Carestream DENTAL

Dental Radiography Series

Guidelines
for prescribing dental radiographs.

Background

Radiological examinations are used to discover and define the type and extent of disease in many clinical situations. However, public and professional concern over the potential risks from radiation exposure and the increasing costs of radiographic examinations have led to studies of methods to reduce unproductive radiographic examinations, i.e., examinations that do not yield information useful to patient management.* There also is the possibility of underutilization of radiography; this can result in inadequate or excessively delayed diagnosis.

Significant reductions in patient radiation exposure from radiographic examinations have occurred and will continue to occur with advances in technology. Nevertheless, radiographic examinations, of necessity, involve some x-ray exposure to the patient. Therefore, before radiographic examinations are performed, dentists should judge whether the examination has an acceptable probability of affecting patient management. Professional, patient, economic, and medico legal pressures may complicate the situation.

Routine dental radiographic examinations have been the norm. It is uncertain what percentage of these routine examinations assisted in patient care. This possible exposure of the public to dental radiographic examinations that did not contribute to patient care concerned numerous dental professionals. They sought to limit the use of such examinations to instances that clearly assist in patient management.

Others shared the concern for possible overuse of dental radiographic examinations and consequent over-exposure of the public and were also disturbed by the possible unnecessary expenditure of resources and funds.

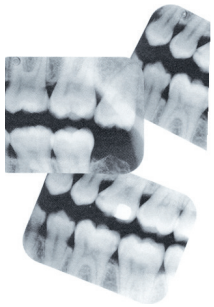
Development and use of patient selection criteria will help insure that patient exposure and associated costs will have maximum diagnostic benefit to the patient and contribute to the development of the dentist's treatment plan. Patient selection criteria are descriptions of clinical conditions derived from patient signs, symptoms and history that identify patients who are likely to benefit from a particular radiographic examination. The development and application of such criteria by the dental profession was intended to promote appropriate use of x-rays, that is, to reduce both over utilization that results in excessive radiation exposure and cost and underutilization that is associated with inadequate diagnosis. Patient selection criteria are not intended to be requirements or regulations, but rather to offer guidance based upon a careful analysis of the scientific literature concerning the impact on patient management of x-ray examinations.

Overview

When do you perform a dental radiographic examination? How do you select patients for a dental radiograph? Patient selection criteria can help in answering these questions. The criteria can also help in allocating limited health care resources, optimizing patient care, and minimizing the total diagnostic radiation burden. Among radiographic examinations, the dental examination is second only to the chest examination in terms of number of examinations and cost to the U.S. public. Thus, the use of criteria is essential. Currently, it is common for dental patients to receive dental radiographic examinations on a routine schedule with little variation in spite of differing patient signs and symptoms. It has been customary

*Unproductive radiographic examinations should not be equated with negative examinations. Negative examinations can be useful and can contribute significantly to patient care.

for dentists to obtain full-mouth series of radiographs at the beginning of a patient's care and to repeat this examination at 3- to 5-year intervals thereafter. In recent years, panoramic examinations have occasionally been substituted for the intraoral examination. Often bitewing examinations are exposed more frequently (perhaps every 6 months) to supplement the full mouth examination schedule. The rationale for this protocol is to ensure continuous radiographic surveillance for caries, alveolar bone loss associated with periodontal disease, periapical disease, and occult disease. Such routine scheduling of both bitewing and full-mouth examinations may result in unnecessary patient exposure.



The recommendations in chart 1 are subject to clinical judgment and may not apply to every patient. They are to be used by dentists only after reviewing the patient's health history and completing a clinical examination. The recommendations do not need to be altered because of pregnancy.

Selection Criteria

The approach of the Center for Devices and Radiological Health for the optimum use of radiography for all areas of medicine has been to encourage the development and use of selection criteria derived from patient signs, symptoms, and history. Usually these selection criteria take the form of identification of specific situations for radiographic examination when it is anticipated that the findings will influence patient treatment. The recommendations of the Dental Panel have been presented in a chart for ease of use. The guidelines in the chart result from an examination of many studies of incidence and rates of progression of dental caries, periodontal disease, growth and development, and occult pathology.

The philosophy behind the guidelines in the chart is found within its matrix. At least three concepts have been used. The first concept is to categorize patients by the type of visit: new or recall. The second is to categorize patients by dental status, defined by the five column headings. The third concept is to assign patients to a risk category, based on the presence or absence of certain conditions. This division is seen in the row captions. The conditions that define a high-risk category are found to the right of the chart.

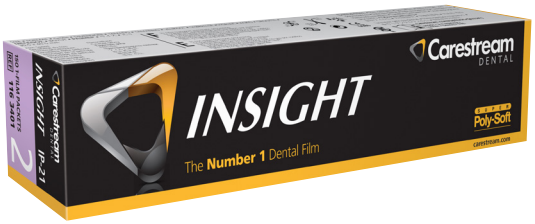
In the practice of dentistry, patients often seek care on a routine basis, in part because dental disease may develop in the absence of clinical symptoms. Since attempts to identify specific criteria that will accurately predict a high probability of finding interproximal carious lesions have not been successful for individuals, it was necessary to recommend time-based schedules for making radiographs intended primarily for the detection of dental caries. Each schedule provides a range of recommended exposure intervals derived from the results of research into the rates at which interproximal caries progresses through tooth enamel. The recommendations are also modified by criteria that place an individual in a high-risk group for dental caries. In scheduling each patient, professional judgment should be used to determine the optimum time of examination within the suggested interval. Use of the recommendations is likely to result in fewer radiographs over time for individuals in the low-risk group and may result in more radiographs for those in the high-risk group. In the future, it may be possible to eliminate even these time-based intervals as the results of additional research become available.

Selected Periapicals

The Panel also endorses the concept of using "selected periapicals," that is, the use of individual periapical radiographs selected by a dentist to examine a specific tooth or region because of specific signs, symptoms, or historical findings that suggest a high likelihood of findings that will influence patient management. It is anticipated that a dentist examining a patient will find situations for which radiographs would provide useful clinical information.

Film

With proper use of film, required diagnostic information can be obtained from dental x-rays at a minimal radiation dose. Converting from D-speed to F-speed film alone can reduce exposure by 60%. And when combined with the use of rectangular collimation, F-speed film, such as INSIGHT, delivers a radiation dose that's less than one-fifth the amount of D-speed film and round collimators. The right high-quality film can help dentists adhere to the ALARA (as low as reasonably achievable) principle to protect patients and staff alike.



Panoramic and Periapical Radiographs

The Panel considered the issue of whether a full-mouth periapical radiographic examination including bitewing radiographs was diagnostically equivalent to a panoramic examination supplemented with bitewings. A literature review was conducted to examine this issue. With respect to caries detection, the consensus finding of multiple studies is that dentists are better able to detect caries using a full-mouth periapical examination with bitewings than using a panoramic examination with bitewings. For detection of alveolar bone loss associated with periodontal disease, there is clear evidence that the full-mouth periapical examination alone is superior to the panoramic examination alone.

The recommendations contained in this brochure were developed by an expert dental panel comprised of representatives from the Academy of General Dentistry, American Academy of Oral and Maxillofacial Radiology, American Academy of Oral Medicine, American Academy of Pediatric Dentistry, American Academy of Periodontology, and the American Dental Association under the sponsorship of the Food and Drug Administration (FDA). This brochure is being reproduced and distributed to the dental community by Carestream Dental.

Chart 1 - Guidelines for Prescribing Dental Radiographs

	Child		Adolescent	Adult	
Patient category	Primary Dentition (prior to eruption of first permanent tooth)	Transitional Dentition (following eruption of first permanent tooth)	Permanent Dention (prior to eruption of third molars)	Dentulous	Edentulous
New patient	Posterior bitewing examination if proximal surfaces of primary teeth cannot be visulaized or probed	Individualized radiographic examination consisting of periapical/occlusal view and panoramic examination and posterior bitewings	Individualized radiographic examination consisting of posterior bitewings and selected periapicals. A full mouth intraoral radiographic examination is appropriate when the patient presents with clinical evidence of generalized dental disease or a history of extensive dental treatment.		Full mouth intaoral radiographic examination or panoramic examination
Recall patient	Posterior bitewing examination at 6-month intervals or until no carious lesions are evident		Posterior bitewing examination at 6- to 12-month intervals or until no carous lesions are evident	Posterior bitewing examination at 12- to 18-month intervals	Not applicable
No clinical caries and no high-risk factors for caries	Posterior bitewing examination at 12- to 24-month intervals if proximal surfaces of primary teeth cannot be visualized or probed	Posterior bitewing examination at 12- to 24-month intervals	Posterior bitewing examination at 18- to 36-month intervals	Posterior bitewing examination at 24- to 36-month intervals	Not applicable
Periodontal disease or a history of periodontal treatment	Individualized radiographic examination consisting of selected periapical and/or bitewing areas where periodontal disease (other than nonspecific gingivitis) can be demonstrated clinically		Individualized radiographic examination consisting of selected periapical and/or bitewing areas where periodontal disease (other than nonspecific gingivitis) can be demonstrated clinically		Not applicable
Growth and development assessment	Usually not indicated	Individualized radiographic examination consisting of a periapical/occlusal or panoramic examination	Periapical or panoramic examination to assess developing third molars	Usually not indicated	Usually not indicated

Clinical situations for which radiographs may be indicated include:

A. Positive Historical Findings
   –1. Previous periodontal or endodontic therapy
   –2. History of pain or trauma
   –3. Familial history of dental anomalies
   –4. Postoperative evaluation of healing
   –5. Presence of implants

B. Positive Clinical Signs/Symptoms
   –1. Clinical evidence of periodontal disease
   –2. Large or deep restorations
   –3. Deep carious lesions
   –4. Malposed or clinically impacted teeth
   –5. Swelling
   –6. Evidence of facial trauma
   –7. Mobility of teeth
   –8. Fistula or sinus tract infection
   –9. Clinically suspected sinus pathology
   10. Growth abnormalities
   11. Oral involvement in known or suspected systemic disease
   12. Positive neurologic findings in the head and neck
   13. Evidence of foreign objects
   14. Pain and/or dysfunction of the temporomandibular joint
   15. Facial asymmetry
   16. Abutment teeth for fixed or removable partial prosthesis
   17. Unexplained bleeding
   18. Unexplained sensitivity of teeth
   19. Unusual eruption, spacing or migration of teeth
   20. Unusual tooth morphology, calcification or color
   21. Missing teeth with unknown reason

Patients at high risk for caries may demonstrate any of the following:

   –1. High level of caries experience
   –2. History of recurrent caries
   –3. Existing restoration of poor quality
   –4. Poor oral hygiene
   –5. Inadequate fluoride exposure
   –6. Prolonged nursing {bottle or breast}
   –7. Diet with high sucrose frequency
   –8. Poor family dental health
   –9. Developmental enamel defects
   10. Developmental disability
   11. Xerostomia
   12. Genetic abnormality of teeth
   13. Many multisurface restorations
   14. Chemo/radiation therapy

Other Publications in the Dental Radiography Series

- Exposure and Processing in Dental Film Radiography
- Radiation Safety in Dental Radiography
- Successful Intraoral Radiography
- Successful Panoramic Radiography
- Quality Assurance in Dental Film Radiography

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