Dental Public Health Project
Descriptive Report Form

Please provide a description of your organization's successful dental public health project by completing this form. Add extra lines to the form as needed but stay within **word limits**.

Please return the completed form to Lori Cofano: lcofano@astdd.org

Name of Project
Apple Tree Dental as a Learning Health System: Using patient records technology to improve practice and policy

Executive Summary (250-word limit))
Apple Tree Dental (Apple Tree) was founded in 1985 as a non-profit dental organization to deliver on-site dental care to residents of nursing and assisted living facilities (collectively known as long-term care, LTC). Pursuit of Apple Tree's mission "To overcome barriers to oral health" and vision "To inspire partnerships that foster healthy communities" is not limited to the delivery of dental care to patients of all ages and abilities. The founders of Apple Tree recognized the potential value of structuring their clinical dental records to be a source for continual learning. This foresight and ongoing organizational commitment have resulted in a unique, nearly 40-year longitudinal database containing records for over 190,000 patients, including rich information from community dwelling older adults and LTC residents.   Although data collection is built into daily patient care, continued investments in staff, technology, and software systems have increased Apple Tree's analytic capacity. Internally, data is actively used for program planning and evaluation, quality improvement, grant seeking and reporting, and staff education. New research collaborator resources have been created to support effective research partnerships that will translate data into evidence to drive clinical and policy innovations to promote oral health equity.   Dental services are not generally covered by Medicare. Efforts to expand coverage are based upon evidence of the impact of oral health and overall health and recognition of increased medical costs for those with untreated dental disease. Research using Apple Tree's longitudinal database has the potential to further inform policy discussions and the development of appropriate benefits for older adults.

Name of Program or Organization Submitting Project
Apple Tree Dental

Detailed Project Description

Project Overview
(750-word limit)

1. What problem does the project address? How was the problem identified?

2. Who is the target population?

3. Provide relevant background information.

4. Describe the project goals.

This descriptive report focuses on Apple Tree's use of data to elevate program impact and planning by operating as a Learning Health System (LHS) and sharing its data to improve practice and policy.

Apple Tree Dental (Apple Tree) was founded in 1985 as a non-profit dental organization to deliver on-site dental care to residents of nursing and assisted living facilities (collectively known

as long-term care, LTC) in Minneapolis/St. Paul MN. They now serve patients of all ages and abilities through Centers for Dental Health, which are clinics that also serve as hubs for their mobile program. Apple Tree accomplishes its mission "To overcome barriers to oral health" through a community collaborative practice model. This approach encourages evidence-based, "top of license" team care by staff dentists, dental therapists, dental hygienists, and dental assistants, with support from non-clinical staff and leadership. Community collaborative practice also establishes partnerships with local leaders, health and social service providers, funders, researchers, and others sharing Apple Tree's vision "To inspire partnerships that foster healthy communities".

Today, Apple Tree employs 280 staff at nine centers across Minnesota. More than 85% of patients are insured through public programs (Medicaid). Because public program reimbursement is below the cost of providing care, innovation, efficiency and multiple funding streams have been essential to the organization's financial viability.

The Agency for Healthcare Research and Quality (AHRQ) defines a Learning Health System as a "health system in which internal data and experience are systematically integrated with external evidence, and that knowledge is put into practice" to provide high-quality, safer, more efficient care. AHRQ notes that this requires strong leadership, effective use of data in the clinical setting, and both a culture and workforce committed to continuous learning and improvement.

The founders of Apple Tree recognized the potential value of structuring their clinical dental records to be a source for continual learning, not just recordkeeping and billing. At that time, electronic health records (EHR) and health information exchange were not well developed. Dentistry generally did not then nor currently utilize diagnostic codes. Therefore, Apple Tree created their own systems to capture and use data, including primary dental finding codes. Initial functions included billing and scheduling, and also communication of treatment recommendations to LTC patients and the "responsible party" of those dependent upon someone for health care decision-making.

Apple Tree's longitudinal database now contains records for over 190,000 patients of all ages, including 56,000 LTC facility residents and nearly 12,000 outpatient seniors. This data on medical conditions, physical limitations, and comprehensive dental care provided to older adults in both mobile onsite and outpatient settings offers a unique resource for understanding oral and systemic conditions at this life stage.

Continued investments in staff, technology, and software systems have increased Apple Tree's analytic capacity. Executive leadership, a full-time Information Systems Director, innovations teams, including one specifically focused on research, support the collection, use, and dissemination of data. In 2023, The research team created its own strategic plan, aligned with that of the organization, and defined the team's overall objective:

> *Sustain and increase Apple Tree Dental's capacity to operate as a Learning Health System. Apply evidence and evaluation in engaging community partners in the design, implementation and evaluation of programs and projects that support our advocacy for improving access to oral health and whole person care through integrated services in our community collaborative practice model.*

Formal research partnerships have included Mayo Clinic's Rochester Epidemiology Project, the Center for Health Workforce Studies, West Health Institute and CareQuest Institute for Oral Health. Apple Tree shares its experience and learnings as part of broader advocacy efforts to improve care delivery, public program reimbursement, and policy reform.

Resources, Data, Impact, and Outcomes
(750-word limit)

1. What resources were/are necessary to support the project (e.g., staffing, volunteers, funding, partnerships, collaborations with other agencies or organizations)?

2. (a) What process measure data are being collected (e.g., sealants placed, people hired)?
   (b) What outcome measure data are being collected (e.g., improvement in health)?
   (c) How frequently are data collected?

3. How are the results shared?

The founders' foresight and organizational commitment to maintaining a structured database for research and learning means that data collection is built into daily patient care. Data is used internally for program planning, evaluation of pilot projects, quality improvement, grant seeking and reporting, staff education, and externally for research, and advocacy.

Apple Tree formed six teams to advance innovations in education, clinical practice, advocacy, fundraising, communications, and research. Staff, including clinical and administrative leadership, contribute expertise in these areas and help disseminate learnings across and beyond the organization. Engaging interested staff creates opportunities for professional development and to influence which projects and programs are undertaken. The research team is directed by a Diplomate of the American Board of Dental Public Health with clinical training in geriatric and special needs dentistry. Her dual administrative leadership and clinical position supports continuity between research and clinical care within the organization.

Apple Tree's analytic capacity and use of data have expanded through the adoption of new technologies and software systems. Examples include:
- Open Dental Software was selected as certified EHR and implemented organization-wide from 2008-2011. This eliminated paper charts and linked records, including digital radiographs and images, across all clinical settings. Pre-2011 records were converted into Open Dental format for unified storage and export to preserve the potential for longitudinal research.
- Practice by Numbers is a suite of analytic and other tools that complement Open Dental. Analysis of key performance indicators at clinician, provider type, and clinic levels are used by Apple Tree's program directors and executives. They report that the result has been improved information for staffing and budgeting purposes as well as significant time savings.
- Microsoft PowerBI links multiple sources of data (electronic health records, financial records, human resources data) to create reports and interactive dashboards. The platform provides a data exploration tool for preliminary phases of research collaborations and as an internal reporting tool. Filters can focus on particular cohorts, such as patients served in LTC settings, providing rapid data access for specific populations and programs.
- OverJet AI is an artificial intelligence software that annotates radiographs to draw attention to potential dental pathology, including bone loss measurements and density changes in tooth structure. In addition to assisting clinicians in diagnosis, Apple Tree has implemented OverJet to encourage early detection and minimally-invasive treatment of oral diseases in all populations, including older adults.

Research infrastructure funding from the CareQuest Institute for Oral Health has made the unique data resources of Apple Tree Dental more accessible to potential research collaborators. A comprehensive research reference was created to guide collaborators throughout the entire research process - from exploration to implementation and dissemination on Apple Tree's website: Research Collaborators Resource. The ultimate goal

Revised January 2023

is to support effective research partnerships that will translate data into evidence to drive clinical and policy innovations to promote oral health equity, including for older adults.

Since 2019, Apple Tree Dental has collaborated as a community partner with the Mayo Clinic Rochester Epidemiology Project (REP), a longitudinal health record linkage system. The REP captures a 29-county region across Minnesota and Wisconsin with contributions of comprehensive electronic health records, lab results, public health records, and a biobank register from hospitals and outpatient clinics. The REP has focused on lifespan studies of comorbidities, including frailty and other conditions related to older age. In compliance with Minnesota statutes on research using health records and patients' authorization, Apple Tree contributes its dental records to be linked to detailed medical, public health, and hospital records for longitudinal analysis, enabling robust investigation into oral-systemic interactions.

In 2020, Apple Tree Dental served as a pilot for the American Dental Association's launch of the Dental Experience and Research Exchange (DERE), a data registry aimed at building capacity for quality measurements at the office level and aggregate level. Apple Tree's participation as a pilot program within the DERE helped inspire expansion of the overall measurements represented in the registry as well as work toward encouraging value-based metrics among all participating practices.

Links to two past publications specific to older adult oral health based on research using Apple Tree's longitudinal data base are found below under Resources.

- Dr. Barbara Smith's doctoral research, "What predicts oral health stability in a long-term care population?", published in 2005 in the Journal of Special Care Dentistry, showed that 44% of older adults achieved oral health stability, defined as needing no new treatment at a subsequent examination after the completion of initial treatment.
- A collaboration between Apple Tree and the West Health Institute resulted in a PLOS One publication entitled "Longitudinal analysis of cost and dental utilization patterns for older adults in outpatient and long-term care settings in Minnesota". The study found that costs decreased over time in both groups and that dental utilization patterns also shifted over time to increased preventive care and decreased restorative care.

Additional research has the potential to inform the development of appropriate Medicare dental benefits and study the workforce needed to meet oral health needs of older adults.

Budget and Sustainability
(500-word limit))

Note: Charts and tables may be used.

1. What is/was the budget for the project?

2. How is the project funded (e.g., federal, national, state, local, private funding)?

3. What is the sustainability plan for the project?

Apple Tree deploys the following strategies for future sustainability:
1) Leverage our skilled teams and unique strengths to build sustainable community collaborations that help people of all ages and abilities achieve health and well-being.
2) Advance oral health care delivery, education, research, and public policy by developing and testing innovative solutions that influence local and national systemic change.
3) Strengthen Apple Tree's financial health and sustainability by investing in purposeful employee development, optimal clinical facilities, and strong community partnerships.

Apple Tree's multiple funding streams support a sustainable business model. Earned revenue from dental services is supplemented with federal, state, and local foundation grants, corporate support, individual gifts, and consulting services. Initially supported primarily by grant funding, opportunities for revenue-generating research projects have resulted from the research team's increased capacity and infrastructure. As recommended by its Board of Directors, Apple Tree plans to develop methods to capture the return on investment in research activities.

Lessons Learned
(750-word limit))

    (a) What lessons were learned that would be useful for others seeking to implement a similar project?
    (b) Any unanticipated outcomes?
    (c) Is there anything you would have done differently?

Apple Tree's journey to become a LHS began with the foresight to establish longitudinal database structured to allow research. Nearly four decades later, practice management, analytic, and artificial intelligence software have exponentially increased the potential uses of their data. Because investments in data analytics and research are more easily quantified than the longer term returns, leadership's commitment to a broader mission and vision has been essential.

The importance of identifying well-aligned partners may sometimes result in declining requests which diverge from Apple Tree's mission. Establishing clear research priorities and partnership criteria support evaluation and selection of opportunities.

The majority of activities described in this report have leveraged the expertise and time of existing staff. In most cases, the core responsibilities of the employee continued during the implementation of an innovative project. With the expansion of opportunities for internal and external research activities, an important lesson has been to consider the implications for current employees or the need for additional staff. Appropriately balanced involvement can enhance employee satisfaction and professional development.

Resources

List resources developed by this project that may be useful to others (e.g., guidelines, infographics, policies, educational materials). Include links if available.

Previous descriptive reports and details of Apple Tree's organizational history, growth, community collaborative practice delivery model, teledentistry and pediatrics program are available at https://www.astdd.org/best-practices/ and www.appletreedental.org.

Internet Citation: About Learning Health Systems. Content last reviewed May 2019. Agency for Healthcare Research and Quality, Rockville, MD.
https://www.ahrq.gov/learning-health-systems/about.html

Open Dental Software™: https://opendental.com/

"What predicts oral health stability in a long-term care population?"
Dr. Barbara J. Smith Spec Care Dentist 25(31: 150-157. 2005)
https://deepblue.lib.umich.edu/bitstream/handle/2027.42/75086/j.1754-4505.2005.tb01426.x.pdf?sequence=1&isAllowed=y

Longitudinal analysis of cost and dental utilization patterns for older adults in outpatient and long-term care settings in Minnesota. PLoS ONE 15(5): e0232898. (2020) https://doi.org/10.1371/journal.pone.0232898

Apple Tree's Research Collaborator Resources: https://www.appletreedental.org/mission/research-2/research-collaborators/

Mayo Clinic's Rochester Epidemiology Project: https://rochesterproject.org/

The Center for Health Workforce Studies: https://oralhealthworkforce.org/

The CareQuest Institute for Oral Health: https://www.carequest.org/

The West Health Institute: https://www.westhealth.org/

ADA Dental Experience and Research Exchange (DERE)™: https://www.ada.org/resources/research/dental-experience-and-research-exchange

Minnesota statute 144.295 related to research authorization: https://www.revisor.mn.gov/statutes/cite/144.295

Contact for Inquiries	
Name:	Lyubov Slashcheva
Title:	Research Director, Dentist
Agency/Organization:	Apple Tree Dental
Address:	327 Western Ave, Suite A, Fergus Falls, MN 56537
Phone:	
Email:	lslashcheva@appletreedental.org
Second Contact for Inquiries	
Name:	Deborah Jacobi
Title:	Policy Director
Agency/Organization:	Apple Tree Dental
Address:	2442 Mounds View Blvd, Mounds View, MN 55112
Phone:	
Email:	djacobi@appletreedental.org

Revised January 2023

To Be Completed By ASTDD	
Descriptive report number:	26018
Associated BPAR:	Improving the Oral Health of Older Adults
Submitted by:	Apple Tree Dental
Submission file name:	DES26018MN-atd-learning-health-system-2023
Submission date:	November 2023
Last reviewed:	November 2023
Last updated:	November 2023