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Criteria mapping for the fractured permanent incisor

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Abstract

Since hospital dental departments currently are regulated by the same quality assurance guidelines as other hospital departments, the Joint Commission on Accreditation of Healthcare Organizations now requires that dental departments review and evaluate the quality of care they deliver. Criteria mapping is an audit method that builds logic and decision making into this review process. This method was field tested on patients having fractures of anterior teeth. Statistically significant results were produced using the criteria map developed by this study; both evaluators scored the same in 98.6% of the criteria reviewed.

Introduction

The structure and financing of health care in the United States has changed in the past decade. The government, third-party payers, and patients all have become more involved in health care delivery. As the cost of providing medical care increased, the government was forced to become more involved in financing, and thus regulating, health care delivery. Third party payers, for similar reasons, also have become more active.

With the advent of Medicare and Medicaid, the Federal government developed the Professional Standards Review Organization (PSRO), whose job was to monitor the justification of hospital care, both inpatient and ambulatory. This, in turn, led to the need to refine methods of assessing quality care in the health field (Hulka 1979). The PSRO was phased out in 1982 and replaced by the Peer Review Organization, to allow nonmedical members to aid in reviews.

Dentistry has become more visible in the health community. In 1967, 900 hospitals had dental programs. Ten years later, this number had increased to 3,748 and included more than one half of the registered hospitals in this country. Currently, more than two-thirds of these hospital clinics provide oral surgical care, as well as primary oral care (Gotowka and Bailit 1982). It is evident that dentistry is becoming more involved in ambulatory hospital care at the same time that the government is becoming more involved in the regulation of this ambulatory care.

As a result of the American Dental Association (ADA) gaining membership on the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) in 1979, the Council on Hospital and Institutional Dental Service determined that its dental service accreditation program could be integrated with JCAHO's program for hospitals. A subsequent moratorium was placed on the Council's accreditation program in 1982. Hospital dental departments then were regulated by the same quality assurance guidelines as the other hospital departments (Bailit and Gotowka 1983). The JCAHO now requires that all inpatient and outpatient departments in hospitals review and evaluate the quality of health care delivered in their departments. Dentistry, being somewhat unique in the type of care delivered, had to respond by developing its own methodology to evaluate quality care.

In July 1976, the ADA joined with the Health Standards and Quality Bureau of the Department of Health Education and Welfare to explore quality assurance programs used in dentistry. Initially, the ADA identified those systems already being used in hospitals, health centers, dental societies, insurance companies, and schools to evaluate the quality of care. A representative sample of those methods was chosen and studied from programs that used one of four information sources: clinical examination, record audit, profile analysis, or any combination (Stern 1979a). The ADA identified those programs that best met the PSRO program's specifications. Visits and correspondence with those in charge of the systems were undertaken. Subjective and objective ratings were tabulated, and recommendations were made.

Clinical examinations were considered to be the best measure of treatment outcome. They are, however, very costly, must be performed by dentists, and can disturb the patient/dentist relationship (Stern 1979b; 1979c).

Many articles have been published about the use of audit systems (Thompson and Osborne 1974; Greenfield 1977; Kaplan and Greenfield 1978; Gotowka and Bailit 1981; Bailit et al. 1982; Bailit and Gotowka 1983; Jerge and Orlowski 1985; Friedman 1985; Bailit 1985). Auditors must determine if the information was documented in the chart, then judge the appropriateness of care delivered. The basic elements used in these systems are summarized in Fig 1. The topic to be audited usually is selected using a profile analysis, which tells the analyst how often each procedure is performed by each operator. Those procedures performed most frequently are usually those that are audited. The next step in the audit system is to develop criteria, i.e. decide what steps should be included in the treatment plan and chart. These criteria must be applied to the charts. If the quality of care delivered is not adequate, the practitioners should be notified where they deviated from the ideal treatment sequence and be reaudited at a later date to determine if deficiencies were corrected.

Criteria lists have been used by the medical profession (Greenfield 1975) for some time. This audit method provides a list of items that should be documented in the charts for specific problems. For example, patients with diabetes should have a specific list of tests and other procedures documented in their charts as part of the "work-up." This method is rigid and doesn't account for decision making. In response to this deficiency, Greenfield et al. (1975) helped to develop a format called "criteria mapping," which builds logic and decision making into the process. The branching format allows for the specific needs of the patient. Each criterion leads to an action based on previous information about the medical problem; one decision builds on another. An example of a dental map as developed by the ADA is seen in Fig 2 (see next page).

The ADA uses this audit method in its manual, *Guidelines for the Development of a Quality Assurance Audit System for Hospital Dental Programs*, which can be used in hospital outpatient settings. The manual includes different criteria maps for various dental treatment sequences, including tooth fractures, acute necrotizing ulcerative gingivitis, pericoronitis, avulsions, fluoride therapy, periodontal and periapical abscesses, facial cellulitis, and referrals to the dental clinic from hospital emergency rooms. For each of these hospital treatment sequences, the manual contains a criteria map, a criteria and decision description for that map which tells a

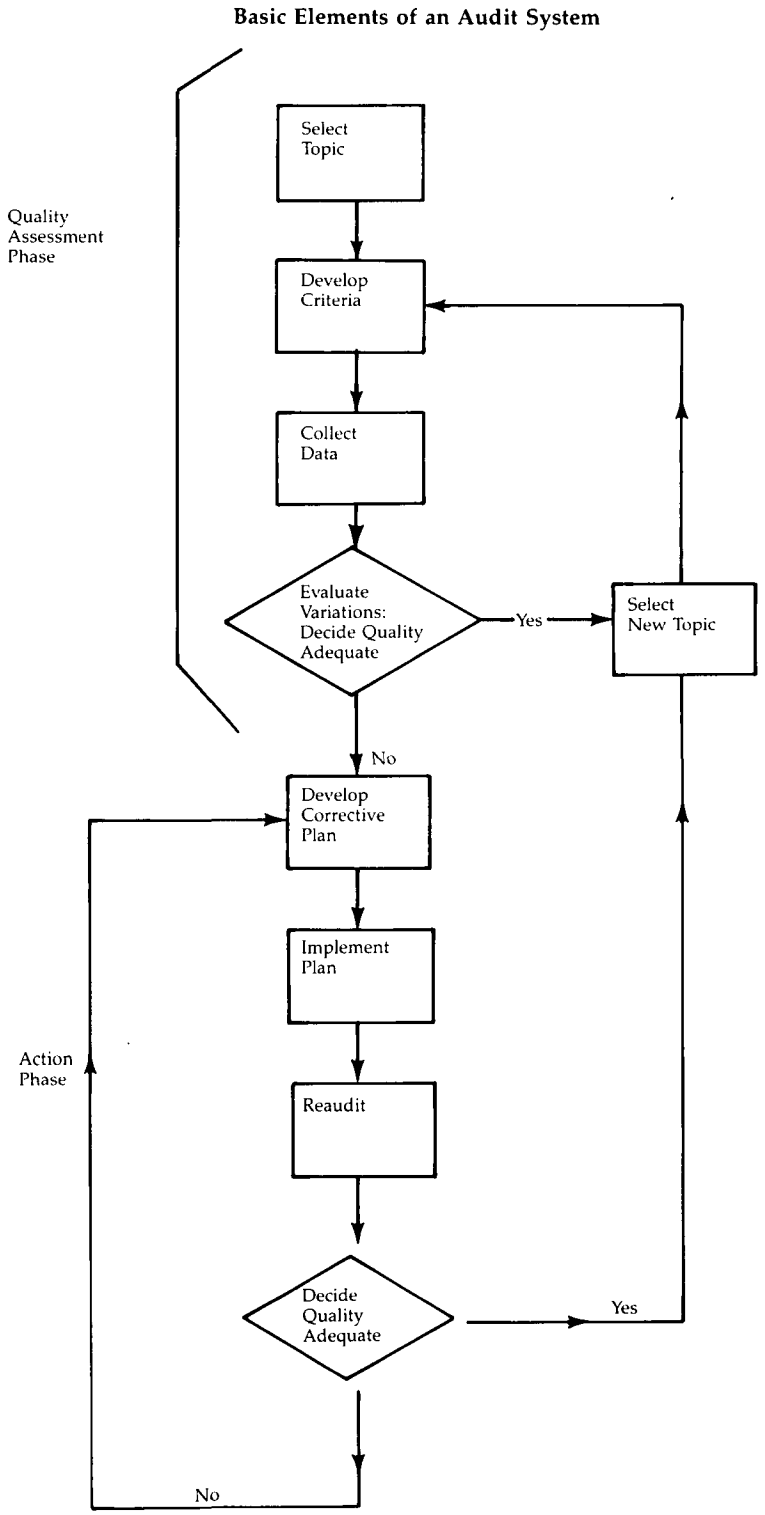

Fig 1. The basic elements of an audit system.

nondentist auditor exactly what to look for in a chart, and a data collection table for scoring.

The purposes of this study were to: revise the criteria map developed by the ADA for a fractured permanent tooth to reflect the treatment goals of our dental department and simplify the scoring mechanism; field test this revised criteria map and evaluate the reliability of the auditors; develop a simple feedback mechanism to notify providers of the results of the audits; and discuss the value, feasibility, and success of this instrument as well as make recommendations for future projects.

Methods and Materials

The criteria map developed by the ADA for management of a fractured permanent tooth (Fig 2) was selected for use in this study since fractures represent one of the most common emergencies seen at The Children's Hospital Dental Department, Boston, in children more than 5 years old. The ADA's criteria map was modified (Fig 3, see next page) to include such factors as root formation, timing and size of fracture, restorability of the tooth, and type of fracture. The criteria map contains a diagnostic section similar to that of the ADA, involving history taking and radiographs. A separate branch was developed for the Ellis Class I fracture (enamel only), Ellis Class II fracture, (enamel and dentin only), and various types of Class III fractures (pulpal involvement).

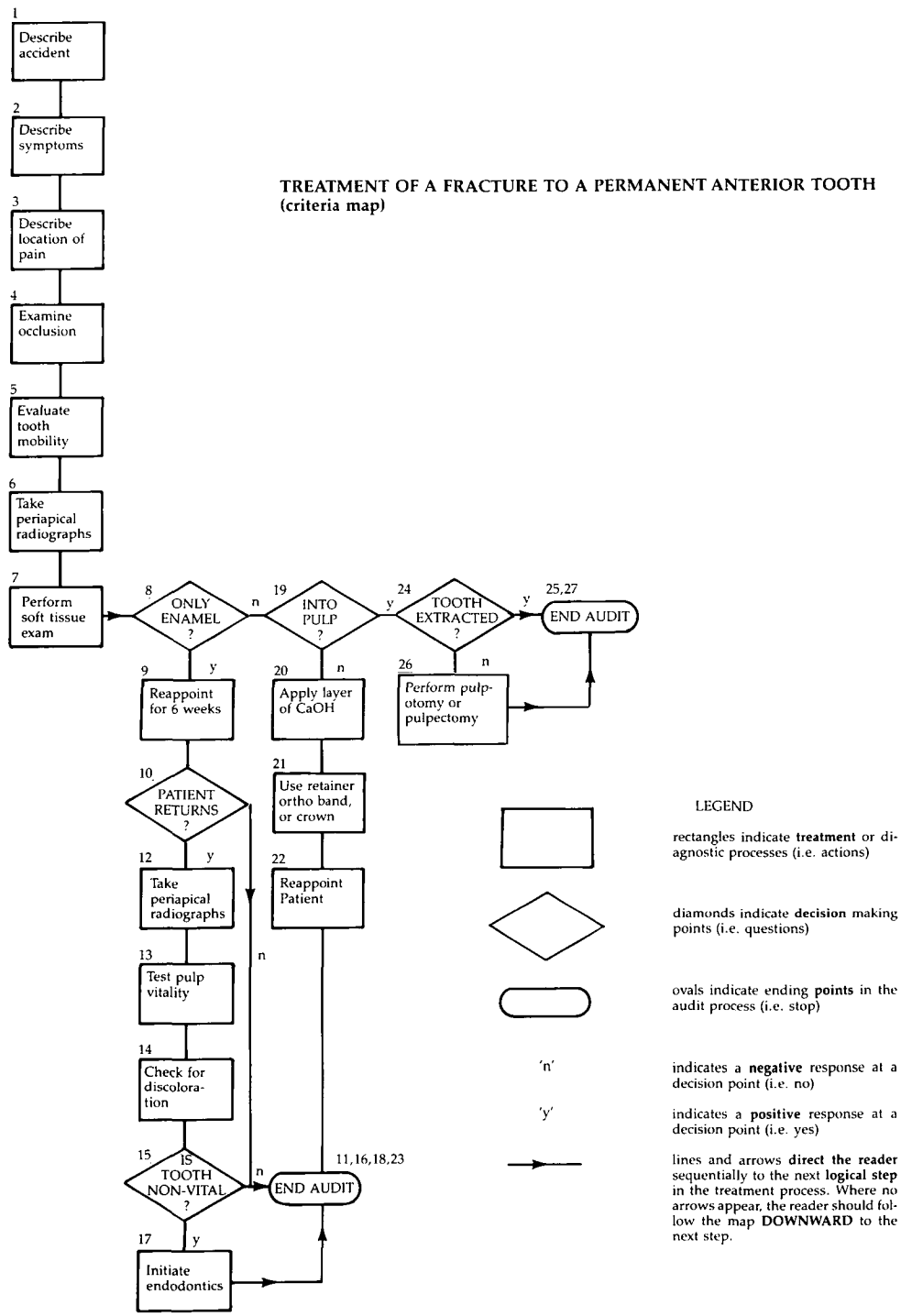

Fig 2. The criteria map that was developed by the American Dental Association.

For a three-month period starting July 1987, the criteria map was applied to the charts of all patients who sustained fractures to permanent teeth and were treated by either of the two dental interns at The Children's Hospital Dental Department. This period coincided with the start of their internship in pediatric dentistry at

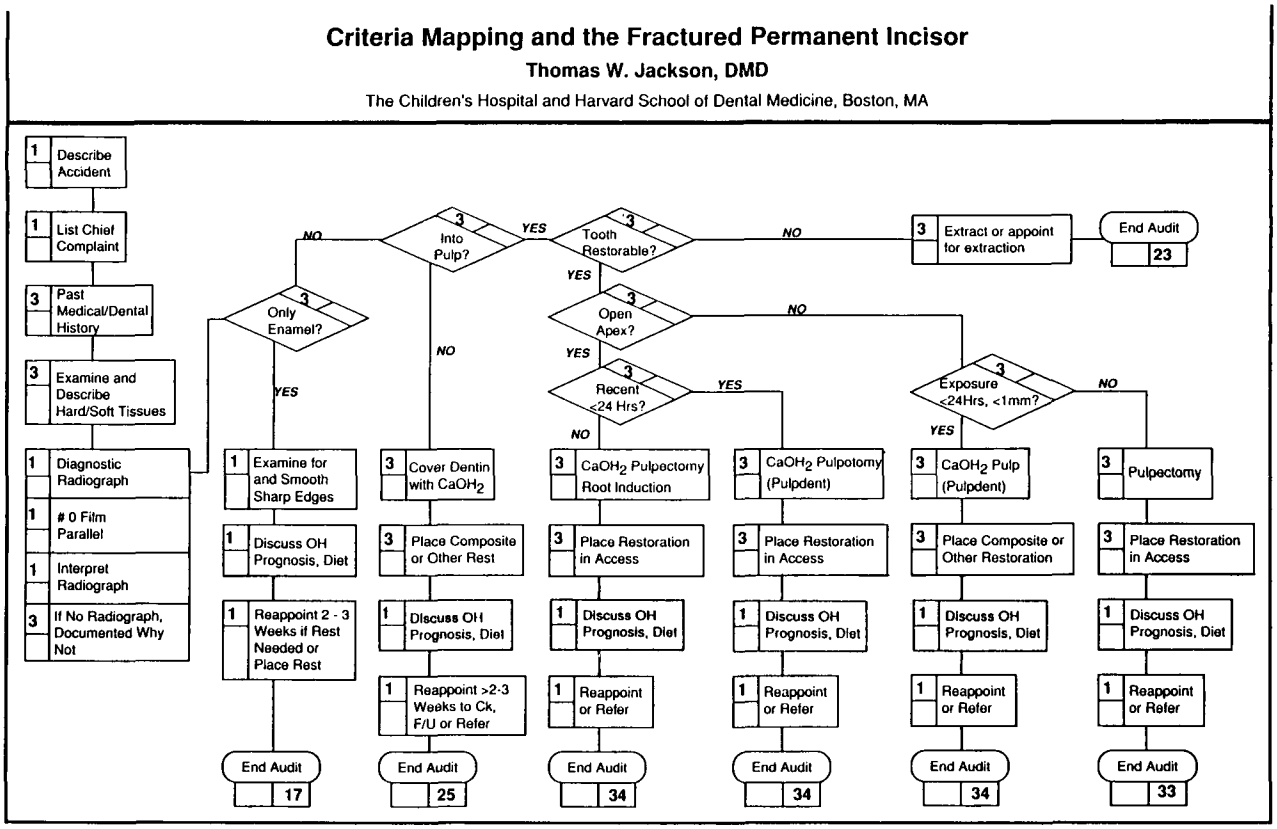

Fig 3. The modified criteria map.

the hospital. The charts then were reviewed by two members of the department, the author (a pediatric dental resident) and a senior staff member. The auditors reviewed the charts independently using the criteria map as a score sheet and writing in a score of 0, 1, or 3 for each decision point in the open box. A score of 0 represented the absence of a certain step in the treatment sequence, or the lack of documentation of this step in the chart. A value of 1 or 3 was given depending on how important that step was to the treatment outcome; a value of 3 represented a more significant decision point than a value of 1. These values were totaled for each type of fracture being treated, and then were used to measure the quality of care provided by the dentist, and to test for auditor interreliability. In addition, scoring was analyzed to see how the practitioners deviated from proper treatment sequences and whether these deviations were isolated or consistent. It also was noted whether a deviation resulted in a poor treatment outcome. Reliability of scoring between the two auditors was analyzed using the Kappa statistic analysis.

An evaluation sheet (Fig 4, see next page) was developed to allow for feedback to the care providers, since the feedback sheets used in the ADA manual were cumbersome and difficult to follow. The form contained the results of the criteria maps, and thus indicated the operator's compliance with ideal treatment protocols. The simpler method would allow each provider to see easily where mistakes were made. The first eight items on this evaluation sheet contained diagnostic steps, were the same for each type of fracture, and included proper history taking and radiographic technique. The remaining items varied depending on the type of fracture and the treatment steps needed to properly treat the fracture. The practitioner was told whether or not the step was performed.

Results

The charts of 18 patients who had sustained fractures to permanent anterior teeth were reviewed. Eleven cases were treated by Intern 2, and seven cases were treated by Intern 1. Of the 18 fractures, 15 were Ellis Class II, two were Class I, and one was Class III. Of the 18 cases reviewed, 14 were fractures of maxillary central incisors.

Deviations from proper treatment occurred in 16 of the 18 cases with only two charts receiving a perfect score by both evaluators. These deviations are summarized in the table (see page 25). Both evaluators scored the charts identically in 15 of the 18 cases, differing by only one point in the three cases. On two occasions, this difference concerned whether a radio-

FEEDBACK SHEET - CLASS II FRACTURE

CRITERIA	MET	NOT MET
Describe accident		
List chief complaint		
PMH PDH		
Describe tissues		
Diagnostic radiographs		
#O film parallel		
Interpret radiograph		
If no radiograph, document reason		
Ask if only enamel fracture		
Ask if into pulp		
Apply $CaOH_2$		
Place composite		
OH prognosis diet		
Reappoint or refer		

Fig 4. The evaluation sheet.

graph was diagnostic; one evaluator felt that the apex was not demonstrated adequately and processing was of poor quality, while the other evaluator felt that they were diagnostic. The other discrepancy concerned whether proper follow-up and reappointment procedures had been followed. Of the 18 charts reviewed, there were a possible 222 scores that required a value of 0, 1, or 3. The same value was given by both evaluators 98.6% (219/222) of the time. This yielded a Kappa statistic of .965, where K greater than .75 denotes excellent reproducibility.

The most frequent error in the provider's management of fractures noted in the audit concerned the type of radiograph used for evaluation of the fractures. The treatment protocol at the dental clinic called for the use of a #0 size film using the parallel technique. It is accepted widely that the paralleling technique is superior to the bisecting technique in producing a more anatomically accurate radiograph image with less distortion. In a pediatric and early adolescent population, it may be necessary to use a #0 size film to make this technique possible (Wei 1988). Intern 1 used a #2 size film using the bisecting technique in seven out of seven cases treated, while Intern 2 used the #2 film in three of 11 cases treated. This probably had a minimal effect on the treatment outcome.

The next most common deficiency was the provider failing to discuss oral hygiene, prognosis, and diet with the child and the parent. In six of the seven cases, Intern 1 had not documented this task, while Intern 2 failed to document this in three of the 11 cases. There was no way to verify whether or not this procedure actually had been performed. This deficiency probably had a limited effect on the prognosis of the treated tooth. Arrangements for proper follow-up were not performed or documented in eight of the 18 fractures that occurred in six cases treated by Intern 1, and two cases treated by Intern 2.

The audits indicated that Intern 2 had been making serious errors in the treatment of Class II fractures. In seven of the 11 cases, he only smoothed the rough edges of the fracture and did not place calcium hydroxide over the exposed dentin, nor did he place the composite "bandage" indicated by the criteria map. This type of error could have detrimental effects on the treatment outcome. Intern 1 had followed proper treatment protocol in all Class II cases treated. This information was provided on the feedback sheets and given to both interns to inform them of how and where they deviated from proper treatment sequences.

Discussion

In the introduction of the manual *Guidelines for the Development of a Quality Assurance System for Hospital Dental Programs,* Charles McCallum, the ADA commissioner for the JCAHO, wrote, "this book is not to be viewed as a monolithic and immutable document, unchanging and irreversible, rather it is an instrument subject to update and development with flexibility and plasticity demanded by a body of knowledge subject to technological breakthrough and change (Bailit and Gotowka 1983)."

Our adaptations of the criteria map originally designed by the ADA met all the steps needed for an audit-based quality assurance system, as well as the objectives of treatment of the hospital at which it is to be used. The project's goal was to call attention to and modify the criteria map so that it would conform to the current treatment recommendations of managing permanent fractured anterior teeth. The instrument proved to be a reliable and viable means of auditing this common pediatric dental emergency. The three occasions when evaluators differed in scoring charts involved issues concerning adequate follow-up procedures and proper

TABLE. Summary of criteria not met by interns

Fracture #	*Tooth #*	*Type*	*Intern #*	*Criteria not met*	*Score Evaluator A*	*Score Evaluator B*
1	9	II	1	O film parallel, OH prognosis diet, reappoint or refer	22/25	22/25
2	9	III	1	No criteria met except exam and type of fracture	15/34	15/34
3	8	II	1	O film parallel	24/25	24/25
4	23	I	2	Diagnostic radiograph (one eval)	16/17	17/17
5	24	II	2	Diagnostic radiograph (one eval)	24/25	25/25
6	22	II	2	No criteria met except PMH PDH exam diagnostic radiograph interpret radiograph	9/25	9/25
7	23	II	2	Chief complaint, O film parallel, no CaOH placed, no composite placed	17/25	17/25
8	8	II	2	All criteria met	25/25	25/25
9	9	II	2	All criteria met	25/25	25/25
10	9	II	2	No CaOH placed, no composite placed	19/25	19/25
11	8	II	2	No CaOH placed, no composite placed, OH prognosis diet, reappoint or refer	14/25	14/25
12	8	II	2	O film parallel, no CaOH placed, no composite, OH prognosis diet	17/25	17/25
13	8	II	2	No CaOH placed, no composite	19/25	19/25
14	9	II	2	No CaOH placed, no composite	19/25	19/25
15	8	II	1	O film parallel, OH prognosis diet, reappoint or refer	22/25	22/25
16	9	II	1	O film parallel, OH prognosis diet, reappoint or refer	22/25	22/25
17	9	II	1	O film parallel, OH prognosis diet, reappoint or refer (one eval)	22/25	23/25
18	8	I	1	O film parallel, smooth edges, OH prognosis diet, reappoint or refer	13/17	13/17

radiographic technique. The ADA manual states that "criteria must not be so specific as to exclude acceptable treatment alternatives (Bailit and Gotowka 1983)." It also states that the "criteria must be specific enough to allow the abstractor to assess compliance from the information in the dental records (Bailit and Gotowka 1983)." Our criteria concerning radiographs were specific in that only size 0 parallel technique films were acceptable for an anterior fractured permanent incisor. The "gray" areas involved processing quality and clarity of apex visualization. All other areas were graded the same by the evaluators.

The instrument also was successful in demonstrating the areas in which providers were found to be providing improper treatment or improper documentation. These problem areas were summarized readily on the feedback sheets, which also were developed by this study. The clinicians were told when inappropriate care was being delivered, and when other types of deficiencies had occurred. Feedback was provided in a positive manner, emphasizing professional pride. As one of the most important functions of a quality assurance program, improvement in quality care should be measured. Further studies should evaluate the effect of this

feedback mechanism on the practitioners' attitudes and the quality of their care.

The quality assurance committee at The Children's Hospital, Boston, will continue to develop and adapt other criteria maps for common pediatric dental procedures. These maps will reflect the teachings and expectations of the department. It is important to note that these criteria maps may or may not reflect the treatment philosophies of other hospital programs and must be adapted accordingly. The criteria maps also can be helpful for teaching purposes in that they provide a concise, step-by-step presentation of the procedures involved in care delivery, and the questions and decisions behind such procedures.

Conclusion

The criteria map for managing fractured permanent incisors developed in this study can be a viable and reliable instrument in evaluating the quality level of fracture management for quality assurance purposes. Interevaluator reliability was excellent when this instrument was used. Errors in treatment appropriateness were discerned from this audit method. Feedback was given to providers using a standardized evaluation form.

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