Riverside University HEALTH SYSTEM Public Health

Dental Screenings Utilizing Artificial Intelligence (AI) Pilot

Overview: Riverside University Health System - Public Health's (RUHS-PH) Oral Health Program focuses on improving Riverside County's oral health through collaboration, outreach, education and advocacy.

Challenge: Dental disease is one of the most common reasons for school absences and negatively impacts students' ability to concentrate and learn, potentially resulting in long-term impacts. In 2022, 351,000 students in California missed at least one day of school due to dental problems, and 87% of these children missed one or more days. This costs California schools $29 to $32 million annually in average daily attendance funding. To improve health outcomes for students, legislators signed the Kindergarten Oral Health Assessment (KOHA) into law in 2005 to help schools identify children suffering from untreated dental disease and assist parents with establishing a dental home for their children. The California Department of Public Health (CDPH) lists specific KOHA measures designed to accurately evaluate a student's oral health. The law mandates that parents or legal guardians must submit proof of an oral health assessment performed by a licensed or registered dental health professional for their child on an annual basis by May 31st. In 2017, the law was revised by SB 397 to allow schools to provide on-site screenings. However, despite the KOHA mandate, cost and lack of access to dental services continues to be a challenge for many California children.

Solution: California Northstate University (CNU) College of Dental Medicine approached RUHS-PH's Oral Health program to create an innovative pilot program that offers students the state-mandated assessment for free, as well as provides families a detailed report of the findings for their child's oral health. The pilot launched at two elementary schools in Riverside County in February 2024 through a partnership with CNU, RUHS-PH, Riverside County Office of Education (RCOE), Nuview Union School District, First 5 Riverside County, and Dental.com. The goal was to demonstrate that trained school staff members, equipped with Dental.com artificial intelligence (AI) technology and backed up by a remote dentist, could produce the same quality assessment that could be obtained by an in-person dental hygienist.

Innovation: Pilot participants each received an initial oral exam by two in-person dental hygienists to complete their KOHA on-site while a school staff member (non-dental) captured photos of the inside of their mouth using the Smart Scan

app on their phone to submit to Dental.com. An off-site Dental.com dentist remotely reviewed each student's information and photos to create a personalized comprehensive report that was provided to the parents, along with a referral to a local dentist.

Results: Completed records were documented from 109 students across the state. 51 students in Riverside County had complete records captured compared to 50 students in Riverside County who only received their KOHA screening. Each of the students with complete records had three measures recorded for a total of 153 data points: untreated caries, caries experience, and urgency. The ratings on all measures were then compared between the two dental hygienists, the non-dental person, and the remote dentist. The methodology demonstrated equivalent, and in some cases superior, results from the KOHA performed by a remote dentist compared to y an in-person dental hygienist. Additionally, the AI Smart Scan Wellness Report provided to parents included photographs and AI generated and dentist verified scores for problems in 5 areas (cavities, defective restorations, broken teeth, plaque build-up, and gum Inflammation). These visual findings increase the likelihood that parents will follow up on the KOHA recommendations.

Replicability: The AI system used in this demonstration has tremendous potential to address the current challenges faced by schools to complete the California mandated KOHA and improve the oral health of all students. By not requiring a dental professional to be present in-person at the school, the costs of the KOHA assessments process can be reduced and made more accessible. With these results, our next goal includes working with CDPH, other agencies and advocates to expand coverage and availability of this innovative system through private insurance, Medi-Cal, or other means of support.

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Additional Materials:

Pilot Program Results (attached below)

YouTube Video: Nuview Union School District Oral Health Checkup

Completing the Kindergarten Oral Health Assessment (KOHA) using an AI supported remote assessment process: Results Summary - July 31, 2024

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Notes

The full report of this demonstration has been submitted for publication to the California Dental Association Journal. It is expected to be published in late 2024.

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Approval was obtained from the California Northstate University IRB: Protocol #2403-05-148.

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- California Northstate University College of Dental Medicine
- Sacramento Department of Health Oral HealthProgram
- Fulsom-Cordova Unified School District
- The Riverside Department of Health Oral HealthProgram
- The Nuview Unified School District

Purpose

California has a mandatory Kindergarten Oral Health Assessment (KOHA) requirement, which was established by AB1433 (2006) and is now included in the California Education Code Section 49452.8. [1,2] It was enacted to help schools identify children suffering from untreated dental disease and help parents establish a dental home for their children. The law mandates that parents and guardians submit proof of an oral health assessment for their children by May 31st of their first year in public school. The law was revised by SB397 (2017) to allow schools to provide on-site screening and improve collection of outcomes data.[3] However, despite the

KOHA mandate, the ability to perform the KOHA assessment on eligible children remains a significant challenge

This report summarized the methods and results of a demonstration of the ability to address the challenges many schools face in completing the California mandated Kindergarten Oral Health Assessment (KOHA).

Methods

After training and calibration, KOHAs at 5 schools in 2 California counties were completed by two in-person dental hygienists, and an in-person non-dental screener working with a remote dentist facilitated by the Dental.com AI Smart Scan and data collection systems. The results of the ratings of three KOHA measures were compared among screeners.

The hypothesis was that there would be no more variability in the assessment results from the remote dentists reviewing records collected by non-dental personnel than there was between the two dental hygienists.

Data Collection System

This demonstration used a data collection and reporting system created and made available by the Virtual Dental Care company and was based on their Dental.com AI Smart Scan systems. Data from the parent registration and consent forms, three in-person screeners (the two dental hygienists and one non-dental person) and the remote dentist were entered into the system. As a result, there were four sets of data for each child from which to compare.

A calibration and data collection system included:

- History information from parents about mouth pain, difficulty chewing or other complaints.
- A visual guide and calibration to help someone take a series of mouth photographs using a cell phone. See Figures 1 and 2.

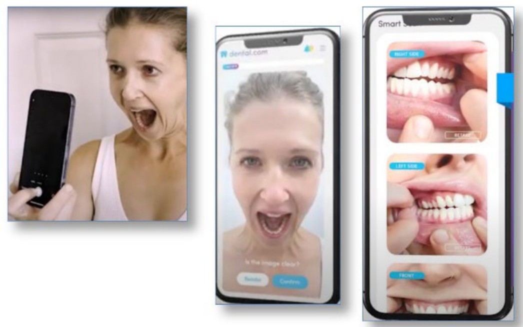

Figure 1. Components of the Dental.Com visual guide for taking a series of mouth photographs if an individual is taking photographs of their own mouth.

Figure 2: A non-dental person taking mouth photographs at a school using a mobile phone and the Dental.Com AI Smart Scan System.

Results

Participants

Table 1 shows the number of children at each of the 5 schools who had a KOHA form completed and the number who had the complete data set used in the demonstration.

	Complete records for demonstration	KOHA only
Sacramento County		
School #1	21	3
School #2	14	19
School #3	23	15
Riverside County		
School #1	40	13
School #2	11	0
TOTAL	**109**	**50**

Table 1: Children receiving KOHA screening or KOHA screening plus complete records for participation in the demonstration.

Data Analysis

Data collected on each child was based on the KOHA measures designed and used by the California Department of Public Health (CDPH) as modified for this demonstration. Each of the 109 children with complete records had three measures recorded for a total of 327 data points.

- Untreated Caries
- Caries Experience
- Urgency

The ratings on all of these measures were compared between the two dental hygienists, the non-dental person, and the remote dentist using all of the information described above.

A summary of the data analysis is included in Table 2.

Summary: disagreement/agreement				
Total data points = 327	Disagreement		Agreement	
	#	%	#	%
Between hygienists	71	21.7%	256	78.3%
non-dental person vs both hygienists	38	11.6%	289	88.4%
non-dental person vs dentist	59	18.0%	268	82.0%
dentist vs both hygienists	12	3.7%	315	96.3%

Table 2: Summary of incidence of disagreement between screeners.

As is evident from Table 2,

- In 21.7% of the measures there was disagreement between the 2 dental hygienists.
- In 11.6% of the measures there was disagreement between the non-dental person and the dental hygienists.
- In 18.0% of the measures there was disagreement between the non-dental person and the remote dentist.
- In 3.7% of the measures there was disagreement between the dentist and the dental hygienists.
- The comparison with the lowest level of disagreement was between the remote dentist and the dental hygienists.

A separate review was conducted of the instances when the remote dentist did not agree with at least one of the dental hygienists. In these instances, the rating by the remote dentist was found to be more accurate than the rating by the in-person hygienists. An example that illustrates some factors contributing to this finding are presented in Figure 3 below.

Photograph showing cavity visible in photograph but missed in visual screening	
Captured Photograph	Zoomed in Photograph

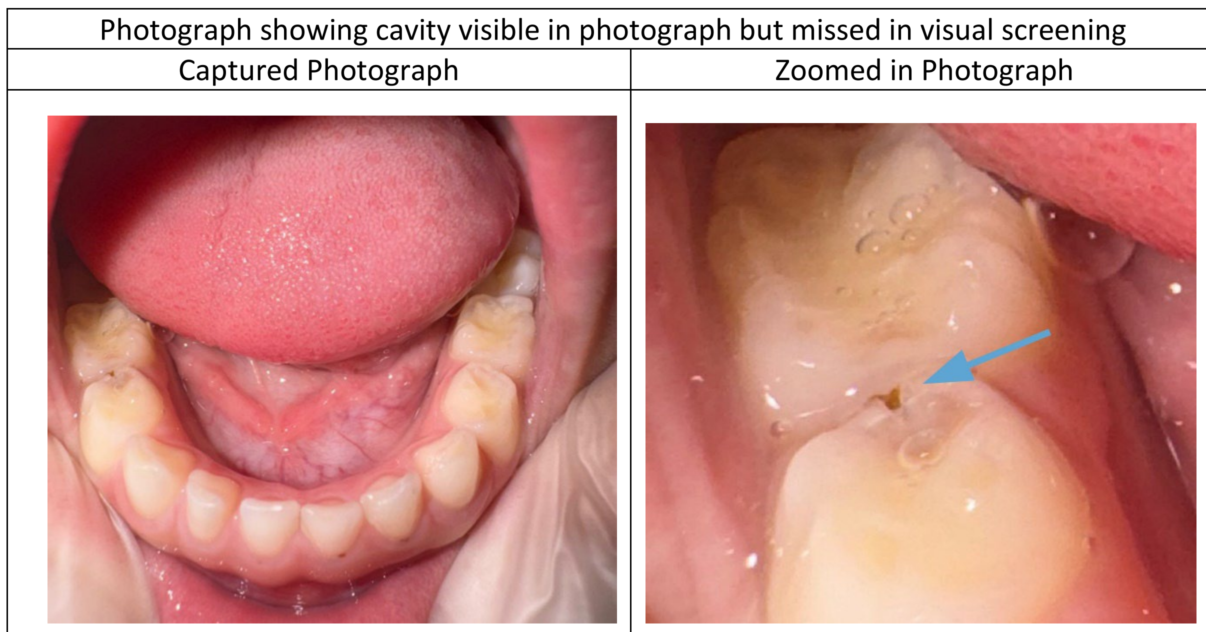

Figure 3: A photograph showing missed caries visible in zoomed-in version

Conclusions

Findings

The findings presented here indicate that using the specific methodology employed in this demonstration resulted in at least equivalent, and in some cases superior results from the KOHA performed by the remote dentist compared to the KOHA performed by an in-person dental hygienist.

Factors

Some factors that contributed to the equivalent or in some cases superior results from the KOHA performed by the remote dentist compared to the KOHA performed by an in-person dental hygienist include:

- The remote dentist had multiple sources of information as listed above to be used in rating the 3 measures.
- The remote dentist did not have the same time pressure to screen as many children as quickly in one session as the in-person dental hygienist had. In addition, the in-person dental hygienist had to screen faster than the remote dentist did due to the inability of many children to hold still.
- The remote dentist was able to review the photographs for longer time than might be possible when looking at a child's mouth in-person. In addition, the ability to zoom in on areas of the photographs, as illustrated above allowed the remote dentist to see things that could be missed during a quick in-person visual screening.

Advantages

In addition to the ability to obtain equivalent, or in some cases superior results on the KOHA using the system employed in this demonstration, there are other advantages:

- The AI Smart Scan Wellness Report provided to parents included photographs and AI generated and dentist verified scores for problems in 5 areas (cavities, defective restorations, broken teeth, plaque build-up, and gum Inflammation. This visual indication of findings increases the likelihood that parents will follow up on the KOHA recommendations.
- The data collected in this system results in an electronic database of findings and follow-up recommendations with the potential to connect this database to exiting referral and care management systems to facilitate referral and treatment.
- The system used in this demonstration has tremendous potential to address the current situation where most children in California do not receive the state mandated KOHA.
- By not requiring a dental professional to be present in-person at the school, the costs of the KOHA assessment process can be reduced.
- Since many schools in low-income areas servicing diverse student populations have trouble completing the KOHA, this system could help address oral health disparities among those groups and improve oral health equity.

Summary

This report describes a novel system to address the challenges many schools face in completing the California mandated Kindergarten Oral Health Assessment (KOHA). The results indicated that using the methodology employed in this demonstration resulted in at least equivalent, and in some cases superior results from the KOHA performed by a remote dentist using the included support tools compared to the KOHA performed by an in-person dental hygienist.

The methods and systems used in this demonstration have the potential to improve the ability for schools to complete the California mandated KOHA and subsequently take steps to improve oral health and oral health equity of children attending school.

References

1 California Department of Education. Required Kindergarten Oral Health Assessment, https://www.cde.ca.gov/ls/he/hn/oralhealth.asp. Accessed June 2, 2024.

2 California Dental Association. Kindergarten Oral Health Requirement. https://www.cda.org/public-health/kindergarten-oral-health-requirement. Accessed June 2, 2024.

3 California Department of Public Health. Office of Oral Health. Kindergarten Oral Health Assessment (KOHA). https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CDCB/Pages/OralHealthProgram/KOHA.aspx.. Accessed June 2, 2024.