Longitudinal Trends in the Use of Individualized Radiographic Examinations at Dental Schools in the United States and Canada

Mel L. Kantor, D.D.S., M.P.H., Ph.D.

Abstract: In the spring of 2002, a mail survey was conducted to determine the use of individualized radiographic examinations (selective radiography) for comprehensive care patients at all sixty-four U.S. and Canadian dental schools. Results from previous surveys were used to evaluate the long-term longitudinal trends. Among sixty-two schools (97 percent response rate), selective radiography was used by 34 percent of schools for dentulous adult patients, by 100 percent for edentulous adults, and by 28 percent for children. Having a credentialed chief of service increased the likelihood that selective radiography would be used for dentulous adults (odd ratio [OR] = 2.36) and for children (OR = 2.33). Selective radiography for dentulous adults increased from 2 percent of schools in 1977 to 36 percent in 1997 and leveled off thereafter. Between 1987 and 2002, selective radiography for edentulous adults was used at nearly all schools (96-100 percent) and for children at about a quarter of dental schools (22-28 percent). Among the sixty-one schools for which there are complete data since 1987, the continuous use of routine radiography was most common (39 percent of schools) for dentulous adult patients, whereas the continuous use of selective radiography was uncommon (7 percent).

Dr. Kantor is Professor, Department of Diagnostic Sciences, New Jersey Dental School, University of Medicine and Dentistry of New Jersey. Direct correspondence and requests for reprints to him at Department of Diagnostic Sciences, UMDNJ New Jersey Dental School, 110 Bergen Street, Room D860, P.O. Box 1709, Newark, NJ 07101-1709; 973-972-4653 phone; 973-972-3164 fax; mkantor@umdnj.edu.

Key words: dental radiology, dental health services, practice guidelines, dental education, radiology education

Submitted for publication 6/20/05; accepted 10/11/05

In 1987, the U.S. Food and Drug Administration (FDA) Dental Radiographic Patient Selection Criteria Panel issued guidelines designed to reduce radiation exposure and contain costs associated with unnecessary radiographic examinations.1 The guidelines recommend that individualized radiographic examinations for the asymptomatic, nonemergency patient seeking comprehensive dental care should be prescribed based upon the patient’s signs, symptoms, and history using selection criteria that increase the likelihood that the patient will benefit from the radiographic examination. This practice will henceforth be referred to as “selective radiography.”2 The FDA guidelines were endorsed by the American Dental Association (ADA) in 1989 and again in 2001.3,4 They are an effective and practical way of reducing the radiation dose to patients, with minimal risk of overlooking significant pathology.5 The Canadian Dental Association (CDA) advocated the use of selective radiography in 1988 and again in 1999, although CDA guidelines do not explicitly refer to the FDA guidelines.6,7 Previous studies have shown that selective radiography is not used widely among U.S. and Canadian dental schools.8-11

The purpose of this study was to determine the use of selective radiography for nonemergency, comprehensive care patients at U.S. and Canadian dental schools. The results are compared with previous studies,8-10 including a 1977 study by Henry and Garcia,12 to establish twenty-five-year trends for the use of radiographs in dental school clinics.

Methods

In March 2002, an explanatory cover letter, survey questionnaire, and stamped return envelope were sent to the deans of all fifty-four U.S. and ten
Canadian dental schools with active clinical programs; excluded were two new U.S. schools that had not yet admitted their first classes.\textsuperscript{13-15} The dean was asked to forward the material to the chief of service (faculty member in charge of radiology), who would reply on behalf of the institution. Five weeks later a second mailing was sent to nonresponding schools, followed by a third mailing five weeks later if necessary. The survey questionnaire used in previous studies was used to permit direct comparisons.\textsuperscript{8-10}

There is a distinction between respondents and informants based on the nature of the survey.\textsuperscript{16} Respondents offer their own opinion or report their own behavior, whereas informants provide information about the practices and attributes of their organizations or businesses. Hence, the chiefs of service who replied on behalf of their schools will be referred to as informants.

Informants identified the preferred radiographic examination prescribed for dentulous adults, edentulous adults, and children by selecting from among six alternative radiographic examinations (Table 1) or by indicating “other” and specifying the examination. Consistent with previous studies,\textsuperscript{8-10} “other” responses were categorized as 1) specific combinations not among the six alternatives or 2) selective radiography, including those cases in which the informant stated explicitly that individualized radiographic examinations were used, in which the modal examination was indicated but the informant stated that selective radiography was used, and in which various combinations based on a child’s age and developmental status were listed. Informants indicated whether or not they were Diplomates of the American Board of Oral and Maxillofacial Radiology, Fellows (Oral Radiology) of the Royal College of Dentists of Canada, or similarly credentialed. These credentials represent equivalent certification and served as a proxy for the chiefs’ educational background and training in oral and maxillofacial radiology.

The Fisher exact test was used to compare responses from schools with and without a credentialed chief of service, from private and public schools, and from U.S. and Canadian schools. The Fisher exact test was also used to compare the results from this study with those from the last administration of the survey in 1997. Multivariable logistic regression was used to assess the association between selective radiography and the chiefs’ credentials, the institutional funding, and the region.\textsuperscript{17} To do this, a binary outcome variable was created by pooling the data from the specific radiographic examinations (the six alternatives plus “other combinations”) to create a single value: routine radiography. Selective radiography, as previously defined, was the second value.

<p>| Table 1. Initial radiographic examination of comprehensive care patients in U.S. and Canadian dental schools, 2002 |</p>
<table>
<thead>
<tr>
<th>Patient Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dentulous Adults</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Examination†</th>
<th>Credentialed Chief</th>
<th>Credentialed Chief</th>
<th>Credentialed Chief</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>FMPa + BW + PAN</td>
<td>3</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>BW + PAN</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>FMPa + PAN</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FMPa + BW</td>
<td>14</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>BW + PAN + Pa</td>
<td>5</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>PAN</td>
<td>0</td>
<td>1</td>
<td>34#</td>
</tr>
<tr>
<td>Other Combinations</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Selective Radiography</td>
<td>15</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>37</td>
<td>25</td>
<td>37</td>
</tr>
</tbody>
</table>

Fisher exact test: p=0.14 p>0.99 p=0.29

* Two schools did not provide responses for the child patient.
† FMPa=full-mouth periapical; BW=bitewing; PAN=panoramic; Pa=selected periapicals.
‡ Nine of fifty-seven informants volunteered that selected periapical or occlusal radiographs were prescribed as necessary based on the findings noted on the panoramic radiograph.
Long-term longitudinal trends were established using data from previous studies. Several schools have closed or opened since the first administration of this survey in 1987. Nonetheless, sixty-one schools have participated in the survey across all four administrations (1987, 1992, 1997, and 2002). Therefore, it was possible to determine the trajectory of these schools over time. With eight examination categories at each of four time points, there were 4,096 theoretical pathways or trajectories that a school could take for the dentulous adult and child patients. The empirical upper limit was the number of schools for which there were complete trajectory data: sixty-one schools for dentulous adults and fifty-seven schools for children (two schools in 1987 and two schools in 2002 did not provide data for children). Excluding the examination categories that included bitewing radiographs, there were four remaining examination categories at each of four time points, or 256 theoretical trajectories for the edentulous adult patient. The sixty-one schools for which there were complete data again define the empirical upper limit. In order to make comparisons across patient classes (dentulous adults, edentulous adults, and children), the trajectory was assessed using the binary outcome variable that was used in the multivariate analyses. With two examination types (routine, R, and selective, S) at each of four time points, there were sixteen theoretical trajectories. The Fisher exact test was used to compare the distribution of trajectories across patient classes.

SPSS 10.1 (SPSS, Inc., Chicago, IL) was used for data management and for all of the statistical analyses except for the two-sided Fisher exact tests, which were performed with SAS 8.2 (SAS Institute, Cary, NC).

Results

Fifty-three U.S. and nine Canadian schools responded, a 97 percent response rate. Two informants provided no information for the child patient because children were not seen in the radiology clinic at the school.

Results for all three patient classes are presented in Table 1, which includes a comparison by the credentials of the chiefs of service as an example of the bivariate analyses. Predetermined routine radiographs were obtained on dentulous adults at 66 percent of schools and on children at 72 percent of schools; selective radiography was the exception rather than the rule. As the panoramic examination and the one “other” examination (full-mouth periapical radiographs) conform to the FDA guidelines for the initial assessment of edentulous patients, all schools employed selective radiography for edentulous patients. The frequency distribution of examinations from schools with and without a credentialed chief of service did not differ significantly within each patient class (Fisher exact test, p>0.05 for all patient classes). A summary of the results of the remaining bivariate comparisons is given in Table 2. The statistically significant difference between U.S. and Canadian schools was due to the disproportionately greater use of the full-mouth series and the full-mouth series/panoramic combination in the United States.

The odds ratios (OR) from the multivariable logistic regressions with exact 100 percent confidence intervals* are given in Table 3. The odds of using selective radiography for dentulous adults and for children were significantly greater when there was a credentialed chief of service and when the school was privately funded. And the use of selective radiography was significantly more likely for children in Canada than in the United States.

Among the twenty-five schools that used selective radiography, four schools used it across all three patient categories, eight used it only for dentulous adults, four only for children, and nine for both dentulous adults and children. Comparable results from previous years are shown in Table 4; there has been little change over the last five years (1997 versus 2002, Fisher exact test, p=0.34).

The twenty-five-year trends for the dentulous adult patient are shown in Figure 1. The response rate was 92 percent in 1977; 100 percent in 1987, 1992, and 1997; and 97 percent in 2002. Therefore, the data reflect what was done at nearly all schools.
schools or the entire population of schools. Hence, a change in one radiographic examination category must be offset by changes in other examination categories. The use of selective radiography increased steadily between 1977 and 1997 and then leveled off at about 34 percent of schools. During the most recent five-year study interval, there has been little change in the frequency distribution of radiographic examinations used to examine dentulous adult patients (1997 versus 2002, Fisher exact test, p=0.69).

The situation for the edentulous adult patient has changed little between 1987 and 2002 (Figure 2). The panoramic radiograph was the preferred examination at most schools (78-92 percent) during this fifteen-year interval. Selective radiography (as a separate category) ranged between 6 percent and 12 percent over the same period. Combining the responses “panoramic,” “selective radiography” (per se), and “others” that were in compliance with the FDA guidelines shows that selective radiography has been nearly universally adopted (96-100 percent of schools) since 1987. There has been essentially no change in the frequency distribution of radiographic examinations used to examine edentulous adult patients during the most recent five-year study interval (1997 versus 2002, Fisher exact test, p=0.74).

The fifteen-year trends for the child patient are shown in Figure 3. The bitewing and panoramic combination has been the preferred examination at most dental schools (28-35 percent). In general, selective radiography was the second most common approach (22-28 percent). The most dramatic trend was the sharp rise and decline of “other combinations,” which peaked in 1997 when it was as common (28 percent) as the bitewing and panoramic combination. The decline in “other combinations” and the concomitant increases in the bitewing and panoramic examination, selective

---

### Table 2. Use of selective radiography (%) and summary of p-values for bivariate analyses for all patient categories, 2002

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>Selective radiography use</th>
<th>P-values†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Edentulous Children</td>
<td>34%</td>
<td>N/A‡</td>
</tr>
<tr>
<td>Adult</td>
<td>100%*</td>
<td>0.29</td>
</tr>
<tr>
<td>Child</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

* Edentulous patients fit a specific FDA selection criteria category simply due to their edentulousness. All schools either used selective radiography (6%) or obtained one of the FDA-recommended radiographic examinations (94%).
† Fisher exact test.
‡ N/A=not applicable. Given the 100 percent use of selective radiography, there were no distinct subpopulations defined by the independent variables and no differential odds for the use of selective radiography. The lack of heterogeneity is evident in Table 1 where the p-value for the credentials of the chief of service was >0.99.

### Table 3. Odds ratios and exact 100 percent confidence intervals for the use of selective radiography for all patient categories, 2002

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>Adjusted odds ratios*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Edentulous Children</td>
<td>2.36 [1.79, 2.69]</td>
</tr>
<tr>
<td>Adult</td>
<td>2.14 [1.63, 2.57]</td>
</tr>
<tr>
<td>Child</td>
<td>1.35 [0.89, 1.83]</td>
</tr>
</tbody>
</table>

* Exact 100% confidence intervals. Statistically significant OR are in bold. Reference groups: Credentials=not credentialed; Funding=public; and Region=United States.
† N/A=not applicable. Given the 100 percent use of selective radiography, there were no distinct subpopulations defined by the independent variables and no differential odds for the use of selective radiography. The lack of heterogeneity is evident in Table 1 where the p-value for the credentials of the chief of service was >0.99.

### Table 4. Use of selective radiography, 1987–2002

<table>
<thead>
<tr>
<th>Patient-Category Combinations</th>
<th>1987</th>
<th>1992</th>
<th>1997†</th>
<th>2002†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Edent Child</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Adult Edent Child</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adult Edent Child</td>
<td>4</td>
<td>6</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Adult Edent Child</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adult Edent Child</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adult Child</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Child</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

* Survey years 1987, 1992, and 1997; references 8, 9, and 10, respectively.
† Fisher exact test, p=0.34
Figure 1. Radiographic examination of dentulous adults at U.S. and Canadian dental schools, 1977-2002
FMPa=full-mouth periapical; BW=bitewing; PAN=panoramic; Pa=selected periapicals; Other Comb.=other combinations

Figure 2. Radiographic examination of edentulous adults at U.S. and Canadian dental schools, 1987-2002
FMPa=full-mouth periapical; PAN=panoramic; Other Comb.=other combinations
radiography, and the bitewing, panoramic, and selected periapical examination accounted for the marginal difference in the frequency distribution of radiographic examinations used to examine children over the last five-year study interval (1997 versus 2002, Fisher exact test, p=0.07).

Between 1987 and 2002, there were thirty-nine distinct trajectories for dentulous adults, fifteen for edentulous adults, and forty-nine for children, when all radiographic examination types were considered. The trajectories for the use of routine (R) and selective (S) radiography for each patient class are shown in Table 5. The continuous use of routine radiography was the most common trajectory (RRRR) for all three patient classes, while the continuous use of selective radiography (SSSS) was uncommon. There is no statistically significant difference in the distribution of trajectories across the three patient classes (Fisher exact test, Monte Carlo estimate, p=0.15). However, when the “panoramic” examination was coded as selective radiography for edentulous adults (consistent with the FDA guidelines), fifty-three schools then engaged in the continuous use of selective radiography (SSSS) for this patient class.

Among the forty-eight schools that used routine radiography for dentulous adults in 1987, 71 percent still did in 2002, but 29 percent switched to selective radiography, regardless of the intermediate trajectories. Conversely, among the thirteen schools that used selective radiography for dentulous adults in 1987, 54 percent still did in 2002, but 46 percent switched to routine radiography. Among the forty-three schools that used routine radiography for children in 1987, 79 percent still did in 2002, but 21 percent switched to selective radiography. Conversely, among the fourteen schools that used selective radiography for children in 1987, 43 percent still did in 2002, but 57 percent switched to routine radiography.

Discussion

The twenty-year trend of increasing use of selective radiography for the dentulous adult patient ended in 1997, plateauing at 35 percent of schools over the most recent five-year study interval (1997-2002). This is a low figure given that Oral and Max-
Illofacial Radiology sections or divisions establish selection criteria policies for the primary radiology clinic in 88 percent of U.S. and Canadian dental schools, and have operational responsibility and authority for selection criteria in the primary radiology clinic in 78 percent of schools. The fifteen-year trends for the edentulous adult and child patient were fairly stable and flat. Virtually all dental schools used selective radiography for the edentulous adult patient, and approximately one quarter of schools used it for the child patient. Whereas 29 percent of schools that used routine radiography in 1987 converted to selective radiography by 2002, a larger percentage did the reverse: 46 percent of schools that used selective radiography in 1987 reverted to routine radiography by 2002. In summary, the adoption of selective radiography has stagnated in the recent past.

In some instances, the results from the bivariate and multivariable analyses appear contradictory, when, in fact, they address different issues. For example, the p-value for the credentials of the chiefs of service is not statistically significant (Table 2) whereas the odds ratio is (Table 3), in the first instance suggesting that the presence of a credentialed chief of service was not related to the use of selective radiography and in the second instance suggesting that it was. The bivariate analysis is a crude comparison of the frequency distribution of all examination types from schools with and without a credentialed chief of service, whereas the multivariable analysis provides an adjusted odds ratio specifically for the use of selective radiography (versus routine radiography). The presence of a credentialed chief of service, being a private school, and being a Canadian institution were associated with the use of selective radiography for dentulous adults and for children in 2002, as was generally the case in the 1990s.

While this panel study documented the longitudinal trends in the use of selective radiography, there was no attempt to assess why the trends occurred. The reasons for the stagnation are a matter of speculation. It is possible that the interest and attention devoted to improving radiology education and practice that was apparent in the early 1980s20,21 waned in the late 1990s.

In response to a perceived deficiency in radiology education in the United States, the accreditation standards in effect between 1986 and 1998 con-

### Table 5. Trajectory of use of selective radiography over four survey administrations

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trajectory</strong></td>
<td><strong>1987</strong></td>
<td><strong>1992</strong></td>
<td><strong>1997</strong></td>
<td><strong>2002</strong></td>
</tr>
<tr>
<td>1</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>2</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>4</td>
<td>R</td>
<td>R</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>5</td>
<td>R</td>
<td>S</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>6</td>
<td>R</td>
<td>S</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>7</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>8</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>9</td>
<td>S</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>10</td>
<td>S</td>
<td>R</td>
<td>R</td>
<td>S</td>
</tr>
<tr>
<td>11</td>
<td>S</td>
<td>R</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>12</td>
<td>S</td>
<td>R</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>13</td>
<td>S</td>
<td>R</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>14</td>
<td>S</td>
<td>S</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>15</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>R</td>
</tr>
<tr>
<td>16</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
</tbody>
</table>

* Survey years 1987, 1992, and 1997; references 8, 9, and 10, respectively.
† Fisher exact test, Monte Carlo estimate, p=0.15.
‡ Two schools did not provide data in 1987 and two schools did not provide data in 2002; complete trajectories available for only fifty-seven schools.
continued emphasis on selective radiography ac-
haps the Canadian accreditation agency and ACFD's
patient as determined by a clinical examination. Per-
radiographic examination based on the needs of the
ner be able to assess the risk/benefit ratio of radio-
tal Office
Guidelines for the Control of Radiation in the Den-
cipients
and the Canadian Dental Association
Association of Canadian Faculty of Dentistry
standards. The Canadian requirements defer to the
ing language similar to the old 1986-98 American
standard was nonspecific, the commission added a par-
enthetical “Intent Statement” in 2000 that again made
explicit the need to apply selection criteria when pre-
scribing radiographs. The 1979 House of Delegates
of the American Association of Dental Schools
(AADS, now the American Dental Education Asso-
ciation, ADEA) adopted a position paper that oblig-
gated dental schools to teach students to “assess criti-
cally the need for diagnostic radiographic
information” as well as to limit patient exposure to
the “minimum number needed for a complete diag-
nostic workup of the patient’s dental needs.”24 The
AADS 1989 House of Delegates rescinded the 1979
position paper and replaced it with a completely new
and updated position paper that also affirmed the use
of selective radiography.25 The position paper ap-
peared annually in the Journal of Dental Education
until 1995 and ceased to appear thereafter. It appears
that the imperative to adopt selective radiography
has been blunted at U.S. dental schools.

The Canadian accreditation requirements26 in
force at the time of this survey are more explicit than
the current American accreditation standards, retain-
ing language similar to the old 1986-98 American
standards. The Canadian requirements defer to the
Association of Canadian Faculty of Dentistry
(ACFD) Global Competencies for DDS/DMD Re-
cipients and the Canadian Dental Association
Guidelines for the Control of Radiation in the Den-
tal Office, which require that a new dental practitio-
ner be able to assess the risk/benefit ratio of radi-
ographic examinations and to select the appropriate
radiographic examination based on the needs of the
patient as determined by a clinical examination. Per-
haps the Canadian accreditation agency and ACFD’s
continued emphasis on selective radiography ac-
counts for the difference between U.S. and Cana-
dian schools observed in this study. In addition, it
may be easier to enforce standards and implement
policy among ten schools (Canada) than among fifty-
four schools (U.S.).

The high response rate is likely due to the sim-
plicity of the questionnaire. However, the simplicity
of the questionnaire also limited the depth of the in-
quiry and prevented an assessment of other factors
that might have influenced radiology prescription
practices. The survey results were not validated by
means of an independent chart audit at a sample of
schools. However, the informants were selected by
their deans and were assured anonymity; hence, the
most knowledgeable person at the school provided
the information, and there is no reason to suspect
any systematic bias. Moreover, any bias would most
likely inflate the estimate of the use of selective ra-
diography, the response that reflects the current pro-
fessional recommendation.4 A comparable indepen-
dent 1994 survey obtained similar results to the 1992
administration of this survey and provides some evi-
dence of external validity.11 The current survey of
institutional practices did not address the actions of
individual providers nor the care provided to indi-
vidual patients. It is reasonable to assume, however,
that most patients received the reported radiographic
examinations in concordance with the institutional
policy. As this was a cross-sectional study, no cau-
sality can be assumed from the associations that were
significant. Further, the decision to classify the pan-
oramic examination for the edentulous adult as se-
lective radiography, while in conformity with the
FDA guidelines, may be controversial and rejected
by some investigators and readers.27-29

Conclusion

The twenty-year positive trend of using indi-
vidualized radiographic examinations for dentulous
adults seeking nonemergency comprehensive care in
U.S. and Canadian dental schools lost its momen-
tum and plateaued in 1997. For edentulous adults
and for children, little has changed since 1987; nearly
all schools used selective radiography for edentu-
lous adults, whereas approximately a quarter of
schools used it for children. A greater percentage
of schools that used selective radiography in 1987
switched to routine radiography by 2002 than schools
that switched in the opposite direction. All of this
suggests that most dental schools are not capitaliz-
Acknowledgments

I sincerely appreciate the cooperation of the deans and faculty informants at the participating dental schools; this study could not have been done without them. Additionally, I thank Dr. Cande V. Ananth (UMDNJ Robert Wood Johnson Medical School) and Drs. Barbara Greenberg and Muralidhar Mupparapu (UMDNJ New Jersey Dental School) for reviewing the manuscript and providing helpful comments and suggestions.

REFERENCES