Structuring Implant Data in the Electronic Health Record: A Prototype to Enhance Patient Care & Research Information

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Structuring Implant Data in the Electronic Health Record: A Periodontal Residency Prototype to Facilitate Research

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Table of Abbreviations, Acronyms, and Definitions

- CPI: Adherence to post-operative care instructions/compliance
- ASA: American Society of Anesthesiologists
- AOH: Assessment of Healing
- BG: Bone Graft
- DCF: Data Collection Form
- Drop-down list: A data entry method where the user selects from a presubscribed list on a specific topic (open text, yes/no buttons not allowed).
- EHR: Electronic Health Record
- eIRB: Electronic Internal Review Board at Oregon Health and Science University
- IS: Implant System Used
- IO: DCF Intra-operative Data Collection Form
- OA: Occlusal Analysis
- Open text: A data entry method in that allows the user to enter any text, numbers, or symbols in specified character length area.
- OHSU/SOD: Oregon Health and Science University, School of Dentistry
- PO DCF: Post-Operative Data Collection Form
- PGS: Pre-grafted Socket
- PreO DCF: Pre-operative Data Collection Form
- PIS: Proposed Implant Site
- SeP: Sedation Plan
- STN: Structured Treatment Note
- SP: Subjective Pain
- SG: Surgical Guide Use
- Y/N: A data entry method where the user selects a radial button yes/no or a drop-down listing stating was or was not. (Equivalent to yes/no).

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Abstract

Purpose

The aim of this study was to evaluate the usability and information completeness of two different methods for structured documentation of dental implant-related clinical data in the electronic health record. The goal is to establish superior methods of clinical documentation that will improve data capture and data search and facilitate future clinical dental implant research and patient care.

Methods and Materials

Clinical data were collected by licensed dentists enrolled in the advanced training program in periodontal surgery (periodontal residents) as they documented dental implant-related encounters within the electronic health record (EHR), including medical history, restorative treatment plans, treatment details, and postoperative care. Two different methods of structured clinical documentation were used and each was evaluated for their completeness at capturing specific clinical data.

The first method used a structured stand-alone data collection form (DCF) in the EHR, set apart from routine treatment documentation. The second method was a structured treatment note (STN) integrated into the treatment documentation which prompted the clinician to answer specific questions during routine treatment documentation. Information was collected using the DCF and STN methods during pre-operative, intra-operative, and post-operative patient encounters. All information was collected in the EHR using unique reference codes for each data field. Twelve matched data fields from DCF and STN were selected and analyzed for documentation completeness:

Assessment of healing (AOH), subjective pain (SP), adherence to post-op care instructions (CPI), ASA status (ASA), surgical guide use (SG), occlusal analysis (OA), proposed implant site (PIS), sedation plan (SeP), bone graft (BG), implant system used (IS), and pre-grafted socket (PGS). Eight periodontal residents were surveyed on twenty-one key points after using both data collection methods, by using a 4 point Likert scale: 1 (agree)-4 (disagree).

Results

Of the eight resident respondents, six evaluations were completed. All respondents agreed (score =1) with the statement that treatment notes must be accurate, that tracking clinical implant data is important, that EHR use is preferred over paper, and that the STN method was easier and faster than the DCF method. Respondents disagreed (score= 4) with the statement that the perceived degree of accuracy when comparing two data field entry methods of the 1) open text box or 2)drop-down list. Users rated the STN higher in perceived accuracy and overall preference.

A total of 263 implants procedures were documented in 183 patients utilizing one of these two methods from 7/1/2010 to 8/31/2011. The twelve matched DCF and STN data fields were compared for completeness of information and were respectively: AOH 100%/100%, SP 98%/100%, CPI 97%/98%, ASA 100%/98%, SG 91%/94%, PIS 86%/93 %, SeP 91.3%/93.54%, BG 94%/100%, IS 98%/98%, PGS 97%/95%, -- no significant differences existed between the two methods in these data fields. One data field, OA, did show a significant difference in percent complete, which was 60% (DCF) and 85% (STN).

Conclusion

The completeness of documented clinical information was similar between the two EHR-based methods evaluated--Data Collection Form (DCF) and Structured Treatment Note (STN), except for OA. However, clinicians demonstrated a strong preference for using the STN method.

These results suggest that future clinical research on procedures, like dental implants, may be better facilitated by structuring clinical documentation and integrating it into the existing processes of documentation rather than relying upon separate data collection forms. The STN model can be used to access and assess clinical outcomes like implant survival as well as procedural data and is considered more user-friendly by clinicians.

Introduction and Literature Review

The Oregon Health & Science University School of Dentistry (OHSU/SOD) transitioned from paper charts to an electronic health record (EHR) (axiUm™, Exan Corp. Vancouver, BC, Canada). The EHR was limited to billing, procedure reporting, and some electronic forms for nine years prior to implementing the comprehensive EHR and 'paperless' clinical environment.

The design of this research project was inspired by the desire to start a prospective point of view research project which could improve the quality of data collected by residents during dental implant treatment with the goal of facilitating future research, inventory control, and ultimately improving patient outcomes. Prior research has demonstrated that implants placed in dental schools can be successful,[1] but no existing research has studied dental implant database development in an educational environment

The intention of this study was to develop two different methods of documenting dental implant related clinical data in the electronic health record and to evaluate these methods for usability and information completeness. The goal was to determine a superior method of clinical documentation that would improve data capture, data search, and facilitate future clinical dental implant research.

This research question has a potentially broad scope as it attempts to improve the methods of developing useful documentation rather than the clinical findings or outcomes of care [2, 3]. This paper describes a process of developing structured documentation methods that can be used to facilitate analysis of during implant therapy. In addition, a survey rating clinician experience utilizing the two data methods was

administered and evaluated. While it is recognized that the methods and manner used in the creation of this database could be applied to other areas (e.g. success of implants, tracking materials, etc.), that is not the goal of this study[4, 5]. It is also understood that the broad generalization of this study is limited due to the number of residents that participated (nine residents).

Importance of Dental Implant Research

Dental implants have now become a standard of care, and are placed by general dentists and specialists, for single tooth replacement as well as for edentulous treatment plans[6]. Research has shown that single tooth implants demonstrate an improved long-term success rate when compared to fixed partial dentures. A review of the literature sites an implant success rate of 90-98% depending on the site (tooth number), arch, and overall complexity of concomitant factors [7] . Therefore patients are no longer advised to accept preparation of a sound tooth as a bridge abutment for our first choice in treatment planning for edentulous spaces.

Dental implants have significantly changed treatment options for patients. The importance of this change has far reaching implications at both post-doctorate and pre-doctorate training levels[8-10]. Choosing the appropriate treatment plan from the assortment of restorative and implant prosthetic protocols presents a challenge for the clinicians from both a surgical and a prosthetic standpoint [11, 12]. This is evident in modern dentistry with the exposure of many young dentists' to the process of dental implant placement and restoration while in dental school[13, 8, 9]. Therefore, it is imperative to teach future clinicians the value of evidence based dentistry and the

impact that survival and success rates impose on future treatment with regards to dental implants [14].

In periodontal literature, there are many definitions of survival and success; however, the two outcomes are not defined synonymously. We often look to the criteria first defined by Albrekkson [15], further modified by Buser[16], Karoussis [17] and others [18, 19] concerning implant success and survival when determining implant success after surgery:

- Absence of mobility
- Absence of persistent subjective complaints (pain, foreign-body sensation, and/or dysesthesia)
- Absence of recurrent peri-implant infection with suppuration
- Absence of a continuous radiolucency around the implant
- No pocket probing depth (PPD) > 5 mm
- No PPD > 5 mm and no bleeding on probing
- Annual vertical bone loss after the first year of service not exceeding 0.2 mm (mesially or distally)

The term *success* is often used to indicate that the implant has osseointegrated without issue(s), but may not be acceptable in the terms of follow-up, functionality, or aesthetics [20].We must keep in mind the patient's idea of success and survival may be different than the clinicians[21, 22, 23]. The complete list of parameters studied in the development

of this database is listed in the appendices, but the data specifically reported on in this report are listed in the materials and methods section.

The specific objective of this study was to initiate the design of a collection method in the EHR uses to track dental procedure codes performed on their patient population. In the proprietary EHR we used data entry could be accomplished in several ways, including open text, drop-down list, and yes/no radial button/box. There are examples of using electronic based medical records[24, 25] in the medical/dental literature which cite using residents. This literature also comments on the accuracy of such data for research purposes[26]. Some would argue the science of medical data management should be taught to residents as required course work [27].

There are many advantages to the creation of a database entry method which utilizes a template format that may result in more accurate notes as compared to unstructured narrative text alone, with easier recall and thus periodic review of results [28, 29]. Another benefit of an electronic template would be the ease of data tracking and evaluation. The database structure and template format of the implant procedural documents created in this study, used in the educational setting of the Department of Periodontics, is an example of this type of informational structure. Some additional advantages (in no particular order and certainly not an all-inclusive list) would be:

- Tracking of periodontal residents implant survival rate and how it relates to the complexity of the initial case through the final prosthesis or restoration for future analysis[30]
- Track implants for inventory, recall, and size most commonly used

- Ability to tell at a glance which implant system were being utilized most and which are the most successful based on the included criteria
- Create useful data for future researchers regarding implants, implant systems and materials used with implants in a specific environment
- Ability of administrative and co-researchers to access data (de-identified data) without compromising patient confidentiality for future research projects
- Eliminates the need to manually scan the label of the implant or bone graft particle manufacturer for attachment to patient records if it is already entered into a structured data coded note (minimize double data entry)
- Creates a more tangible link for the clinician to recognize how their work may be connected to research

The biggest challenge with creation of a template, for the sole purpose of information retrieval at a later date, appears to be ensuring the accuracy and completeness of the record [26, 27, 23, 1]. In other words there is currently no tested method of validating that the true clinical findings were accurately documented by the clinician.

Background into Project Development

While researching how to best approach this project, it was necessary to investigate how OHSU/SOD was currently tracking the aforementioned factors: Implant/type usage, augmentation, etc. What was discovered was that most of this information was not being stored centrally by all departments, but was being used by separate individuals by either a paper filing method or excel spreadsheet format. For example the assistants and administrative staff in the graduate clinics were tracking implant data on a separate excel sheets (only accessible by them), independent of one another, and each with their

own format. Only some of the data was being tracked using axiUm™, by a one of the clinic departments, and generally unrelated to the patient and other specific criteria. Implant inventory was being tracked by a point of sale system, unrelated to patient information and surgical usage. There was no use of databases that allowed multiple users to view, input, or change or add data. It was my desire to develop better methods of facilitation about implant specifics between different departments (i.e. pre-doctoral and post-doctoral departments). Another important goal was the development of an interdisciplinary data registry that would allow tracking and collaboration based on the clinical evidence of resident surgical experiences and patient encounters. Current dental implant information was not being used to correlate survival of the implants, nor was it linked directly to the patient. The current system did not allow for different departments to access clinical evidence in an efficient, organized, or systematic way.

The transition to go completely paperless mid 2010 presented the perfect opportunity to address this issue. There are many programs and software databases on the market that could be used for this purpose, however; the existing SOD EHR system provided ample storage space and addressed the inter-disciplinary factors that affect implant survivability.

Material and Methods

Key individuals were interviewed about types of clinical and surgical data that could be used to answer important future research questions regarding dental implants[32]. Members responsible for holding inventory at the school were also questioned regarding the current methods used to track implant inventory.

From this survey, it was decided that two methods of clinical documentation in the EHR would be evaluated. Two methods of structured clinical documentation were tested and then evaluated for their use in collecting specific clinical data. The first method was utilization of forms (Data Collection Form, DCF) in the EHR and was set apart from the patient treatment note. The second method utilized a more traditional clinical note format but prompted the clinician to answer specific questions within the note (Structured Treatment Note, STN). A total of 263 implants were placed in 183 patients utilizing one of these two methods from 7/1/2010 to 8/31/2011.

The DCF was utilized first, from 7/1/2010 to 2/2011. The residents were then instructed to stop using the DCF and begin using the STN for all future patients. It has been assumed that only one or the other was used, with no duplication of data through daily interaction with the residents.

Both methods delivered context sensitive, case specific, clinical diagnostic data that reduced potential for data duplication. A set of structured answers were collected from the questions using the DCF and STN methods during pre-operative (PreO), intra-operative (IO) and post-operative (PO) patient encounters. Questions were asked concerning surgical space dimensions, implants dimensions, implant placement specifics, materials and procedures used, and the systemic health of the patient. Questions were also asked about patient compliance with post-operative instructions and patient subjective pain levels reported post-operatively. Specific examples of the information asked for in the DCF and STN templates are included and can be located in the appendix, in which one can see the questions concerning the detailed, context

sensitive, case specific, and clinical diagnostic information collected for this research project.

The template forms (DCF and STN) also suggest relevant required data fields to ensure specific answers. To avoid confusion, the structures of clinical documentation options were similar for both methods: yes/no, drop-down lists, or unstructured narrative text (open text). The clinical data were collected in axiUm™ EHR, using unique reference codes for each data field. This allowed us to explore data that were context specific and de-identified. When comparing the usage of the IO DCF with the IO STN, it was found that both had relatively equal usage, with 98 patients/data points in the DCF IO group and 92 in the STN group.

Twelve matched clinical data points from the DCF and STN were selected and analyzed for documentation completeness. The data points were as follows: Assessment of healing (AOH), subjective pain (SP), compliance with post instructions (CPI), pre-surgical ASA status (ASA), surgical guide (SG), occlusal analysis (OA), proposed implant system (PIS), sedation plan (SeP), bone graft (BG), implant system used (IS), and pre-grafted socket (PGS).

Eight periodontal residents were surveyed on twenty-one key points after 6 months experience with each documentation method (twelve months total). The survey assessed their perception of several usability factors including human-computer interaction, accurate data entry fields, ease of use, and their preferred method of use. Survey responses were collected using a 4 point Likert scale: 1 (agree)-4 (disagree). {See Figures 1, 2, 6}

The DCF included in the appendix (PreO, IO, PO), were used to guide the creation of the STN (PreO, IO, PO) in which the answers would be specifically linked to a code in the database. It is difficult to extract specific data for research from unstructured/open text field in an EHR. Unstructured narrative data entries generally do not allow the user to retrieve information needed for later use, much the same way it is difficult to retrieve the same information from a paper chart. The goal was to link these synoptic (structured) data points with a specific code from the beginning with this outcome in mind.

All implants placed regardless of brand/manufacturer were tracked in the Department of Periodontics. Bone grafts (Brand name, type of graft material) and types of membranes were also recorded. All patient information was de-identified prior to inclusion or analysis in this study. The Internal Review Board at OHSU (eIRB) reviewed and exempted this project: IRB #7513 (See appendix). De-identified data was reported including: Manufacture of the dental implant, sequence of the surgery {immediate, one or two stage, sinus lift (indirect/direct), bone type (prior to implant or during implant placement, or both), patient medical history status (smoker, diabetic, other autoimmune, periodontal diagnosis), and whether the implant was restored by a dental student or by a private practice referral[18].

Other factors being tracked are site location and flap design, medication prescribed, suture (type and number), local and other sedation used (type and dosage), patient compliance, and follow up visit reports. The restoration information survey is limited at this time but may become more sophisticated as this database develops. The final

occlusal scheme is a significantly important aspect of implant survival. Other researchers have called for databases to be developed for national use [33].

The definition of the scoring system to identify recorded information was developed based on completeness, not accuracy, in an effort to avoid unfairly weighting one method of data entry over another. For example, a Y (yes) answer would be weighted the same as a selection from a drop-down list. The accuracy of the data could not be validated due to the restriction that all data points being de-identified and patient examinations were not part of this protocol.

Answers were scored as follows: 0 = undocumented and 1 = answered appropriately (Y/N, Drop-down, Open text). The twelve data points taken from the collected de-identified implant data templates and data entry method option allowed are listed below. {See Figure 3}

1. ASA Status (PreO)
    a. STN and DCF : Number only open text
2. Surgical Guide Usage (PreO)
    a. STN and DCF : Drop-down list
3. Occlusal Analysis (PreO)
    a. STN and DCF : Drop-down list
4. Proposed Implant System (PreO)
    a. STN: Drop-down list
    b. DCF: Y/N, Open text
5. Sedation Plan (PreO)
    a. STN: Drop-down list (5 options)
    b. DCF; Y/N (3 options)
6. Bone Graft (IO)
    a. STN and DCF: Y/N, Open text

7. Implant System Used (IO)
    a. STN and DCF : Drop-down list
8. Pre-grafted Socket (IO)
    a. STN and DCF : Y/N
9. Assessment of Healing (PO)
    a. STN and DCF : Drop-down list
10. Subjective Pain (PO)
    a. STN and DCF : Number only open text
11. Adherence to Post-op Care Instructions (PO)
    a. STN: Open text
    b. DCF: Y/N, Open text
12. Proposed Implant Location (PO)
    a. STN and DCF : Open text

Results and Discussion

A review of the literature showed limited research has been done in this area and did not shed light on how data entry is completed at other institutions in the United States.

The literature reports success and survival rates for implants in general. One study claims a higher academic success percentage with dental students in medically comprised patients when compared to private practice [1].Many of the variables are being recorded, electronically coded for future retrieval, and are related to surgical placement and materials used. The increased use of the templates could improve the usability via feedback and change, thus leading to less user frustration and more accurate data collection [24].

One of the research goals was to enhance tracking and record keeping by reducing redundancy. Primarily, the database was designed to track the implants placed by the Department of Periodontics which are restored by either private practice or dental students, and to support the use of implants as a valid treatment choice. One of the long term aspirations, not

encompassed in this paper, but certainly retrievable due to this projects design, is to be able to determine the implant survival rates and later success rates of the implants placed by the residents of the OHSU/SOD Periodontology Department. By tracking these clinical data electronically, the information is easily accessible for future research on outcomes of implant placement.

Of the eight respondents, six surveys were completed and analyzed. The results were rated using the Likert scale of: 1 (agree), 2 (somewhat agree), 3 (somewhat disagree), and 4 (disagree). Questions asked in the resident surveys which were answered unanimously that they agreed (rating 1) on the Likert scale were: Accuracy is critical for treatment notes, importance of tracking implant cases, using EHR in their future practice, and the STN was the easiest and the fastest method tested. Residents marked 4 (disagree) with regards to accuracy on data field entry using the open text box or drop-down list. Respondents indicated that they wanted both open text along with a drop-down list as options in the EHR depending on the service provided. Using DCF appeared to be the least popular and accurate by their ranked opinion when comparing to the STN. {Figures 1, 2, 6}

The twelve matched clinical data points taken from the DCF and STN analyzed were AOH 100%/100%, SP 98.81%/100%, CPI 97.62%/98.56%, ASA 100%/98.65%, SG 91.30%/94.59%, PIS 86.96%/93.24%, SeP 91.3%/93.54%, BG 94.9%/100%, IS 98.98%/98.9%, PGS 97.96%/95.60% respectively, which were all fairly close in % complete with the exception of charting OA which was 60.87% (DCF) vs. 85% (STN). Overall, the STN data demonstrated a tendency to be shown as more complete when compared in a line item analysis. {Figure 3}

Despite an attempt to have the DCF (PreO, IO, PO) and STN (PreO, IO, PO) appear so similar as to be identical, it was found on data retrieval that two of the twelve study questions options given; compliance and sedation plan, yielded significantly different results due to the differing

data entry method of the DCF compared to the STN for the same question. There appears to be a substantial difference in resident response quality when given the data entry option methods of Y/N or the option of unstructured/open text answers.

The prospective issues with using an open text or unstructured format over the other types of data entry is that the answers may be unrelated to the question asked (not the intended field answer) or answers may be less qualitative answers than could be achieved through directed answers in the drop-down list.

Evaluating the Impact of Data Collection Options

In discussing the differences found in the residents' answers when looking specifically at compliance and comparing the two methods (DCF and STN) it was noted the Y/N and unstructured/open text was asked with regards to compliance. When the switch was made from the DCF form to the STN, it was noted the Y/N was absent and the only choice was unstructured/open text.

The STN comment field entries suggest that residents interpreted patient compliance as a range, from "wonderfully, 100% compliant" to "compliant" or "reports compliant" to "patient admits to bending the rules on vacation". This suggests the entry field method used in the DCF could be replaced with a range of options including "fully compliant, compliant, moderately compliant, and states noncompliant". Noncompliance could also be measured subjectively in the case of a surgical site appearing as if the patient behaved in a noncompliant way, by means of appearance of the gingival flap being torn open and sutures gone during the first week of healing as an example.

Looking at proportions and assuming patient compliance was independently distributed across DCF and STN methods, we can see that clinicians appear to report mild noncompliance (C-) as noncompliance or 100% compliance (C+) or adequate compliance (C). To the extent that mild compliance is of concern, this substantiates the idea that we can increase the number of options from Y/N to fully compliant, complaint, moderately non-compliant, and non-compliant while offering a comment field only for the latter two with no considerable information loss in our STN.

It was found that residents were more likely to document noncompliance when initially asked if the patient was non-compliant, and then asked to explain. When given an unstructured/open text box, without first asking if the patient was compliant, it was found that other treatment information was written down in the open text field unrelated to compliance (e.g. other treatment notes). When using the DCF, the residents showed improved accuracy at answering the compliance question, while the STN was more likely to allow for interpretation using a range. {Figure 4}

In examining sedation plans, it was observed that the DCF and STN methods offer significantly different perspectives. As can be seen in the Figure 5, greater than 60% of clinician-patient encounters document no sedation plan using the DCF method, while the STN method indicates that slightly over half of the clinicians recommended only the “local anesthesia” (LA) for sedation. This discrepancy may be attributable to the lack of a “local anesthesia only” option on the DCF. Assuming that cases are evenly distributed across the two methods, this data suggests that nitrous sedation is underreported or not used as a sedation plan in the DCF method. It was determined that the no answer option offered in the DCF method referred to LA only (Figure 5}. It should be noted that

additional clinical information may have been recorded elsewhere in the patient record such, as the sedation form.

The key concept of this comparison is that the patient data are sensitive to the comprehensiveness of the options offered in forms. It can be seen in this study that the deficiency of local anesthesia option leads clinicians to report lacking a sedation plan and underreport nitrous sedation. Due to the low number of residents, those findings from the survey are not generalizable beyond the scope of this program.

Comprehensive Conclusion

The resident evaluated comparison form indicates the STN data entry model was preferred in 8 of the 12 categories while the DCF model was preferred in 3 categories with no difference noted in 1 category. The data implies that improvements should be made to the STN model using the preferred data entry method of the DCF model as the basis of the change.

Regardless of the design chosen, EHRs utilizing clinical data can be seen to be a valuable resource to access a variety of procedure specifics for prospective studies.

The importance of modern technology (i.e. EHR) and utilizing the graduate level professionals for research purposes should not go unacknowledged[28, 34-38]. Significant time, training, and expense are invested in student residents, medical or dental. One of the many goals of this project was to facilitate future clinical research by improving access to key clinical findings (through trained residents) that are known to be related to clinical implant success and survival, and hopefully change the quality of patient care.

Residents confirm in the survey the implementation of EHR accessed by a database application used as a clinical tracking tool in the placement of dental implants as a priority in evidence based dentistry. Periodontology residents in this study have indicated their desire to use the EHR to monitor the success and survival rate of implants as well as other treatment choices in their future practice. More importantly, they want to be able to customize how this information is tracked. They want to use EHR database for the tracking procedures, supplies used, and other factors in order to achieve enhanced patient success from their treatment modalities.

Figure 1: Data Methods Preferred from Resident Survey Comparing DCF vs. STN 2011

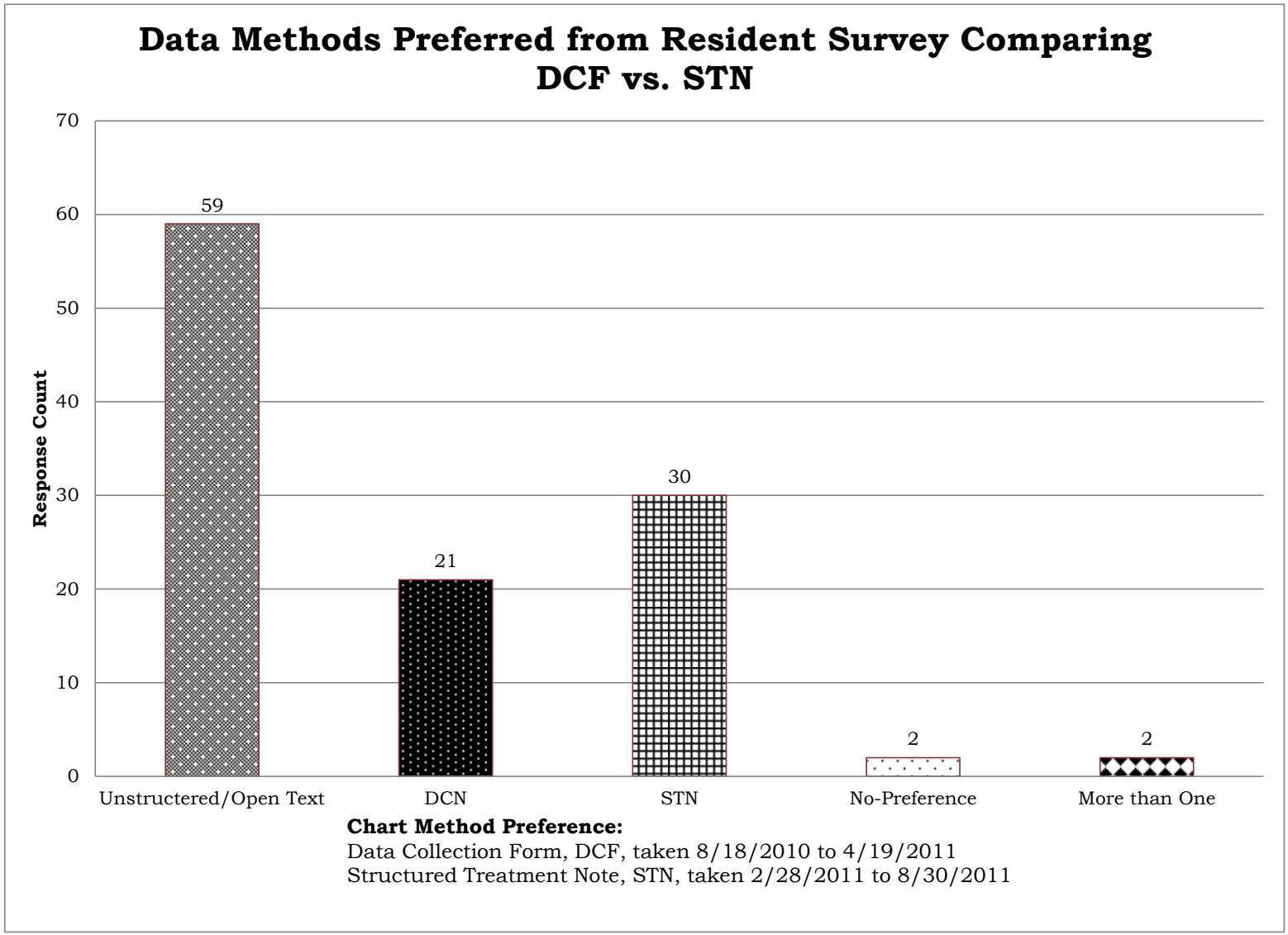


Figure 2: Yr. A vs. Yr. B Answers from Resident Survey 2011 Regarding DCF vs. STN Preference, Including Open Text

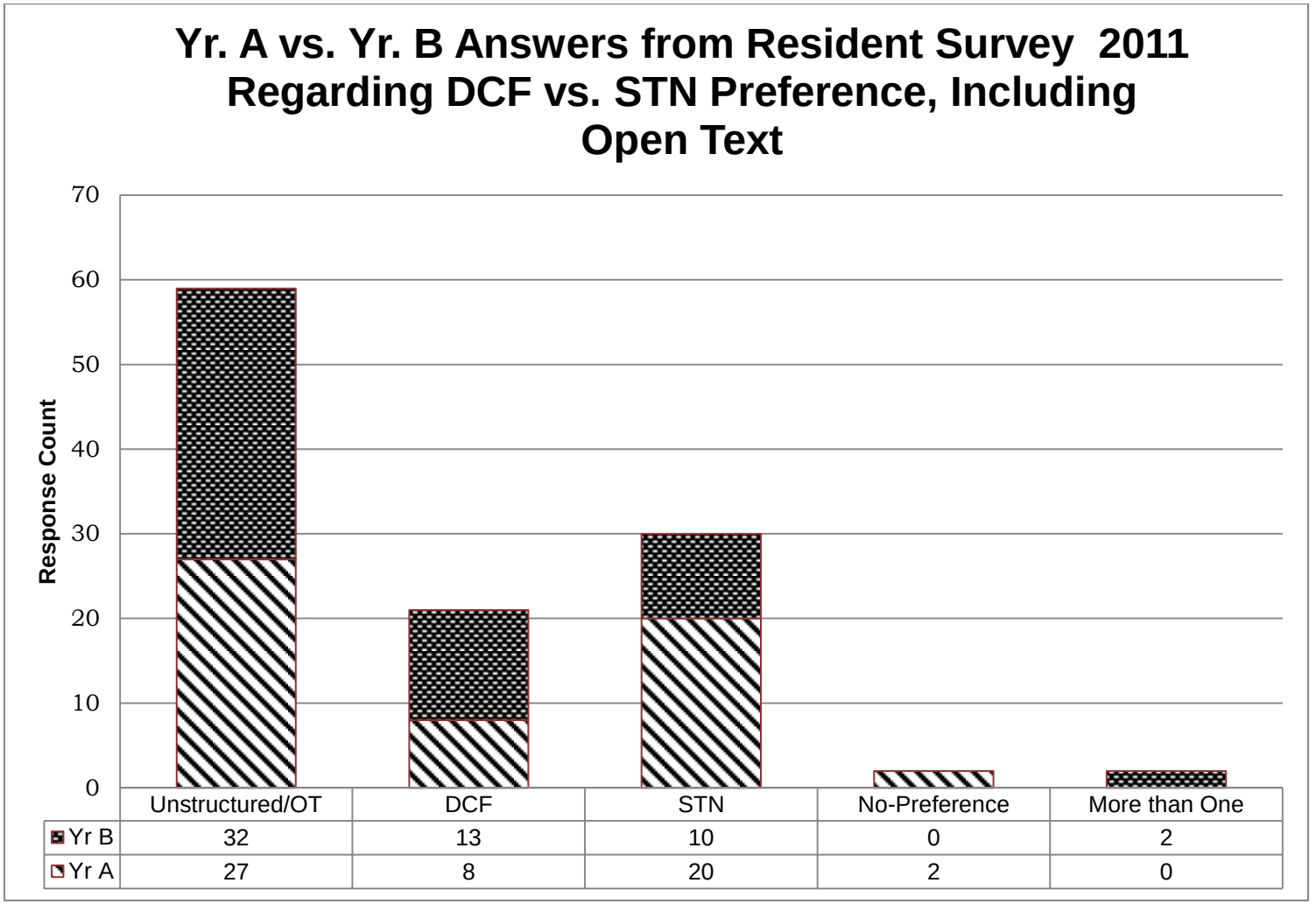
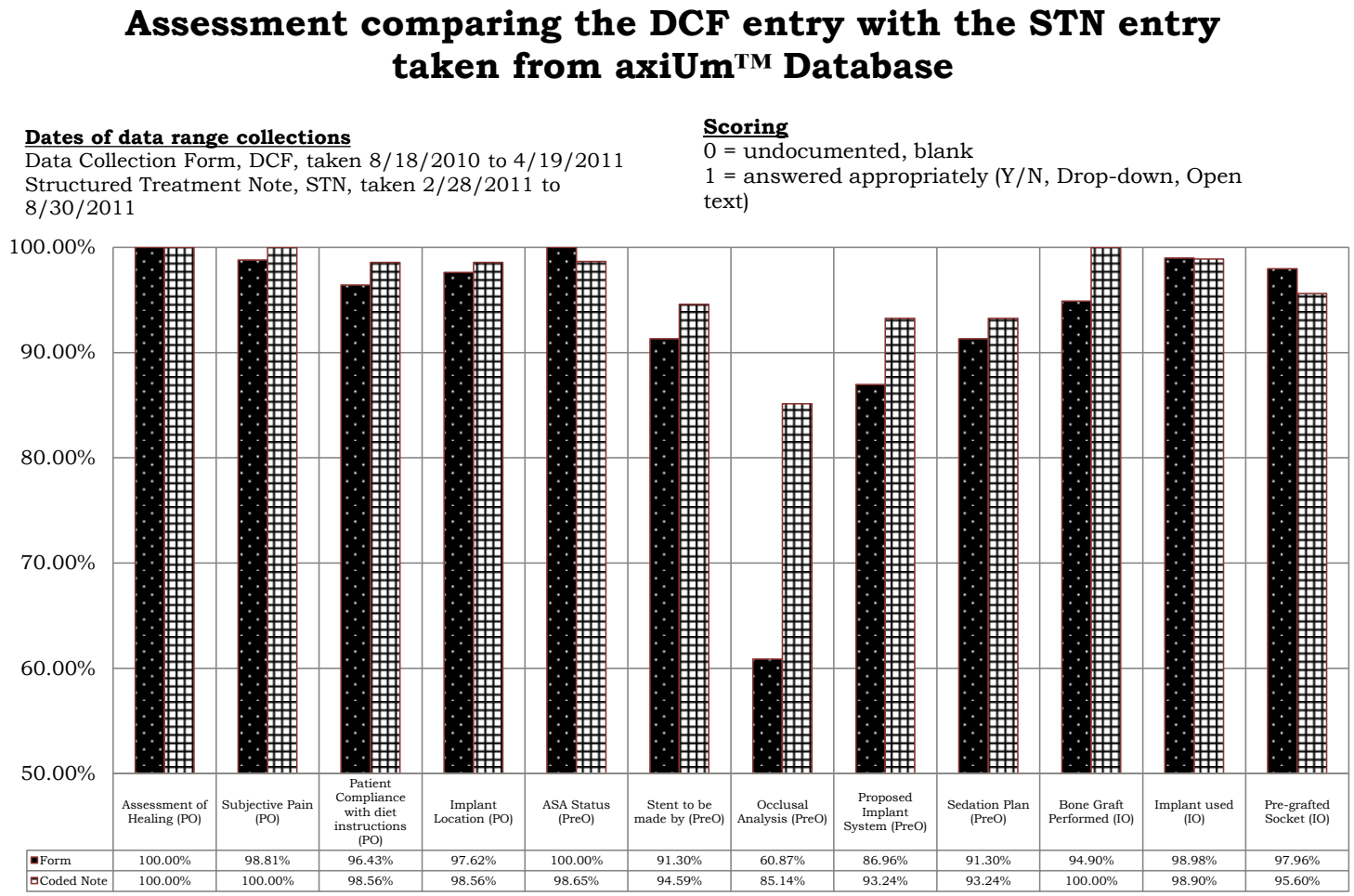
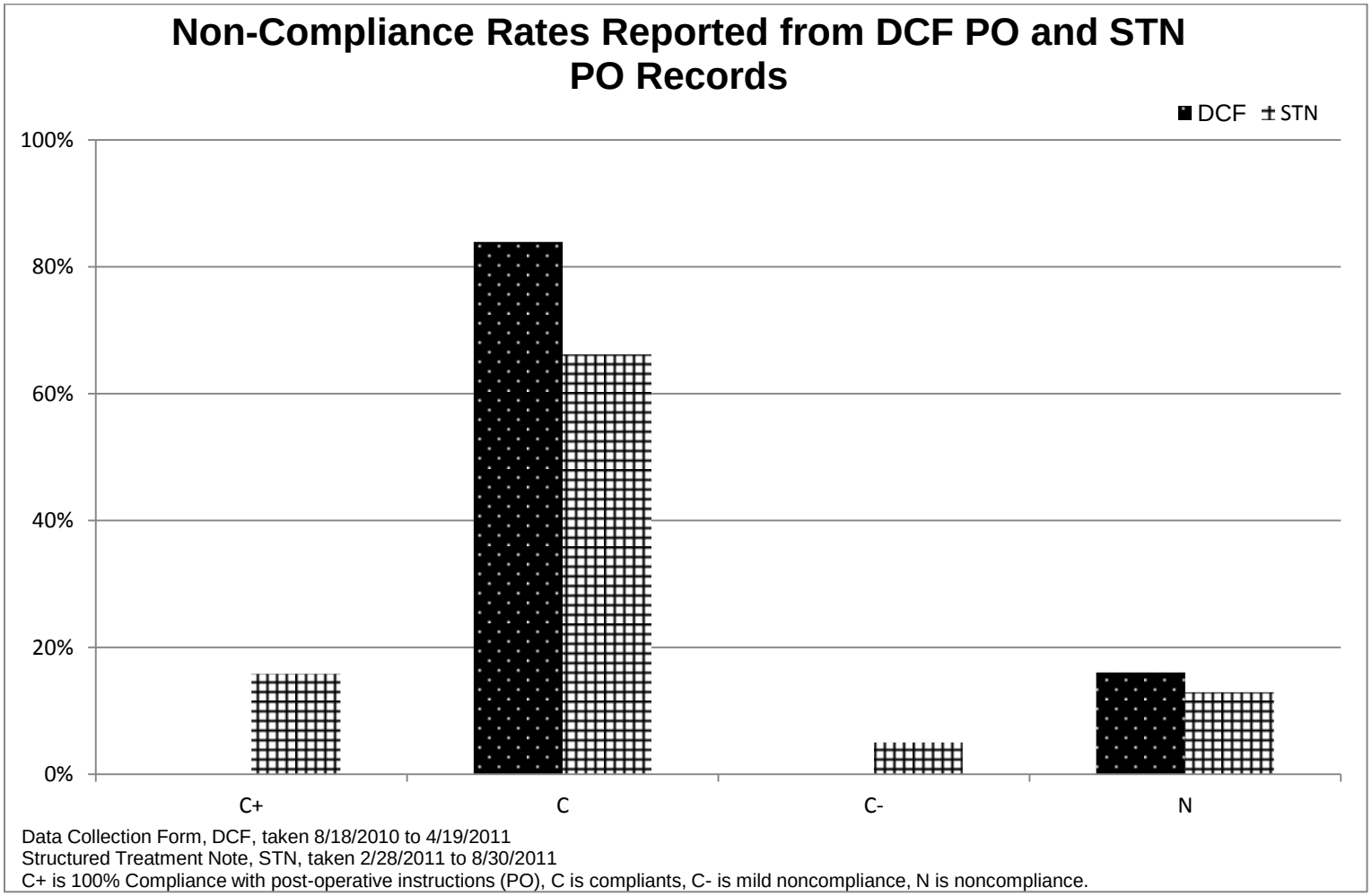


Figure 3: Assessment Comparing the DCF Entry with the STN Entry taken from the axiUm™ Database



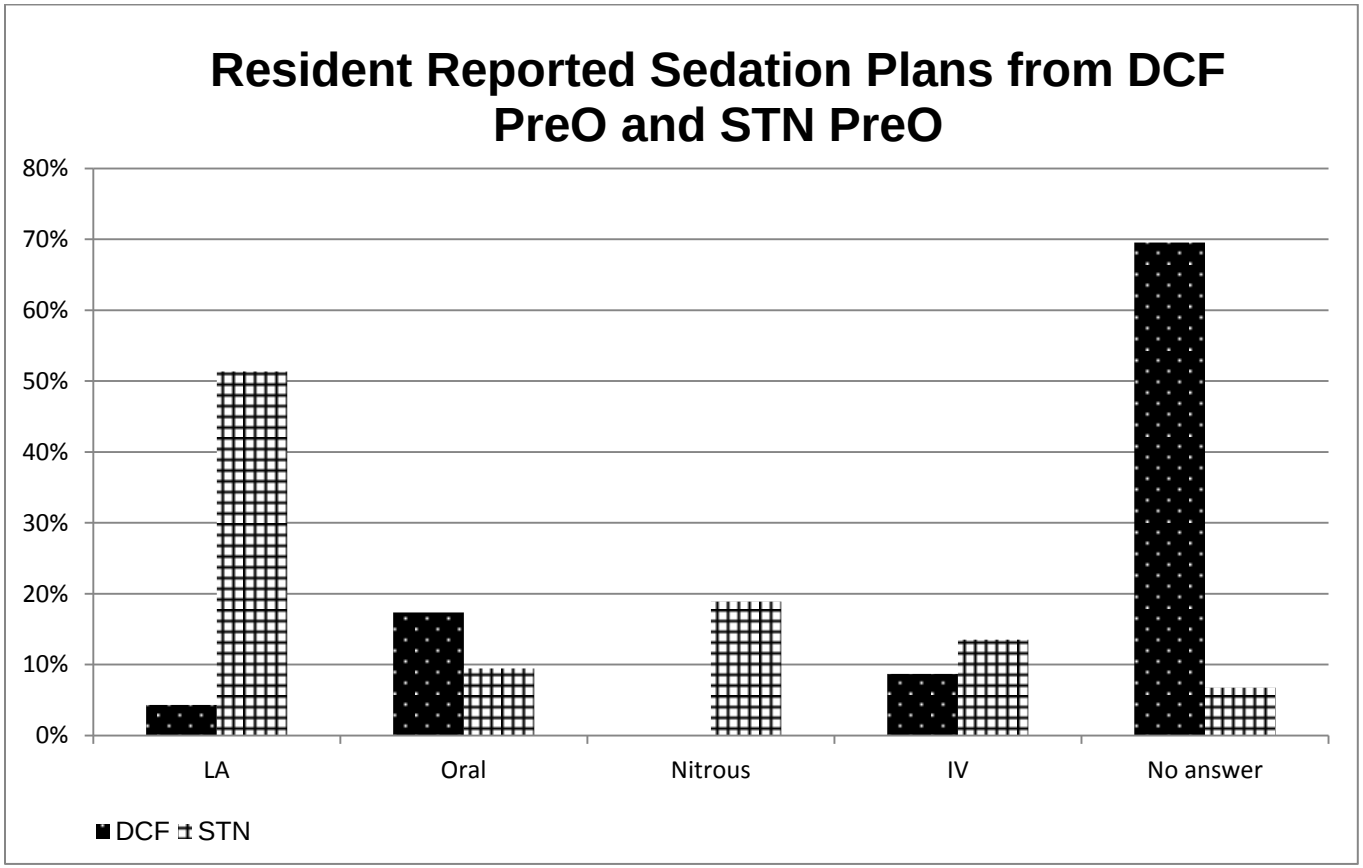
Data collection acquired at the O.H.S.U. S.O.D. Graduate Periodontal Residency Program.
This currently includes 9 residents from 263 implants placed during the date range stated.

Figure 4: Discrepancy of Noncompliance Rates Reported 2011



Mild noncompliance (C-) as noncompliance,100% compliance (C+), compliance (C), and noncompliance as (N). DCF n= 47 patients/84 entries. STN n= 85 patients/144 entries. Clinically it makes sense implants would be assessed more than once per patient.

Figure 5: Reported Sedation Plans 2011



LA is local anesthesia, Oral is oral sedation, IV is for intravenous sedation, PreO is for pre-operative assessment entry method

Appendices

Tabulated Answers from Resident Survey 2011 Comparing DCF with STN entry methods, and data entry styles Y/N, Drop-Down, and Open Text

1=open txt; 2= form; 3= coded note; 4= no pref; 5 = more than one

Survey #	Resident Year	Accuracy is critical	open text easiest	form easiest	coded note easiest	open text most accurate	form most accurate	coded note most accurate	rank open text	rank form	rank coded note	dx tx	tx pl	preimpl	implt plcmnt	surgical other	post op	preventive	e record in your practice	time to enter data reasonable	missing information	important to track implant electronically
1	B	1	2	2	1	2	2	2	1	3	2	5	3	1	3	5	3	3	Y	1	B	1
2	2	1	2	3	1	2	3	1	2	3	1	4	1	3	3	3	4	3	Y	1	B	1
3	2	1	1	1	1	1	1	1	1	2	3	3	3	3	3	3	3	3	Y	1	B	1
4	2	1	3	1	1	2	2	2	3	2	1	1	1	1	3	1	3	3	Y	1	B	1
5	3	1	1	1	1	1	1	1	1	2	3	1	2	1	1	1	2	2	Y	1	A	1
6	3	1	1	3	1	3	1	1	1	2	3	3	1	1	1	1	2	2	Y	1	A	1
7	X																					
8	X																					
9	X																					

for all enter B if left Blank

Answer for Missing information one respondent: flap,LA,Sutures, post op rx's complications, Survey 5

Answer for Missing information one respondent: Nothing was missing Dr. Drake is very thorough. Survey 6

e-IRB Approval

From: eirb@ohsu.edu [mailto:eirb@ohsu.edu]
Sent: Friday, July 29, 2011 9:08 AM
To: Sunny Drake
Subject: Study Approval Memo

OHSU *eIRB*

Short Study Title:	Implementation of EHR in tracking implant data in a periodontal residency
IRB Number:	IRB00007513

Your study has received final IRB approval. To access your official IRB Approval Memo, click on the following link, IRB00007513 . At the top of the Project Log, is a "See Memo" link, under the word "Approved." Click it to access the approval memo.

Note: There may be outstanding compliance committee approvals that still need to be obtained before your study may enroll subjects. You can check the status of these compliance committee approvals by clicking on the "Additional Compliance Approval Status" link under the "Quick Views" section in the left column.

Resident Survey

Implementation of Electronic Health Record in Tracking Implant Data in a Periodontal Residency

IRB#7513

This survey is to assess your opinion about using the coded treatment notes vs. templates in tracking implant information entered into the axiUm EHR.

Survey to include the following questions either open ended or on a scale of 1-4, with 1 equaling Agreement, and 4 equaling Disagreement (2 somewhat agree, 3 somewhat disagree).

Definitions:

CODED NOTE: A note in axiUm, used as a template, which is part of the patient record/treatment notes which the answers can be quantified into a meaningful report.

FORM: An attachment located in axiUm, not part of the patient record.

OPEN TEXT: Ability to enter free following text/digits. No limitations on length or data.

TREATMENT NOTE: A note in the patient record describing the treatment, also known as the patient's record.

Respondent information:

Resident year (circle): 1 2 3

Survey Questions

For questions 1-7, circle the response that most closely describes your opinion.

1. Accuracy of treatment notes is a critical element of good patient care.

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

2. Overall, an open text format is the easiest way to record a treatment note.

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

3. Overall, A form that guides recording the elements of treatment provided is the easiest way to record a treatment note

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

4. Overall, a coded treatment note that guides recording the elements of treatment provided is the easiest way to record a treatment note.

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

5. Overall, an open text format is the most accurate way to record a treatment note.

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

6. Overall, a form that guides recording the elements of treatment provided is the most accurate way to record a treatment note

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

7. Overall, a coded treatment note that guides recording the elements of treatment provided is the most accurate way to record a treatment note.

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

8. Given the three choices, open text, form, coded note, rank them in order with 1 being your most preferred, 2, next and 3 least preferred:

_____ open text

_____ form

_____ coded note

9. Given your preferences for method of recording treatment notes, are there certain treatments that are best recorded one way and others another way? In the matrix below, for each procedure, indicate which method you prefer to record the treatment note. Please provide a brief rationale for why you have this preference.

Procedure	Preference for note	Rational
Diagnostic	• open text • form • coded note • no preferenc	
Treatment Planning	• open text • form • coded note	

	• no preferenc	
Pre-Implant	• open text • form • coded note • no preferenc	
Implant placement	• open text • form • coded note • no preferenc	
Surgical – othe than implant	• open text • form • coded note • no preferenc	
Post-operative	• open text • form • coded note • no preferenc	
Preventive or Maintenance	• open text • form • coded note	

	• no preferenc	

10. In your own practice, do you intend to use an electronic record? yes no

11. Do you feel that the time required to enter the data for implant tracking is reasonable?

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

12. What question or information do you feel should have been included that wasn't? (Fill in the blank)

13. Do you feel that is important to track implant information electronically in your practice? (1-4)

1 (agree) 2 (somewhat agree) 3 (somewhat disagree) 4 (disagree)

Pre-Operative DCF

IMPLNT EPR Form Codes for Implant Presurg (IMPLNT)

Form	Implant Presurg
Owner Type	EPR
Section	Adult Record
Sub-tab	Implant pre/srg/post
Multiple Forms Per Patient	Yes
Inactive	No

Question	Answer Type	Alert	Answer Code
Presurgical Implant - Page 1			
MEDICAL HX REVIEW FOR IMPLANTS			
NOTE: PARQ, consents, tx plan and alternate plans, and other consults must be performed and obtained			
Chief Complaint - Reason for wanting implant:	Long Text		
ASA classification	Number		
Review medical history - ANY changes must be made in electronic med hx; information in this form is summary only			
Drug Allergies history - does the patient have drug allergies?	Yes/No		
describe drug allergies and reaction	Long Text		
Current Medications and impact on tx plan	Long Text		
Smoker current or past?	Yes/No		
impact of smoking on implant tx	Long Text		
Diabetes - is the patient diabetic?	Yes/No		
diabetes under control? impact on implant tx	Long Text		
Autoimmune diseases/disorders?	Yes/No		
describe disesase/disorder and impact on implant tx	Long Text		
Bisphosphonate history	Yes/No		
describe hx , how long, CTX test results	Long Text		
SITE ASSESSMENT			
Dimensions			
How many implants are planned to be placed during this surgery?	Text		
by tooth space			
Tooth # for implant replacment (1st implant during this surgery):	Number		
Mesial-Distal in mm (1st implant)	Number		
Bucco-Lingual in mm (1st implant)	Number		
Apico-coronal (1st implant)	Number		
Tooth # for implant replacment (2nd implant during this surgery):	Number		
Mesial-Distal in mm (2nd implant)	Number		
Bucco-Lingual in mm (2nd implant)	Number		
Apico-coronal (2nd implant)	Number		
Tooth # for implant replacment (3rd implant during this surgery):	Number		
Mesial-Distal in mm (3rd implant)	Number		
Bucco-Lingual in mm (3rd implant)	Number		
Apico-coronal (3rd implant)	Number		
Tooth # for implant replacment (4th implant during this surgery):	Number		
Mesial-Distal in mm (4th implant)	Number		
Bucco-Lingual in mm (4th implant)	Number		
Apico-coronal (4th implant)	Number		
Tooth # for implant replacment (5th implant during this surgery):	Number		
Mesial-Distal in mm (5th implant)	Number		

EPR Form Codes for Implant Presurg (IMPLNT)

Question	Answer Type	Alert	Answer Code
Bucco-Lingual in mm (5th implant)	Number		
Apico-coronal (5th implant)	Number		
Tooth # for implant replacment (6th implant during this surgery):	Number		
Mesial-Distal in mm (6th implant)	Number		
Bucco-Lingual in mm (6th implant)	Number		
Apico-coronal (6th implant)	Number		
Interarch space	Number		
general			
Occlusal analysis	List		
ListCode: OCCLA			
Canine disclusion			
Group function			
Important anatomical features (e.g., mental foramen, sinus, etc) - describe distance and surgical considerations	Long Text		
Site preparation needed?	Yes/No		
ridge augmentation	Yes/No		
describe	Long Text		
sinus lift	Yes/No		
describe	Long Text		
socket graft	Yes/No		
describe	Long Text		
other site preparation	Yes/No		
describe other	Long Text		
Implant type and surgical decisions			
Surgical stent to be provided by	List		
ListCode: PROV			
Resident			
Dental Student			
SOD Faculty			
Outside private dentist			
N/A			
Proposed implant system (click yes to open up options)	Yes/No		
Zimmer	Yes/No		
which teeth?	Text		
Nobel Biocare	Yes/No		
whcih teeth?	Text		
Staumann	Yes/No		
which teeth?	Text		
3i	Yes/No		
which teeth?	Text		
Astra	Yes/No		
whcih teeth?	Text		
Biohorizons	Yes/No		
which teeth?	Text		
other implant system	Yes/No		
what system:	Long Text		
which teeth	Text		
sedation plan? check all that are proposed	Yes/No		
oral sedation	Yes/No		
nitrous oxide	Yes/No		

Question	Answer Type	Alert	Answer Code
IV conscious sedation	Yes/No		
Other Information			
other information	Long Text		
have presurgical images (radiographic and photographic been taken and mounted in emago?	Yes/No		

be sure to enter a treatment note that references this form and to complete appropriate procedure codes

Post-Operative DCF

IMPPO EPR Form Codes for Implant Post-surgical Assess (IMPPO)

Form	Implant Post-surgical Assess
Owner Type	EPR
Section	Adult Record
Sub-tab	Implant pre/srg/post
Multiple Forms Per Patient	Yes
Inactive	No

Question	Answer Type	Alert	Answer Code
Implant Post Surg - Page 1			
IMPLANT POST SURGICAL EXAMINATION			
Implant locations (tooth numbers):	Long Text		
Assessment of healing (click yes to open list)	Yes/No		
healling within normal limits	Yes/No		
delayed wound healing	Yes/No		
primary closure achieved	Yes/No		
primary closure not achieved - healing by 2ndary intention	Yes/No		
membrane exposed	Yes/No		
implant exposed	Yes/No		
edema	Yes/No		
infection	Yes/No		
abnormal bleeding from site	Yes/No		
Patient NONcompliant with post operative instructions (diet, OHI)?	Yes/No		
describe NON-compliance	Long Text		
Pain on scale of 1 - 10 analog scale	Number		
Rxs added?	Yes/No		
describe Rxs in detail	Long Text		
Was healing abutment placed?	Yes/No		
list tooth numbers	Long Text		
summarize clinical findings in treatment note			
NX			
disposition (next appt, referral, etc)	Long Text		

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Intra-operative DCF

IMPLSX EPR Form Codes for Implant Surgical Treatment (IMPLSX)

Form	Implant Surgical Treatment
Owner Type	EPR
Section	Adult Record
Sub-tab	Implant pre/srg/post
Multiple Forms Per Patient	Yes
Inactive	No

Question	Answer Type	Alert	Answer Code
Implant Surgical Tx - Page 1			
SURGICAL PLACEMENT OF IMPLANT(S)			
Implant placed (tooth/teeth #s):	Text		
Surgical Stage	List		
ListCode: SRGSTG Stage 1 of 2 Stage 2 of 2 Stage 1 only Immediate Flapless			
Pre-grafted (socket preservation)	Yes/No		
Surgical stent used?	Yes/No		
Surgical stent provided by	List		
ListCode: STENT Resident SOD dental student Private practitioner No stent provided			
Radiograph type used for placement (click yes to open options and check all that apply)	Yes/No		
ICAT or other conebeam image	Yes/No		
Pano	Yes/No		
Periapical	Yes/No		
Other	Yes/No		
describe other	Long Text		
Bone graft, membrane			
Bone graft (if no, answer no and skip to sinus lift)	Yes/No		
Type of bone graft material used (manufacturer/lot number, etc.)	Long Text		
Type of bone (particle size, cortical, etc.)	Long Text		
Membrane	Yes/No		
type of membrane (manufacturer and lot number, etc.)	Long Text		
Sinus Lift			
Sinus lift	Yes/No		
indirect	Yes/No		
direct	Yes/No		
Sinus lift timing pre implant or at implant placement?	Long Text		
Implants			
Was more than one implant placed?	Yes/No		
list tooth numbers where implants were placed	Long Text		

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Question	Answer Type	Alert	Answer Code
Implant system used	List		
List Code: IMPSY			
Zimmer			
Nobel biocare			
Straumann			
Astra			
3i			
Biohorizons			
Other implant system			
1st implant tooth number	Number		
Implant placement 1st implant	List		
List Code: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 1st implant	Number		
implant length 1st implant	Number		
implant lot number 1st implant	Text		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
2nd implant tooth number	Number		
Implant placement 2nd implant	List		
List Code: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 2nd implant	Number		
implant length 2nd implant	Number		
implant lot number 2nd implant	Text		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
3rd implant tooth number	Number		
Implant placement 3rd implant	List		
List Code: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 3rd implant	Number		
implant length 3rd implant	Number		
implant lot number 3rd implant	Number		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
4th implant tooth number	Number		

Question	Answer Type	Alert	Answer Code
Implant placement 4th implant	List		
ListCode: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 4th implant	Number		
implant length 4th implant	Number		
implant lot number 4th implant	Text		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
5th implant tooth number	Number		
Implant placement 5th implant	List		
ListCode: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 5th implant	Number		
implant length 5th implant	Number		
implant lot number 5th implant	Text		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
6th implant tooth number	Number		
Implant placement 6th implant	List		
ListCode: IMPLCM			
Crestal			
Sub-crestal			
Supra-crestal			
Other			
implant diameter 6th implant	Number		
implant length 6th implant	Number		
implant lot number 6th implant	Text		
healing abutment placed?	Yes/No		
healing abutment manufacturer and lot number	Long Text		
Other surgical information			
Is stage 2 surgery planned	Yes/No		
time frame estimate for stage 2	Long Text		
Sedation used	Yes/No		
oral sedation	Yes/No		
Nitrous Oxide/O2	Yes/No		
IV Conscious sedation	Yes/No		
Written and verbal post operative instructions given	Yes/No		
other information	Long Text		

be sure to enter a treatment note that references this form and to complete appropriate procedure codes

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