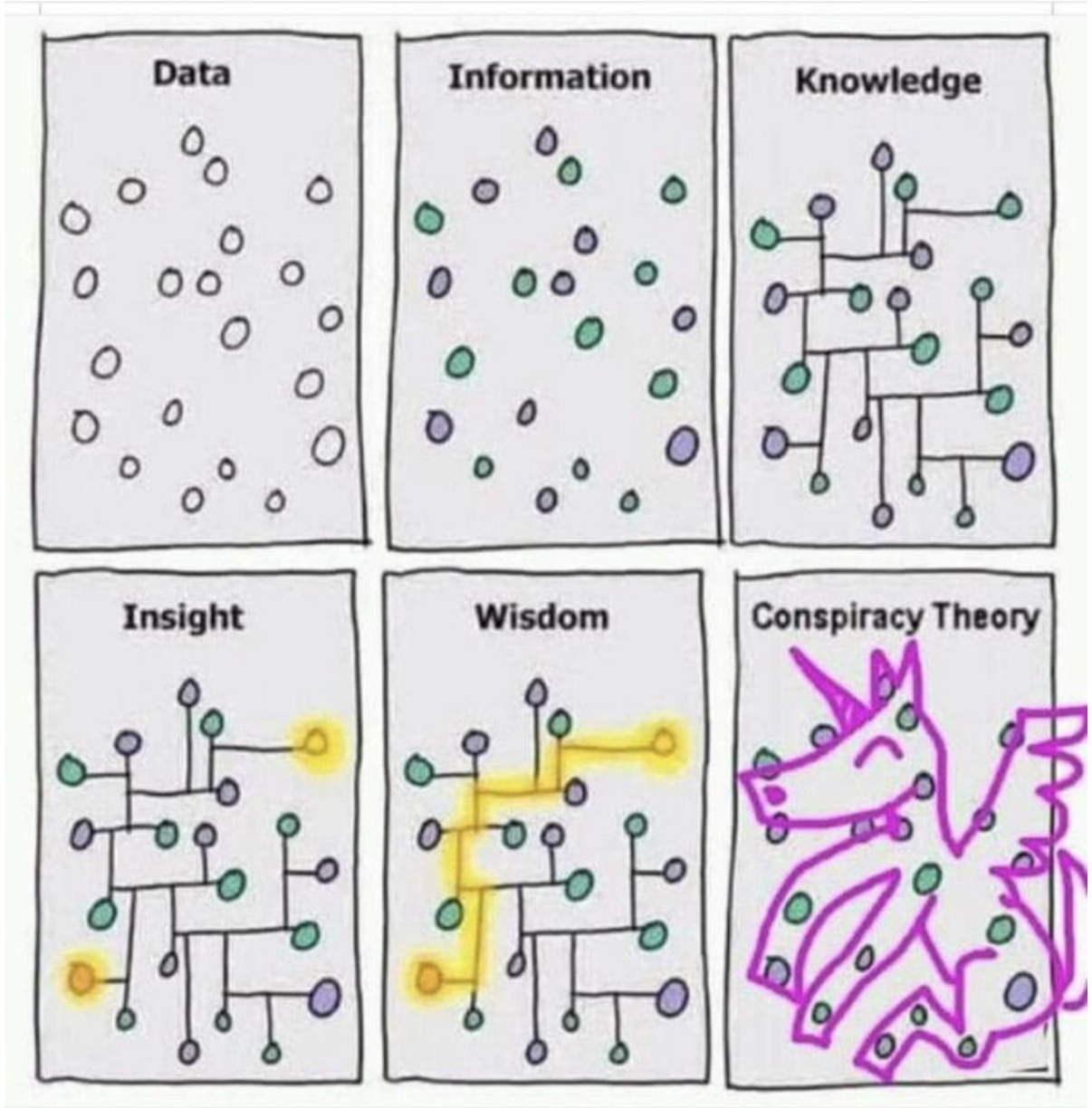
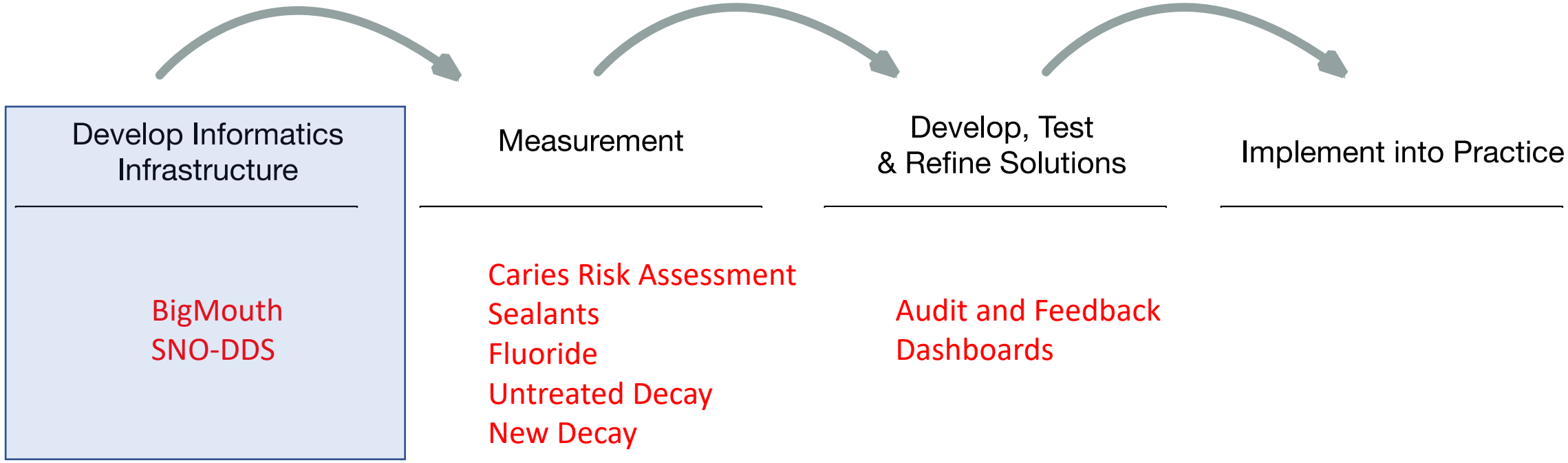


https://www.gapingvoid.com/blog/2014/01/22/information-vs-knowledge/

Big Idea

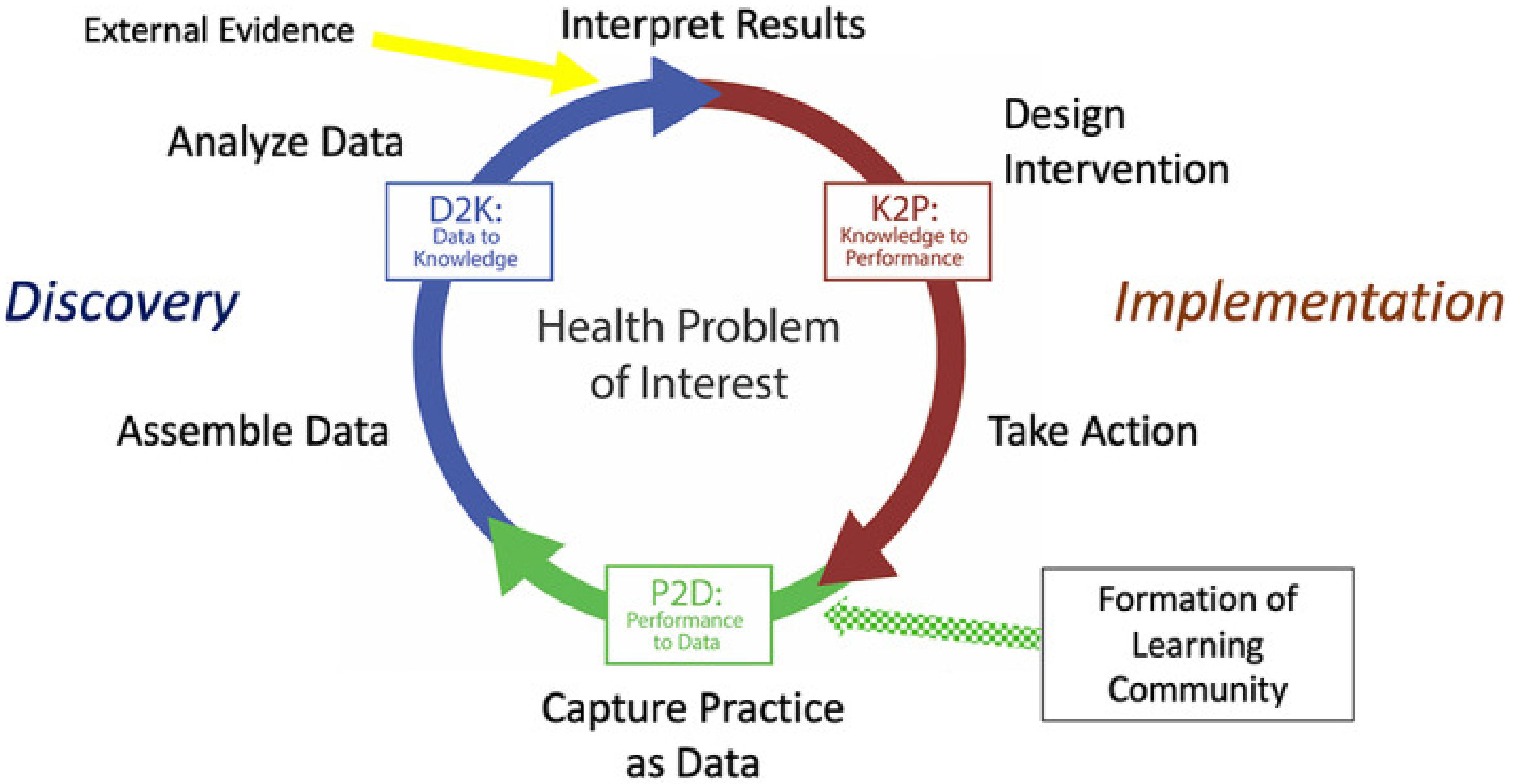
- Every patient should receive person-centered, safe, effective, timely, efficient, and equitable **oral health care**



Learning health system and informatics infrastructure

A system in which science, informatics, incentives, and culture are aligned for continuous improvement and innovation, with best practices seamlessly embedded in the care process, patients and families as active participants in all elements, and new knowledge is captured as an integral by-product of the care experience

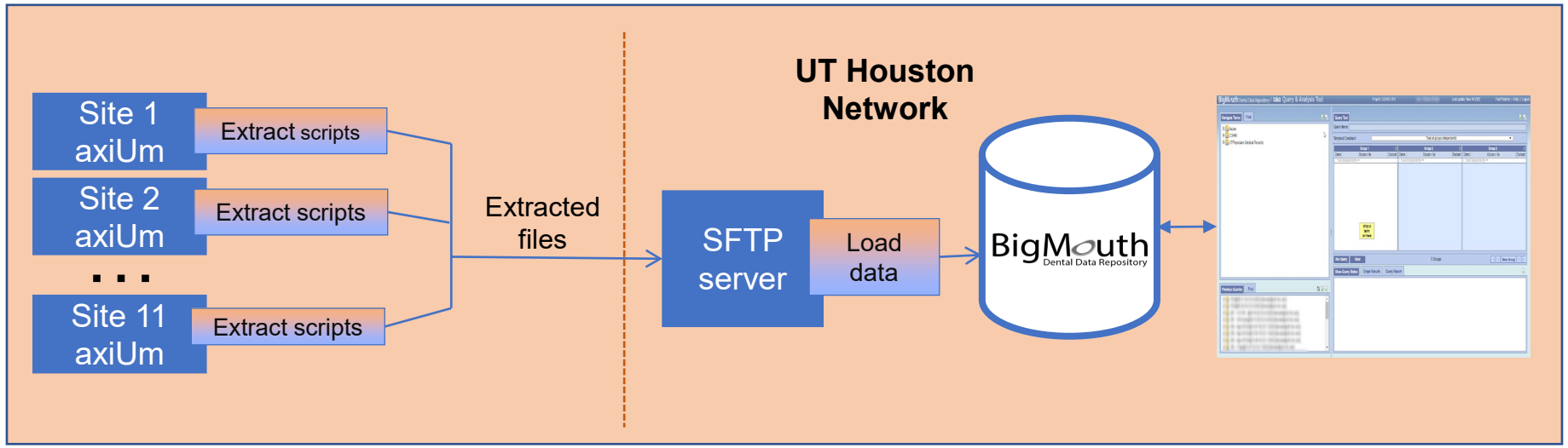
Committee on the Learning Health Care System in America; Institute of Medicine , Smith M, Saunders R, et al. *Best Care at Lower Cost: the Path to Continuously Learning Health Care in America*. Washington, DC: National Academies Press; 2013



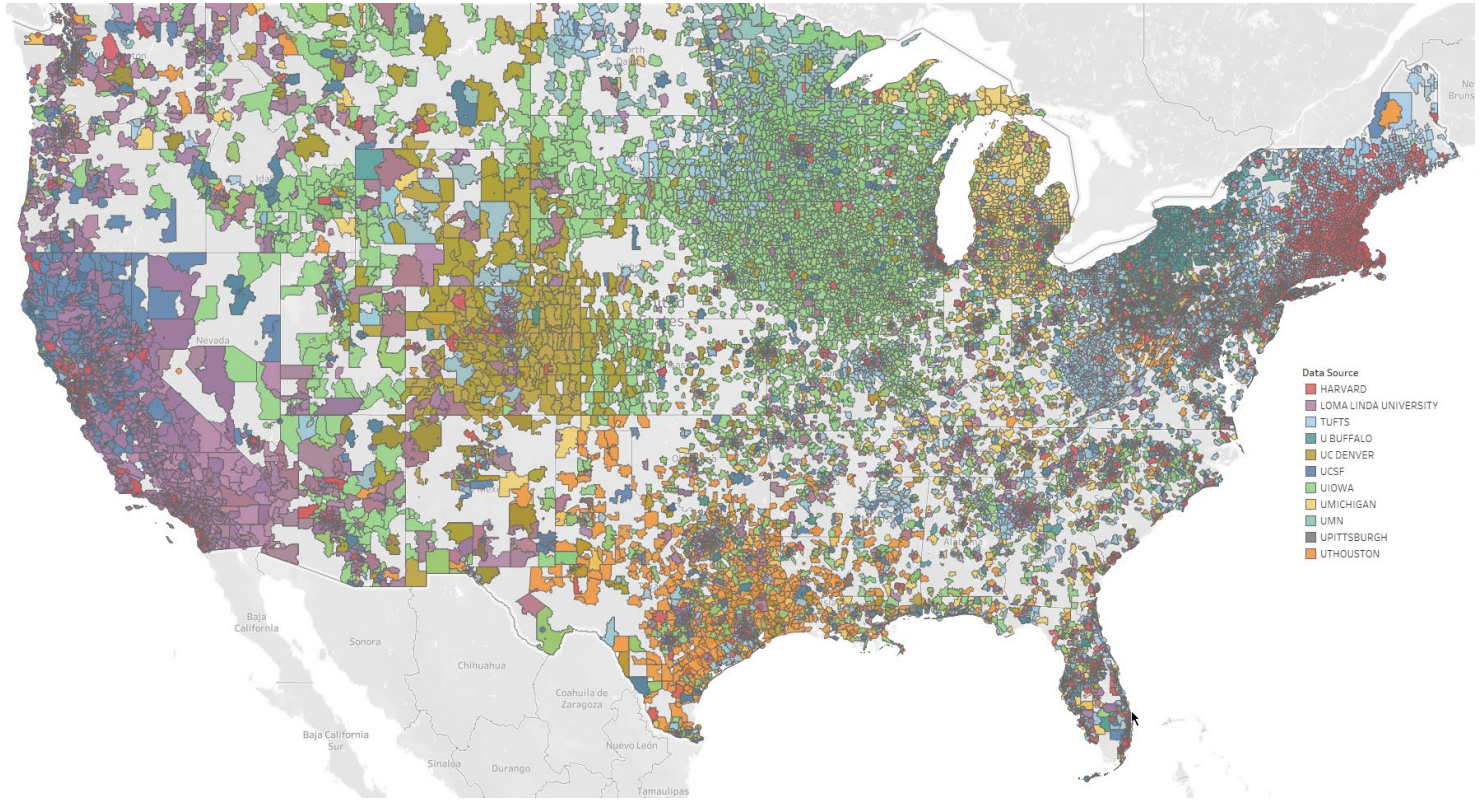
Friedman CP. What is unique about learning health systems? Learn Health Syst. 2022 Jul 15;6(3):e10328.

BigMouth Dental Data Repository

- A multi-institutional dental data repository with data from 11 dental schools
- Established in 2012
- 4.59 million patients - Quarterly data updates
- BigMouth's query interface allows non-technical users to query data across all institutions
- 26 research projects completed – Students, residents, and faculty



COHRI
Consortium for Oral Health Research and Informatics



1.1M		1.59M	2.02M		2.4M		3M	4.37M		4.57M
2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022

11 institutions - 4.57 Million patients

HARVARD School of Dental Medicine

UCSF School of Dentistry

Tufts University | School of Dental Medicine

UTHealth | School of Dentistry
The University of Texas Health Science Center at Houston

University of Pittsburgh
School of Dental Medicine

School of Dentistry
University of Michigan

School of Dental Medicine
University of Colorado Anschutz Medical Campus
DENTAL. INTEGRATED FOR HEALTH.

Loma Linda University
School of Dentistry

University at Buffalo
School of Dental Medicine

IOWA College of Dentistry and Dental Clinics

School of Dentistry
University of Minnesota
Driven to Discover℠

Standardized Dental Diagnostic Terminology

Milieu in Dental School and Practice

The Development of a Dental Diagnostic Terminology

Elsbeth Kalenderian, D.D.S., M.P.H.; Rachel L. Ramoni, D.M.D., Sc.D.; Joel M. White, D.D.S., M.S.; Meta E. Schoonheim-Klein, D.D.S., Ph.D.; Paul C. Stark, M.S., Sc.D.; Nicole S. Kimmes, D.D.S.; Gregory G. Zeller, D.D.S.; George P. Willis, D.D.S.; Muhammad F. Walji, Ph.D.

Journal of Dental Education ▪ Volume 77, Number 1

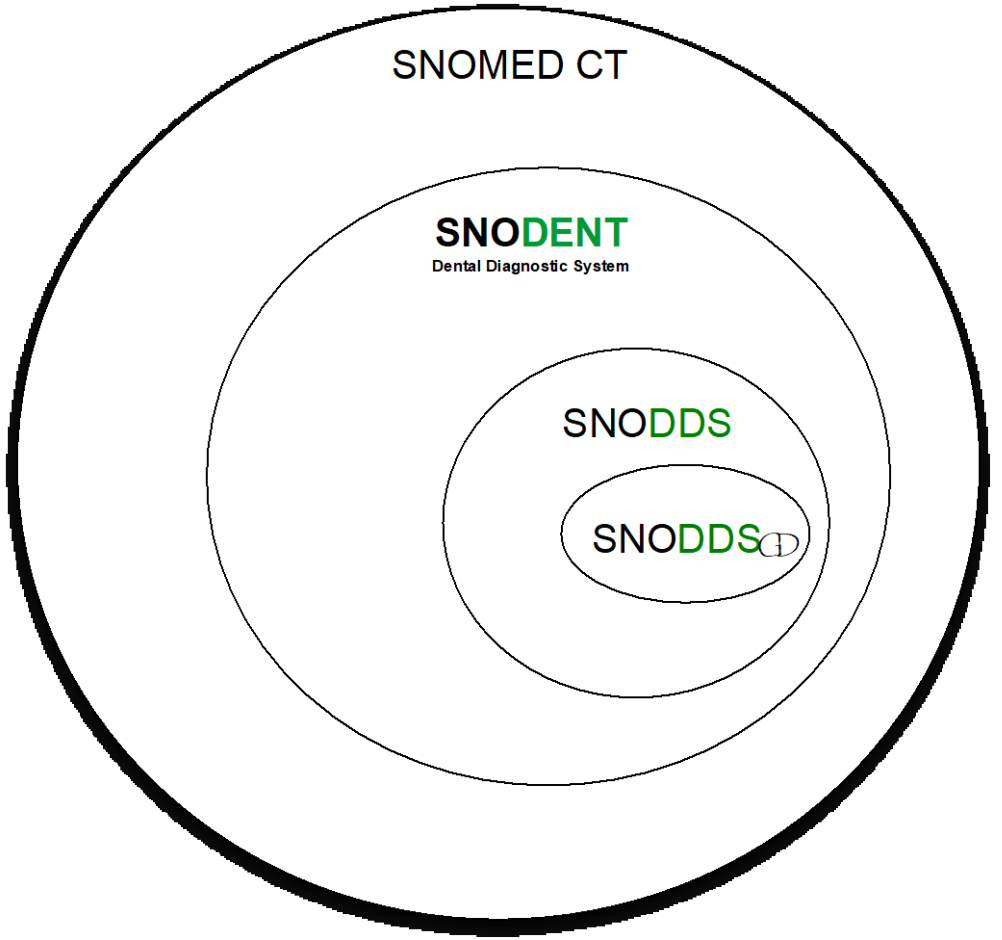
Assessing Use of a Standardized Dental Diagnostic Terminology in an Electronic Health Record

Oluwabunmi Tokede, D.D.S., M.P.H.; Joel White, D.D.S., M.S.; Paul C. Stark, M.S., Sc.D.; Ram Vaderhobli, D.D.S.; Muhammad F. Walji, Ph.D.; Rachel Ramoni, D.M.D., D.M.Sc.; Meta Schoonheim-Klein, D.D.S., Ph.D.; Nicole Kimmes, D.D.S.; Anamaria Tavares, D.D.S.; Elsbeth Kalenderian, D.D.S., M.P.H.*Abstract:* Although standardized terminologies such as the International Classification of Diseases

Journal of Dental Education ▪ Volume 75, Number 5

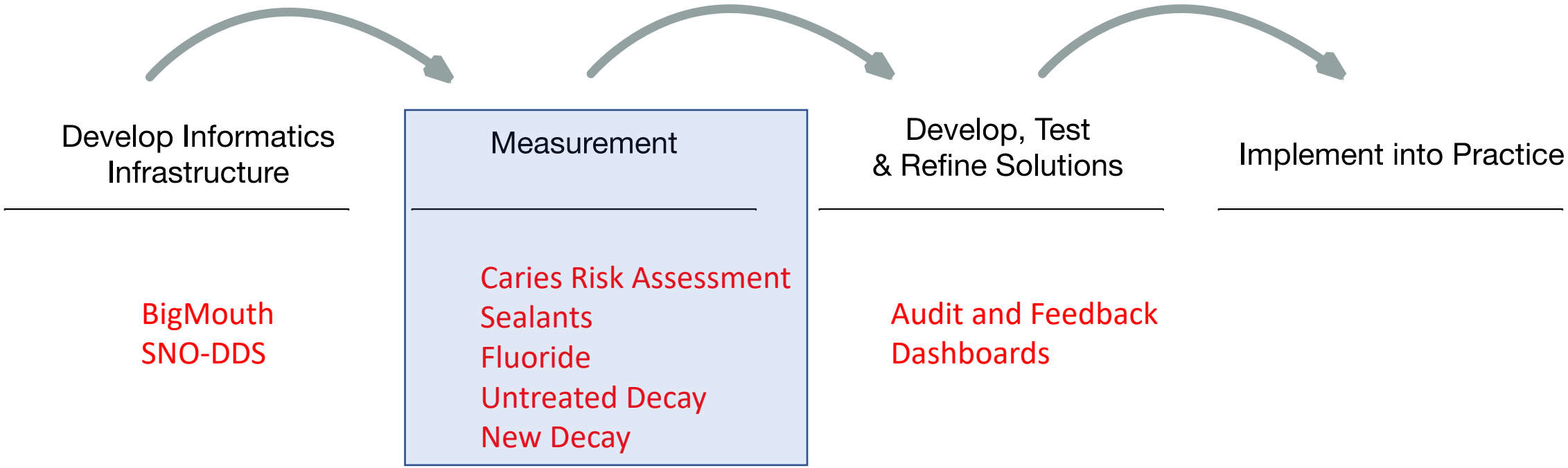
Evaluating a Dental Diagnostic Terminology in an Electronic Health Record

Joel M. White, D.D.S., M.S.; Elsbeth Kalenderian, D.D.S., M.P.H.; Paul C. Stark, M.S., Sc.D.; Rachel L. Ramoni, D.M.D., Sc.D.; Ram Vaderhobli, B.D.S., M.S.; Muhammad F. Walji, Ph.D. *Abstract:* Standardized treatment procedure codes and



Big Idea

- Every patient should receive person-centered, safe, effective, timely, efficient, and equitable **oral health care**



Dental Quality Measures (DQM)

Caries risk assessment

Did patients receive a caries risk assessment?

Caries preventative treatment

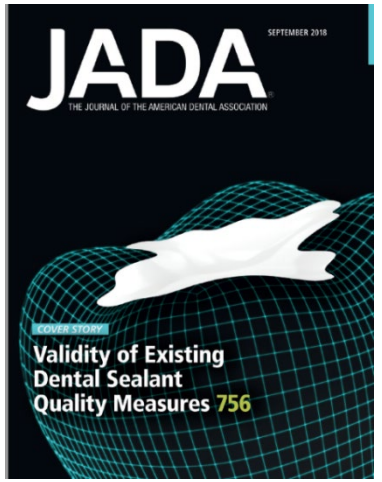
Did patients with “elevated” caries risk receive an appropriate caries treatment?

Sealants

Did patients with “elevated” caries risk receive a sealant/preventive resin restoration?

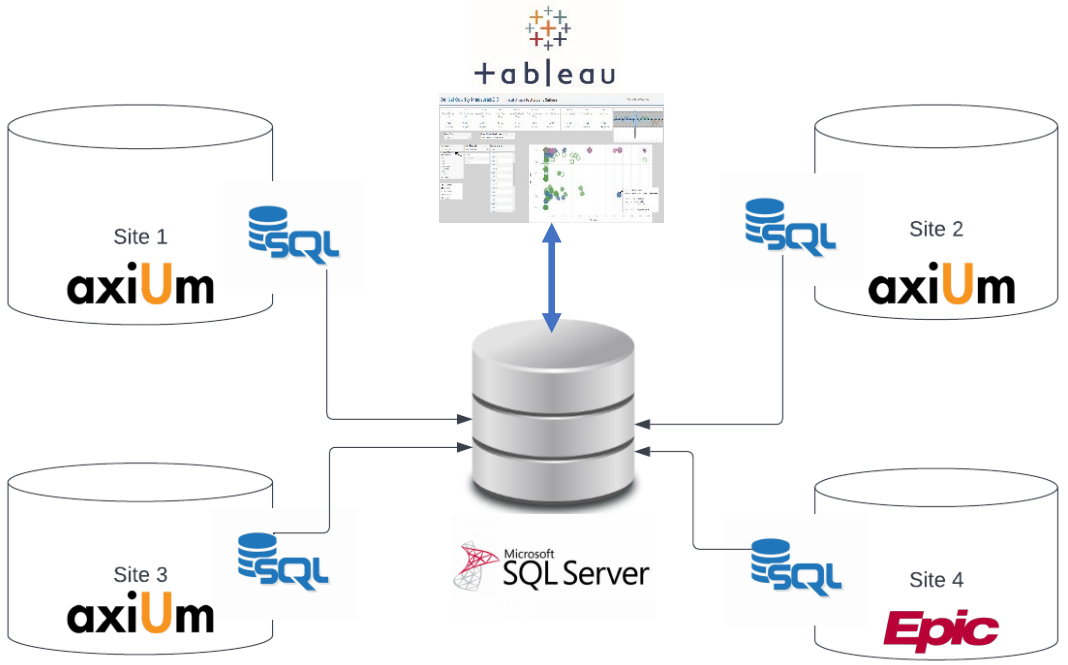
Caries treatment outcome

- Was **no new tooth decay** found at follow-up?
- Was **no untreated active decay** found at follow-up?



The heart of the project: DATA

- Systematic data collection
  - 1 million patient visits
  - 4 dental institutions
- Process the data
  - Flag numerator-denominator status on each measure
- Use data to develop an interactive dashboard



Dental Quality Measures (DQM)

Caries risk assessment

Did patients receive a caries risk assessment?

49% 66% 97% 100%

Caries preventative treatment

Did patients with “elevated” caries risk receive an appropriate caries treatment?

65% 68% 82% 99%

Sealants

Did patients with “elevated” caries risk receive a sealant/preventive resin restoration?

26% 30% 35% 43%

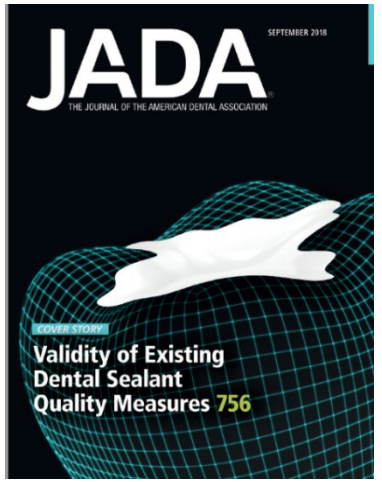
Caries treatment outcome

- Was **no new tooth decay** found at follow-up?

47% 63% 81% 89%

- Was **no untreated active decay** found at follow-up?

78% 79% 77% 84%



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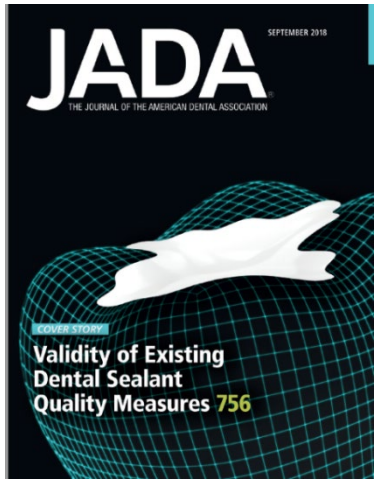

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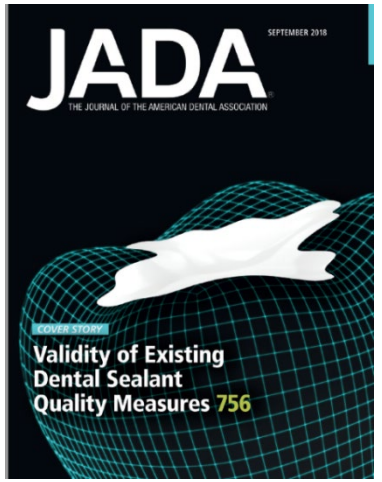

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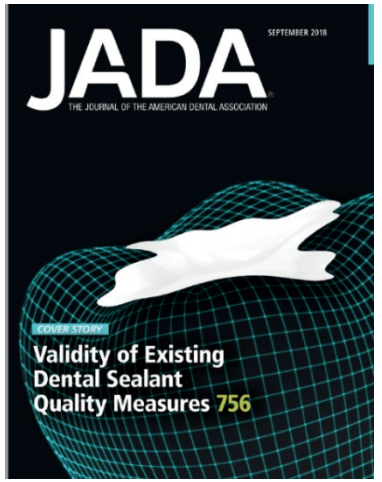

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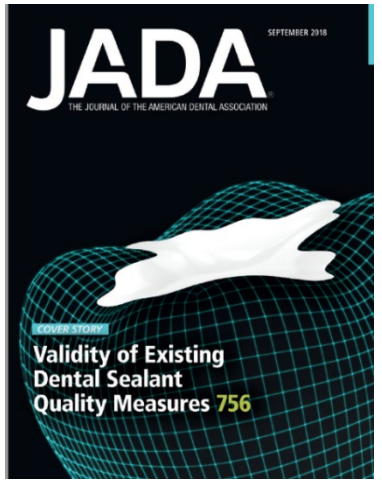
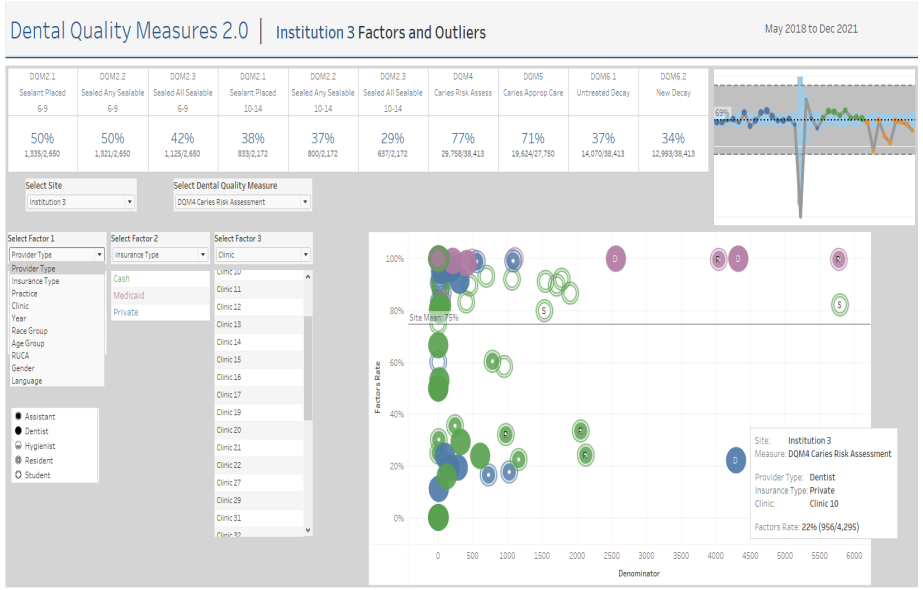


Dashboard - Data-Driven Design

- Interactive data visualization for data exploration
- **Design Principles and Key Features**
  - Provide the big picture first, then drill down
  - Factor in the wide variability in the volume of visits using logarithmic scales
  - Statistical Process Control (SPC) charts - Identify trends in data
  - Analysis of Proportions (ANOP) - Identify outliers in data



Dashboard Overview - Banner

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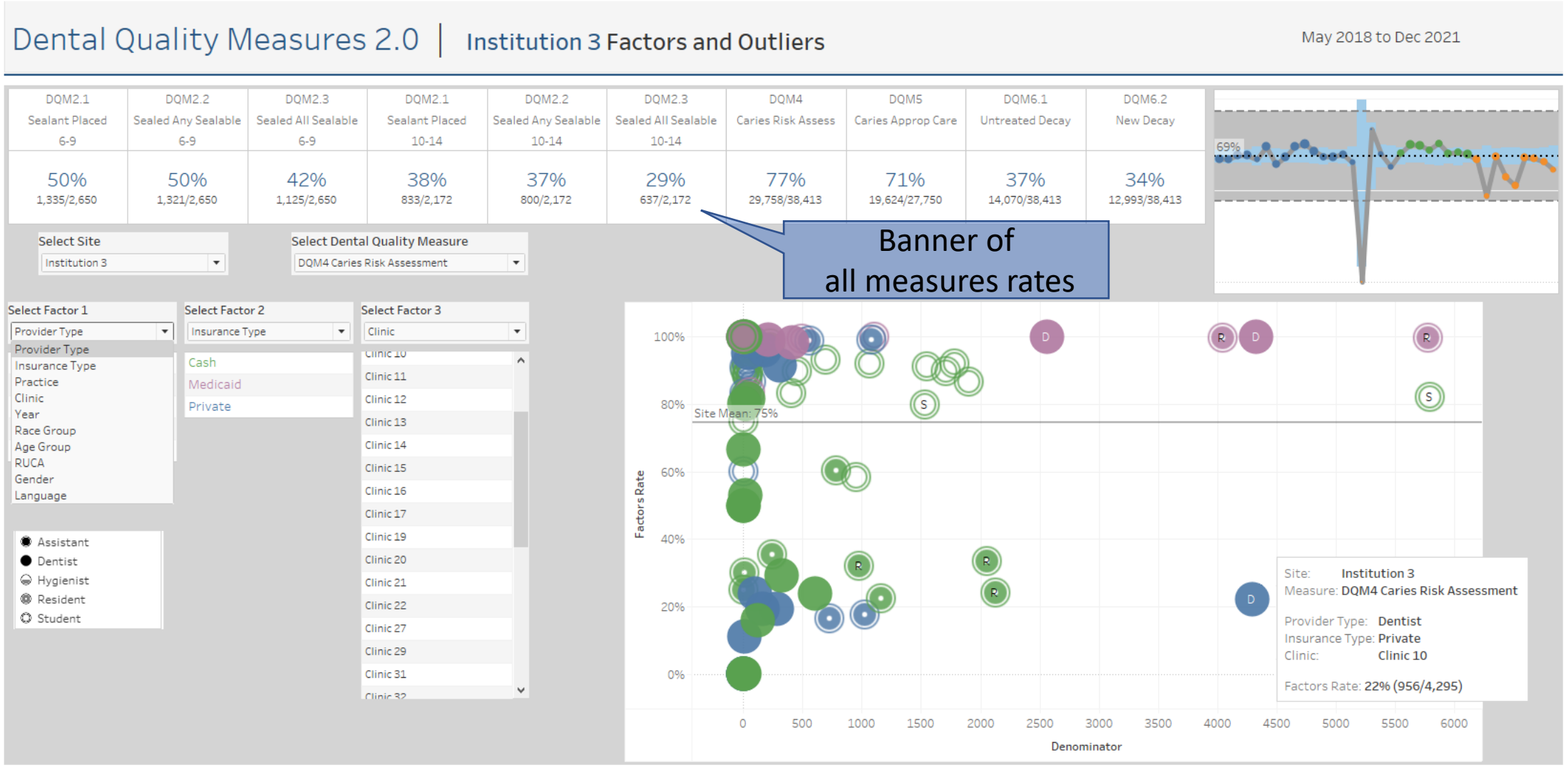
Texas Center for Oral Healthcare Quality and Safety



Dashboard Overview – SPC Chart

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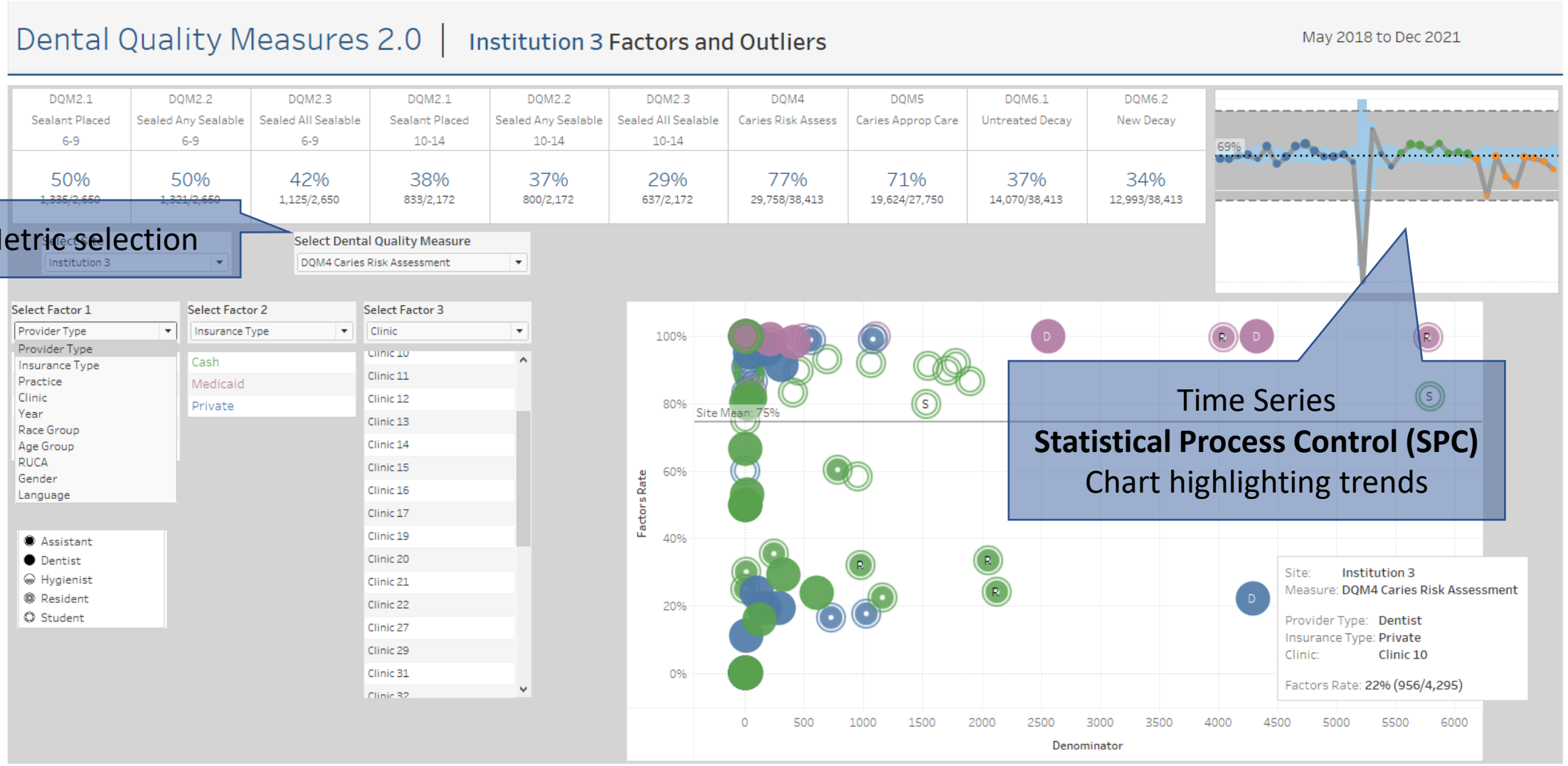

Dashboard Overview - Factors

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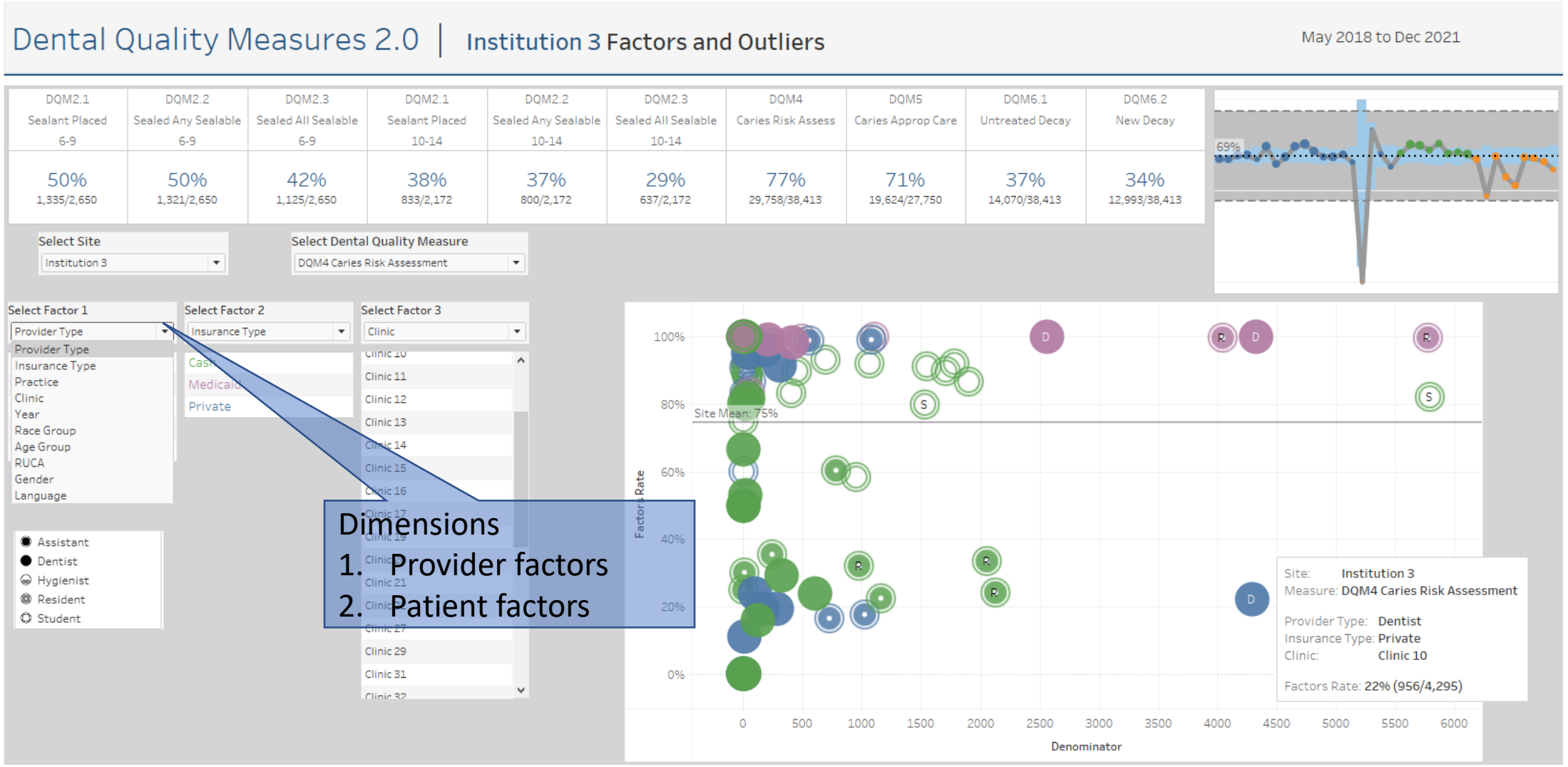

Factor Analysis – Level 1

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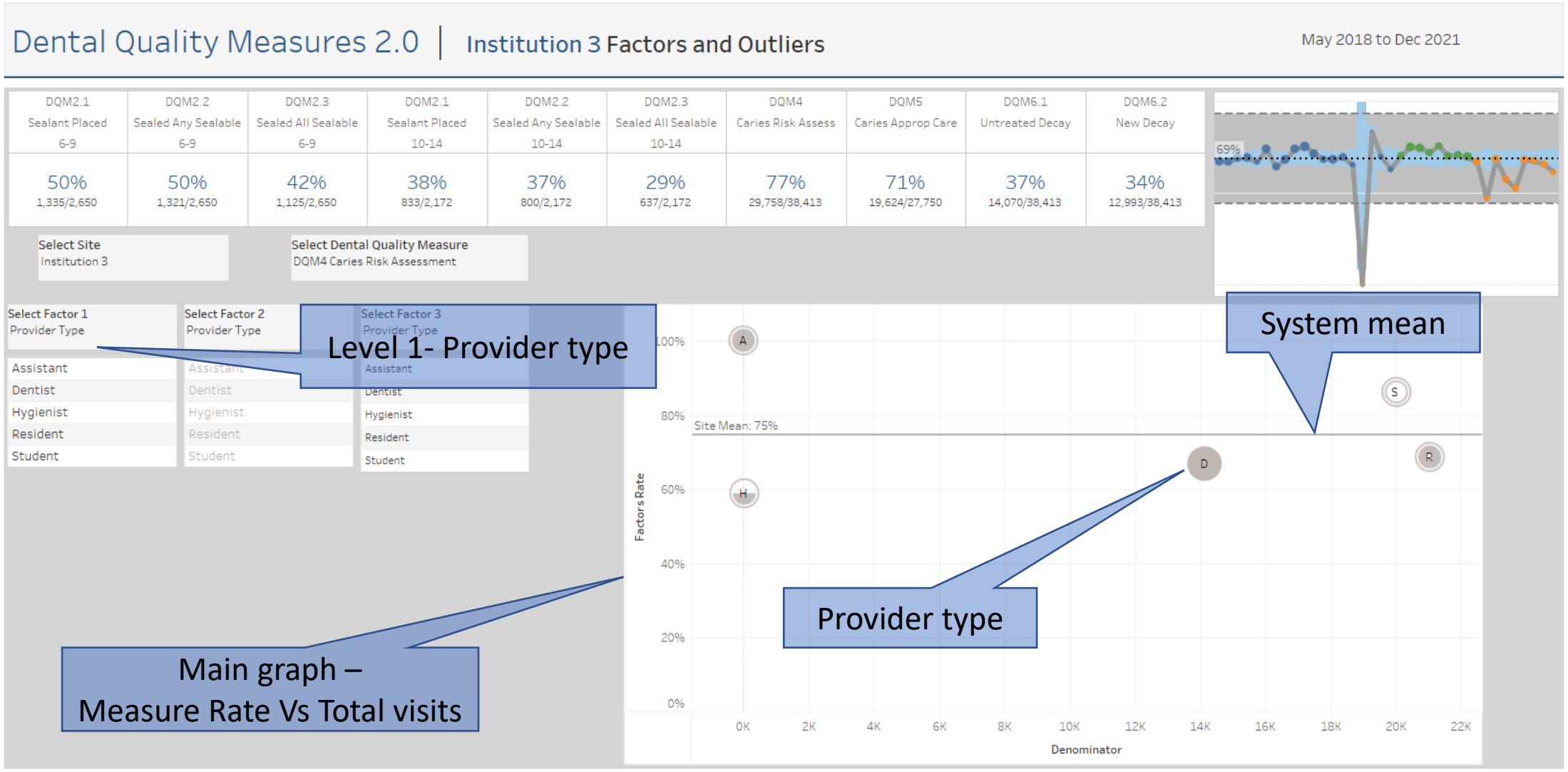

Factor Analysis – Level 2

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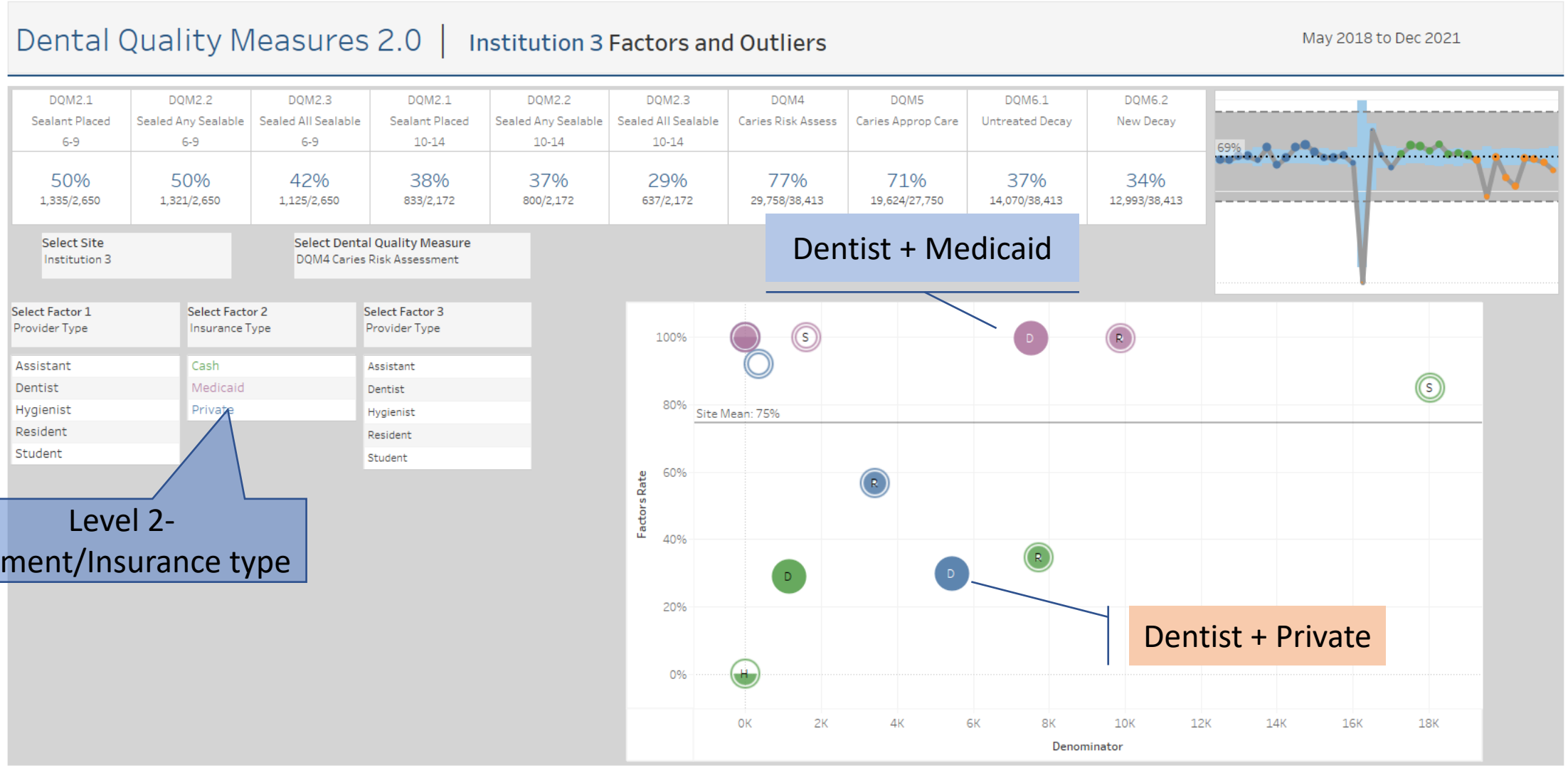

Level 2- Payment/Insurance type

Factor Analysis – Level 3

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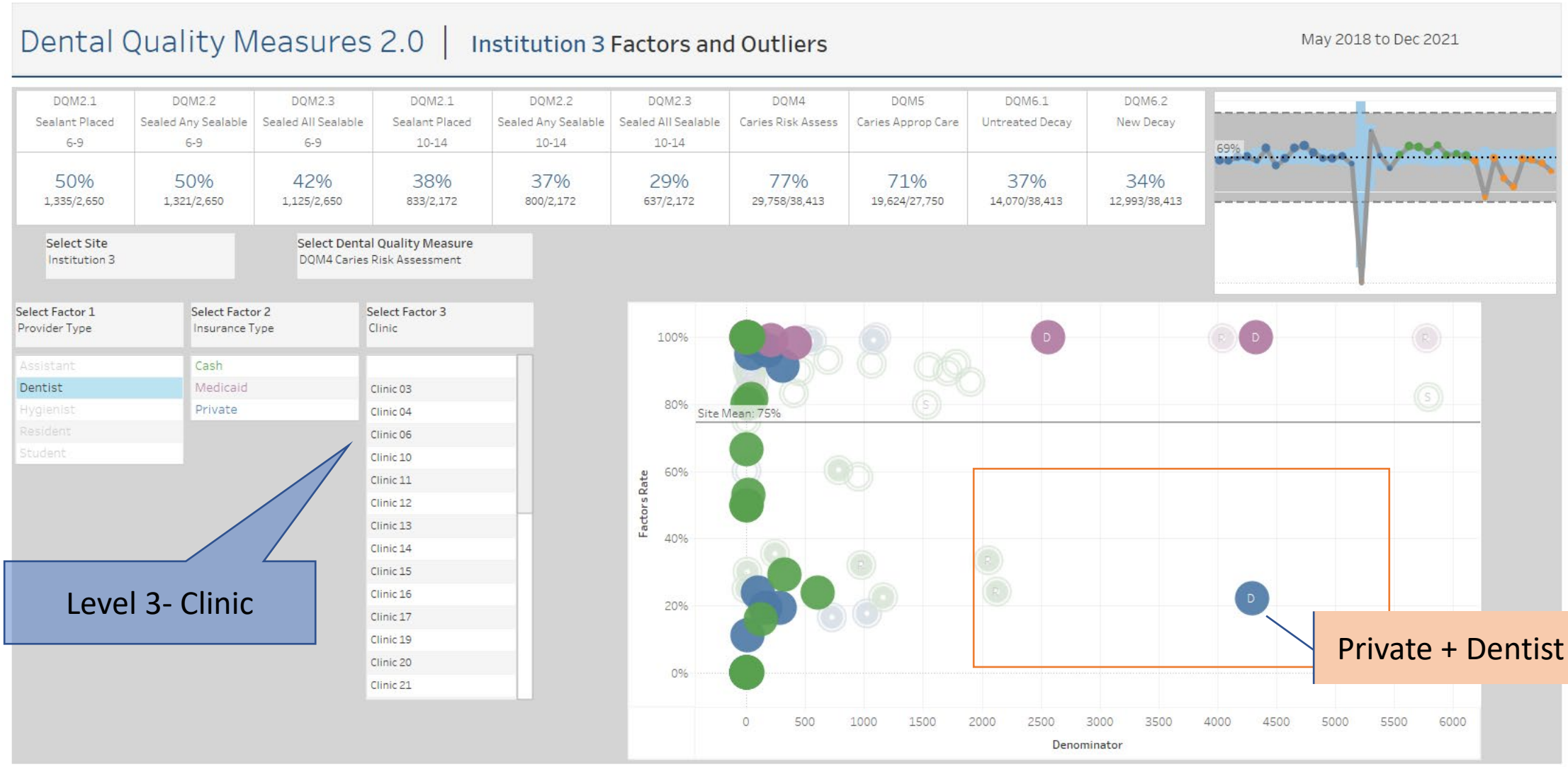
Texas Center for Oral Healthcare Quality and Safety



Outlier Analysis - Grouping

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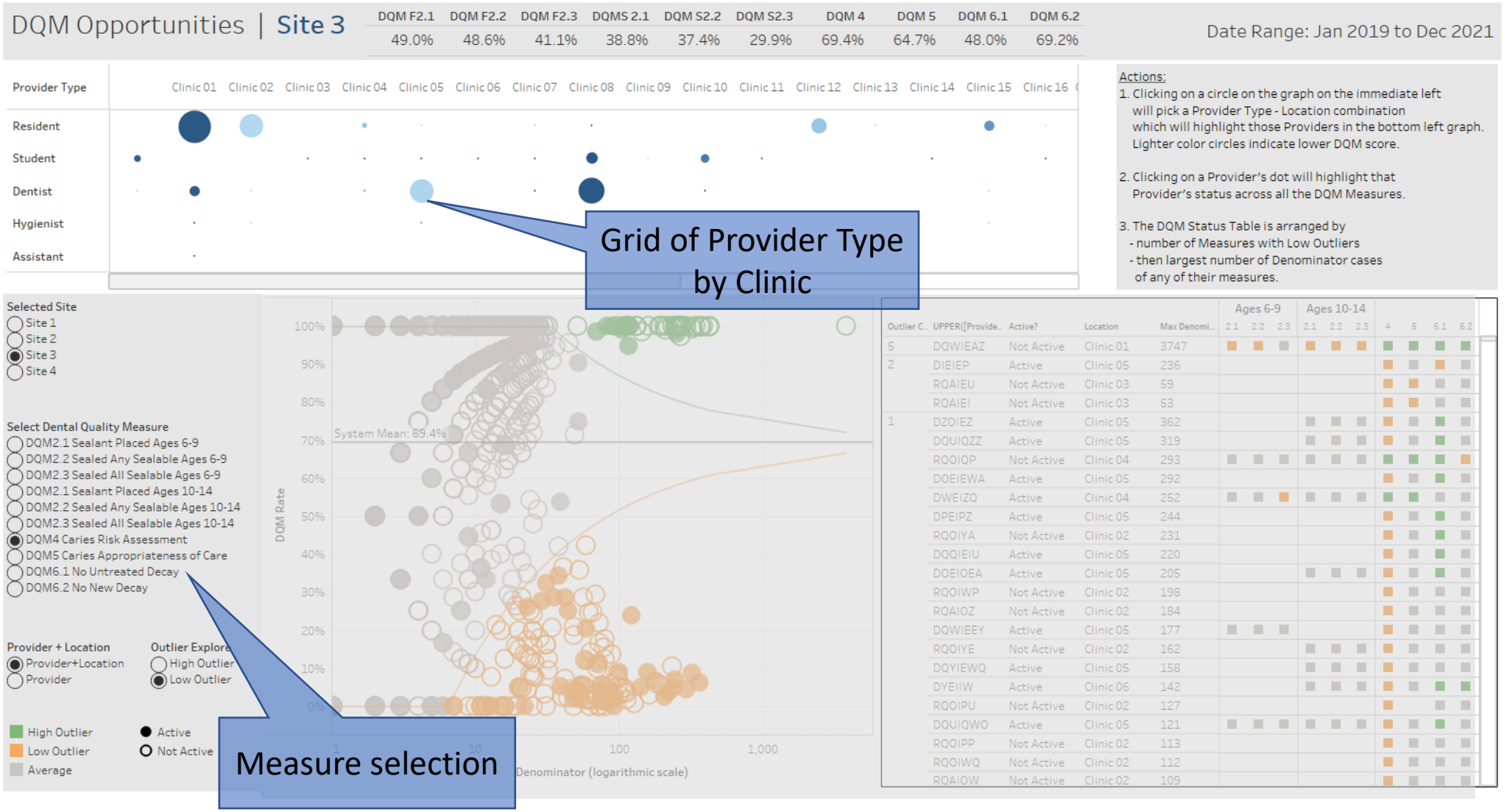

Outlier Analysis – Funnel Plot

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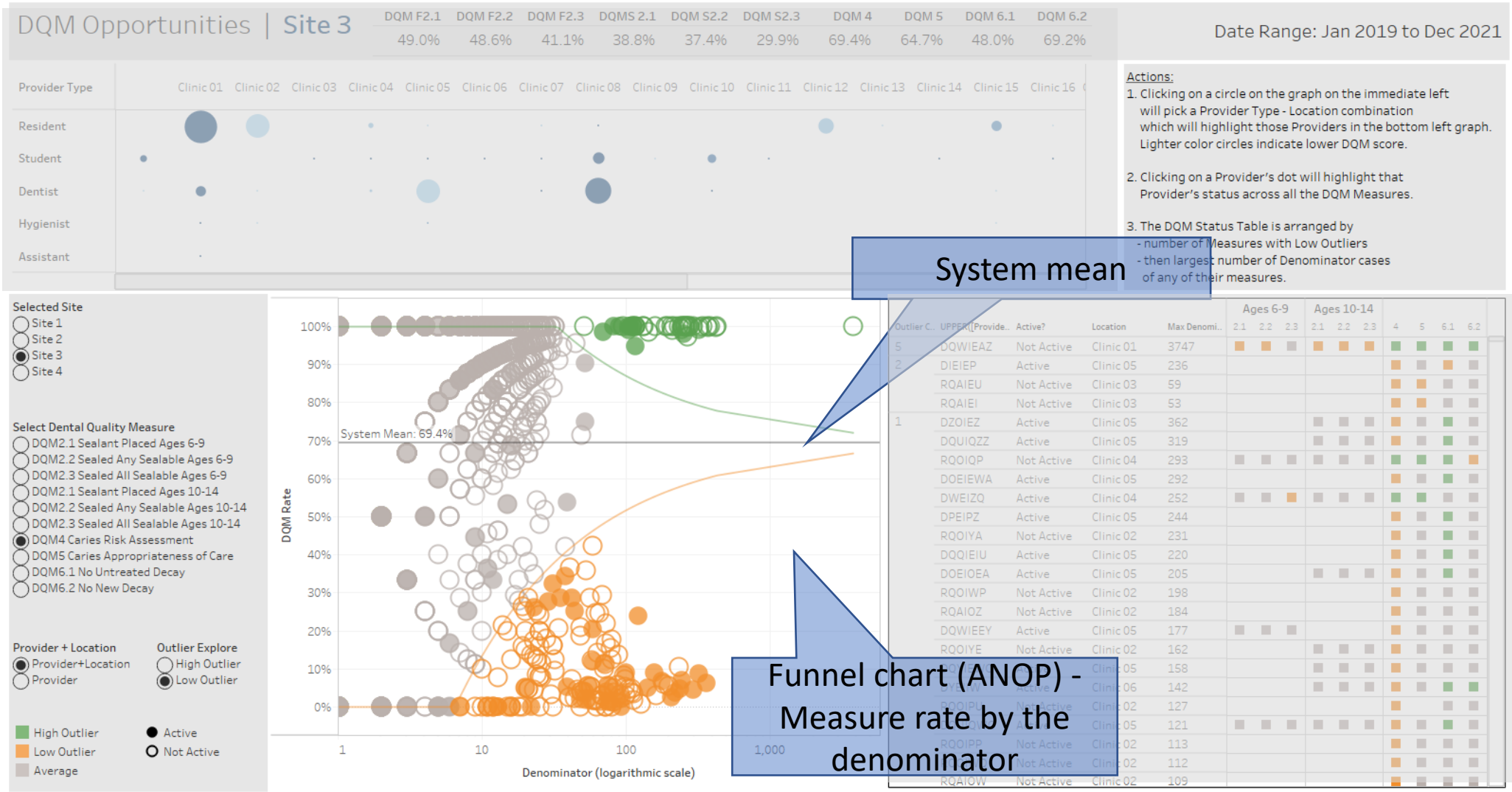

Outlier Analysis – Highlight Providers

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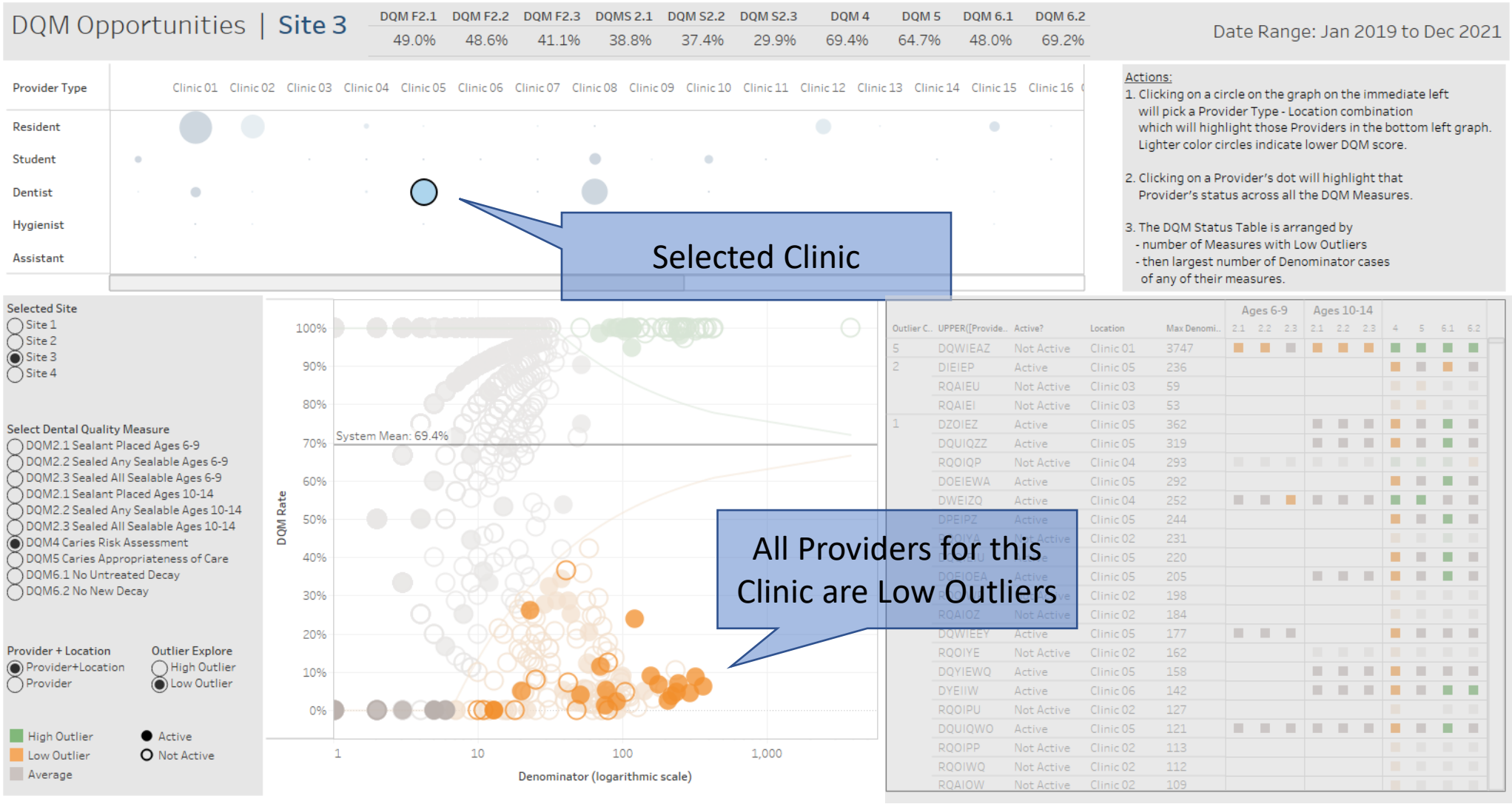

Outlier Analysis – Provider Details Table

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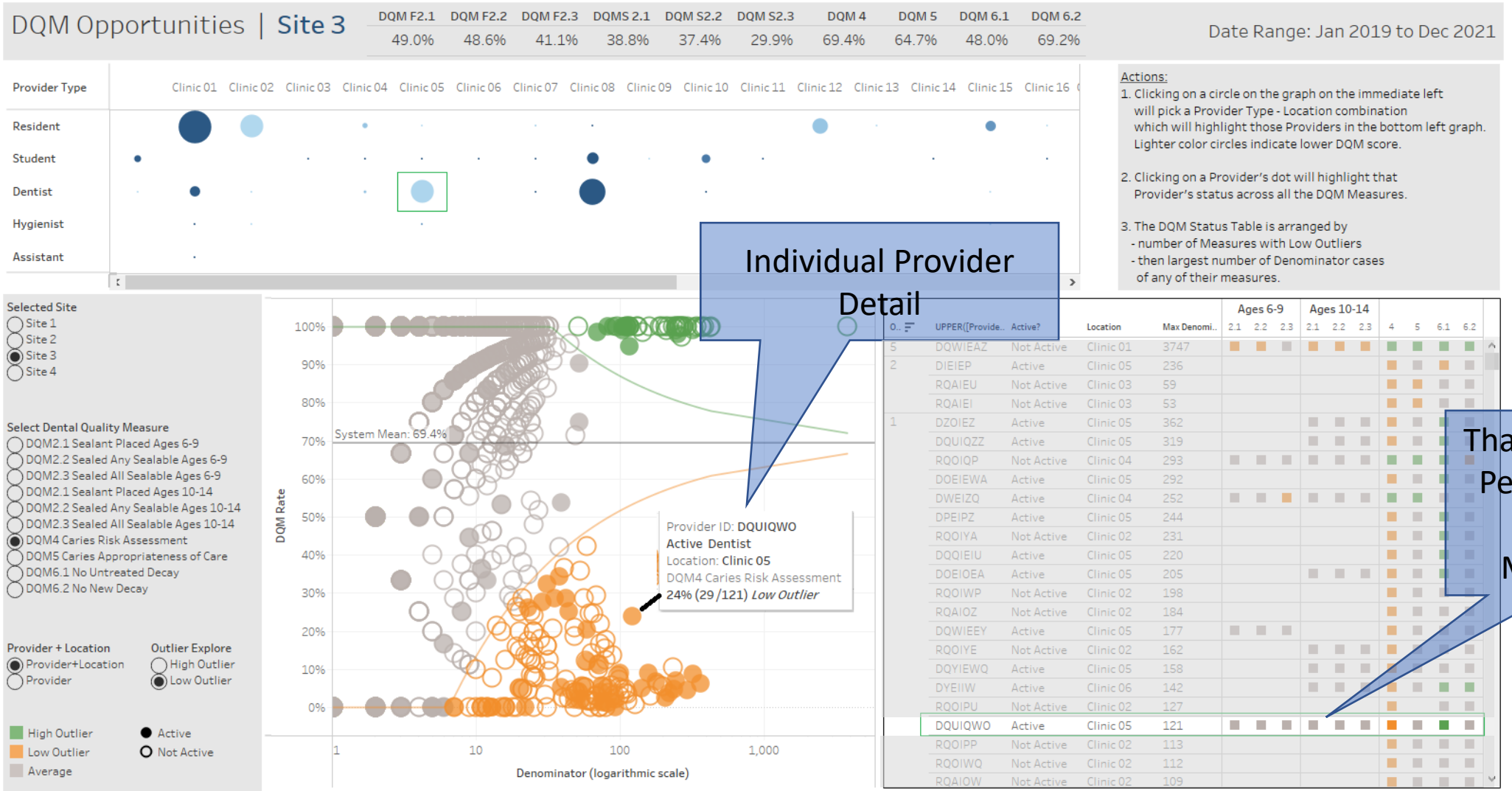


Measurement to Understanding

(What is the problem?)

- What are the quality issues related to caries management?
- What are the outcomes?

(What is the experience around the problem?)

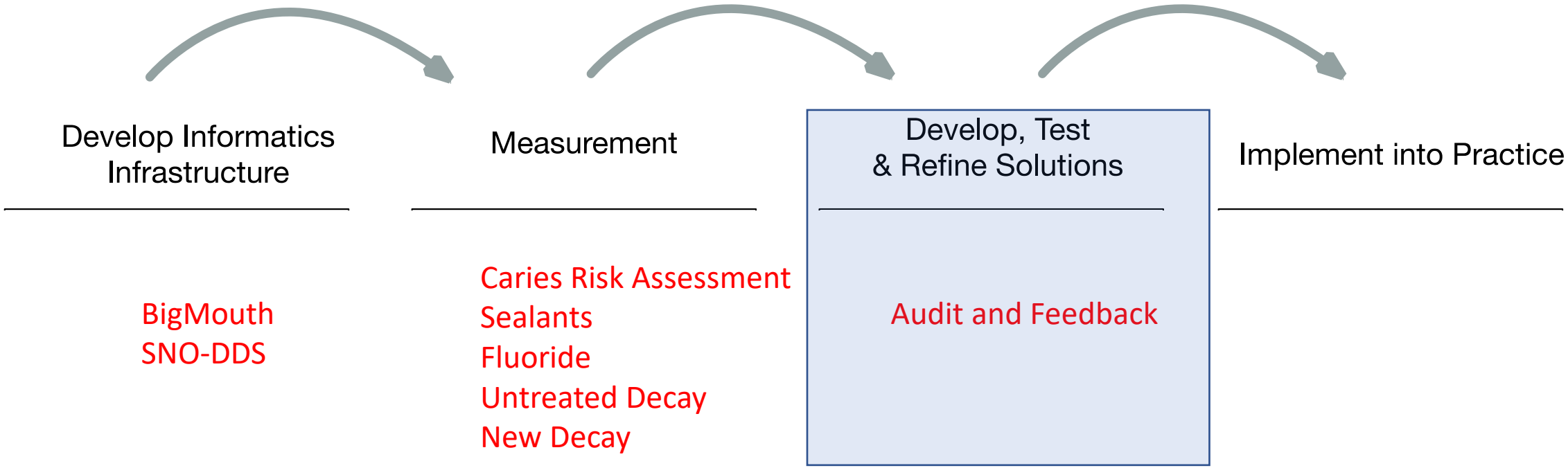
What are the human & system factors that contribute to the experience?

(How do we address the needs of patients, providers to deliver better outcomes?)

How might we improve quality of care?

Big Idea

- Every patient should receive person-centered, safe, effective, timely, efficient, and equitable **oral health care**

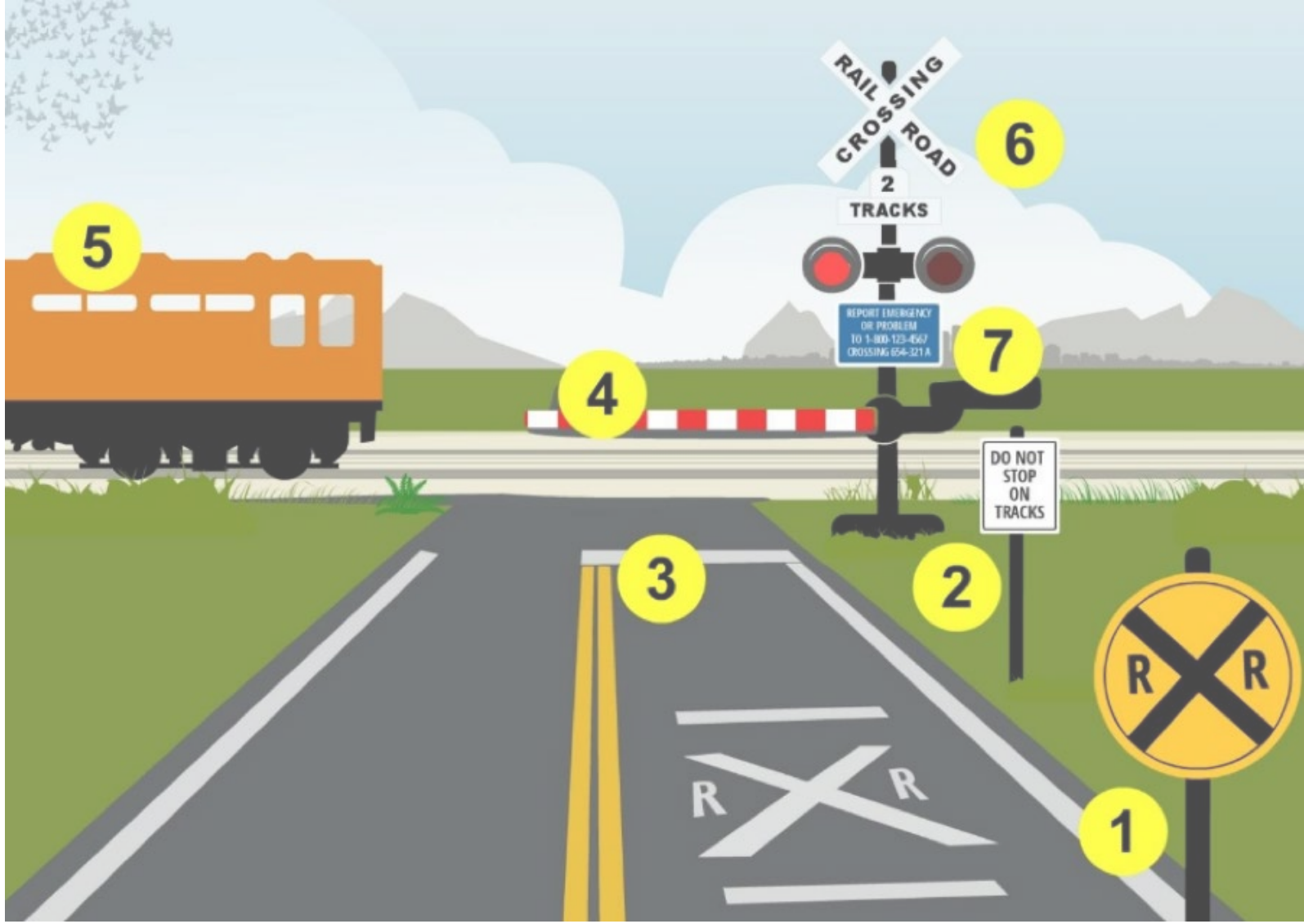


The Design of Everyday Things

Donald A. Norman


STOP
RAILROAD
CROSSING

1. Stop, look both ways, and listen. Remember that trains always have the right of way.
2. Make sure you have room to get across. Once you enter the crossing, keep moving.
3. Stop 15 feet away from flashing red lights, lowered gates, a signaling flagman or a stop sign.
4. Never try to drive around a lowering gate. Never ignore signals, and always use caution.
5. Before you begin to cross, wait for gates to fully rise and for all lights to stop flashing.
6. Never assume that there is only one train coming from a single direction.
7. If your car stalls on a rail track, quickly get everyone out - even if you don't see a train coming. Then, run away from the tracks and your car. Avoid running in the same direction that the train is coming, because you could be hit by flying debris if a train hits your car. When it's safe to do so, call the number on the blue Emergency Notification System sign. If the sign is not visible to you, call 911.



"Dentists should consider nonsteroidal anti-inflammatory analgesics as the first-line therapy for acute pain management." *

*Recommended by the American Dental Association (ADA), Centers for Disease Control and Prevention (CDC) and National Institute of Dental and Craniofacial Research (NIDCR)

Link to UTSD Guidelines on Opioid Prescribing

Dr. XXXXXX:

Your 3 month opioid prescribing rate is higher than your specialty's goal.
Your 15 month opioid prescribing rate is higher than your specialty's goal.

Your 3mo Rate	Your 15mo Rate	Oral Surgery Goal	Opioid Encounters	Total Encounters	Other Opioid Rxs
26.5%	32.1%	< 14.0%	50	156	0

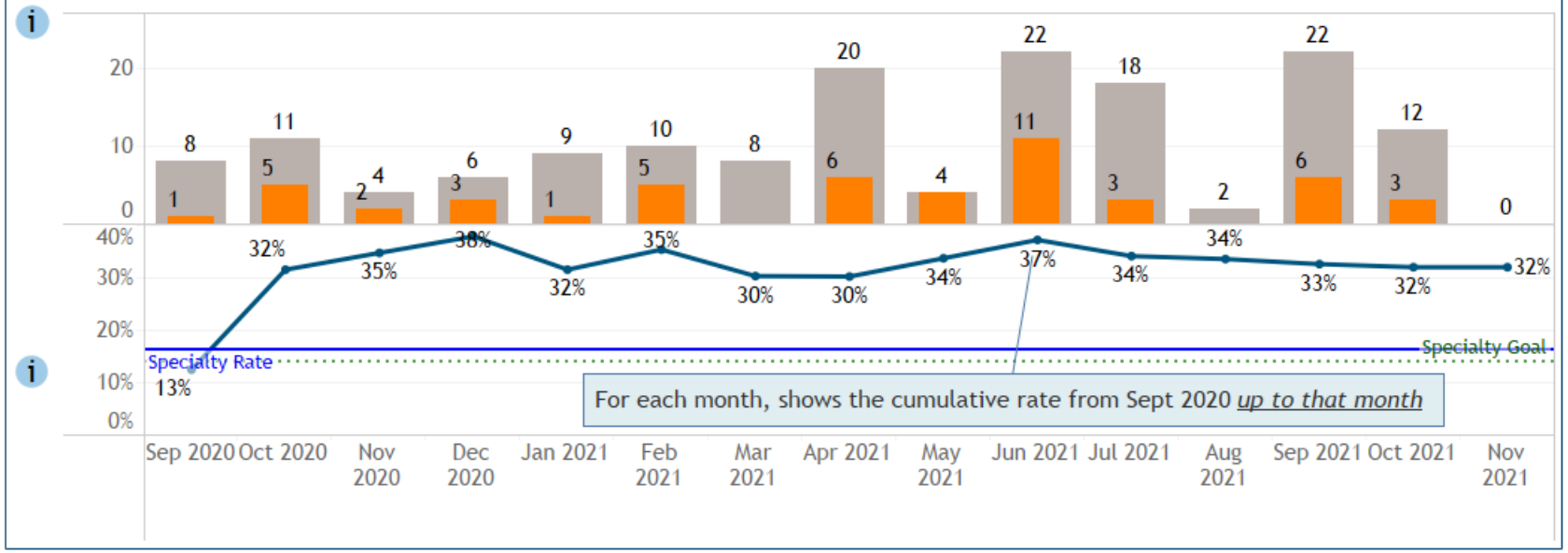
Click here to view
Opioid Prescribing Rates by Procedure Type

Your Opioid Prescribing

Opioid Prescribed during encounter, by month
All eligible encounters, by month

Encounter = Unique patient visit
Click on bars to see detail

The lower line graph: for each month, shows the cumulative percentage of encounters from the beginning (Sept 2020) up to that month



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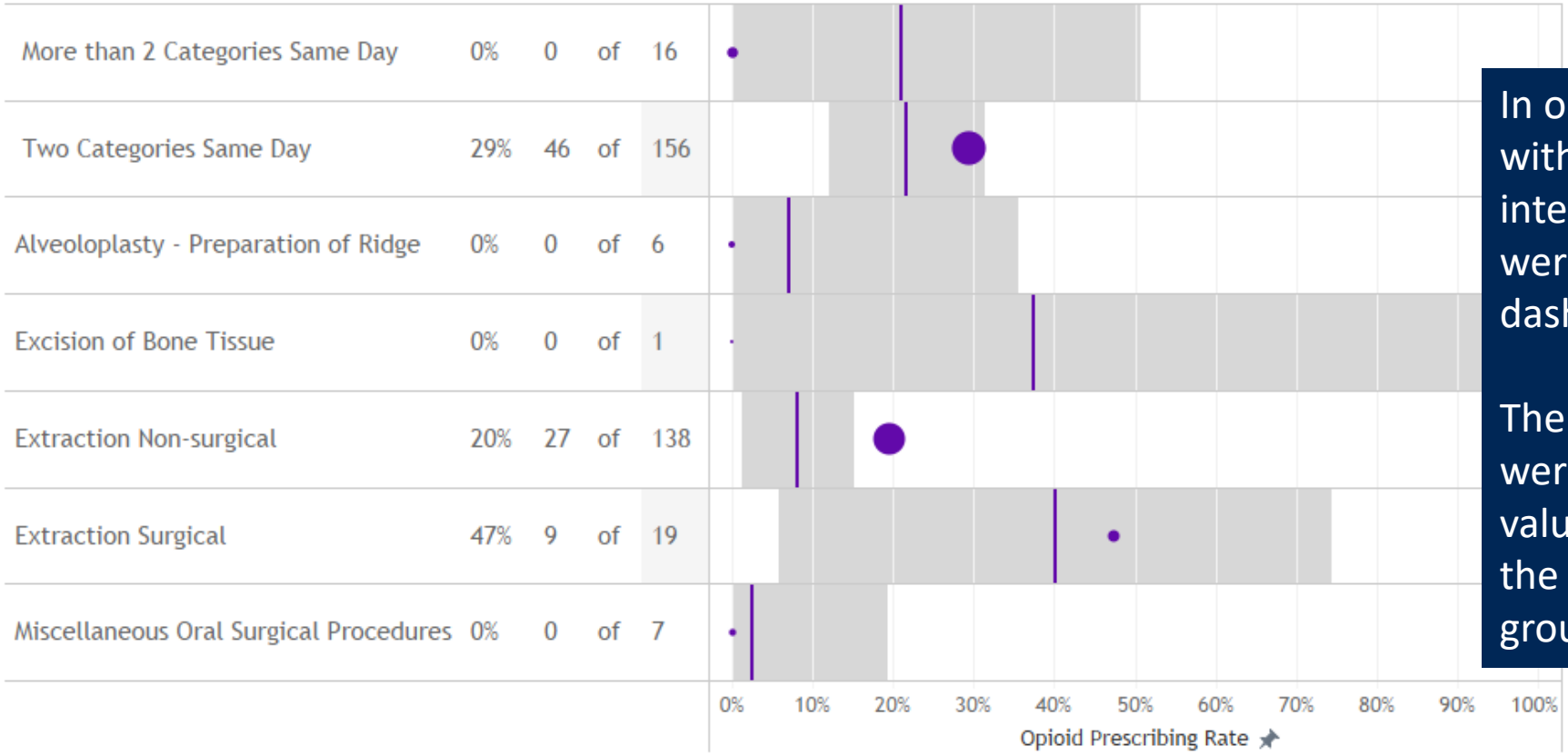
Opioid Prescribing Study: | Provider Overview | Encounter Details | **Procedure Details** | About | Navigation Tips

"Dentists should consider nonsteroidal anti-inflammatory analgesics as the first-line therapy for acute pain management." *

*Recommended by the American Dental Association (ADA), Centers for Disease Control and Prevention (CDC) and National Institute of Dental and Craniofacial Research (NIDCR)

Link to UTSD Guidelines on Opioid Prescribing

Category Prescribing Rate in Comparison to UTSD Oral Surgery Peers



In our pilot RCT at one academic site with 37 providers, we found an intervention effect when dentists were sent monthly prescribing dashboards.

The odds of prescribing an opioid were reduced by 72% (OR= 0.31, p-value < 0.00013, 95%CI: 0.16, 0.55) in the dashboard group vs the control group

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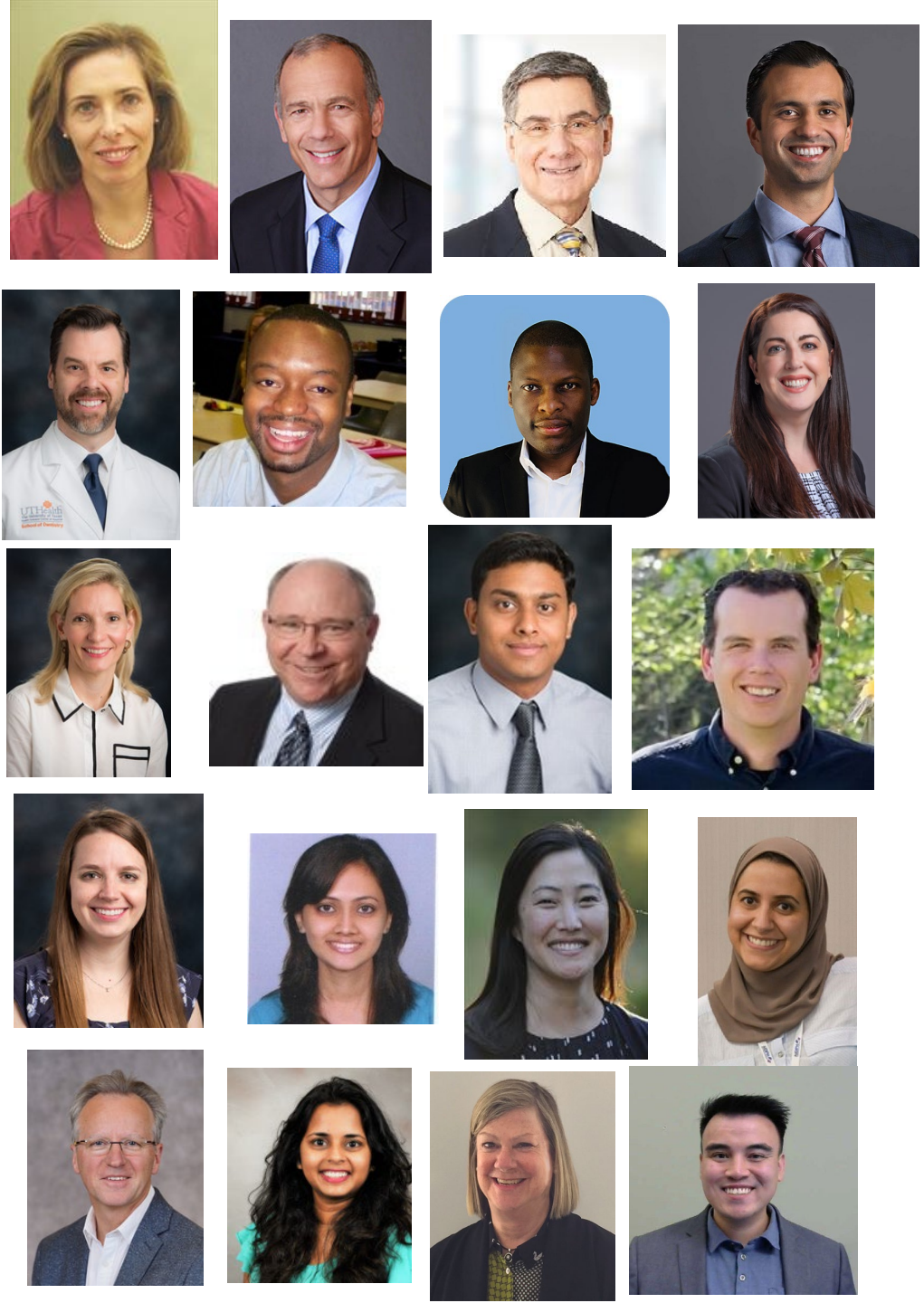

Acknowledgements

- **G08LM010075** (NLM): Development of an Inter-University Oral Health Research Database
- **R01DE021051** (NIDCR): A Cognitive Approach To Refine And Enhance Use Of A Dental Diagnostic Terminology
- **R01DE023061** (NIDCR): A Whole Systems Approach To Implementing Standardized Dental Diagnostic Terms
- **R01DE024166** (NIDCR): Implementing Dental Quality Measures in Practice

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Thank you!