Pediatric Oral Health Research & Policy Center

Technical Report 1-2012:

Considerations for Caries-Risk Assessment in an Essential Health Benefits Dental Plan for Children

Summary

The American Academy of Pediatric Dentistry supports the concept of caries-risk assessment, and acknowledges that scientific advances have been made to improve its use in clinical care of children.[19] However, the Academy also recommends that an essential dental benefits plan clearly define the role of caries-risk assessment and provide compelling scientific evidence of its benefit to the oral health of children. Caries-risk assessment must be broadly defined beyond the biologic parameters of the classic caries model. At this time, the Academy encourages more study to gather evidence to support clinical application of caries-risk assessment in any plan. To date, no existing instrument can ensure accurate categorization of children by risk or predict future caries experience through its application in clinical practice. Without good science and its thoughtful application, both children and the clinicians who serve them are placed in jeopardy.

Introduction

The evolving science of caries-risk assessment holds promise to meet two major goals of health care reform: efficiency and quality. Efficient allocation of resources for the prevention and control of caries should reduce costs; individualized prevention and focused treatment should minimize unnecessary interventions on children, keeping to the tenet of *primum non nocere* (first, do no harm).

To date, caries-risk assessment remains an incomplete science. A recent review of caries-risk assessment literature [1] suggests that the best predictor of future caries remains the child's caries history. One of the longest running prospective caries risk projects in Sweden confirms that early caries is the strongest predictor of dental caries in teenage years. [2] Other factors, such as diet and fluoride adequacy, provide weaker predictive value and have limited clinical utility. Risk paradigms have been proposed for use in oral health care of children by several professional groups, based largely on expert opinion using extant research literature [3, 4, 5] rather than on randomized clinical trials. The attachment depicts some examples. These clinically applied paradigms share the commonalities of: (1) historical and clinical data collection by clinicians, (2) quantification of risk by an algorithm, and (3) assignment of individuals into a risk category. Some risk assessment tools use risk status to allocate recommended preventive and health supervision services.

Risk-based care already has taken root in some aspects of pediatric dentistry, such as fluoride therapy,[6] prescription of radiographs,[7] and determination of the need for sealants. [8] Even within these current risk-framed applications, broad risk characteristics predominate and clinician judgment plays a significant and potentially mitigating role. Few payer organizations currently require risk assessment be performed for allocation of services.

Considerations

The use of risk assessment in allocation of preventive and therapeutic services in any dental benefits plan for children demands caution. As an evolving science with: (1) weak supporting evidence, (2) broad risk categories depending upon the instrument used, (3) an overdependence on biological aspects of dental caries, and (4) inconsistent specificity and sensitivity, dental caries-risk assessment should be limited in its role in adental benefits package offered under the ACA or otherwise at this time. The following are important considerations:

Further study and rigorous testing must be done before any caries-risk assessment tool is employed in allocation of services to children.

1. *Caries-risk science needs to provide stronger supportive evidence of its predictive value in assignment of risk at the individual patient level.* Expert-derived or population-based caries-risk assessment schemes should not be used for patient care without adequate testing and validation.

2. *Caries-risk assessment instruments in use today do not provide the clinician with individualized direction to determine appropriate preventive and therapeutic measures.* At best, available measures are an adjunct to a clinician's judgment, which has been shown to be a reasonable predictor of risk. [9]

3. *Caries-risk assessment today does not provide the precision to permit accurate or valid addition or reduction of preventive services in a care plan.* More frequent health supervision visits, fluoride applications or other preventive services are not well-supported by existing caries assessment instruments. Conversely, little is known about the effect of reduction in caries preventive and control services in low-risk patients who may enjoy that status because of those services.

Prior to implementation of any caries-risk assessment within a dental benefits package for children, the nature of its use and management within a dental coverage plan should be clear.

1. *Determination of caries risk should be considered a professional service in itself and, if included in a benefits package, be assigned an appropriate fee.* Periodicity of risk assessment must also be addressed as circumstances change and clinicians must re-assess caries risk to assure appropriate preventive care.

2. *With medical care advances in medications, surgical care, and adjunctive services, it is important that plans have the capacity to modify policies on what constitutes caries risk for those children with medical problems and disabilities.* Caries risk may be altered with physiologic or pharmacologic changes during the course of a systemic illness and diagnosis of a medical condition may be justification of a higher caries risk.

3. *Clinicians would be well-advised to include caries-risk assessment in the assessment of oral health and plans should provide participating clinicians with guidance and education about how caries risk should be applied in clinical practice.* A growing body of literature supports a relationship between early childhood caries and caries in adolescence. Further, based on work in high-risk populations in this country and abroad, [10, 11] it appears that even intensive prevention may not alter the caries pattern of some children who have experienced early childhood caries and caries in the permanent dentition. This finding is amplified by the recurrence of early childhood caries in a very short time after restoration. [12, 13, 14, 15] This recognition challenges essential benefits plans to have guidance for intensive prevention and aggressive treatment such as stainless steel crowns and sealants on primary teeth. It is not clear, for example, how caries-risk assessment would fit into care decisions by individual clinicians or care systems that serve populations already at adverse risk for caries.

4. *With the availability of electronic health care records, billing, and provider tracking information, plans should be encouraged to develop policies related to caries-risk assessment that are scientifically sound and beneficial to patients.* In keeping with a movement toward caries-risk assessment as an accepted procedure within oral health supervision, industry should work with the research and clinical communities to develop useful diagnostic coding related to caries risk. Policies and procedures should be modified to permit new applications of established preventive and therapeutic services to address caries risk in individuals. These would include procedures such as interim therapeutic restorations and more frequent applications of fluoride. Further, current periodicity of services should be open to revision as the impact of risk-based therapies is better understood. To date, few dental insurers require or encourage caries-risk assessment as a viable tool.

5. *Since there is little evidence to support or refute the use of caries-risk assessment to reliably predict future disease, recognition should be given to the practitioners' ability to longitudinally monitor their patients' clinical condition through regular recall visits that incorporate the caries-risk assessment rather than the prediction of risk at one point in time.* Clinical evidence indicates that frequent risk assessment addresses the fact that patients may go from inactive caries to active caries in a relatively short period of time[1]. Regular recall allows for ongoing clinical assessment of risk while maintaining the dental home relationship. During recall visits, additional risk reduction activities such fluoride varnish application, reinforcement of positive oral habits and anticipatory guidance take place. In the development of risk-based reimbursement structures, it is important to retain a minimum semi-annual recall schedule for all to allow for both risk monitoring and positive risk-reducing activities. Individuals with active caries may benefit from more frequent recall for purposes of disease monitoring and mediation.

The literature now strongly supports the role of non-biologic factors in caries risk and caries-risk assessment must address non-biologic patient-based factors in any caries-risk assessment application.

1. *The now widely accepted association of non-biologic factors such as ethnicity and socioeconomic status in dental caries initiation [16, 17] must be considered with appropriate weight* along with classic biologic factors in determining caries risk. Non-biologic factors may place a child in a higher risk category *even in the absence of biologic risk factors*. The established relationship between caries incidence and minority and poverty status challenges proponents of a caries-risk assessment requirement in individual patient care to address the influence of difficult-to-mitigate socioeconomic factors such as family income, cultural norms, food insecurity and parental caries status on a child's caries susceptibility, particularly when that child is currently caries-free. Further, risk assessment must reach into the realm of compliance. Case management has become critical to the success of treatment for many pediatric diseases. Early childhood caries, tied closely to poverty and social dysfunction, may not be managed without due consideration of and payment for case management services. Caries-risk assessment must include determination of compliance with current and future recommendations within the overall risk assessment of the child at high risk.

2. *In pediatric dentistry, due consideration must be given to behavior in the management of dental caries.* Any model of caries-risk assessment must address both the biologic and behavioral management of the disease. Conventional thinking linked to the biological model of dental caries initiation only [18] does not address behavior as a key to management of disease. This consideration ranges from acceptance of pharmacologic methods allowing for appropriate and humane treatment of caries to support for aggressive restorative approaches to the primary dentition in high caries risk children. In other words, the best treatment for a high caries risk child may be to restore the dentition with stainless steel crowns, seal susceptible primary molars, and choose pulp therapy with the greatest likelihood of long-term success.

References

1. Tagliaferro EPdS, et al. An overview of caries-risk assessment in 0-18 year-olds over the last ten years (1997-2007). Braz J Oral Sci 2008;7(27): 1682-1690.

2. Alm A et al. Caries in adolescence – influence from early childhood. Comm Dent Oral Epidemiol 2011;

3. American Academy of Pediatric Dentistry Council on Clinical Affairs. Guidelines on caries-risk assessment and management for infants, children and adolescents. Pediatr Dent 2011; 33 (6): 110-17.

4. Scottish Intercollegiate Guideline Network (SIGN). Prevention and management of dental decay in the preschool child. 2005. Available at: *http://www.sign.ac.uk/pdf/sign83.pdf* Accessed January 26, 2012.

5. American Dental Association Councils on Scientific Affairs and Dental Practice. Caries-risk assessment form (Ages 0-6). American Dental Association: Chicago, IL, 2008 Available at: *http:///www.ada.org/sections/professionalResources/docs/topics_caries_under6.doc* Accessed January 26, 2012.

6. Centers for Disease Control and Prevention. Recommendations to use fluoride for the prevention and control of dental caries in the United States. MMWR Recomm Rep 2001; 50 (RR14): 1-42.

7. American Dental Association, US Department of Health and Human Services. The selection of patients for dental radiographic examination – 2004. Available at: *http://www.ada.org/prof/resources/topics/radography.asp* Accessed January 26, 2012.

8. American Dental Association Council on Scientific Affairs. Evidence-based clinical recommendations for use of pit-and-fissure sealants. JADA 2008; 139 (4):257-67.

9. Isokangas P et al. The clinician's ability to identify caries risk subjects without saliva tests – a pilot study. Community Dent Oral Epidemiol 1993;21: 8-10.

10. Hausen H, Karkkainen S, Seppa L. Application of the high-risk strategy to control dental caries. Community Dent Oral Epidemiol 2000; 28: 26-34.

11. Symposium on early childhood caries in American Indian and Alaska Native children. ADA Panel Report—Council on Access, Prevention and Interprofessional Relations 2009. 1-14.

12. Almeida A, Roseman M, Sheff M, Huntington N, Hughes C. Future caries susceptibility in children with early childhood caries following treatment under general anesthesia. Pediatr Dent 2000; 22(4): 302-6.

13. Kakaounaki E, Tahmassebi JF, Fayle SA. Further dental treatment needs of children receiving exodontia under general anaesthesia at a teaching hospital in the UK. Int J Pediatr Dent 2006; 16: 263-269.

14. Berkowitz RJ, Moss M, Billings RJ, Weinstein P. Clinical outcomes for nursing caries treated using general anesthesia. ASDC J Dent Child 1997; 64(3): 210-1, 228.

15. Berkowitz R et al. Dental caries recurrence following clinical treatment for severe early childhood caries. Pediatr Dent 2011; 33: 510-4.

16. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader Mah-J, Bramlett MD et al. Influences on children's oral health: a conceptual model. Pediatrics 2007; 120: e510-e520.

17. Larson K et al. Influence of multiple social risks on children's health. Pediatrics 2008;121:337-44.

18. Fitzgerald RJ, Keyes PH. Demonstration of the etiologic role of streptococci in experimental caries in the hamster. J Am Dent Assoc. 1960; 61: 9-19.

19. Gao X-L, Hsu C-YS, Xu Y, Hwarng HB, Loh T, Koh D. Building caries-risk assessment models for children. J Dent Res 2010; 89: 637-43.

Attachment

Examples of Caries-Risk Assessment Tools

AAPD Caries-Risk Assessment Tool: The AAPD CAT consists of various one-page assessment forms (based on patient age) which characterize risk in terms of biologic/behavioral factors, protective factors and clinical findings. The tool includes recommendations for treatment planning based on patient risk. Factors evaluated include: socioeconomic status, diet (sugar and beverage consumption), special health care needs, recent immigrant, fluoride use, oral hygiene, dental home, inter-proximal lesions, active white spot lesions or enamel defects, salivary flow, restorations, wearing an intraoral appliance. There are separate forms for age 0-5 years and age > 6 years. There are separate tools for dental professionals and for non-dentists.

Pros: The AAPD CAT is simple to use and easily integrated into the clinical record. Additionally, the tool provides a clear, research-based caries management protocol.

Cons: The AAPD CAT is a point in time assessment and has not been clinically tested to provide predictive utility.

ADA Caries-Risk Assessment Tool (ADA CAT): The ADA CAT is a one-page risk assessment questionnaire which allows the dental professional to rate the patient's risk as low, medium, or high based on a number of behavioral, health and clinical conditions. Risk is given a numerical value. Identified factors include: fluoride exposure, sugary foods or drinks (diet), eligible for government programs, caries experience of mother, caregiver or other siblings, dental home, special health care needs, restorations/cavitated carious lesions, non-cavitated carious lesions, teeth missing due to caries, visible plaque, dental/orthodontic appliances and salivary flow.

Pros: The ADA CAT is simple to use and easily integrated into the clinical record. Additionally, the tool encourages additional clinical examination to determine risk and guide treatment planning.

Cons: The ADA CAT is a point in time assessment and has not been clinically tested to provide predictive utility.

Informal Caries-Risk Assessment: A survey of caries-risk assessment in children from Dental Practice-based Research Network member dentists revealed that, although 73% of dentists used some type of risk assessment in their practices, only 14% utilized a specific caries-risk assessment form. Factors thought to be most important in determining risk by these dentists were: the presence of active caries lesions, current oral hygiene practices, and decreased salivary flow. Those factors considered least important include family socioeconomic status and parents' caries status. Current use of fluoride and current diet were also identified as risk factors.[2]

Pros: This process is easy to implement and intuitive for busy providers.

Cons: The informal risk assessment is unstructured and, thus, does not guarantee consistent implementation. The inclusion of one criteria or another is based on clinical intuition, rather than hard data.

Saliva testing: Presence of *mutans streptococci*, both in plaque or saliva of young caries-free children, appears to be associated with a considerable increase in caries risk. There are two test kits currently available in the United States for chairside testing. One is the "Caries Risk Test" (CRT) marketed by Vivadent/Ivoclar (Amherst, N.Y.). The other is the "Dentocult SM" and "Dentocult LB" test, marketed by Edge Dental. Both provide a level of low, medium, or high cariogenic bacterial challenge separately for MS and for LB.

Pros: Clinical studies have established a statistically significant relationship between positive saliva testing and future caries.[3]

Cons: Saliva testing requires specialized equipment, can be expensive and is not often reimbursed by insurance.

Cariogram: Cariogram is a software program which aims to demonstrate the multi-factorial background of dental caries by illustrating the interaction of nine caries-related factors. Patients are scored on diet, plaque, caries experience, bacterial counts and saliva secretion and the results are shown as a pie-chart risk profile.

Pros: The cariogram applies a comprehensive and exhaustive approach to identification of risk. The process includes a questionnaire, an interview, an estimation of oral hygiene and saliva sampling.

Cons: One possible barrier for the use of this program is the inclusion of salivary tests with microbiological cultivations. Chair-side microbial tests are costly and time consuming and they delay the process.

Caries Management by Risk Assessment (CAMBRA): The caries-risk assessment process for the infant/toddler is comprised of parent/caregiver interview, examination of the child, assignment of caries-risk level, and bacterial cultures, if indicated. The model includes recommendations for preventive services based on identified risk.

Pros: The CAMBRA tool is simple and straightforward to use.

Cons: In practice, the CAMBRA interviews are used as a complete risk assessment. The factors identified on the interviews do have a relationship with caries risk, but have not been tested to be predictive of future caries incidence. The CAMBRA is a point-in-time measure of risk, however, the preventive services and recall recommendations (up to 12 months for periodic exams and 24 months for radiographs) for low-risk children do not account for the sometimes rapidly changing circumstances that can drastically modify risk in a short period of time.

Definitions

Risk Factor: Environmental**,** demographic, behavioral or biologic factors which have been confirmed to directly influence the probability of contracting a disease (in this case, caries).

Risk Indicator: Factors which have been identified as having possible or probable relationship to contracting a disease.

Risk Assessment Tool: An instrument to determine an individual's susceptibility to future dental caries, which is non-invasive, reproducible, has validity, is inexpensive, and relates to treatment and preventive therapy.

(Endnotes)

[1] *Brocklehurst P, Ashley J. & Tickle M. Patient assessment in general dental practice – risk assessment or clinical monitoring? British Dental Journal 2011, 210: 351-354.*

[2] *Riley, J, Qvist, V, Fellows, J, Rindal, D, Richman, J, Gilbert, G, & Gordan, V. Dentists' use of caries-risk assessment in children: findings from the dental PBRN. Gen. Dent 2010, 58(3): 230-234.*

[3] *Twetman S, Ståhl B, Nederfors T: Use of strep mutans in the assessment of caries risk in a group of preschool children. Int J Paediatr Dent 1994, 4:245-50.*

Founded in 1947, the American Academy of Pediatric Dentistry (AAPD) is a not-for-profit membership association representing the specialty of pediatric dentistry. The AAPD's 8,000 members are primary oral health care providers who offer comprehensive specialty treatment for millions of infants, children, adolescents, and individuals with special health care needs. The AAPD also represents general dentists who treat a significant number of children in their practices. As advocates for children's oral health, the AAPD develops and promotes evidence-based policies and guidelines, fosters research, contributes to scholarly work concerning pediatric oral health, and educates health care providers, policymakers, and the public on ways to improve children's oral health.

The Pediatric Oral Health Research and Policy Center (POHRPC) exists to inform and advance research and policy development that will promote optimal children's oral health and care. To fulfill this mission, the POHRPC conducts and reports oral health policy research that advances children's oral health issues and supports AAPD public policy and public relations initiatives at the national, state, local, and international levels with legislatures, government agencies, professional associations, and other non-governmental organizations.

For more information about the AAPD Pediatric Oral Health Research and Policy Center, please access our website at *http://www.aapd.org/policycenter/*.

This report was authored by Paul Casamassimo, DDS, MS and Jan Silverman, MS, MSW, LCSW