Medical-led Silver Diamine Fluoride Demonstration Project

2022

Rationale, Conceptual Design, Project Duration, Purpose

Across all ages, American Indians and Alaska Natives (AI/AN) suffer disproportionately from dental disease. **AI/AN preschool children in particular, have the highest level of untreated tooth decay in the United States, more than 4 times higher than white non-Hispanic children.** Additionally, AI/AN preschool children 3-5 years of age have the highest prevalence of caries experience of any population group in the United States, almost three times higher than white non-Hispanic children.

These oral health disparities are caused by a variety of risk factors, such as host, bacterial, behavioral, sociodemographic, and environmental. In addition, there are often access to dental care barriers, with IHS dental provider vacancy rates of approximately 25% over the past two decades. Specific to 1-5 year old AI/AN children who access care within the IHS system, approximately 50% of these children receive medical care but not dental care at an IHS program, which means that the IHS Division of Oral Health must consider opportunities beyond the dental clinic to impact oral health.

Past IHS Division of Oral Health initiatives have demonstrated the importance of partnership with non-dental programs to address oral health disparities. For example, with the IHS Early Childhood Caries (ECC) Collaborative, 2010-2017, dental staff along with medical staff, public health nurses, community health representatives, Head Start programs, day cares, Women Infant and Children (WIC), and the tribe/community, all played a vital role in improving AI/AN children's oral health. In fact, fluoride varnish applications and oral screenings by medical providers increased by over 300% during that initiative.

Since the IHS ECC Collaborative, silver diamine fluoride (SDF) has emerged as an additional treatment option to address dental caries in the U.S. Although silver ion antimicrobials have been used in dentistry for over a century to arrest dental caries, it wasn't until recently that this minimally invasive treatment option re-emerged as a viable alternative to restorative dentistry. SDF, specifically, was first used in Japan in the 1960s. Since then, it has been used in various countries to arrest carious lesions on children and adults. In 2014, 38% SDF received Food and Drug Administration (FDA) approval as a tooth desensitizing agent in adults over 21 years old in the U.S.; in 2015, it became available for purchase. Similar to fluoride varnish, SDF's use for caries arrest is considered off-label.

To assess the use of SDF in IHS, tribal, and IHS-funded urban dental programs, the IHS Division of Oral Health conducted a demonstration project with SDF from 2014 to 2016. The results of the demonstration project were similar to that of systematic reviews on adults and children,

which have demonstrated that SDF can arrest caries in 30-70% of cases. Additionally, the demonstration project showed that results depend on a variety of factors, including but not limited to: frequency of SDF applications – studies show biannual applications are more effective than annual application – and location of carious lesion – studies show higher proportion of caries arrest for anterior compared to posterior teeth and smooth surface lesions respond better to SDF compared to areas that tend to trap food.

As a result of the 2014-2016 demonstration project, in 2017, the IHS Division of Oral Health developed a first-ever national silver ion antimicrobial protocol which details how to apply silver diamine fluoride (SDF), outlines indications and contraindications, describes treatment frequency, and more. This protocol was updated in 2020.

Subsequently, to further strengthen the medical-dental partnerships formed through the ECC Collaborative and to continue to address ECC in 1-5 year old AI/AN children, on November 12, 2021, the IHS Division of Oral Health announced a *medical-led* SDF demonstration project. With the support of the IHS Chief Medical Officer at IHS Headquarters, the project began on January 12, 2022 and ended on July 11, 2022, a six-month duration. The purpose of the project was to identify best practices related to medical providers applying silver diamine fluoride in a medical setting.

Participating Sites

On November 12, 2021, a solicitation email was sent by the IHS Chief Medical Officer to the National Council of Chief Medical Officers. The solicitation email was also shared on the IHS dental listserv to encourage dental programs to partner with their medical programs for the demonstration project. Initially, a total of three sites applied by the December 14, 2021 deadline. All three sites were funded ($5,000) for the demonstration project; however, one site was unable to continue with the project due to inadequate medical staffing levels. On February 22, 2022, the IHS Division of Oral Health identified one additional service unit to participate in the demonstration project.

Structure/Format

The demonstration project kicked off with an orientation webinar presented by Dr. Nathan Mork, Dr. Tim Ricks, and Dr. Jeremy Horst (national SDF subject matter expert). This presentation outlined how to perform oral health screenings; how to apply silver diamine fluoride in a medical setting; and how to document their results. It was well attended by the participating clinics and included both medical and dental providers. The slides and recording were shared with the participating clinics as reference material for their use as they developed local hands-on training for medical providers.

Following the orientation, IHS DOH held monthly video conferences with the demonstration project coordinators at each site. These meetings offered an opportunity for clinics to share their successes and challenges through informal conversations.

For the demonstration project, each program developed their own approach to training medical staff and coordinating follow up in the dental program when indicated. Both sites followed the same oral health screening process in which the participating medical providers used an IHS Division of Oral Health form (Appendix 1) to capture tooth decay status (yes or no); whether or not SDF was indicated; whether or not SDF was applied; treatment urgency (no obvious problems, early care needed, and urgent care needed); and dental consult status (request or no request). What follows is a brief overview of how each program approached training and implementing the demonstration project:

Program #1

- Following the IHS HQ orientation, dental personnel provided an in-service for the medical provider (one M.D.) that participated in the demonstration project. The in-service reviewed how to identify dental caries, assess caries risk, and apply SDF to carious lesions.
- The dental program created a SDF tooth model along with an SDF education brochure for use by the medical department.
- During the initial stages of the project, the dental hygienist attended well-child clinics one day each week at the Medical Department to assist with oral health screenings and SDF applications. Then, as the physician became more familiar with the oral health screening and SDF process, the dental hygienist was able to transition back to the dental program full-time.
- The medical provider also collaborated with the nursing department during immunization clinics to perform oral health screenings, educate parents and guardians, and apply SDF when indicated.
- To promote oral health and increase awareness of SDF in the community, the participating dental hygienist and physician broadcast an informative talk show program on the local radio station.

Program #2

- In addition to the training documentation and videos provided by IHS Division of Oral Health, a member of the dental department presented an SDF application demonstration using a mannequin containing a typodont to the participating med staff members.
- Nine members of the medical staff attended the SDF application demonstration/training: 1 dentist, 1 pediatrician, 1 physician's assistant, 3 nurses and 4 health technicians. In the end, however, only three of the med staff participated in the project.
- All oral screenings and SDF applications were performed by the pediatrician and physician's assistant with one of the health technicians as an assistant.

Results - Overall

Two dental programs completed the demonstration project and submitted final reports. For this section of the report, IHS Division of Oral Health combined data from both sites.

Overall, the participating medical providers (n=3) completed oral health screenings on 98 children (male, n=46; female, n=52), representing approximately 70% of the 0-5 year olds seen during the study period by the medical providers participating in the project (Figure 1). The medical providers noted that SDF was indicated for teeth on 32 of the screened children; and treated teeth with SDF on a total of 17 children (male, n=8; female, n=9). Of the children who received SDF treatment, the medical provider treated an average of three teeth per child, for a total of 56 SDF-treated teeth. The mean age of children who received an oral health screening was 2.9 years, while the mean age of children who were treated with SDF was slightly higher, at 3.3 years.

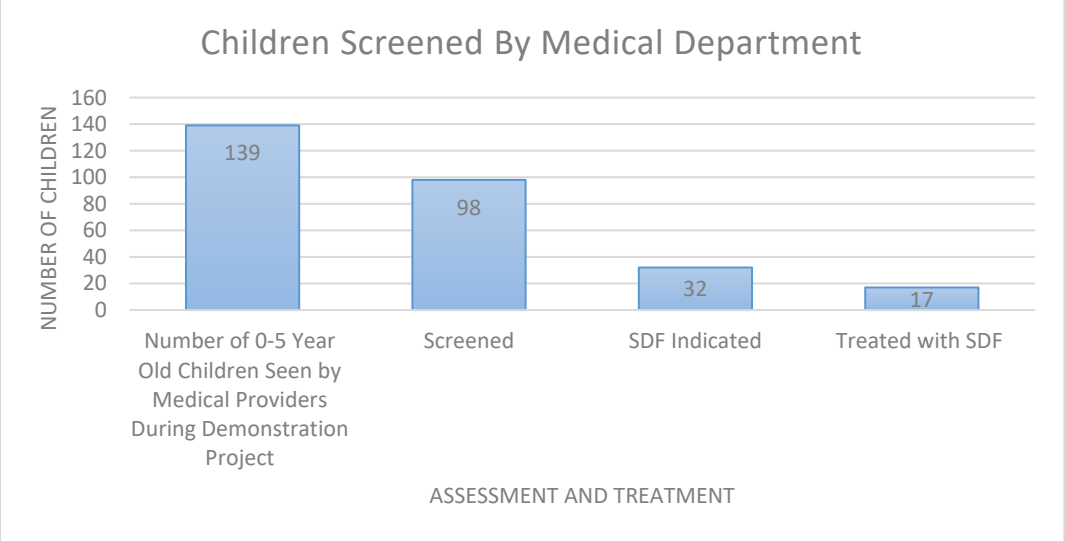

Figure 1: Total number of children seen by medical providers, screened, assessed, and treated with SDF by 3 IHS medical providers during 2022 medical-led SDF demonstration project.

During the oral health screenings, the medical providers evaluated the children for active decay and oral infections. For the majority of screened children the providers noted "no obvious problems" (n=51, 52%), followed by "early care needed" with 42 children (43%), and only 4 children (4%) categorized as "urgent care needed" (Table 1).

Treatment Urgency?	N
No Obvious Problems	51
Early Care Needed	42
Urgent Care Needed	4
Not Specified	1

Table 1: Treatment urgency as determined by medical provider.

Of the 98 children who received an oral health screening by a medical provider, 26 were referred to the dental clinic for an evaluation and follow-up care, while the majority of patients (n=72) did not receive a consult for a variety of reasons outlined in Table 2.

Consult Request to Dental Clinic?	N
No Consult Request Entered - Encouraged Annual Dental Exam	33
No Consult Request Entered - Other Reason*	8
No Consult Request Entered - Patient Already Has Dental Appointment	31
Request consult with dental clinic for evaluation/follow-up care	26

**Other reasons included recent dental appointment (n=2) and seen by non-IHS dentist (n=2).*

Table 2: Status of dental consult requests after oral health screening in medical clinic.

After patients were seen by the medical provider, the project coordinators tracked the consult request status until the demonstration project report was submitted, approximately six weeks after the project concluded. The sites reported that of the 26 children with a documented request for a dental consult, 6 children (23%) were seen in the dental clinic; 3 children (12%) were scheduled to be seen after the demonstration project report deadline; and 17 children (65%) did not have a dental encounter after the medical provider's oral health screening (Table 3). Regarding children without a dental consult request (n=72), the majority (n=33, 46%) were encouraged by medical staff to schedule a dental exam (if due) and many children (n=26, 36%) already had a dental appointment scheduled.

	Was There a Dental Encounter After Medical's Oral Health Screening?			
Consult Entered?	No Dental Encounter	Dental Encounter	Scheduled (Not Seen By Dental)	Grand Total
No Consult Request Entered - Encouraged Annual Dental Exam	32		1	33
No Consult Request Entered - Other Reason	7	1		8
No Consult Request Entered - Patient Already Has Dental Appointment	18	11	2	31
Request consult with dental clinic for evaluation/follow-up care	17	6	3	26
Grand Total	**74**	**18**	**6**	**98**

Table 3: Outcomes of oral health screenings by medical providers, by dental consult request and dental encounter status.

Specific to children treated with SDF (n=17), 4 children (24%) were seen for a follow up appointment in the dental clinic; 11 children (65%) were not seen in the dental clinic (e.g. broken appointment, not scheduled, or not recorded by project coordinator); and 2 children (12%) were scheduled for an upcoming dental appointment (but not seen before the demonstration project reporting deadline).

Results – By Site

Program #1

Outcome Measure	N
Number of 1-5 year-old patients seen overall in the medical department during the project period?	67
Number of 1-5 year-old patients receiving an oral health screening in the medical department?	44
Number of 1-5 year-old patients who were screened who received SDF treatment in the medical department?	11
Number of 1-5 year-old patients who were screened who needed SDF treatment (received, refused, or referred) in the medical department?	20
Number of 1-5 year-old patients who were screened by medical and then referred to the dental department for follow-up care?	4
Number of 1-5 year-old patients overall seen in medical (screened or not) referred to the dental department for follow-up care?	18

Program #2

Outcome Measure	N
Number of 1-5 year-old patients seen overall in the medical department during the project period?	72
Number of 1-5 year-old patients receiving an oral health screening in the medical department?	54
Number of 1-5 year-old patients who were screened who received SDF treatment in the medical department?	6
Number of 1-5 year-old patients who were screened who needed SDF treatment (received, refused, or referred) in the medical department?	13
Number of 1-5 year-old patients who were screened by medical and then referred to the dental department for follow-up care?	7
Number of 1-5 year-old patients overall seen in medical (screened or not) referred to the dental department for follow-up care?	7

Successes and Lessons Learned – By Site

Program #1

- A patient referral system between Medical and Dental was created in the Electronic Health Record (EHR) charting system.

- A Health Podcast was developed to help improve community member's awareness on early childhood cavities and to increase their knowledge about the benefits of Silver Diamine Fluoride. The Podcast was broadcast over the local radio station during the latter half of the demonstration project period. Also, this Podcast concept was shared IHS, tribal, and IHS-funded urban dental programs through the Division of Oral Health (DOH) dental listservs as part of the Oral Health Literacy Initiative.
- A different subset of Native American children ages 1-5 years were accessed by having a SDF program carried out by medical providers.
- Medical providers need more awareness of oral disease allowing them to make appropriate referrals to the dental department.
- This type of program helps improve parents/patient awareness about silver diamine fluoride and its benefits.
- The project promoted the dental department through referrals from the medical department. Additionally, the dental department was also promoted by having the dental hygienist participate in the first several weeks of oral screenings, SDF treatment, and patient education.
- One observation made early in the grant project was that a large proportion of 1-5 year old Native American children seen in the medical department do not access dental services at Program #1 and instead seek dental services through private dental offices in nearby towns. During some of the planned screening events, there was a 20% "No Show Rate."
- Another barrier was the time investment to train the medical provider on how to conduct an oral health screening and to how to apply SDF.
- The last barrier was that only one medical provider participated in the demonstration project. With another participating provider, oral screenings and SDF applications could be distributed evenly among both providers, allowing more time in their schedules for non-demonstration project patients.
- During the demonstration project reporting period, the participating medical provider separated from program #1, creating a medical staffing shortage. In light of this change, the dental program has encouraged the other medical providers to screen 1-5 year old children for active oral disease and refer them to the dental department for evaluation and treatment. When the medical staffing shortage improves, program #1 hopes to continue with a medical-led SDF program.

Program #2

Below is an assessment of the project provided the by lead med staff participant. The response is addressed to the dental program lead.

> *I tried different ways of laying the kids down and holding their heads still but no one way worked well with the furniture I have (and the lack of experience lol). My assistant getting the stuff ready and handing it to me from that cart worked well. The problem we ran in to was that many of the kids already had the silver diamine, had appt with you in the next week or so, or had seen out of town dentists for work under sedation with caps and teeth removal. Most of who I see in that age group are parents trying to get their kids into head start or preschool so they are required to see*

the dentist and have forms that need to be filled out by the dentist. OR they are parents who want their kids to be healthy so they come in for physicals regularly and see the dentist regularly too. A lot of the kids had started going to the dentist early because you told me (and I told them) that you wanted to see them soon after their teeth started coming in. With your work and the preschool requirements, it doesn't seem to be needed to have silver diamine in our clinic. I can see where it would be helpful in other communities though that don't have the same availability. I know in the community where I was in private practice in another state, the dentists didn't see kids until they were 3 years old and up. So silver diamine would be handy in pediatric clinics there. I would recommend that a clinic that might start a new program try it out like we did first and see what the demand tends to be before advertising that they have it available permanently.

Conclusion

This demonstration project provided a glimpse into the challenges as well as opportunities for I/T/U medical programs to implement a medical-led SDF program. Through this demonstration project, the following common themes emerged:

- **Medical Staffing** –Two of the four funded project sites experienced medical staffing shortages during the demonstration project. For one site, the lack of staffing prevented them from participating in the demonstration project entirely. For the other site, the participating medical provider separated after the conclusion of the demonstration project. The lesson learned from these experiences is that adequate medical staffing levels are necessary for a successful medical-led SDF program.
- **Local Champions** – The two sites that successfully completed the medical-led SDF project had strong local champions for oral health, in both the dental and medical programs. Without local champions, with a shared goal to improve oral health, this type of medical-led model may be difficult to sustain.
- **Non-IHS Dental Clinics** – Both sites reported that several of the children screened in the medical program were being seen by private practice (i.e. non-IHS) dentists. It is likely that I/T/U programs that are close to larger cities and towns may have a higher proportion of children seeking dental care from non-IHS dentists. Therefore, the remoteness of the I/T/U program should be considered when I/T/U programs are evaluating the need for a medical-led SDF program; with a higher need for a medical-led SDF program in remote locations.

Appendix

Appendix 1

2022 IHS SILVER DIAMINE FLUORIDE (SDF) MEDICAL DEMONSTRATION PROJECT
DATA COLLECTION FORM FOR CHILDREN 1-5 YEARS OF AGE

We recommend that you copy this form to use for the project data collection form and to provide to the dental department if the patient is referred. This form is for internal use only; not to be shared outside the facility.

Screen Date: ☐☐ / ☐☐ / ☐☐	Date of Birth: ☐☐ / ☐☐ / ☐☐
Gender (check one): ☐ Male ☐ Female	
Chart Number/Patient Identifier: _____	

Screening

1. Is tooth decay present? ☐ Yes ☐ No obvious problems (*if no → go to question 5*)

2. Is SDF indicated? ☐ Yes (*if yes → go to question 4*) ☐ No

3. If SDF is not indicated, why not? (Check all that apply)
   - ☐ Tooth decay is too large (e.g. tooth pain or abscess)
   - ☐ Patient is currently seeing a dentist for treatment
   - ☐ Patient has mouth sores/ulcers
   - ☐ Patient has silver allergy
   - ☐ Other:_____

4. Was SDF completed today?
   - ☐ Yes _____(# of teeth treated)
   - ☐ No – parent/guardian did not want treatment
   - ☐ No – patient was uncooperative
   - ☐ No – plan to reschedule with medical
   - ☐ Other:_____

5. Treatment Urgency:
   - ☐ No obvious problems
     No problems requiring care before next scheduled dental visit
   - ☐ Early care needed
     Needs dental care but does not have pain or infection
   - ☐ Urgent care needed
     Needs dental care within next 24-48 hours (pain or infection)

6. Dental Consult:
   - ☐ Request consult with dental clinic for evaluation/follow-up care
   - ☐ No consult request made; patient already has dental appointment
   - ☐ No consult request made; encouraged annual dental exam
   - ☐ No consult request made; other reason: _____

Consult comments (directed to your facility's dental program):

If you have questions contact:

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