

Caries Risk Assessment-Protocols and Paraphernalia

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Abstract

Measures of caries control involve identifying the disease process and the risk factors; this is achieved by first performing a caries risk assessment for the patient in order to identify his/her risk factors for caries development. With a better understanding of the caries process, there comes a change in operative dentistry. Although there is considerable variability between dentists, there is more emphasis on preventive dentistry than ever before. The shift in emphasis appears to be occurring in dental schools in which curriculum and practical skills are focused more on caries risk assessment, modern management of the caries disease. This paper reviews about the various caries risk assessment approaches and models and stresses on the need for a risk assessment based approach.

Keywords: *Dental caries, Risk assessment, Basic protocols, Management.*

Introduction

Dental caries is a major oral health burden and is the commonest dental disease seen throughout the world. Dental caries has been linked to food habits, lifestyle changes, oral hygiene etc. Recent advances in the field of dentistry regarding caries detection and management, preach CRA to be the need of the hour. The American Academy of Paediatric Dentistry (AAPD) has recognized caries-risk assessment and management protocols as a tool to assist clinicians with decisions regarding treatment based upon caries risk and patient compliance and are essential elements of contemporary clinical care for infants, children, and adolescents.

Awareness about caries risk assessment is essential as it helps the dentist assess caries susceptibility and carious lesions at an earlier stage, which indirectly helps in educating & motivating the patient in maintaining a good oral hygiene and also reduces the amount,

extensiveness of invasive treatments. A caries risk assessment tool saves both the dentist's and the patients chair side time for further appointments.

Hence, a set guideline has to be followed to educate healthcare providers and other interested parties in preventive dentistry and aid in clinical decision making regarding diagnostic, fluoride, dietary and restorative protocols¹.

Caries Risk Assessment: Caries risk assessment (CRA) is the process of collecting data regarding various factors (e.g. bacterial level) and indicators (e.g. previous caries experience) to predict caries activity in the immediate future².

Formal CRA has been described as a four-step process:

1. Identification of measurable risk factors;
2. Development of a multifactorial tool;
3. Risk assessment to determine a patient's risk profile; and
4. Application of preventive measures tailored to the risk profile³.

The risk assessment tool should estimate caries risk, identify the primary etiological factors, provide an inventory of the patient's current preventive practices,

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and serve as a guide for selecting specialized preventive care tailored to that individual's needs.^{4,5,6} Research has shown that experienced clinicians are often able to assess caries risk very quickly and accurately.^{7,8,9}

Performing a CRA assists practitioners in providing patients with appropriate levels of preventive care and to avoid unnecessary procedures^{10,11}. If dental professionals were able to identify, in advance, individuals at the greatest risk of developing dental caries, the cost of caries prevention procedures could be markedly reduced and their efficiency greatly increase. Dental caries management by formal risk assessment represents a significant change in the profession and should be incorporated into daily practice as dictated by practices of evidence-based standards of care. CRA should be routinely built into preliminary and recall examinations as the findings help to guide the patient's designated course of treatment. This is especially important before extensive prosthodontics, restorative, and orthodontic treatment is undertaken to ensure a favourable prognosis^{13, 14}.

Need for having CRA:

CRA may be valuable in the clinical management of caries by helping dental clinicians to:

1. Categorize the level of the patient's risk of developing caries to control the intensity of treatment rendered.
2. Pinpoint main etiological factors that contribute to the development of decay and thus determine appropriate form of therapy.
3. Assist in restorative treatment decisions (e.g. choice of restorative material).
4. Improve prognosis of planned therapeutic care.
5. Provide information on what additional diagnostic tests and screening are required.
6. Educate and motivate patients to improve and maintain optimum oral health.
7. Guide timing of subsequent recall appointments.

CRA tools screen people based on risk factors and predictors and classify patients into one of three risk categories- low, moderate, or high^{6,15,16}. If new caries has developed since the last examination, the patient is categorized either as moderate or high risk depending on the time elapsed since the last examination, and the number and severity of carious lesions¹⁷. Diagnosing a

moderate risk group accurately is the greatest challenge. These patients, along with people who are at risk without any apparent signs or symptoms of disease, benefit the most from identification from CRA^{18,19}.

Although dental caries has long been established to be a disease of multifactorial etiology, many of the traditional caries prediction models have focused on individual factors associated with high caries activity²⁰. More recently, the multifactorial etiology of caries points in the direction of constructing a more promising risk assessment model that includes the various factors that contribute to the development of caries as: host resistance, cariogenicity of the diet, and microbial pathogens.^{2, 21, 22}

Caries risk assessment model: There are two frameworks that can be used for the development of CRA instruments: *the risk model and the prediction model*. The risk model, or sometimes called the etiologic model, is employed when one wants to identify the risk factors for the disease to implement the most effective prevention and treatment interventions. It detects only true risk factors and is typically simple to use, but it is not intended to predict future caries risk. Because of its simplicity and stability across different subgroups of the population, it is often used for screening in public health domains^{23, 24}.

In contrast, a prediction model uses both risk factors and risk predictors to maximize its ability to identify low and high risk individuals (i.e. maximize sensitivity and specificity). Risk factors (e.g. *Streptococcus mutans* counts) are often more costly to measure; however, they tend to be more reliable in caries prediction. Caries-risk assessment models involve a combination of factors that include diet, fluoride exposure, a susceptible host, and micro-flora that interplay with a variety of social, cultural, and behavioural factors. Caries risk assessment is the determination of the likelihood of the incidence of caries (i.e., the number of new cavitated or incipient lesions) during a certain time period or the likelihood that there will be a change in the size or activity of lesions already present. With the ability to detect caries in its earliest stages (i.e., white spot lesions), health care providers can help prevent cavitation. It can be done using radiographs, risk assessment forms designed by various institutes (AAPD, CAMBRA).

Selection of Risk Assessment Instrument

The principle of risk assessments is that individuals

with elevated levels of risk factors will receive more aggressive preventive interventions. Because of this, examiners must be cautious in how they categorize patients in the various risk levels. One must decide at what stage a risk factor changes from low to moderate to high risk categorization. This can prove to be a difficult task as many etiological factors do not have a clear demarcation between absence and presence, but normally range from excellent to poor (e.g. oral hygiene) or from low to high (e.g. *Lactobacillus* counts).

In creating a CRA tool, a balance between sensitivity (percentage of truly diseased persons who test positively) and specificity (percentage of persons without the disease who test negatively) must be made.²⁴ In doing so, a balance is struck between the number of false positives (i.e. patients assumed to be high risk but do not develop caries) and false negatives (i.e. patients assumed to be low risk but develop caries). It is imperative that the values of sensitivity and specificity remain high to ensure that a patient labelled as high risk truly has the disease and the threat of identifying low risk individuals as diseased should be minimal.

Because it is impractical to believe that a diagnostic test would have sensitivity (Se) and specificity (Sp) values of 100%, different criteria and cut-off points have been established by researchers investigating caries risk^{26,27}. Wilson and Ashley suggested that Se and Sp values each be set at 80% to be considered an acceptable test for caries risk. Alternatively, it has been recommended by Fleiss and Kingman that the combined Se and Sp of a risk model should be at least 160%, which has become the gold standard amongst many researchers. Unfortunately, this benchmark value has only been achieved by a small number of caries prediction instruments.²³

Several tools have been used to assess the caries risk. A few of them have been enlisted below:

Caries risk assessment form was introduced by the ADA²⁸. The clinical judgment of the dentist may justify a change of the patient's risk level (increased or decreased) based on review of this form and other pertinent information. For example, missing teeth may not be regarded as high risk for a follow up patient; or other risk factors not listed may be present.

The assessment cannot address every aspect of a patient's health, and should not be used as a replacement for the dentist's inquiry and judgment. Additional or more focused assessment may be appropriate for

patients with specific health concerns. As with other forms, this assessment may be only a starting point for evaluating the patient's health status. The ADA plans to periodically update this tool based on:

1. Member feedback regarding its usefulness, and;
2. Advances in science. ADA member-users are encouraged to share their opinions regarding this tool with the Council on Dental Practice.

Two forms have been devised to assist the caries risk assessment, for the age group of less than 6 yrs. of age and that of above 6 yrs. of age. Apart from the forms, one of the most important tool of CRA is cariogram. The details have not been discussed in this article.

Public Health Significance: If the CRA tool is to be used at the public health level for mass screenings, it may be advantageous to have a higher specificity as, Public health administrators would want to avoid false positives in order to avoid over treatment of individuals that do not necessarily require the preventive services. This is especially crucial in environments where resources are scarce. On the contrary, it may be more advantageous from an ethical and economic standpoint to increase the sensitivity of the test in order to avoid false negatives. Failure to identify those at risk for caries development may result in unnecessary treatment in the future that may be more costly and painful to the patient due to the progression of undiagnosed disease. Although increasing the sensitivity may result in over treatment of some patients, if the clinician uses an appropriate preventive strategy, this would result in little to no harm to the patient in that dental caries would not be permitted to start or progress.¹²

Caries risk assessment by dentists: In recent years, a lot of importance has been attached to formal caries risk assessment to guide treatment planning decisions and recall intervals for individual patients, and various risk assessment tools and checklists have been developed for this purpose. With an established protocol on caries risk assessment, the factors that contribute to a child having caries are identified, and modifiable risk factors can be addressed. The Caries Risk Assessment Checklist (CRAC) has been developed by the Irish public dental service to encourage a formal, risk-based approach to the management of caries in Irish school-children. Given that the Guideline Development Group considered all children to be at risk of developing caries, it was decided at the outset that the checklist would only record high caries risk status.²⁰⁻²⁴

Re-assessment of caries risk: Caries risk assessment is a continuous process, as an individual's risk status can change over time. In the public dental service, intervals between dental assessments for most children are measured in years rather than months. A guideline on dental recall, which was developed for the NHS in the UK by the National Institute for Health and Clinical Excellence (NICE), recommended that the "*interval between oral health reviews should be determined specifically for each patient and tailored to meet his or her needs, on the basis of an assessment of disease levels and risk of or from dental disease.*" The guideline also recommended that "*the longest interval between oral health reviews for patients younger than 18 years should be 12 months*" based on evidence that the rate of progression of dental caries can be more rapid in children and adolescents than in older people, and seems to be faster in primary teeth than in permanent teeth.²⁰⁻²⁴

Conclusion

Caries risk assessment, based on a child's age, biological factors, protective factors, and clinical findings, should be a routine component of new and periodic examinations by oral healthcare providers. There is not enough information at present to have caries risk assessment analyses, estimating children at low, moderate, and high caries risk by a preponderance of risk and protective factors will enable a more evidence-based approach to dentists' referrals, as well as establish periodicity and intensity of diagnostic, preventive, and restorative services.

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