Assessing Continuous Quality Improvement in a Pediatric Dentistry Residency Program

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Abstract

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Purpose: The purpose of this study was to assess the quality improvement process in a pediatric dentistry residency program.

Methods: A qualitative research design was chosen to elicit information from stakeholders about the current program's continuous quality improvement (CQI) process. A semi-structured interview script was developed, and interviews were conducted with 4 current residents, 5 recent graduates, 4 faculty members, and 2 administrators of the University of Washington (UW) Advanced Education in Pediatric Dentistry Residency program (UWSOD-PD). Participants were asked about elements of quality in the program, knowledge about the current CQI process, and perspectives on current feedback processes. Transcribed data were thematically analyzed.

Results: Three over-arching themes arose from the data analysis: Delineation of knowledge about the current CQI feedback process, identification of stakeholder's perspectives on elements of quality in a residency program, and opportunities for CQI. Opportunities for CQI included increased frequency of feedback, improved formative feedback, recognition of accomplishments, and faculty training on providing feedback. Specific solutions to areas needing improvement included implementing quarterly formal feedback, resident documentation of informal feedback- including daily accomplishments, incorporating required faculty training courses, and allocated time in the curriculum for the formal feedback process.

Conclusion: This study distinguished the current CQI process, identified elements of quality in a pediatric dentistry residency program, and identified opportunities for CQI. Recommendations were proposed in this study to improve the program CQI process. The methods used in this CQI review may be useful to other dental residency programs interested in implementing a similar assessment of their CQI program.

Table of Contents

I. INTRODUCTION……………………………………………………………………

II. METHODS…………………………………………………………………………

III. RESULTS…………………………………………………………………………..

IV. DISCUSSION……………………………………………………………………

V. CONCLUSIONS…………………………………………………………………...

VI. FIGURES & TABLES………………………………………………………………

VII. APPENDIX……………………………………………………………………...…

VIII. REFERENCES…………………………………………………………………..

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I. INTRODUCTION

Continuous quality improvement (CQI) is the cyclic progression towards improvement in the quality of different processes working towards an end goal. That end goal in healthcare is ultimately improvement in the quality of patient care.[1] Implementation of CQI projects in a pediatric residency program has been shown to improve patient care and minimize medical errors.[2]

Continuous quality improvement can also be applied to education and may be particularly critical in higher education where teachers are not required to complete formal pedagogical training.[3]Accreditation is necessary to independently validate an educational program's quality,[4] but is limited by occurring at discrete time intervals that are years apart. Detecting and addressing educational elements that interfere with program quality is an internal process that is best addressed through CQI. [5, 6] For this reason, the process of CQI or at least quality assurance is a required component in accreditation standards for most healthcare education programs.[7, 8, 9, 10] Medical education programs have started to institute an annual institutional review (AIR) and form program evaluation committees (PEC) to obtain, analyze and review key performance data.[11] These annual reviews and key performance data allow educational organizations the ability to execute CQI.

Continuous quality improvement is a required accreditation component for dental residency programs established by the Commission for Dental Accreditation (CODA) and is a part of CODA's mission statement.[7] Pediatric dentistry residency programs are required to plan for, evaluate and improve the educational quality of the program using a process that is broad-based, systematic, continuous and promotes achievement of the program's education, patient care, research and service goals. Moreover, there must be a cyclical process in place enabling

collection and analysis of data measuring program quality, regular review of the data, sharing of these data with stakeholders, and identification and implementation of corrective actions enabling program improvement (Figure 1). Despite this clear mandate, there is a paucity of literature outlining how CQI in pediatric dental residency programs has been implemented. While the Dental Quality Alliance successfully identified metrics and created dashboards for the quality of patient care,[12,13] including pediatric oral health care, this organization does not seem to have identified quality metrics or processes for dental education programs. Parkinson and Zeller described methods of CQI in reference to the CODA standards,[14] their suggested quality metrics were oriented more toward clinical care rather than oral health education.

We set out to perform the final step identified in the CODA CQI mandate, which is to review the assessment plan and revise as appropriate. Since CQI is essential to ensuring quality patient care and the continued improvement, it is imperative that residency programs identify and evaluate internal CQI processes. We found no published literature on assessment of CQI processes within dental residency programs, so we attempted to fill that gap using qualitative research methods. The primary aim of this study was to examine and outline the current educational CQI program at the University of Washington (UW) Advanced Education in Pediatric Dentistry Residency program (UWSOD-PD), define elements of quality from stakeholders' perspectives, and identify opportunities for improvement. Additionally, the gathered date was used to propose recommendations to the current CQI process.

II. RESEARCH METHODS

Participants and setting.

This study was conducted at the UWSOD-PD, a two-year CODA-accredited specialty program that follows CODA guidelines, including performing CQI. Participants were recruited using purposeful sampling[15] of second year pediatric dental residents, alumni who graduated within the past year, and faculty and staff CQI stakeholders in the residency program. For the purposes of this study, recent alumni were categorized as residents because they were only 1-5 months out of residency when this study was conducted.

Study design

A qualitative study design was chosen to allow identification of stakeholder perspectives in their own words. A design thinking framework was employed for both study design and data analysis because of its similarity to the CQI process.[16] Semi-structured in-depth interviews[17] were used to outline the current feedback process used by the program, obtain the participant's perspective on elements of quality in a pediatric dentistry residency program, and identify areas for improvement and areas of strength. A neo-positive approach was used for the interview design and conductance,[18] where the interviewer took a neutral role and did not contribute any perspectives; this approach minimized bias from the interviewer and focused on what the participant offered in the interview. To refine the scripted interview questions, two beta interviews were conducted with a non-participating faculty member and a resident from a different program. The beta interviews also provided the interviewer an opportunity to practice conducting the interviews. Suggestions and recommendations noted in the beta interviews were used to improve the script. The data collected in the beta interviews were not used in this study.

The study protocol was reviewed by the University of Washington Human Subjects Review Board Study (STUDY00015259: CQI in Pediatric Dentistry Residency) and determined to be exempt from human subjects' research, as defined by federal guidelines.

A standardized initial email was sent to the selected participants introducing the research team and a synopsis of the study goals. Participants were given a minimum of two weeks to respond to the initial email prior to a second follow-up email being sent by the research team. Participants were emailed a consent form and directions regarding the logistics of the interview.

Data collection was conducted remotely through in-depth interviews which were audio recorded and transcribed (Zoom®, San Jose, California). All interviews were conducted by the same interviewer from August 2022 to November 2022. The interview duration ranged from 15 to 40 minutes. No field notes were taken, and no repeat interviews were conducted. Participants were not exposed to the interview questions prior to the interview. The interviews were transcribed by the recording software and the transcriptions were edited by the interviewer to eliminate all potential references to participants, including any names of people, places, dates, times, and any other specific information that could reasonably identify any of the participants. The recordings were kept in a secure location available only to the principal investigator for the mandated data retention period. Figure 2 outlines the study flow.

Data analysis

The raw transcriptions were edited to match the recorded audio, ensuring that the transcriptions accurately depicted what was verbalized by the participants. The edited transcriptions were manually entered into a spreadsheet (Microsoft Excel®, version 16.57). After independently reviewing the data, two investigators (EB and TO) met to compare initial

impressions, identifying preliminary key words and ideas emerging from the data; this process was repeated in an iterative manner, to refine ideas into themes, write coding rules, and identify illustrative quotes.[19]

III. RESULTS

A total of four second year residents, five recently graduated alumni, four faculty members and two administrators were interviewed. Participant characteristics are outlined in Table 1.

From the data analysis, investigators were able to outline the current feedback process for the UWSOD-PD, identify stakeholder's perspectives on elements of quality and identify opportunities for CQI.

Essential elements of the current feedback processes

Program administrators provided the greatest level of detail regarding the process of evaluating resident performance. They outlined a formal review process that involved gathering feedback from faculty and self-assessment by each resident using the same assessment instrument. Residents were scored on communication abilities, care provision including treatment planning, management of restorative care, management of medically complex children, behavior management of children and caregivers, and general skills. For each section, faculty reviewers were presented with a 5-point agreement Likert scale anchored by "strongly agree" and "strongly disagree." In addition to the scale, reviewers were asked to provide commentary on student performance. Data were collected by the program administrator and program director via surveys which were emailed to all the faculty. Gathered data were presented to residents by the program administrator and director in a closed-door manner. The timing of the formal feedback

began with an initial review three months into the start of the program. Subsequent formal reviews were conducted 6, 12 and 18 months into the program and culminated with an exit interview to gather final data on the resident experience.

Faculty and residents also noted opportunities for informal performance assessment. Faculty members spoke of time set aside at monthly faculty meetings to discuss resident performance and progress; when asked whether data from these meetings were collected, the faculty were unsure. Residents spoke of informal feedback, identified as a fluid process which occurred on a day-to-day basis on the clinic floor. Residents received on-the-spot feedback from faculty and staff regarding work completed that day. Feedback was given verbally at the discretion of faculty, staff, and residents. Residents seeking feedback reported having to request it sometimes and felt it was always helpful. Unlike the formal review, no documentation of the informal feedback was identified.

Residents were asked to describe their experiences regarding receiving feedback. All residents reported that the feedback received from faculty, staff and other stakeholders in the program had helped them become better clinicians and providers. One resident commented on how the feedback received by the program had impacted their residency experience:

> "I think it's caused me to be more intentional with my learning and be more aware of what my strengths are and what my weaknesses are as well. Probably one of the most valuable things about residency is getting feedback on your skills, because outside of that and after this [residency] it's pretty much just your own reviews of yourself." (Participant R-4)

Residents noted the feedback received was an integral and highly valued part of their learning. When asked about mechanisms in place that allowed them to provide feedback on quality aspects of the program to administrators, some residents described having the opportunity to do so at monthly resident meetings with the program director.

Faculty and administrators were asked about any other educational CQI initiatives within the residency program. Three faculty members identified a project occurring in the dental surgery center where quality metrics were being collected, such as number of general anesthesia cases each resident participated in, and the number, type, and timing of procedures being completed by residents. Although faculty were able to identify components of the program's CQI processes, the majority noted that their experience and knowledge of CQI was limited. Three of the four faculty members reported either "a little bit of understanding" or expressed that their experience and understanding of CQI was deficient.

Quality aspects of a pediatric dentistry residency program.

Four elements were identified by the residents as characteristics of a high-quality pediatric dentistry residency program: a program with diverse clinical experiences, a strong didactic component, the caliber of the faculty and the culture of the program.

Diverse clinical experiences. Diverse clinical experiences were identified by all current residents as an element of a high-quality residency program. Residents spoke of getting "hands-on experience," "a wide range of experiences," and "lots of opportunities." Many participants listed skill-building in all the patient care tasks and procedures that a pediatric dentist normally does, with a typical description voiced as:

> “Clinical care would include the various domains that are pertinent to pediatric dentistry, which would include exposure to care of patients within the pediatric age ranges for procedures that encompass preventive care, diagnostic, procedures, restorative care and oral rehabilitation, oral surgery procedures, exposure to procedural sedation and dental care under general anesthesia, dental trauma and orthodontic care among others, but those are the areas.” (Participant A-2)

Two specific areas that were repeatedly identified by residents were working with patients in the hospital setting and patients with special health care needs (SHCN). One resident reported,

> “Of course, having a lot of hands-on experience and getting to work in a hospital setting. Every now and then, be able to work with medically complex patients and patients that many [general practice] offices will not be able to see.” (Participant R-1)

Resident participants identified that work in a hospital—specifically the hospital partnering with the residency program—was one of the reasons they applied to the program. Hospital based care was also identified as an element of a high-quality program by three of the four faculty who were interviewed. Resident participants felt the program’s strong commitment to serving children with SHCN contributed to high program quality.

Robust didactics. Residents reported that a strong didactic component was an element of a high-quality residency program. They wanted the didactic work to be connected to what they saw in clinic. One resident voiced the desire for an academically challenging experience:

> “That was important to me because I think outside of residency there's not really a time where you're ever going to have the ability to focus on academics like you do again during a residency program.” (Participant R-4)

One resident spoke of a good balance between the didactic and experiential portions of the program while another noted there should be “good organization and systems in place to support both patient care and education.” (Participant R-7)

Caliber of faculty. The caliber of the faculty and the reputation of the residency program were identified by two of the residents as a component of a high-quality residency program. Caliber was described as “well published and world renowned” (Participant R-2). This included the experience of the faculty, presence within academia, including publications, and the field of pediatric dentistry.

Program culture. Two residents reported that they found the culture of the program enticing. One resident specifically referred to the "open arms feeling” of the program despite interviewing remotely. Another resident reported,

> “The program is very strong for utilizing positive reinforcement and keeping the educational setting very positive and healthy, in my opinion. I think that those are some of the key characteristics.” (Participant R-5)

All participating residents reported feeling safe providing candid feedback to the residency program, further supporting a positive program culture.

Areas of opportunity for program CQI

Frequency of feedback. One area several residents noted could be improved was more frequent formal feedback than every six months.

> "I think reviews could happen more frequently so that you can remember things. I think thinking back six months, especially starting the program until your first review in February, you're already six months in. It's really hard to remember how things were in the summer in [when it is] the fall." (Participant R-6)

Residents reported a potential lag with currency of the reviews; for example, a faculty member thinking back over the prior 6 months might note an area that needed improvement several months prior but had since been addressed by the resident. One resident proposed increasing the frequency of the formal reviews from bi-annually to quarterly, as it might help decrease the lag in feedback delivery. Partial improvement had already been made by the program administrators at the time of the interviews by incorporating an initial review at three months into the program for the new residents.

Improved formative feedback in formal performance assessments. The second area of improvement identified was a relative lack of formative (i.e., qualitative) feedback in the formal review. One resident reported,

> "I think it should be encouraged to write more feedback, as opposed to just clicking boxes [on a survey/rubric]. I know that's challenging because there's so many of us, but I think feedback when you're writing something about a person gives that person more opportunities to learn as opposed to just going through and clicking out a survey." (Participant R-4)

Much of the current formative feedback residents reported receiving was through the informal feedback process, but there was no process for documentation of informal feedback. One faculty member noted,

> "It might be helpful to have those informal assessments and feedback sessions, but if it's not written down, then it kind of doesn't exist and you can't measure it. So, if you want to meet a goal, the goal needs to be measurable. So having something that is clearer as far as, "Okay, this is the goal and then this is how we're going to assess you. Then when you've met these requirements, then the goal is done." It's written and you can track that. That's a much more valuable tool for the learner and the instructor both." (Participant F-1)

This faculty member also noted that documentation of learner performance occurs for pre-doctoral students but not for residents and wondered if a similar process could be employed in the residency program. One resident proposed a "running comment stream" that could be used by both faculty and staff as a possible solution to the lack of formative feedback documentation.

Recognition of resident accomplishments. When asked to describe how their achievements were recognized, residents described formal recognition at graduation. Informal recognition of achievements seemed more faculty dependent. As one resident noted,

> "I guess it's usually through emails from leadership when there's something that you've done that someone has recognized and highlighted. But aside from that not much else I don't think." (Participant R-7).

Because much of the current recognition of resident accomplishments took place through the informal feedback process, documentation of the informal feedback process could also identify accomplishments.

Faculty training in providing feedback. No formal training for educators was required or provided. Two faculty members who did obtain formal training sought out these opportunities on their own or received training at previous jobs. Informal feedback processes established by faculty were contingent upon past experiences as residents and their subjective values on how feedback should be given. As outlined by one faculty member,

> "I guess it goes back even further than my experience as a resident because I practiced for three years [before residency]. I was hungry for feedback as a resident." (Participant F-4)

IV. DISCUSSION

In this formal qualitative study assessing the quality of the UWSOD-PD, we distinguished CQI efforts already in place. Faculty and residents described a formal and informal ongoing resident performance assessment processes that appears broad-based, systematic, continuous and designed to promote achievement of program goals related to education. The program appears compliant with the CODA intent of comprehensively preparing competent individuals for the practice of pediatric dentistry.

During the process of exploring the CQI efforts already in place, we extrapolated opportunities for CQI from the obtained data. This included an increase in feedback frequency and formative feedback. Residents reported feedback as a valuable component of a residency program. Bi-annual formal residency reviews create a lag in delivery of feedback which causes multiple challenges. One challenge being that when an area needing improvement is identified

for a resident, that information is not formally shared with the resident until 6 months into the program. This may delay resident growth and improvement. Another challenge with a lag in feedback delivery is that issues that were noted earlier may have been resolved prior to the formal review and thus the review given to the resident is not an accurate representation of the resident's standing in the residency.

The second opportunity for CQI was improvement of formative feedback. This study found that much of the formative feedback residents obtained was through a minimally documented informal feedback process. If informal feedback could be captured in real time and served to faculty members when they address the next performance assessment cycle, it could provide a more robust picture of the resident's progress over time. Resident clinical logs (RCLs), a secure and valid account of resident procedures and experiences, are a required component of CODA.[7] However, there is ambiguity in how programs implement RCLs. The faculty in this study identified a CQI project in the surgery center where RCLs are being used to document procedures performed by the residents. These RCLs include the number of general anesthesia (GA) cases, number of procedures and timing of each case and are maintained by residents. Like the CQI project currently being conducted in the dental surgery room, a running log could be kept by the resident for other clinical experiences. An example of the type of information the resident could record is contained in Table 2. Allowing both faculty and residents to have access to this log could facilitate provision of formative feedback, documented in real time. To ensure accuracy, faculty initials in the table could be used to indicate that the faculty agree with what was written in the log. A running log could also highlight the resident's achievements over the prior cycle and facilitate development of performance goals for the subsequent cycle. More

research will be needed to understand the burden of time RCLs would have on faculty and residents.

Implementing faculty training on providing feedback could improve consistency of feedback. Our study noted that many of the methods in which faculty provide feedback are based upon their own subjective experiences. This makes it difficult to calibrate faculty feedback processes and obtain consistent data on how residents are performing. Although some fluidity is an inherent part of the informal feedback process, having an established mechanism in which feedback is provided to residents from faculty would produce consistency. Residents would better understand what the expectations are of faculty and faculty would improve quality and delivery of feedback to residents. By incorporating faculty training, we would also be ensuring that up to date teaching methods and standards are being utilized by the program.

We began each CQI interview by first asking residency stakeholders how they defined quality in a pediatric dental residency. They responded with several perceived elements, including diverse clinical experiences, robust didactics, caliber of faculty, and program culture. We identified these as key performance indicators (KPIs). Programs use KPIs as a means of measuring program progress and quality standards in specific areas. These metrics can be measured continuously throughout the academic year and assessed periodically. Metrics of diverse clinical experiences might include the numbers of various procedures completed by residents, numbers of days working in the medically complex clinic and numbers of hospital shifts. Metrics of "robust" didactics were less easy to identify but could include course grades. Metrics for caliber of faculty could include faculty involvement in resident coursework and resident evaluation of faculty performance. Faculty caliber metrics could include number and quality of publications but might also include publication(s) of residents working under their

mentorship. Metrics of program culture could be obtained by asking residents about how safe and/or supported they feel in the program. Every individual residency program undergoing a CQI review must consider how to define and measure quality, so the process outlined here may be helpful.

Examination of performance indicators from the graduate medical education literature may provide additional useful recommendations on the implementation of KPIs and metrics. One publication described implementation of an annual institutional review where all residency programs within a multicenter healthcare system met annually to examine key performance data allowing them to identify program strengths and areas for ongoing improvement.[11] Another group instituted a "report card" for their annual institutional review, which contained metrics such as resident scholarly activities, exit interview assessments, alumni survey results, resident evaluations and faculty evaluations.[20] In one annual institutional review medical educators from a health system in Singapore identified 13 metrics, including resident scholarly activities, faculty scholarly activities, participation by residents in quality improvement and safety activities, and faculty development participation; a dashboard was designed to show whether each metric met a pre-defined benchmark.[21] Residency program directors at a single US institution with 7 different residency programs incorporated several educational interventions over a 4-year period. These included an annual institutional review; analysis of whether action items were specific, measurable, accountable, realistic, and timely (SMART); incorporation of KPI dashboards, and a plan-do-study-act (PDSA) cycle.[22] Re-envisioning a CQI program in a pediatric dentistry residency program could incorporate similar metrics and processes.

Some quality elements identified in the UWSOD-PD CQI program were described in one publication examining culture characteristics amongst education quality advisory committees of

medical schools in the Netherlands.[23] In this qualitative study investigators found five themes associated with high quality CQI: fostering an open systems perspective, involving stakeholders in educational (re)design, valuing teaching and learning, promoting ownership and accountability, and building on integrative leadership. Residents confirmed in our study that the program had a supportive communication climate. Residents described faculty who highly valued teaching and learning, and faculty described steps they were taking or had taken to improve their teaching. There is a clear responsibility structure. An element that might be strengthened includes resident participation in the CQI process. Indeed, a systematic review of publications assessing the effectiveness of increasing quality improvement initiatives between 1987 and 2008 identified 28 published articles in which residents were active in leadership, participation, planning or development of quality improvement projects. This illustrates how residents can play vital roles in the CQI process at their training sites.[24] Resident participation in the CQI process might in itself be a KPI.

We propose the implementation of an annual residency CQI review that would be attended by all stakeholders. This would allow for discussion of information pertaining to CQI projects and KPIs and discussion of new initiatives for the upcoming year. This annual review would accomplish two goals: regular review of the data and sharing with stakeholders. A CQI review committee, consisting of individuals responsible for collecting and analyzing CQI data, could be established to present the data at the annual review. Incorporating a resident in the committee would satisfy the need to have residents involved in the CQI processes. Every year results from one or two quality initiatives started the year previously could be examined.

At the annual residency CQI review, KPIs would be examined. Proposed KPIs are included in Table 3. Most of the proposed KPIs were derived using the elements of quality

identified by participants in this study. Other KPIs such as resident perception of preparedness for the practice of pediatric dentistry and feedback documentation were also identified by participants. These proposed KPIs provide areas for which metrics could be formulated. This would allow the program to measure progress and identify areas for quality improvement.

Programs interested in assessing their CQI processes may benefit from utilization of the methods used in this study to define quality and extrapolate relevant KPIs from the collected data. We recommend that programs define quality in their individual programs prior to forming KPIs, because elements of quality may be different than those identified in this study. Future research will be needed to form a singular definition of quality for all pediatric residency programs. Programs may benefit in a formalized CQI process such as an annual residency review. This would facilitate the identification of areas of growth and allow for quality improvement to take place.

Several elements were included in the design of this study to increase trustworthiness of results. Current and recent graduates of the residency program were interviewed because they would have the most current viewpoints on the program. Some of the same questions were asked of residents, faculty, and administrators to ascertain agreement of answers, a form of data triangulation. The same person conducted all interviews, minimizing variability in the way that questions were asked. Reflexivity, where each investigator defined the lens through which they approached this study, was established early in the design process and this definition was used during data analysis to examine how it might affect results.

The study conclusions are limited in that the data are obtained from a single pediatric dentistry residency program. Therefore, results cannot be generalized to all pediatric dentistry residency programs. However, the similarities in the responses of the participants make it likely

that the data obtained are representative of key informants at other programs. Another limitation to this study was the sample size of only four faculty members. This may have led to bias in responses and opinions that are not representative of all faculty members. However, when asked similar questions the themes identified by the faculty responses coincided with the responses from residents. This study was conducted in a combined university and hospital pediatric dentistry residency program. Residents may be biased in their responses due to personal preference towards this type of combined program.

V. CONCLUSION

1. Elements of quality in this pediatric dentistry residency program included diverse clinical experiences (specifically hospital dentistry and working with patients with SHCN), robust didactics, caliber of the faculty, and the culture of the program.
2. We identified that the current CQI feedback process included both a formal and informal feedback process.
3. Areas of opportunity for CQI in this program included increased frequency of formal assessments, improved formative feedback, accomplishment recognition and faculty training on providing resident feedback.
4. We propose adopting the use of KPIs, the addition of an annual CQI review and, development of a CQI Committee that includes a resident role.

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VI. FIGURES & TABLES

	Residents	Faculty	Administrators
	N =	N=	N=
	N (%)	N (%)	N (%)
Gender			
Female	2 (15.3%)	3 (23.1%)	1 (7.69%)
Male	7 (53.8%)	1 (7.69%)	1 (7.69%)
Age			
20-40	9 (69.2%)	1 (7.69%)	0
40-60	0	3 (23.1%)	1 (7.69%)
>60	0	0	1 (7.69%)
Race			
Non-Hispanic White	5	2 (15.3%)	2 (15.3%)
Black	0	0	0
Non-black Hispanic	1 (7.69%)	1 (7.69%)	0
Asian	3 (23.1%)	1 (7.69%)	0

Table 1: Participant demographics

Date	Clinic area	Faculty	Treatment	Area of improvement	Area of accomplishment	Faculty Initials
04/02/20XX	C-Pod	Dr. Jane Doe	#S-DO composite #T-SSC	Local anesthetic technique	Patient behavior management	J.D
04/03/20XX	MCC	Dr. John Doe	#B-Pulpotomy and SSC	Lack of communication with other team members.	Well prepared workups prior to treating medically complex patients.	J.D

Table 2: Proposed formative feedback documentation.

Key performance indicator (KPI)	Purpose	Proposed metrics
Resident performance	To formally assess performance	% of faculty agreement on resident progression
Diverse clinical experience	To identify and quantify resident clinical experience.	Report on # of procedures completed by residents (Example: composite restorations, SSCs and Zirconia crowns, pulpotomy, pulpectomy, permanent and primary extractions, orthodontic cases completed, interdisciplinary cases and dental emergencies)
Medically complex patient/patient with SHCN encounters	To quantify and ensure resident experience working with medically complex patients and patients with SHCN	# of days working in the Medically Complex Clinic # of hospital shifts
Robust didactics	To quantify resident involvement and opportunities in academic education	Formal grades # of resident publications
Program culture	To assess resident experience within the program and promote a culture of excellence, inclusivity and continuous improvement	% of residents report feeling safe to provide feedback to program % of residents report feeling supported by the program and/or report being provided resources for support.
Faculty caliber and scholarly activities Resident scholarship	To identify faculty involvement within academia and educational setting and ensure faculty are provided opportunities for academic involvement.	# of faculty and resident publications # of faculty involved with resident courses
Resident perception of preparedness for practicing pediatric dentistry	To assess resident experience and satisfaction. Quantifying resident preparedness after completion of residency requirements.	% resident satisfaction upon graduation % resident reporting feeling prepared for practicing pediatric dentistry upon graduation Alumni survey
Feedback documentation	To assess how both formal and informal resident feedback is being documented and used in the program	# of daily resident reports Resident perception of actionable formative feedback provided by the formal assessment process
Resident participation in CQI program	To identify and assess current quality improvement projects and resident involvement. To quantify resident improvement and progression.	Resident participation at annual CQI review % residents meeting improvement goals after formal reviews

Table 3: Proposed Key Performance Indicators

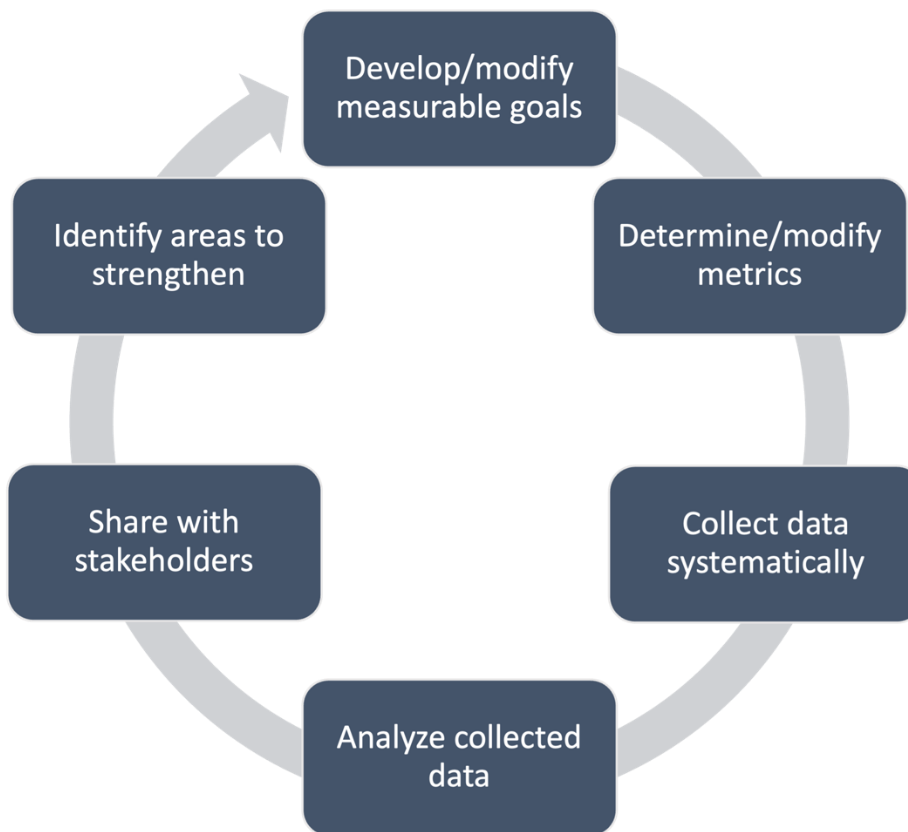

Figure 1. A graphical representation of the steps in continuous quality improvement as outlined by the Commission on Dental Accreditation

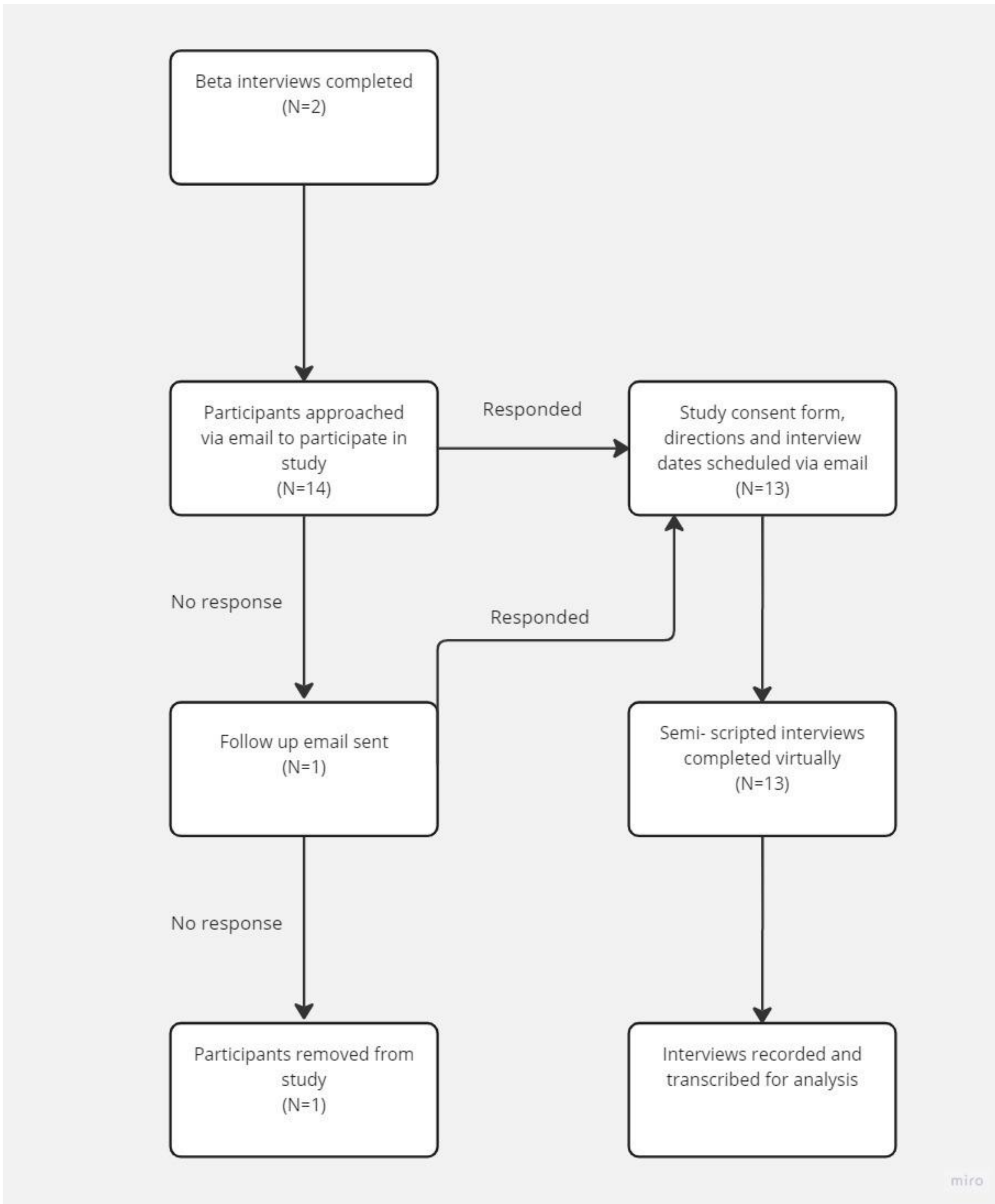

Figure 2: Participant flow diagram

VII. Appendix

Semi-structured interview questions

Demographic questions
Faculty

1. How long have you been teaching and training pediatric dental residents?
2. How long have you been practicing pediatric dentistry?
3. Tell me more about your practice history. (Academic vs private vs corporate vs community)
4. You make choose to skip the following three questions:
   a. What gender do you identify as?
   b. What race or ethnicity do you identify as?
   c. Is your age range 20-40, 40-60 or over 60?

Residents:

1. How many years or months after graduating from dental school did you begin this pediatric dentistry residency?
2. If you practiced dentistry prior to starting residency, what type of practice? (Private vs corporate vs community health).
3. What made you want to pursue pediatric dentistry?
4. You make choose to skip the following three questions:
   a. What gender do you identify as?
   b. What race or ethnicity do you identify as?
   c. Is your age range 20-40, 40-60 or over 60?

Study questions:

Residents

1. Describe what a high-quality pediatric dental residency program would look like to you.
   a. What are specific characteristics or qualities of such a program?
2. What are some qualities or characteristics of this program that made you rank it highly in the MATCH?
   a. Has the program met your initial perception? Why or why not?
   b. Has your perception of the program changed now as a resident vs when you were an applicant?
   c. What are qualities or characteristics of other programs that interested you that may or may not have been part of this program?
3. Describe in general what you know or have learned about quality improvement processes.
4. Describe how you have received feedback in this program.
   a. Describe any formal feedback process in this program. Who is involved?
   b. Describe any informal feedback process in this program. Who is involved?
   c. Would you consider the feedback process well organized?
   d. Are there any aspects of the feedback process that could be improved?

5. How has the feedback you have received from this program affected your performance and resident experience? (Give specific examples)
6. What mechanisms are in place that allow you to provide feedback to residency staff and faculty on quality aspects of the program? (Refer to answer provided in question #1).
7. I want to preface this question by saying that all answers will be kept confidential. Do you feel safe in providing candid feedback to the program? Why or why not?
8. Describe how your achievements are recognized.

Faculty

1. What are essential elements of a high-quality residency program? (Versus a residency program you would not consider high-quality.)
2. What is your experience and understanding of the quality improvement process?
3. Describe the current quality improvement process utilized in this program. (Refer to answers from question #1 if participant is having difficulty understanding question).
    a. What data is collected and how is this data analyzed and shared? With whom is this data shared?
    b. What positive changes could be made to the current quality improvement process?
    c. Describe actions that you have taken to improve aspects of this program such as communication, expectations, and feedback.
4. How do you provide feedback to residents on their performance?
    a. How did you establish your feedback process?
    b. Was there formal training? If so, please describe the training.
5. How do you obtain feedback from residents on your performance? For example, your performance as a preceptor/attending.

Administrators

1. What are essential elements of a high-quality residency program? (Versus a residency program you would not consider high-quality.)
2. Describe how you obtain information on aspects of resident performance from other faculty members.
3. How do you obtain and incorporate information from residents in the current quality improvement process?
4. How do you obtain feedback from residents on your performance? For example, your performance as a preceptor/attending.
5. Describe the current quality improvement process utilized in this program.
    a. What data is collected and how is this data analyzed and shared? With whom is this data shared?
    b. What positive changes could be made to the current quality improvement process?
    c. Describe actions that you have taken to improve this program.

VIII. References

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