On Adding a Dental Practice Component to an Ongoing Longitudinal Population-based Study of Oral Health

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Abstract

Objective: *To determine the feasibility and effectiveness of adding a dental practice component to the Florida Dental Care Study (FDCS).* ***Methods:*** *The FDCS was a study of dental health in which no treatment was provided. In-person interviews and clinical examinations were conducted at baseline, 24 months, and 48 months, with six-month telephone interviews between those times. Participants reported any dentists visited and treatment received. All but four of the 764 participants at the 24-month session gave written permission to review their dental records. Dental hygienist research assistants abstracted information on treatment that was received during the 48-month interval.* ***Results:*** *Of the 286 practices named by FDCS subjects, all but 10 (of whom five refused) practices participated. Eight practices allowed access to records, but did not allow us to record fees. Fees were unavailable at another 13 practices. Of the 764 persons who participated for the 24-month interview, 677 ultimately reported at least one dental visit during the first 48 months of the study. Of those 677, we located dental records on 619. We also found records on four of the 111 persons who reported no dental visits, by querying practices while recording information on other participants. Charts varied in comprehensiveness; nevertheless, in conjunction with office staff consultation, all practices had adequate record of what procedures were performed.* ***Conclusions:*** *Although time intensive, this method of collecting data substantially increased information about dental treatment received, compared to relying on participant self-report and clinical examination. [J Public Health Dent 2002;62(1):32-7]*

Key Words: dental records, dental care, adults, longitudinal.

Dental health services research often relies on participants' self-reports to quantify utilization. One noteworthy example is the United States National Health Interview Survey (1), which uses self-reported information to guide national health policy. These types of self-reported designs are advantageous in that they can provide information in a relatively inexpensive manner, and can provide information on self-reported symptoms that led to the use of dental health care. Other studies have added to the literature by making use of administrative databases; however, these seldom provide information on symptoms or patient characteristics. During the conduct of a longitudinal study of oral health and dental care called the Florida Dental Care Study (FDCS), we had an opportunity to combine detailed information on patient characteristics, self-reported dental care incidence, self-reported incidence of dental signs and symptoms, and dental disease as measured by direct clinical examination, with incident use of specific dental services. Taking advantage of that opportunity required gathering dental procedure information from dental charts maintained by private practice dentists in the community, dentists who coincidentally treated FDCS participants.

In planning this activity, we sought guidance from extant reports in the literature, reports that would provide detail on the feasibility and logistics of conducting such a dental practice study in the community. Several studies have gathered data from dentists in private practice, which have led to important results (2-7); however, no report has been devoted to the methodologic aspects of such a study. Consequently, none have provided the level of detail needed while planning for such a study. The intent of this report is to fill that void in the dental literature.

In this paper, we report results from the FDCS, which was a longitudinal observational cohort study of oral health and dental care use, the field phase of which began in August 1993 and ended in May 2000. More detail on the study is provided at the Internet site listed in the Acknowledgments section at the end of this paper. In 1998, we expanded the FDCS to include data retrospectively from participants' dental charts. We describe the methods used in this effort. To our knowledge, this is the first report in the literature devoted to describing the methods of a community-based approach to adding dental records data to what was at the time an ongoing longitudinal study of oral health and dental care.

The objective of this report is to assess the feasibility and effectiveness of adding a dental practice component to the FDCS. These questions are addressed: (1) Will participants consent

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to having their dental records reviewed? (2) Will participants' retrospective reports of which dentist(s) they visited be sufficiently accurate and comprehensive? (3) Will private practice dentists in Florida and Georgia consent to a review of their dental records for specific dental patients? (4) Will these dentists provide information on actual or typical fees charged to these patients? (5) Are the charts from these practices sufficiently comprehensive to determine what dental procedures were done and when? (6) Can dental procedure data be gathered reliably and validly by dental hygienist research assistants? (7) What types of costs are incurred in gathering data in this manner?

Methods

This project added a dental practice component to the FDCS. We begin by providing an overview of the methods of this "parent" study, and then describe the methods used for the dental practice study that was added to it.

Sampling Methods of Parent Study. The goal of the sampling design of the parent study was to ensure that a large number of persons at a hypothesized increased risk for oral health decrements would be included (namely, blacks, residents of rural areas, persons who were 45 years old or older, and the poor). Details of sampling methodology and selection are provided in an earlier publication (8). The 873 subjects who participated at baseline resulted in a sample of only minimal bias with respect to the population of interest (8). Specifically, limiting the sample to households with telephones created a small bias toward more females, larger households, and fewer functionally impaired persons (8). As an example of the magnitude of this bias, this sample had a dental care recency at baseline that was very similar to recent US National Health Interview Survey (NHIS) data, and conclusions drawn from the FDCS and the NHIS regarding sociodemographic determinants of dental care recency were the same (8). Additionally, the percentage of the sample that had one or more dental visits in the first two years of the FDCS, 77 percent, was very similar to the figure, 75 percent, among the comparable group of 1989 NHIS respondents (8,9).

Data-gathering Stages of Parent Study. An in-person interview was conducted at baseline, which was immediately followed by a clinical dental examination. We have previously described the financial and sociodemographic circumstance of the FDCS sample, its prevalence of dental conditions at baseline, and its incident dental care use (e.g., 10-15). The baseline interview and clinical examination were followed by a telephone interview at six months, 12 months, and 18 months following the baseline.

Participants were asked at each six-month interview whether they had been to a dentist since the last interview. If so, they were asked how many times they had been, and the name of each dentist and/or dental practice providing treatment. For each visit, they were asked why they went, and what dental procedures were done. Six-month intervals were chosen for this design for two reasons: (1) to improve memory recall of dental visits, in contrast to a presumably poorer recall if a longer (e.g., 12-month) interval had been used; and (2) our expectation that a substantial percentage of subjects in the sample would have a dental visit each six-month interval. The actual wording of all questionnaire items can be found at the Internet site listed in the Acknowledgments section.

At 24 months, the interview was done in person instead of by telephone, and was followed immediately by the clinical examination. During the 24-month interview, we asked participants for written permission to review and abstract information from their dental records, which we would do by approaching each of the dentists whom participants had seen since baseline. Of the 764 persons who participated for the 24-month interview, all but four gave us that permission.

A telephone interview was conducted at 30 months, 36 months, and 42 months after baseline. At 48 months, the interview was done in person instead of by telephone, and was followed immediately by the clinical examination. For the sake of completeness, and because we had not yet begun the dental practice study, written permission to review dental records was again asked at the 48-month interview. Only one of the 48-month participants refused. Because the dental practice study required grant funding separate from the parent study, dental chart data collection did not begin until the summer of 1998, which was after all participants had completed their 48-month interview. The original parent study was designed for longitudinal follow-up from its outset. However, at the beginning of the study, we only had funding for 18 months of follow-up. Ultimately, with two grant continuations, the follow-up period became 72 months. At each new funding cycle, we informed participants of the newly funded follow-up period and requested their consent for continued participation.

Although the study began at baseline from August 1993 to April 1994 with 873 participants, by 48 months 85 percent (weighted n=743; unweighted n=714) remained in the study. Reasons for nonparticipation through 48 months included death (n=55), loss to follow-up (n=34), refusal (n=35), and medical inability (n=7).

To evaluate the potential for bias as a result of subject attrition, we compared characteristics of those who participated at 48 months for the interview with those who did not. Persons who participated were more likely to have been regular dental care attenders, in better self-rated general health, white, have graduated high school, were above the 100 percent poverty threshold, free of severe loss of periodontal attachment at baseline (7 mm or more on at least one tooth), free of root fragments at baseline, free of severely mobile teeth at baseline, able to pay an unexpected $500 dental bill as reported at baseline, and to have had a household income at or above USD $20,000 (Pearson and Mantel-Haenszel chi-square tests, P<.05). No differences in participation were observed with respect to age group, sex, rural or urban area of residence, whether the participant was above the 150 percent poverty threshold, present financial situation (income meets expenses), presence of active dental caries at baseline, or whether they had dental insurance. The mean (SD) number of teeth present at baseline among the 743 persons who participated through 48 months was 22.2 (7.0); for the nonparticipants, 21.2 (7.6). This difference was not statistically significant. As an example of the typical magnitude of this bias due to attrition, of the persons at baseline (n=873), 47 percent reported that they had been to a dentist in the previous six months. If the baseline had only

included persons who ultimately participated in the 48-month interview (n=743), then that figure would have been 49 percent.

Conduct of Pilot Study. The dental practice component required Human Subjects Institutional Review Board review separate from the review given the parent study. Following approval from this review, a pilot study was done to evaluate the feasibility, validity, and success of the methods that we had planned to use for the dental practice study. A total of 20 dentists in two counties of north Florida (counties other than those sampled in the parent study) were asked to participate, of whom 17 actually did. This convenience sample was taken from the Yellow Pages®. Because we did not want to conduct the pilot on any of the dentists named by the FDCS participants, we could not present permission forms signed by patients whose records would be abstracted. Three techniques were used to establish contact with the offices: (1) mailing an introductory letter, followed by a telephone call to the office manager; (2) calling the office manager only, and arranging an appointment to visit the practice; and (3) showing up at the office unannounced, but prepared to explain the study and to reassure the office of the legitimacy of our request. In all cases, the offices were reluctant initially due to suspicions that the request was coming from some state or federal regulatory authority, or from someone who was actually representing insurance industry interests. In each case, legitimacy was ultimately established by wearing a university picture identification badge, presenting a business card, giving examples of published articles and abstracts from the FDCS, presenting an introductory letter on university letterhead, as well as by attaching a university magnetic sign to the side of the vehicle taken to the office. We also established an Internet site devoted to the study; one of the purposes of doing so was to aid in establishing the legitimacy of the study.

None of the dentists who participated in the pilot study were offered any participation incentives. However, we did query them for suggestions. The consensus was that providing a voucher for a continuing education (CE) course or a home-study CE course should be helpful. The pilot study also was used to verify that information from the dental records would be sufficiently complete and legible, or could be verified sufficiently in concert with office staff. Full treatment plans, complete diagnostic information, and reasons that procedures were done were not recorded by all dental practices. In each case, however, exact dates and exact procedures were recorded. Data from the pilot study also were used to quantify agreement between the research assistant and the dentist principal investigator with regard to treatment record abstraction and procedure coding. The pilot study also was used as an opportunity to further pretest a dental practice characteristics questionnaire. The pilot study lasted three months.

Training Conducted Before Field Phase. Four dental hygienists served as research assistants for the field phase. A total of eight days of training were conducted. In addition to training in field procedures, which included direct data entry into a portable microcomputer, training was necessary to achieve a high level of interrecorder reliability in use of American Dental Association (ADA) dental procedure codes. By the end of training, inter- and intrarecorder reliabilities for number of visits, dates of visits, teeth or areas of the mouth treated, and fees charged were perfect. Agreement for specific ADA codes was at the level of 97 percent concordance; disagreement arose from documenting advanced dental procedures to which the dental hygienist research assistants had received little exposure.

Gaining Cooperation from Named Dental Practices. Because the pilot study suggested no clear preference, the four research assistants were given latitude to use the dentist contact protocols with which they felt most comfortable in eliciting cooperation from the dental practices. The most common technique was for the research assistant to send an introductory letter to the assigned dental practice, along with a list of participants who had named that practice. A follow-up telephone call was then made to confirm receipt of the letter, and to set an appointment time to visit the practice. One research assistant typically did not mail a letter, but made an introductory telephone call, identified a contact person for the practice, and then made an appointment to visit this person. Another research assistant simply preferred to show up at the dental practice with an introductory letter and copies of written permission from the study participants. Some of the dental offices kept an answering machine on all the time and did not respond to messages we left. It was then necessary to go to the office without an appointment.

A total of 11 practices named by participants were not in Florida or Georgia. In these instances, the research assistant telephoned the practice, identified the office manager for the practice, and mailed a packet addressed to this person. This packet contained an introductory letter, copies of the permission forms signed by the relevant participants, the dental practice questionnaire booklet, the research assistant's business card, and a postage-paid return envelope. A follow-up telephone call was made three to five days later to verify that the package had been received and examined. With the exception of 13 of the six-month interviews, participants in the FDCS knew the name(s) of their dentists, their street address, or clinic name, from which we could identify the dentist or group practice. We also had available Excel® databases purchased from the states of Florida and Georgia that listed all the dentists licensed in those states from 1994–97. We also made use of printed Yellow Pages® and similar sources available on the Internet.

To encourage participation by the dentists, we provided a voucher for a $50 credit toward a CE course offered by the University of Florida, which could be redeemed within one year of its receipt. When some offices were reluctant to participate, a list of dentists who had been particularly helpful (and who had given us permission to use their names) was offered to help legitimize the study and elicit cooperation.

One FDCS participant had received dental treatment in a hospital emergency room, and that hospital would not honor permission forms that had been signed more than six months previously. The research assistant then traveled to the participant's home to get a new permission form signed. One urban dentist, who had served the largest number of participants in the FDCS, initially declined participation. Ultimately, a retired dentist partner, who still maintained an interest in the

practice, went to the office and made photocopies of all the relevant charts and brought them to the research assistant's home. The main dentist in the practice was not interested in exerting the effort required for participation, but was willing to let the retired dentist exert the effort if he so chose.

Chart Abstraction Procedures. We recorded dates of participants' dental visits since their FDCS baseline session, the name of the dentist for a given visit, teeth or areas treated, ADA procedure codes, a description of the ADA procedure code (to ensure that the code matched its description), the actual or typical fee charged for those procedures, as well as the name of the participant, date of data entry, and the name of the research assistant doing the data entry. The dental record was not used to gather other information, such as diagnostic or payment information.

We recorded what procedures were done as distinct from those for which a billing was done. The most common circumstance was the recording of procedures (e.g., root canal or prosthetic procedures) that required multiple visits, but for which only one billing was made. This was also important for patients who were relatives or friends of the dentist who provided care for no fee, or for cases in which certain dental procedures were redone because of a previous treatment failure. We also recorded procedures that ultimately were not completed, such as one case in which a prosthetic crown preparation was done, but that ultimately was not cemented because the tooth was evulsed before crown cementation.

Some practices had relevant records held in storage. Examples were the attic of a dentist's home, a dentist's garage, and mini-storage warehouses. Typically, these were charts from a dental practice from which the dentist retired, or a new dentist recently purchased the retiring dentist's practice. One FDCS participant had copies of all his dental records; all of his dental treatment had been provided in Veterans Affairs dental clinics.

Almost all dental offices allowed the research assistant to view the relevant dental charts and to enter the data directly into the laptop computer in the office, or to photocopy the charts using a portable photocopier, from which data would be entered at a later time. Four offices stated that the charts were their private property and no one else could see them, but verbally read treatment information from the dental chart, or manually copied treatment information onto blank forms. Computerized records were used when the research hygienist was not certain from the written record what procedure had been done. This was done after an initial review of all the relevant records for the practice. Typically, computerized confirmation was necessary if the initial chart review revealed an idiosyncratic notation style.

While dental charts were being reviewed, notes were made of referrals to specialists. This was especially important in those instances when participants had not informed us of these specialists during the 6-month interviews. Specialists were contacted last so that no dentist noted in general practice offices would be missed. A copy of the participant's written permission form was placed in each chart.

Dental Practice Characteristics Questionnaire. We also asked each dental practice to complete an 11-page questionnaire about the characteristics of his or her dental practice. The actual wording of questionnaire items can be viewed at the Internet site listed in the Acknowledgments section. A total of 204 of the 286 dental practices returned a practice characteristics questionnaire. Apparently not all dentists valued the CE incentive; six dentists who returned questionnaires refused a voucher, and only 29 ultimately redeemed the voucher before the year's expiration date.

The field phase took 12 months to complete, by which time the four research hygienists had devoted a total of 1.8 full-time equivalents to the project during that period.

Results

Of the 297 dentists in 286 practices named by FDCS participants, all but 10 practices participated; these 10 practices had provided treatment to 17 participants. Of the 10 practices that did not participate, five refused and one practice's dentist was severely ill. Two practices had closed operation, had all their charts stored in a warehouse, and the participant's record could not be located. The dentists in two practices could not be located because they had moved from the state. Of the 788 persons (weighted n) who participated at the 24-month time point, 677 (86%) ultimately reported having had at least one dental visit during the first 48 months of the study. Of those 677, we located dental records on 619 persons, of whom 618 had a documented dental visit during their 48 months of follow-up. By querying practices while we were recording treatment information on other participants, we also found dental records on 10 of the 111 persons who had said that they had no dental visits, or for whom there were missing dental visit data, of whom 4 actually had a documented dental visit during their 48 months of follow-up. Therefore, we had dental chart data on 622 persons who had at least one documented dental visit during their 48-month follow-up period.

We assessed bias in the resulting sample of 622 persons by comparing characteristics of those persons to the 55 persons (677–622) for whom we could not locate a dental chart. Persons for whom we did locate a dental chart were much more likely to have reported more dental visits (mean (SD) of 8.1 (5.2) visits, compared to 2.8 (2.0) visits for those with no dental chart; $P<.001$). There were no statistically significant differences based on age group, sex, rural or urban area of residence, whether the participant reported having dental insurance at baseline, number of teeth at baseline, whether the participant was free of severe loss of periodontal attachment at baseline (7 mm or more on at least one tooth), free of root fragments at baseline, or free of severely mobile teeth at baseline. However, we were more likely to have located a dental chart on persons with these characteristics: high school graduates, whites, persons in better self-rated general health, persons with better financial resources, regular dental attenders, and persons with at least one carious tooth at baseline (Pearson and Mantel-Haenszel chi-square tests, $P<.05$). When "number of dental visits" and each of these characteristics were included as variables in separate logistic regressions of "had chart"/"did not have chart," none were statistically significant. This suggests that the most important factor in whether we were able to locate a dental chart had to do with the self-reported number of dental visits. As an example of the typical magnitude of

this bias, of the persons who reported a dental visit and for whom a chart was located (n=622), the mean number of visits was 8.1 (5.2). If our sample had included all persons who reported at least one visit (n=677), then that figure would have been 7.4 (5.2).

Charts varied in comprehensiveness, but in conjunction with office staff consultation, all practices had adequate records of what procedures had been performed. When limited to only those visits that occurred during participants' 48-month follow-up period, a total of 11,418 lines of ADA procedure codes and visit details were recorded.

Eight practices allowed access to records, but did not allow us to record fees. Fees were unavailable at another 13 participating practices. Among practices that allowed any type of records review, we recorded an actual fee for 91 percent of procedures, a typical fee for 8 percent of procedures, and the fee was unavailable or refused in 1 percent of procedures. If the actual fee was for some reason discounted, or if the procedure fee was bundled with the fee for another procedure, or if only an insurance copayment was made by the patient, then the relevant notation was made.

Costs of Data Collection. This project was not designed to assess the cost benefit of adding a dental practice component to the parent study. However, for the sake of investigators considering a design of this type, we delineate the types of costs involved. The largest cost was the 1.8 FTE research hygienists during the field study. We also purchased portable microcomputers, portable photocopiers, and office supplies for each of the four research hygienists. They were also reimbursed for mileage incurred while traveling to dentists' offices. We established dedicated telephone lines in the homes of each research hygienist, paying for monthly service and long-distance telephone calls. Electronic mail accounts were established such that they could electronically mail data files on a regular (usually weekly) basis to a data manager, who contributed approximately a 10 percent effort during the field phase and for three months following to conduct data recoding and descriptive analyses.

Discussion

Several methodologic limitations of this study warrant discussion. The most important limitation in our judgment has to do with the fact that we mainly had to rely on participants to tell us about the dentist(s) from whom they received treatment to be able to measure incident use of specific dental services from the dental record. Some estimation of the magnitude of this limitation is garnered from the fact that of the 111 persons who had said they had no dental visits in the 48 months of follow-up or for whom that information was missing, we actually found dental records on four in which dental treatment had been rendered during the 48-month window of time. Identifying these charts was made possible by labor-intensive detective work by the dental hygienist research assistants in the study. Furthermore, of the 677 persons who reported a visit, we could only locate records on 619 of them. Therefore, although we used the dental record information as the criterion to quantify use of specific services, this gold standard may have in fact been tarnished due to the limitations of this study design.

Participants knew prospectively that they were going to be asked about their dental care utilization behavior. This may have improved the validity of their self-reports because this behavior took on a greater importance than would have occurred otherwise. Behavior can change as a result of knowing that this behavior is being observed (16-18), and we observed such an effect (albeit a small one) with regard to dental care utilization for this FDCS sample (13). Also, during the 24-month interview, participants became aware that not only was their dental care utilization being observed, but that the FDCS would now be verifying their reports of that behavior by abstracting information from their dental records. We could only speculate as to whether this might increase the validity of their self-reports (because the observation is intensified), or in fact decrease it, because participants concluded that there would be less reliance on their self-reports. We have conducted so far two analyses of validity of self-reports with these participants; each analysis confirmed a high validity, although that validity decreased with an increasing level of specificity required (19,20). Therein lies the main value of adding a dental chart component: an increase in the level of detail on the types of dental procedures performed, as well as the dates of treatment and the actual or typical fee charged.

This report is intended to provide methodologic detail for use when planning a community-based dental practice study. Dental practice records have been used as an information source in a small number of studies. For example, a study of dental practices in North Carolina observed that documentation of diagnostic information, with the exception of dental radiographs, was inadequate to describe patients' periodontal health (3). However, one study abstracted treatment information, instead of diagnostic information, from dental practices serving approximately 500 male veterans being followed in a dental health study (4). The subjects were asked retrospectively for the names and addresses of all dentists seen during a 10-year period. A total of 94 percent of subjects gave permission to have their dental records reviewed, and 95 percent of the dentists so named also gave permission. The bulk of missing data from dentists was due to dentists' retirement, death, or having sold the dental practice. Gathering the data required about 16 months of one FTE, or 1.3 FTE (Dr. Raul Garcia, electronic mail communication, 12/20/96). A study of the relationship of dental x-rays to tumors of the parotid gland reviewed dental radiation histories, obtaining data from a total of 272 dentists, of whom 10 percent refused to participate (2).

As a result of adding a dental practice component to the FDCS, we conclude (1) that a representative sample of dentate adults 45 years old or older would almost always consent to having their dental records reviewed; (2) that participants' retrospective reports of which dentist(s) they visited are sufficiently valid and comprehensive to allow for a substantial increase in knowledge about their incident use of dental services; (3) that almost all private practice dentists in Florida and Georgia would consent to a review of their dental records for specific dental patients; (4) that all dental practices would not provide fee information, but almost all would; (5) that the charts from these private practices would be sufficiently comprehensive to determine what dental procedures were done and when, but would not consis-

tently contain full diagnostic information; (6) that dental procedure data can be gathered reliably and validly by dental hygienist research assistants; and (7) that, although time intensive, this method of collecting data substantially increased detail about treatment received, compared to relying on participant self-report and clinical examination only.

Acknowledgments

This investigation was supported by NIH DE-14164, DE-11020, DE-00392, and DE-12457. The opinions and assertions contained herein are those of the authors and are not to be construed as necessarily representing the views of the authors' employers or the National Institutes of Health. The informed consent of all subjects who participated in this investigation was obtained after the nature of the procedures had been explained fully. An Internet home page devoted to details about the FDCS can be found at http://nersp.nerdc.ufl.edu/ ~gilbert/(formerly at http://www.nerdc. ufl.edu/~gilbert/).

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