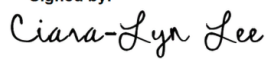**Power BI Dashboard Development for Clinical Documentation and Quality Monitoring**

By

Ciara-Lyn Lee

Submitted in fulfillment of the

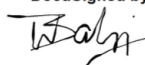BMI 6000: Practicum in Biomedical Informatics

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Faculty Signature

Date project submitted: August 6, 2025

Date project accepted: August 7,2025

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Summary

This capstone project aimed to design and develop an interactive Power BI dashboard for the Texas Center of Oral Healthcare Quality and Safety (TCOHQS) at The University of Texas Health Science Center at Houston (UTHealth Houston) School of Dentistry. The dashboard aimed to improve the visibility and tracking of clinical documentation completeness and quality-of-care metric compliance by leveraging structured data extracted from the Axium electronic health record (EHR) system. The project supports the intuition's shift from static, retrospective reporting to dynamic, real-time monitoring, enhancing its ability to implement continuous quality improvement (QI) initiatives.

The dashboard transforms the Quality Assurance Indices Review (QAIR) process into a reusable, automated visualization tool that is updated monthly. It enables monitoring of patient medical history updates, consent status, treatment planning documentation, caries risk assessments, fluoride application, periodontal exams, and radiographic documentation. Using calculated columns and DAX logic, the dashboard standardizes and scores documentation responses as compliant, non-compliant, or not applicable.

Users can filter data by dental class year and provider group, enabling tailored insights into student compliance patterns. This supports faculty efforts to monitor trends, identify documentation gaps, and implement targeted interventions. For example, the dashboard can reveal whether fourth-year students nearing graduation demonstrate improved documentation habits compared to their third-year counterparts. These insights can be used to adjust training or policy.

Ultimately, this project provides the School of Dentistry with a scalable informatics solution that enhances clinical oversight, supports student performance evaluation, and promotes data-driven decision-making to improve oral healthcare quality.

Introduction

Healthcare informatics in academic dental settings provides a unique opportunity to enhance clinical documentation practices, support performance tracking, and promote compliance with quality-of-care data. The University of Texas Health Science Center at Houston (UTHealth Houston) School of Dentistry's Quality Assurance Indices Review (QAIR) process previously relied on a static, manual annual report to review documentation trends. While this process provided insight into institutional performance, it lacked the frequency and interactivity required for timely intervention and continuous quality improvement (QI) initiatives.

In response, this capstone project was established to design and develop a dynamic Power BI dashboard that modernizes how documentation quality is monitored across clinical activities performed by dental students. Specifically, the dashboard tracks the completeness of critical clinical documentation elements dental students perform, including consent forms, active treatment plan, oral & maxillofacial (OMS) surgery, carries risk assessment (CRA) treatment plan, fluoride application, periodontal (perio) cleaning, recorded exam, CRA value, oral hygiene education, medical history, extraoral exam, intraoral exam, radiograph bitewings, period chart, perio therapy, and scaling and root planning (SRP) treatment. These components ensure comprehensive patient care and align student practices with institutional quality standards.

This work was conducted in collaboration with the Texas Center of Oral Healthcare Quality and Safety (TCOHQS) at UTHealth Houston School of Dentistry. The TCOHQS's mission is to promote high-quality oral healthcare through evidence-based research, safety innovation, and educational advancement to reduce errors and improve patient outcomes (UTHealth Houston School of Dentistry, n.d.). This project directly aligns with that mission by transforming the QAIR process into a dynamic, data-driven tool that leverages data to improve clinical performance and student education and enables more effective clinical oversight that supports the school's educational mission.

From a QI perspective, this dashboard provides a foundation for leveraging EHR data in actionable ways. Monthly updates allow for trend monitoring over time, enabling end-users to evaluate the impact of curriculum changes, policy updates, or targeted interventions. For example, if the school implements a documentation training initiative, the dashboard enables pre- and post-intervention analysis to determine whether it produced measurable improvements.

The ability to filter by graduation class and provider group adds a behavioral dimension to the data. Fourth-year students, who are approaching clinical sign-off and graduation, often demonstrate higher documentation completion rates. In contrast, third-year students may require additional motivation or support. These cohort-based insights inform faculty decisions on engaging and supporting learners at different stages in their training.

Ultimately, this project enhances institutional capacity for real-time quality monitoring and continuous improvement. It also establishes a reusable informatics infrastructure that can be expanded or adapted to future clinical and educational needs. It reinforces the UTHealth Houston School of Dentistry's commitment to quality, safety, and excellence in oral healthcare delivery.

Evidence-Based Practice Review

Informatics solutions have been increasingly adopted across healthcare settings to monitor, evaluate, and improve the quality of care. In dentistry, structured data captured in electronic health records (EHRs) is valuable for developing quality indicators and identifying clinical performance gaps. National organizations such as the Dental Quality Alliance (DQA) have emphasized the importance of consistent documentation and standardized quality measures to promote accountability and improve clinical outcomes. The completeness and quality of clinical documentation are essential components of safe, effective, and evidence-based dental care. There is increasing emphasis on leveraging EHR data to monitor clinical performance and identify areas for improvement. Several studies have demonstrated how structured data within dental EHRs can be leveraged for quality measurement and continuous improvement.

Mullins et al. (2021) assessed the completeness of periodontal disease documentation in EHR. The authors demonstrated how EHR-based quality measures can be used to evaluate documentation practices. Their study directly supports the methodology used in this practicum project, which utilizes Axium EHR data and Power BI to visualize documentation completeness. Their findings emphasize the need for consistent, structured documentation to identify gaps in care at dental institutions.

Brandon et al. (2023) described the development of EHR-derived quality measures in dental settings. Their work demonstrated the feasibility of extracting clinical data to generate actionable quality indicators across various domains. This reinforces the current project's focus on transforming raw EHR data into visual tools supporting quality monitoring and decision-making.

Patel et al. (2023) introduced automated algorithms to track periodontal disease progression using longitudinal EHR data. Their approach to automation offers a model for continuous monitoring of documentation and patient outcomes. Similarly, Tokede et al. (2022) advocated creating learning health

systems that transform real-time clinical data into tools for longitudinal quality improvement. This principle aligns directly with this dashboard's monthly auto-refresh and trend analysis capabilities.

Schwendicke and Krois (2022) introduced the concept of "data dentistry," which promotes the use of advanced analytics, dashboards, and artificial intelligence (AI) to improve dental care delivery. Their work provides a conceptual foundation for using visualization platforms like Power BI to enhance operational insight, clinical training, and documentation quality in academic environments.

This practicum dashboard builds on these findings by integrating multiple data elements essential to oral healthcare quality and transforming them into an automated, interactive platform. It supports longitudinal tracking of documentation completeness across student cohorts and provider groups, enabling end-users to identify gaps and trends in real time. Additionally, this project aligns with emerging best practices in academic dentistry. It fills a practical need for timely, visualized quality data supporting faculty feedback, student engagement, and institutional decision-making. The literature strongly supports the integration of EHR-based informatics tools to drive continuous improvement in clinical education and care delivery.

Learning Objectives and Expected Outcomes

The learning objectives for the practicum focused on supporting student development in applied biomedical informatics and quality improvement within an academic dental setting. Specific learning objectives included:

1. Apply informatics principles to evaluate clinical documentation completeness using EHR data.
2. Develop proficiency in Microsoft Power BI for data modeling, visualization design, and dashboard development.

3. Translate complex EHR datasets into accessible, actionable visual tools that support clinical quality monitoring and educational decision-making.

4. Develop and implement automated reporting workflows that enable longitudinal monitoring of documentation performance.

5. Collaborate with institutional stakeholders to ensure alignment with organizational quality assurance goals and priorities.

The expected outcomes of the practicum included the following deliverables:

1. A fully structured Microsoft Power BI dashboard integrated with de-identified data extracted from the Axium EHR system.

2. An automated process for monthly data updates to ensure real-time visibility of documentation completeness and compliance.

3. A group of interactive visualizations tracking trends in key quality indicators such as consent forms, active treatment plan, OMS surgery, CRA treatment plan, fluoride application, perio cleaning, recorded exam, CRA value, oral hygiene education, medical history, extraoral exam, intraoral exam, radiograph bitewings, period chart, perio therapy, and SRP treatment.

4. A reusable dashboard framework and accompanying DAX measure library to support future scalability and reporting enhancements.

5. Actionable institutional insights into documentation trends by graduation class and provider group, enabling targeted interventions and educational feedback.

Methods

Setting

This practicum project was conducted at the UTHealth Houston School of Dentistry in collaboration with the TCOHQS. The primary objective was to support clinical documentation monitoring by designing and developing an interactive dashboard using real-time data extracted from the dental school's EHR system.

Data Source

The data used for the dashboard were extracted from the Axium EHR system and consisted of a de-identified subset of patient records from January 2025. These data represented routine care delivered by dental students and included critical fields related to documentation completeness and quality-of-care indicators.

Data Preparation

The raw export was structured and de-identified in Microsoft Excel, then loaded into Microsoft Power BI for further transformation and analysis. Data preparation included renaming columns and using Power BI's *Transform Data, Add Column* and *Custom Column* tools to create new calculated fields. Text-based values were parsed so that compliant responses (e.g., "100%") were recoded as "1", non-compliant responses (e.g., "0%", "25%", "50%", "75%") were recoded as "-1", and values labeled "N/A", indicating an edentulous patient, were converted to null. These values were derived using Power Query calculations, transforming raw text entries from the Axium EHR (e.g., "100% - Patient has an active treatment plan") into numeric compliance indicators for aggregation.

Table 1 summarizes the EHR data processing steps, listing the original measure names, definitions, newly assigned field names used in Power BI, and the corresponding Power Query calculations. Not all variables were included in the final dashboard. For instance, fields like CHK_M and CHK_O through CHK_W were omitted as they were irrelevant to the documentation metrics tracked in this project.

Table 1. QAIR Dataset Measures, Definitions, and Power Query Calculations: This table defines each measure in the QAIR dataset and outlines the data transformations applied to support binary classification for dashboard development and analysis.

Initial EHR Measure	Definition	Revised EHR Measure	Power Query Calculation
Chart	Unique identifier for the patient chart	–	–
PtAg	Patient's age	–	–
Patient	Unique patient identifier	–	–
ExamDate	Date of dental exam	–	–
ExamC	Type of exam	–	–
Produce	Procedure code representing treatment or service provided	–	–
Pgroup	Assigned student provider group	–	–
GradC	Graduation year of dental student	–	–
NTE	Number of treatment encounters/visits	–	–
GENC	Indicates whether general consent is signed and on file	General_Consent	= if Text.Start([GENC], 4) = "100%" then "1" else "-1"
TXPL	Indicates if the patient has an active treatment plan	Active_TxPl	= if Text.Start([TXPL], 4) = "100%" then "1" else "-1"
CHK_A	Indicates if OMS consent is on file for all OMS procedures provided within the past 6 months	OMS_6mos	= if Text.Start([CHK_A], 4) = "100%" then "1" else "-1"
CHK_T	Indicates if CRA treatment plan has been updated	CRA_TxPl	= if Text.Start([CHK_T], 4) = "100%" then "1" else "-1"

	within the past 3 months		

CHK_F	Indicates if fluoride application has been completed	Fluoride	= if Text.Start([CHK_F], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_F], 3) = "N/A" then null
			
			    else "-1"

CHK_B	Indicates if perio cleaning has been completed	Perio_Cleaning	= if Text.Start([CHK_B], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_B], 3) = "N/A" then null
			
			    else "-1"

CHK_C	Indicates if exam has been recorded	Last_Exam	= if Text.Start([CHK_T], 4) = "100%" then "1" else "-1"

CHK_D	Indicates if CRA value has been updated recently	CRA_Updated	= if Text.Start([CHK_D], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_D], 3) = "N/A" then null
			
			    else "-1"

CHK_E	Indicates if oral hygiene education has been completed	Oral_Hygiene_Education	= if Text.Start([CHK_E], 4) = "100%" then "1" else "-1"
CHK_G	Indicates if medical history has been completed within the past 6 months	Medical_History	= if Text.Start([CHK_G], 4) = "100%" then "1" else "-1"

CHK_H	Indicates if radiographs are current	Last_Radiograph	= if Text.Start([CHK_H], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_H], 3) = "N/A" then null
			
			    else "-1"

CHK_I	Indicates if the patient has unapproved items	Unapproved_Items	= if Text.Start([CHK_I], 4) = "100%" then "1" else "-1"
CHK_J	Indicates if extraoral exam has been completed	Extraoral_Exam	= if Text.Start([CHK_J], 4) = "100%" then "1" else "-1"

	and approved within the past 12 months		
CHK_K	Indicates if intraoral exam has been completed and approved within the past 12 months	Intraoral_Exam	= if Text.Start([CHK_K], 4) = "100%" then "1" else "-1"

CHK_L	Indicates if radiograph bitewings are recorded and current	Radiograph_Bitewings	= if Text.Start([CHK_L], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_L], 3) = "N/A" then null
			
			    else "-1"

CHK_M	Indicates if plaque index on precision perio health care form was answered and approved	–	–

CHK_N	Indicates if perio chart was recorded	Perio_Chart	= if Text.Start([CHK_N], 4) = "100%" then "1"
			
			    else if Text.Start([CHK_N], 3) = "N/A" then null
			
			    else "-1"

CHK_O	Indicates if perio condition MOBIL has been charted within the past 14 months	–	–
CHK_P	Indicates if perio condition FURC has been charted within the past 14 months	–	–
CHK_Q	Indicates if perio condition GM-MGJ has been charted within the past 14 months	–	–
CHK_R	Indicates if perio condition ATTACH	–	–

	has been charted within the past 14 months		
CHK_S	Indicates if perio condition FGM has been charted within the past 14 months	–	–
CHK_U	Indicates if perio condition BLEED has been charted within the past 14 months	–	–
CHK_V	Indicates if perio condition POCKET has been charted within the past 14 months	–	–
CHK_W	Indicates if perio condition PROG has been charted within the past 14 months	–	–
CHK_X	Indicates if perio therapy has been completed and reported	Perio_Therapy	= if Text.Start([CHK_X], 4) = "100%" then "1" else if Text.Start([CHK_X], 3) = "N/A" then null else "-1"
CHK_Y	Indicates if patient received SRP treatment and had appropriate follow-up	SRP_Treatment	= if Text.Start([CHK_Y], 4) = "100%" then "1" else "-1"

Data Transformation and Reshaping

Once the transformed values were created, the dataset was reshaped using the *Unpivot Columns*

feature under the *Transform* tab in Power BI. This step generated two columns: Attribute and Value,

where each row represents a student's status for a specific documentation metric.

Three key calculations were created using DAX:

- **Numerator:** The count of compliant (1) or non-compliant (-1) responses per attribute.

- **Denominator:** The total number of valid responses per attribute, excluding null values.

- **Rate:** The percentage of compliant (or non-compliant) documentation, calculated by dividing the numerator by the denominator.

Table 2. QAIR Documentation Compliance Measures and DAX Scoring Logic: This table describes the logic used to assign numerical scores to documentation measures in the QAIR dataset using Power BI's DAX language. Scores were standardized as follows: "1" = compliant, "-1" = non-compliant, and null = not applicable (e.g., edentulous patients). These values supported calculating monthly compliance rates by graduating class and provider group.

Measure	Definition	DAX Calculation
Numerator	Number of compliant (Value = 1) or non-compliant (Value = -1) responses for each attribute, representing each documented response for the measure.	= CALCULATE(COUNTROWS('Jan25'), FILTER(ALLEXCEPT('Jan25','Jan25'[Attribute]), 'Jan25'[Value] = SELECTEDVALUE('Jan25'[Value])))
Denominator	Number of all reported responses (Value = 1 or -1), excluding nulls (e.g., edentulous patients), for each attribute, representing the total number of students assessed for the measure within the reporting month and year.	= CALCULATE(COUNTROWS('Jan25'), FILTER(ALLEXCEPT('Jan25','Jan25'[Attribute]), 'Jan25'[Value] IN {1, -1}))
Rate	Percentage of compliant or non-compliant responses.	= (DIVIDE([Numerator], [Denominator]))

Dashboard Development

Microsoft Power BI was used to build a dynamic and interactive dashboard to assess and visualize documentation quality metrics across the UTHealth Houston School of Dentistry. The dashboard was developed to monitor compliance with quality-of-care indicators documented in the Axium EHR system.

A custom color palette was implemented in Power BI by manually entering hex codes from the Tableau Color Blind 10 Palette to enhance visual accessibility. The colors used were: #1170aa, #fc7d0b, #a3acb9, #57606c, #5fa2ce, #c85200, #7b848f, #a3cce9, #ffbc79, and #c8d0d9.

Key features of the Power BI dashboard include:

- **Custom Visualizations and Performance Tracking:** Stacked horizontal bar charts display compliance rates by graduating class and provider group for each measure. Time-series line charts track monthly compliance trends, enabling stakeholders to monitor performance over time and identify areas for improvement.

- **Interactive Filtering:** Users can filter the dashboard by month/year, documentation measure (e.g., General_Consent, Active_TxPl, OMS_6mos, CRA_TxPl), graduating class (e.g., DS2025, DS2026, DS2027), and provider group (e.g., BLUE, GREEN, RED, YELLOW) to enable targeted analysis of compliance gaps.

- **Compliance Scoring Logic:** Each quality measure is scored using the following scale:

    - 1 = Compliant (e.g., 100%)

    - -1 = Non-compliant (e.g., 0%, 25%, 50%; representing incomplete, overdue, or missing cases)

    - **Blank/null** = Not applicable (e.g., edentulous patients)

- **Automated Monthly Data Refresh:** The dashboard is linked to a shared Excel source file generated by the Axium QAIR report. Once connected and published to the Power BI Service, it is scheduled to auto-refresh monthly as new data is uploaded, supporting near real-time monitoring of documentation compliance.

- **Embedded Measure Definitions:** To enhance usability and transparency, definitions for the numerator, denominator, and compliance rate calculation logic are embedded within the dashboard and updated alongside the visualizations.

The visual design focused on clarity, comparability, and alignment with institutional priorities for documentation quality. The ability to filter by graduation class supports cohort-level accountability, while provider group filters enable faculty teams to monitor and mentor their assigned students effectively.

The primary end users of the dashboard include clinical faculty, quality assurance personnel, and academic administrators at UTHealth Houston School of Dentistry. Faculty can use the dashboard to evaluate documentation completeness by provider group and class year, supporting more targeted feedback during clinical instruction. Quality improvement staff monitor ongoing compliance with documentation standards, while administrators can leverage these insights to inform curriculum design, accreditation preparation, and institutional reporting. The dashboard delivers role-specific, actionable insights by tailoring visualizations and filters to each group's responsibilities.

This tool is intended to support operational leadership and clinical educators in identifying documentation patterns that may require intervention, education, or workflow redesign.

Results

The resulting Power BI dashboard effectively visualizes documentation completeness and quality-of-care metrics derived from the Axium EHR system. It was developed to support compliance tracking at individual and cohort levels. Each measure is scored automatically using predefined logic: a value of 1 indicates compliance, -1 denotes non-compliance, and null represents "Not Applicable" (e.g., edentulous patients who are excluded from certain dental measures).

The dashboard offers a range of functionalities, including custom visualizations, interactive filtering by month/year, measure, graduating class, and provider group, real-time performance tracking, and embedded definitions for each measure. To enhance accessibility and ensure consistency with design best practices, a custom color palette was applied using hex codes from the Tableau Color Blind 10 Palette. These colors were manually configured in Power BI to support inclusive interpretation

While the dashboard is populated with sample data for development and privacy purposes, it is fully structured to ingest live monthly exports from the QAIR report. Upon deployment, the dashboard will refresh automatically as new data becomes available, enabling timely monitoring and intervention.

Figures 1 through 4 display selected views from the dashboard, including cohort compliance rates, measure-specific distributions, and interactive slicers. These visuals demonstrate the dashboard's clarity, adaptability, and utility as a quality improvement tool within the clinical education environment.
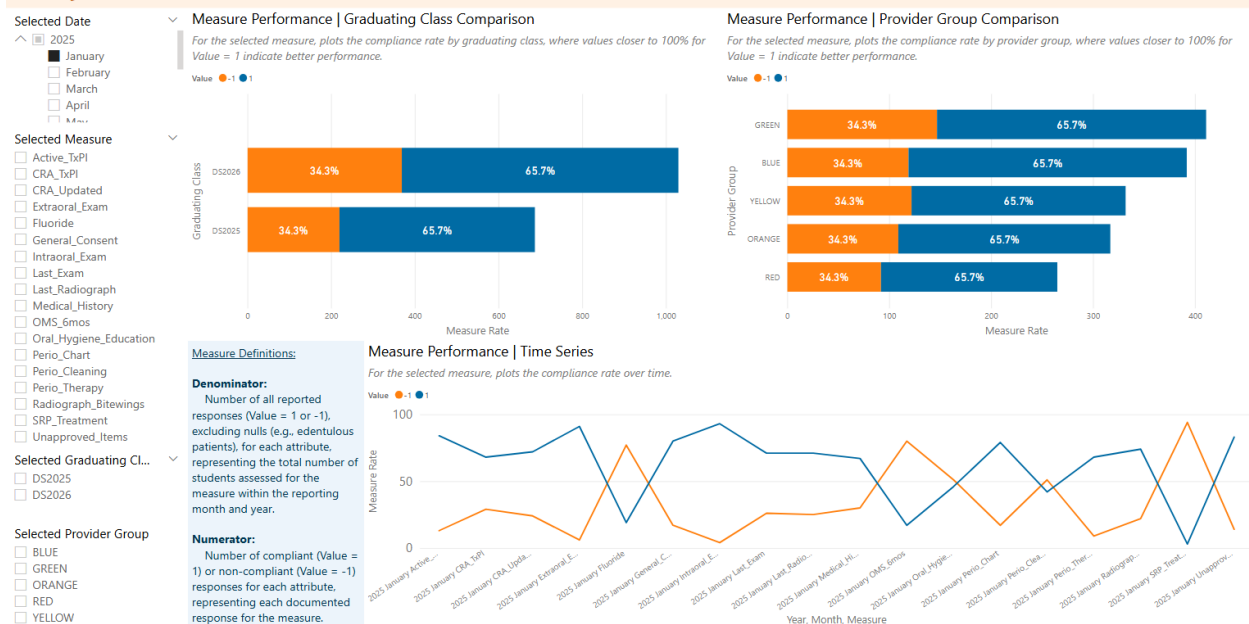
Figure 1. Quality Assurance Indices Review (QAIR) Dashboard – Overview: This figure provides an overview of the interactive Power BI dashboard developed to monitor documentation completeness and quality-of-care compliance metrics extracted from the Axium EHR system. Key features displayed include comparison of measure performance by graduating class and provider group, a time series trend for compliance rates, and interactive slicers for date, measure, provider group, and class year. The layout supports targeted analysis and promotes transparency in clinical education quality tracking.

Note: The data displayed has been intentionally altered to ensure privacy protection and HIPAA compliance. The percentages and values do not reflect actual student or clinical documentation
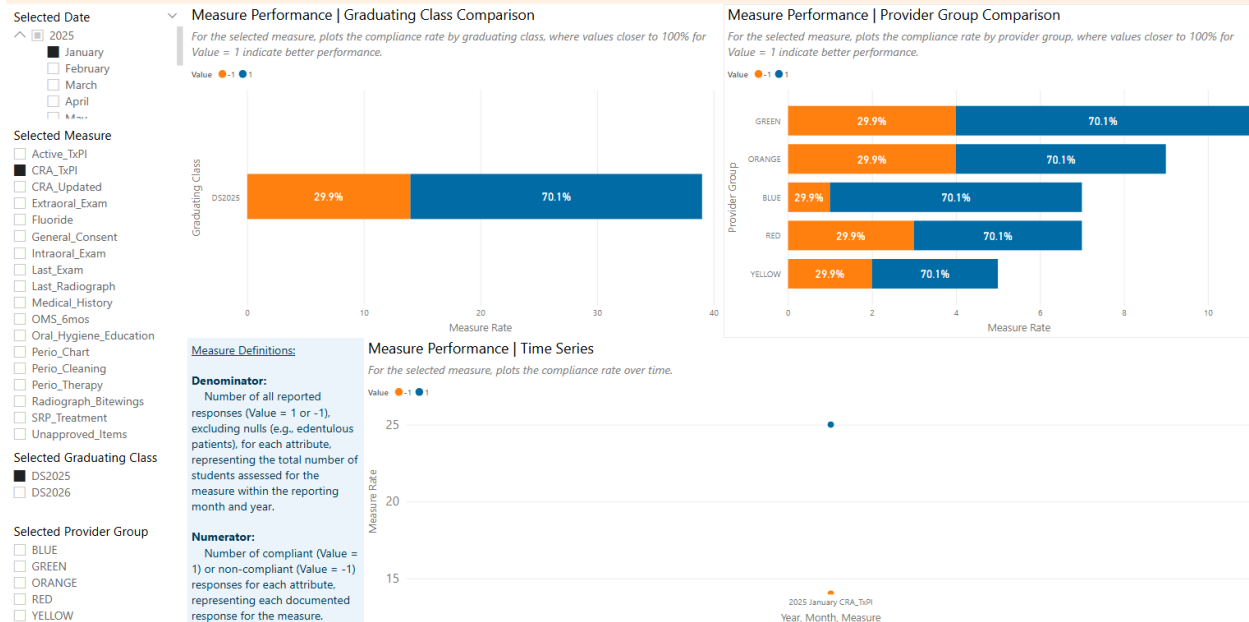
performance.

Figure 2. Compliance Performance for January 2025, CRA_TxPl, DS2025: This figure displays

compliance performance for the CRA_TxPl measure in January 2025, filtered for the DS2025

graduating class. No provider group was selected, allowing for a whole cohort view. The bar charts

compare compliant (Value = 1) and non-compliant (Value = -1) documentation rates across the

graduating class and provider groups. The line chart visualizes this measure's compliance trend over

time. DS2025 demonstrated a compliance rate of 70.1%, with a corresponding non-compliance rate of

29.9%, providing a baseline for targeted quality improvement efforts.

Note: The data displayed has been intentionally altered to ensure privacy protection and HIPAA

compliance. The percentages and values do not reflect actual student or clinical documentation
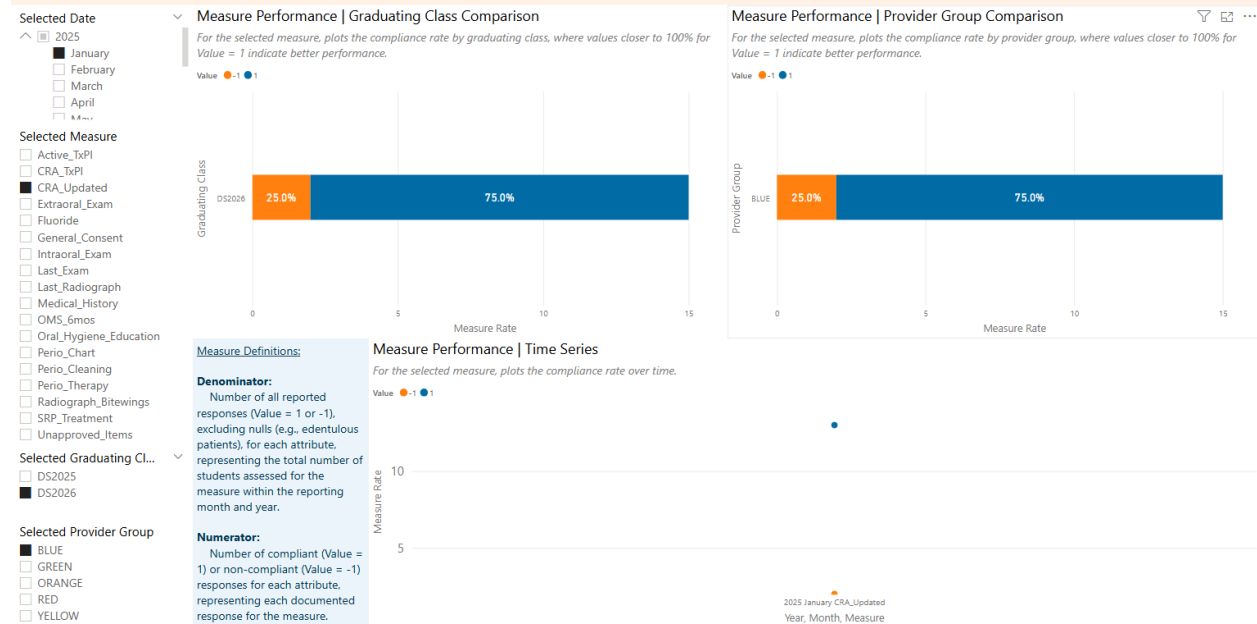
performance.

Figure 3. Compliance Performance for January 2025, CRA_Updated, DS2026, Blue: This figure presents

the compliance results for the CRA_Updated measure in January 2025, filtered by the DS2026

graduating class and the Blue provider group. The charts display a compliance rate of 75.0% and a

non-compliance rate of 25.0%, as shown in both class and provider group comparisons. The time series

chart confirms consistent performance for this measure during the selected month.

Note: The data displayed has been intentionally altered to ensure privacy protection and HIPAA

compliance. The percentages and values do not reflect actual student or clinical documentation
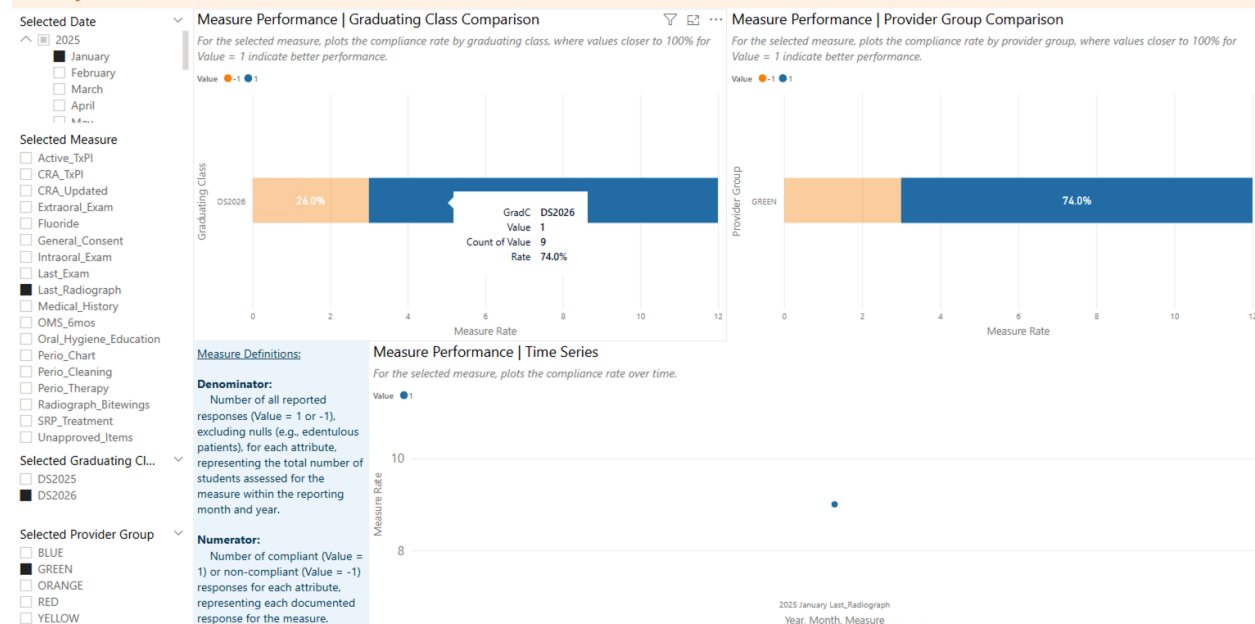
performance.

Figure 4. Compliance Performance Featuring Tooltip for January 2025, Last_Radiograph, DS2026, Green: This figure displays compliance performance for the Last_Radiograph measure in January 2025, filtered by the DS2026 graduating class and the Green provider group. It highlights the tooltip functionality, which enables users to access detailed contextual information by hovering over data points. In this example, the tooltip reveals that the selected group had a 74.0% compliance rate (Value = 1) for the measure. This interactive feature enhances usability by supporting real-time exploration and interpretation of performance metrics.

Note: The data displayed has been intentionally altered to ensure privacy protection and HIPAA compliance. The percentages and values do not reflect actual student or clinical documentation performance.

Discussion

This practicum project demonstrated the successful design and implementation of an interactive Power BI dashboard to monitor documentation completeness and quality-of-care metrics using EHR data at an academic dental institution. When compared with findings from the literature, several methodological and functional consistencies were recognized, alongside unique contributions specific to this project.

A key similarity lies in using structured EHR data for documentation quality assessment. Mullins et al. (2021) evaluated the completeness of periodontal disease documentation, highlighting the challenges associated with inconsistent data entry across users. These same challenges were encountered in this project when categorizing text-based documentation fields and values used throughout the dataset. This reinforces existing literature advocating for standardized clinical documentation to support meaningful and reliable quality measurement.

Similarly, the current dashboard aligns with the findings of Brandon et al. (2023), who demonstrated how EHR data could be repurposed into institution-level quality indicators. The interactive visualizations developed in this project further enhance that concept by making data more accessible, timely, and actionable for end-users. Both projects show that documentation data can be repurposed as powerful tools for performance monitoring and education.

Automation and longitudinal monitoring were highlighted by Patel et al. (2023) and Tokede et al. (2022) as foundational elements of learning health systems, which are also fully integrated into this dashboard. The automated design of this dashboard directly supports this principle by enabling longitudinal analysis without requiring manual updates. Monthly data updates and cohort-based filtering allow users to track documentation behavior over time by graduating class and provider group for timely interventions and feedback loops. This parallels Patel et al. (2021)'s emphasis on dynamic, behavior-sensitive indicators.

Schwendicke and Krois (2022) introduced the concept of "data dentistry," which emphasizes using analytics and dashboards to drive operational and clinical improvements. The authors framed these informatics applications as part of a broader shift where analytics dashboards become routine tools in clinical practice. This practicum project reflects that shift by embedding data literacy and visual tools into quality assurance processes at the institutional level.

Unlike most prior studies focusing on a single clinical domain (e.g., periodontal care or caries risk assessment), this project adopted a multi-domain approach. The dashboard includes as consent forms, active treatment plan, OMS surgery, CRA treatment plan, fluoride application, perio cleaning, recorded exam, CRA value, oral hygiene education, medical history, extraoral exam, intraoral exam, radiograph bitewings, period chart, perio therapy, and SRP treatment to offer a holistic view of documentation quality in patient records.

One notable distinction is the emphasis on cohort-based analysis. While previous research has largely overlooked class-year comparisons in dental education, this project's ability to compare trends across graduating cohorts offers an innovative approach. For example, documentation completeness was consistently higher among fourth-year students, likely due to impending graduation requirements. This insight can inform educational strategies aimed at earlier engagement and documentation training for third-year students.

Finally, this project contributes a practical, end-to-end implementation model from raw EHR data extraction to dashboard deployment. Although many articles advocate EHR-based dashboards, few offer concrete examples of backend data transformation and automation. This project bridges that gap and demonstrates how informatics solutions can be operationalized within an academic setting.

Conclusion

This practicum successfully applied biomedical informatics principles to design and deploy a Power BI dashboard that visualizes clinical documentation completeness and quality-of-care metrics among dental students at UTHealth Houston School of Dentistry. By transforming static QAIR reports from the Axium EHR system into dynamic, auto-populated visualizations, the project strengthened the institution's capacity for real-time monitoring, quality improvement, and educational alignment.

One of the most impactful features of the dashboard is its ability to filter compliance metrics by graduating class and provider group. This functionality revealed clear trends in documentation behavior, which were most notably, that compliance rates tend to increase as students approach graduation. These findings suggest that greater transparency and targeted educational interventions may help improve documentation practices earlier in students' clinical training.

A key takeaway from the development process was the importance of designing the dashboard with diverse end-users in mind. Early feedback from faculty highlighted the need for quick access to relevant metrics and intuitive filtering options to support clinical instruction. End-user feedback included prioritized features that enabled longitudinal tracking and cohort-level comparisons. These insights directly influenced the final layout and interactivity of the dashboard, underscoring the importance of user-centered design in informatics projects.

Ultimately, this tool empowers quality assurance teams to make informed, data-driven decisions, supports ongoing monitoring of documentation practices, and lays the foundation for evaluating future quality improvement interventions. It directly supports the mission of the TCOHQS by advancing data-informed strategies to improve clinical documentation, student engagement, and patient care outcomes.

Lessons Learned

- **Data Cleaning and Standardization**: One of the most time-intensive components of this project involved recoding inconsistent, non-standardized EHR fields into structured categories suitable for analysis. This emphasized the importance of uniform data entry practices and the need for standard documentation templates in clinical systems.

- **Automation and Reusability**: Designing reusable Power Query and DAX calculations enabled scalable monthly updates and streamlined future reporting. This experience underscored the value of planning for long-term sustainability in dashboard development.

- **User-Centered Design**: Early feedback from end users, such as Quality Coordinators, highlighted the importance of intuitive slicers, clear labels, and meaningful visuals. Designing with the end user in mind significantly improved the dashboard's usability and adoption potential.

- **Behavioral Insights**: Incorporating cohort-based filters revealed valuable insights into documentation behaviors by graduating class and provider group. These findings point to opportunities for earlier intervention to support student documentation performance.

Future Work and Recommendations

- **Expand Data Fields**: Future dashboard versions could incorporate additional quality metrics, such as this project's omitted CHK_M and CHK_O through CHK_W fields. While this project focused on the appropriateness of periodontal chart completion and diagnosis, the infrastructure supports expansion.

- **Incorporate Benchmarking**: Establishing performance benchmarks by provider group or dental class year would help set documentation targets and track progress over time, encouraging accountability and competition.

- **Develop Role-Specific Views**: Consider creating separate dashboard interfaces for faculty, students, and administrators. Tailoring the interface to each stakeholder group would enhance relevance, usability, and engagement.

- **Evaluate Intervention Impact**: The dashboard provides a foundation for evaluating future quality improvement efforts. For example, it can be used to assess the effectiveness of curriculum enhancements, student training modules, or workflow redesigns.

- **Integrate with Broader Systems**: Future work could include integrating institutional quality management systems to support broader goals such as accreditation, faculty peer review, or performance-based evaluations.

References

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Acknowledgements

I would also like to thank Keisha Smoke, MHA, for supporting and coordinating the practicum experience.

Finally, I am grateful to the McWilliams School of Biomedical Informatics at UTHealth Houston for providing a rigorous and enriching curriculum that has prepared me to complete this practicum successfully and for continued growth in the health data science field.