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Use of Online Sources of Information by Dental Practitioners: Findings from The Dental Practice-Based Research Network

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Abstract

Objectives—Estimate the proportion of dental practitioners who use online sources of information for practice guidance.

Methods—From a survey of 657 dental practitioners in The Dental Practice Based Research Network, four indicators of online use for practice guidance were calculated: read journals online, obtained continuing education (CDE) through online sources, rated an online source as most influential, and reported frequently using an online source for guidance. Demographics, journals read, and use of various sources of information for practice guidance in terms of frequency and influence were ascertained for each.

Results—Overall, 21% (n=138) were classified into one of the four indicators of online use: 14% (n=89) rated an online source as most influential and 13% (n=87) reported frequently using an online source for guidance; few practitioners (5%, n=34) read journals online, fewer (3%, n=17) obtained CDE through online sources. Use of online information sources varied considerably by region and practice characteristics. In general, the 4 indicators represented practitioners with as many differences as similarities to each other and to offline users.

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Conclusion—A relatively small proportion of dental practitioners use information from online sources for practice guidance. Variation exists regarding practitioners' use of online source resources and how they rate the value of offline information sources for practice guidance.

Keywords

Dental; Online; Information sources; continuing education; practice-based

INTRODUCTION

Translating research findings into everyday practice can be a long process. An NIH report in 2000 estimated that it took on average 17 years for research findings to be fully implemented into clinical practice.⁽¹⁾ The traditional pathway to dissemination has been a top-down approach as follows: the research is conducted in a university setting, findings are published (typically in a peer-reviewed journal), cumulative findings are evaluated by clinical associations, who in turn develop and publish clinical recommendations, then these are disseminated and slowly become incorporated into routine practice. Practice-based research networks (PBRN) have been established, first in medicine ^(2,3) and more recently, namely the past decade, in dentistry ⁽⁴⁻⁶⁾, with a goal of facilitating the translation of research findings into practice. This translation, in other terms, may be considered the implementation of evidence based dentistry (EBD), the corner stone of which are systematic reviews.⁽⁷⁻⁹⁾

These reviews and the manuscripts they are based on are one example of the information available to dentists and other health professionals to aid in clinical decision making. The Cochrane reports (<http://www.cochrane.org/cochrane-reviews>), which publishes systematic reviews, may be considered a key resource in evaluating and summarizing the available published information on a variety of topics. All of this information is available online. Dental professionals in clinical practice have increasing opportunities to obtain information for clinical decision-making from a variety of resources, including a growing availability through online technology. The joint development of both the growing importance of EBD and availability of information online is the establishment of a website by the American Dental Association (ADA) Center for EBD (ebd.ada.org).

An increasing majority of practicing dentists today not only have ready access to computers in their offices, but these computers are connected to the Internet. Surveys done in 2000 and 2004 found that 85% of practices had computers in the office.^(10,11) In 2000, 48% were connected to the Internet. From a survey of nearly 1,000 dentists that we conducted in 2010, 94% had internet access in their office (Ellen Funkhouser, personal communication).

There is a wealth of informational resources available online for clinical decision making in dental practice and continuing dental education (CDE); however, the extent that online technology is utilized in clinical decision making in dentistry or the need for it is not well documented. Few studies have reported on informational sources and needs of practicing dental professionals and many may be considered dated. A report by Strother et al. in 1986, from Louisiana, found that professional colleagues and personal journal collections were preferred sources of information.⁽¹²⁾ Reports in 1995 by Gravois et al. of dental hygienists found that the most common sources used for professional development and information retrieval were continuing education courses, discussions with colleagues, and journals.^(13,14) Computer use within the employment setting was primarily for business rather than clinical applications. Many hygienists were interested in attending continuing education courses on use of computers to acquire professional information. Cobb reviewed Internet Continuing Education for Health Care Professionals in 2003.⁽¹⁵⁾ She found that although

in-person Continuing Education remains the most frequent and most preferred format across health professions, Internet Continuing Education is gaining in popularity. Most participants who engage in online Continuing Education express satisfaction with the experience and find it to be an effective learning format. Barriers to online Continuing Education include technical difficulties and lack of computer knowledge. Cobb's review included only one report of online dental continuing education, a pilot study involving 23 practitioners conducted in North Carolina in 1998.(16) Participants were positive about online learning. Schleyer et al, in a report of clinical decision-making and the Internet, found that some dentists were trying to adopt an EBD treatment approach, but felt insufficient support due to the lack of evidence based information accessible at the point of care, such as key statistics and clinical practice guidelines.(17) Wårdh et al, in a qualitative study in Sweden, found that first-order information that was required in a short time, was sought from the nearest colleagues. Literature and Internet-based technology were second-order information, mainly sought by younger dentists.(18)

A survey of members of the Academy of General Dentistry found that 25% of respondents indicated using an online source at least once a month for clinical decisions.(19) A survey of 518 Iowa dental practitioners found that between 7 and 11% had frequently used an online journal or database in the past year to support clinical decisions and 17% an organizational website and 2% a CDE source.(20)

The objective of this study was to estimate the proportion of dental practitioners participating in The Dental Practice-Based Research Network (DPBRN) who obtain information to guide their dental practice through online sources. We also sought to identify practitioner and practice characteristics associated with use of online sources, and in broad terms, ascertain whether different measures of online information use reflect the same or different constellation of practitioner/practice characteristics. We used four indicators of use of online sources: (1) use of online journals, (2) use of online CDE; (3) considering an online source as "most influential" for practice guidance, and (4) considering him- or herself a frequent user of an online source.

METHODS

Study population

The DPBRN is a consortium of dental practices and organizations in the United States and Scandinavia in operation since 2005. Practitioners can participate in research from idea generation to presentation and publication. Face-to-face meetings of practitioner-investigators are held annually in each of the 5 main DPBRN administrative regions: Alabama/Mississippi (AL/MS), Florida/Georgia (FL/GA), Minnesota, which comprises practitioners in the Health Partners Dental Group (HP) and other community practitioners (MN), Permanente Dental Associates (PDA), and Scandinavia (SK: Denmark, Norway, Sweden).

Administration protocol

Questionnaires with a uniquely identified barcode were mailed in July 2009 to 1,013 enrolled dentists who had provided descriptive practice-level data, and who were either general dentists, pediatric dentists, or indicated that they performed at least some restorative dentistry. This included practitioners who enrolled by completing the online DPBRN Enrollment Questionnaire but who were outside the 5 main DPBRN administrative regions; most of these were in the southeastern region of the U.S. The protocol for questionnaire content and administration was reviewed and approved by an independent panel advisory to the NIDCR and was approved or received a waiver from each of DPBRN's administrative

regions' IRBs. Reminders were sent 2-3 times to non-responders. Overall, 657 (64.8%) dentists completed the questionnaire between July 2009 and February 2010. To measure test-retest reliability, the questionnaire was completed twice by 18 DPBRN practitioners who completed the second questionnaire a mean (S.D.) of 62.9 (30.1) days after the first questionnaire. The median value of the kappa statistic for these questions was 0.81, with an inter-quartile range of 0.55-0.94.

Enrollment data

As part of enrollment in DPBRN, all practitioner-investigators complete a 101-item Enrollment Questionnaire about their practice characteristics and themselves. This questionnaire is publicly available (21), and the distribution of these characteristics for DPBRN dentists has been reported previously.(22,23) Practitioner sex, race, ethnicity, practice specialty, year of dental school graduation, whether the practitioner belonged to a large group practice with availability of an electronic dental record system (EDR, mainly PDA and HP), and geographic location were obtained from the enrollment database.

Study questionnaire

The questionnaire is publicly available.(21) It included 25 items and took an estimated 30 minutes to complete. Five questions assessed where the practitioner sought information for practice guidance and updates on dentistry: 1) Which of the following dental publications were regularly read (a combination of 10 peer- and non peer-reviewed publications were listed, with additional queries to list other publications read, specifically, other state and local publications, other US or Canadian, and other European journals); 2) The format of the most frequently read journals: print or online; 3) Where they usually obtained CDE credits (state or local dental meetings, national dental meetings, online CDE services, other CDE services, school of dentistry); 4) Ranking of 12 listed sources of information (4 pertained to online: online journals or newsletters, online CDEs, chat rooms, web searches) as to their level of influence on how practiced (little, some, or most influence); and 5) Ranking of the same 12 resources as to how frequently they used them for practice guidance (never, rarely [$<10\%$ or once per year], sometimes [$10\text{-}50\%$ of when available or 1-6 times per year], or frequently [$>50\%$ when available or >6 times per year]).

Analysis

The total number of publications usually read was calculated by summing the responses to the 10 publications specified on the questionnaire and all other publications the respondent listed. The national dental association journals of Sweden, Denmark, and Norway were grouped with *Journal of American Dental Association (JADA)* in analysis. Four indicators of online use and importance were used or calculated: 1) Usually reads journals online (specific question with yes/no response options), 2) Usually obtains CDE online (one question), 3) Rated at least one online source as most influential, and 4) Rated at least one online source as using frequently or every time available. Using logistic regression models, with a separate model for each indicator of online use, we ascertained independent practitioner/practice characteristics associated with each (indicator of online use). We next evaluated whether number of publications usually read, whether specific journals read, and whether offline sources of information differed by each indicator of online use. Analysis of variance was used for number of publications and chi-square tests for differences in proportions. All analyses were performed using SAS version 9.2.

RESULTS

Demographics (Table 1)

The majority of participants were male (79%), non-Hispanic White (90%), in general practice (94%), and approximately equal numbers received their degree before 1980 (34%) and in 1980s (33%), and fewer graduating in 1990s (20%), and since 2000 (13%) (Table 1). The majority was from the southeastern U.S., 9% from Scandinavia, and 12% practiced in a large group practices in the U.S. and utilized EDR (PDA or HealthPartners {HP}). These two large group practices have higher proportions of females, of races other than non-Hispanic Whites practitioners and of more recent graduates (since 2000). Practitioners from Scandinavia graduated in more recent years than did their counterparts and had an equal proportion of females and males.

Indicators of online use

As shown in Table 1, a small proportion (5%, n=34) of practitioners usually read journals online and fewer (3%, n=17) usually obtained CDE through online sources. Although about equal numbers either rated an online service as most influential for practice guidance (n=89) or frequently using an online service for guidance (n=87), they were different people; of the 120 in either, only 56 (47%) were in both. Overall, 21% (n=138) of practitioners were classified into one of the four online use for practice guidance categories, of whom 70 (50.7%) were in only one online use category, 49 (35.5%) were in two, 17 were in three (12.3%), and only 2 were in all four (1.4%).

Online use and demographics

The associations of reading journals online and of obtaining CDE through online sources with year of graduation were of marginal statistical significance ($p=0.06$, Table 2). Practitioners from SK were significantly more likely to use online sources of information for practice guidance on all indicators except CDE. Contrary to expectations, practitioners from PDA or HP were not more likely to use online sources of information for practice guidance.

Number of publications read

The median total number of publications usually read was 3 [interquartile range: 2-5]. In bivariate analyses, practitioners who usually read journals online read fewer articles (medians 2 vs. 3, $p=0.002$); however, this difference disappeared after adjustment for year of graduation, country, and whether the dentist belonged to PDA or HP.

CDE

Of the 589 (90%) practitioners who specified where they usually obtained CDE, most cited state or national dental meetings (n=449, 76%), followed by symposiums from dental schools or other bodies (n=123, 21%), with few indicating obtaining CDE online (n=17, 3%).

Publications read

(Table 3) The most common publications read were national professional journals *JADA* (71%) [US: 429/594=72%, SK: 35/62=56%], *ADA News* (68%), *Compendium of Continuing Education in Dentistry* (53%), and *General Dentistry* (42%). A lower proportion of practitioners who read journals online read these common journals (e.g., *JADA*, 53% vs. 72%). This was not true for the other indicators of online use of “frequently using an online source” or indicating that an “online source was most influential.” Considering the latter, a higher proportion of these practitioners usually read *J Prosthetic Dentistry* (15% vs. 6%) and *Quintessence* (14% vs. 6%) than did their counterparts. This did not appear to be

associated with being a dental specialist, although as 94% of our respondents were in general practice we were limited in our ability to ascertain if this difference might be due to specialty. All practitioners surveyed performed restorative dental care, which is most commonly done by general dentists.

Sources of information: influence and frequency of use

(Figure 1) Sources of information that most practitioners rated as most influential (“common sources”) were state and local meetings (53%), symposiums offered by school of dentistry (51%), printed peer-reviewed journals (41%) and national dental meetings (40%). Overall, none of the online sources (web searches, online CDE, online journals/newsletters, chat rooms) were rated as “influential” by even 10% of practitioners. The online source for which the highest proportion of practitioners indicated “most influential” were Web searches; 8% overall and 56% of practitioners classified as online users on the basis of influence selected this option. Similarly, nearly 21% of practitioners who usually read journals online indicated that “online journals” was most influential. In general, fewer (smaller proportion of) practitioners who read journals online or usually obtained CDE credits online ranked any of the common sources listed above as most influential. In contrast, as high or higher proportion of practitioners who were classified as online users (based on “most influential” or “frequently used” response), also indicated the common sources as most influential. In addition, a higher proportion (over 40%) of these practitioners also indicated that informal conversation with colleagues was most influential, compared to their counterparts who were not classified as online users by influence or frequency criteria (less than 30%).

Sources of information that more practitioners rated as using frequently (“common sources”) were state and local meetings (38%), informal conversation with colleagues (34%) and printed peer-reviewed journals (34%). In contrast to the “common sources” practitioners indicated as most influential, common sources that practitioners overall (primarily offline) indicated that they used frequently were also common sources for online users.

DISCUSSION

A relatively small proportion of dental practitioners report using information from online sources for practice guidance, from 3 to 20%, depending on the criteria used to classify. Characteristics that were significantly associated with online use varied for the different measures; namely, reading journals online and obtaining CDE credits online were associated with more recent graduation, and practitioners from Scandinavia were more likely to use online journals, rate online sources as most influential and indicate that they frequently used an online source than were U.S. practitioners.

Studies conducted in countries outside the United States report a larger proportion of practitioners using the Internet than we observed,(24) although it is not possible to discern use for practice guidance to make comparisons directly comparable. A 2003 international meeting on continuing professional development in dentistry (25) reported first on the increase internationally of requiring CDE. In countries, such as the United States and Canada, which have required CDE and have several options for obtaining it, traditional lecture courses were the mainstay and that the desire of practitioners were more hands-on clinical and laboratory courses. There was little mention of use of online courses for CDE. A 2008 online survey(26) reports that a slight majority of dentists (57%) complete their continuing education hours online; however, that survey is probably not generalizable to the typical practitioner as the survey was of a self-selected sample with no pre-specified denominator and conducted online. Our findings are consistent with the results of the prior study(24) in that a higher proportion of practitioners from Scandinavia reported online use for all measures other than CDEs. Also consistent with findings of other studies is our

observation that recent graduates appear to be more likely to use online sources for practice guidance compared to those who graduated earlier,(20) although our associations did not reach formal statistical significance. Our findings are similar to the two prior studies that found 2% to 25% of practitioners used an online source for clinical guidance,(19,20) the lowest percent being for CDE in our survey and that in Iowa.

The present study was almost solely among general practitioners, so we could not ascertain whether dental specialists would be higher online users. Studies in the medical literature often find that specialists are higher users of online resources than general practitioners.(27) We should note that our survey was among practitioner-investigators in a practice-based research network.(4) Although characteristics are similar to dentists in general,(23) we suspect that, as a group, DPBRN practitioners are more convinced of the value of taking recent evidence into account because they actually contribute to such evidence. The DPBRN respondents are similar to dentists recently surveyed from Iowa(20) in reporting that face-to-face CDE, printed journal articles and consultation with peers were most widely used for practice guidance, with little reliance or reported use of internet sources for practice guidance. To our surprise, the large group practices with electronic dental records (PDA and HP) had a lower proportion of practitioners reporting online use, specifically, obtaining CDE online. We did not ask specifically about DentalTown, an online magazine founded in 2002. This publication was written in by some participants as an ‘other’ source and coded as reading a non-journal.

Studies in the medical literature have found that online continuing medical education courses have the same effectiveness as traditional CME methods, e.g., in-person meetings. (28-31) In 2008, online continuing education among physicians surpassed that of the more traditional in-person meetings or academic courses.(32) It is not known whether dental practitioners will follow the same path as physicians. A larger proportion of dental practitioners are in solo practice compared to their medical counterparts, i.e., over 60% compared to less than 33%.(33,34) Meetings, both national and local, as well as school of dentistry symposiums may remain most influential for some time because such meetings offer more opportunities to discuss options of treatment in person versus in an online setting. Such discussion may be more helpful, especially to solo practitioners who do not have daily contact with other professional colleagues to discuss clinical decisions.

The online source rated as most influential and used most often were Web Searches at 8% overall, over half (56%) of our “online” users. This is a very broad term that includes no assessment of the quality of the search, the information retrieved, or the understanding of retrieved information. In general, Web searchers review only the first few hits of a search. There have been reports of deficits in being able to critically evaluate information obtained from the Web among the younger generation.(35) The applicability of information retrieval evaluation to professionals has not been evaluated. Our dental respondents from DPBRN did not seek online information to the same degree as reports from a medical PBRN, of whom 18% reported performing web searches weekly or daily.(36,37) Furthermore, the majority of these medical searches were performed while the patient waited, in contrast to the dental searches which were not performed with patient in the chair.(18,38) Dental studies have reported the need for access to clear information at chair side, including EBD guidelines. (38). Many of these studies are related to electronic dental records, with a goal of having all relevant information at chair side.(10, 17, 38)

Information overload is considered one of the key barriers to accessing the best evidence for decision making.(18, 36,39) EBD is a method to increase uptake of effective knowledge; however, the Cochrane Collaboration’s Oral Health Group’s Website lists over 100 published systematic reviews of dental treatments and interventions. In contrast, as of April

2011, there are only four clinical recommendations on the ADA's EBD Website <http://ebd.ada.org>. This leaves a need for simple, online EB knowledge resources that is more extensive than currently present.

In conclusion, we found that a relatively small proportion of dental practitioners use information from online sources for practice guidance. These practitioners vary with type of online use (e.g., reading journals, obtaining CDE) and with relative value of offline sources of information for practice guidance.

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Figure 1.

Percent of respondents who indicated a source was “most influential” and percent who used a source “frequently/every time available.”

Table 1
Characteristics of 657 participating dental practitioners overall and by practitioner and practice characteristics.

Characteristic ^a	Online use measure			
	Usually read journals online	Usually obtains CDE ^b online	Rated an online service as most influential	Rated an online service as use frequently
<u>Gender</u>	Overall	5%	3%	14%
Female (n=135)	21%	7%	2%	14%
Male (n=521)	79%	5%	3%	13%
<u>Race/ethnicity</u>				
Non-Hispanic White (n=519)	90%	5%	2%	13%
Other (n=58)	10%	7%	0%	12%
<u>General practice</u>				
Yes (n=620)	94%	5%	3%	14%
No (n=37)	6%	8%	0%	14%
<u>Year graduated from dental school</u>				
prior 1980 (n=226)	35%	4% ^e	1%	14%
1980-1989 (n=215)	33%	5%	4%	14%
1990-1999 (n=131)	20%	3%	2%	11%
2000 or later (n=83)	13%	13%	5%	13%
<u>DPBRN administrative region^c</u>				
AL/MS (n=334)	51%	2% ^e	1% ^e	8% ^e
FL/GA (n=127)	19%	7%	9%	24%
MN (n=47)	7%	2%	0%	15%
PDA (n=52)	8%	4%	2%	8%
US-Other ^d (n=35)	5%	3%	3%	17%
Scandinavia (n=62)	9%	24%	2%	23%
<u>Practice: PDA or HP</u>				
Yes (n=82)	12%	4%	1%	10%
No (n=575)	88%	5%	3%	14%

^a Missing: gender-1, race-80, year graduated-2

^c AL/MS: Alabama/Mississippi; FL/GA: Florida/Georgia; MN: Health Partners (HP) and other practitioners in Minnesota; PDA: Permanente Dental Associates (WA and OR); Scandinavian countries of Denmark, Norway and Sweden; US-Other: Participants outside the main regions.

^d US-Other states: 17 in NC, 4 in SC, 4 in TN, 2 in NY, and one each in CA, CO, DE, ME NM, OH, PA, TX

^e $p < 0.01$

^b CDE: Continuing dental education

Table 2

Adjusted odds ratios (OR) of dentist/practice characteristics with measures of using online sources of information for practice guidance

Characteristic ^a	Read Journals Online		CDE ^b online		Online source most influential		Frequently use an online source	
	OR	p ^d	OR	p	OR	p	OR	p
Male	1.64	--	2.20	--	0.99	--	1.20	--
PDA/HP vs non-PDA/HP US	1.04	--	0.35	--	0.75	--	0.48	--
SK vs non-PDA/HP US	10.31	<0.001	0.55	--	1.99	0.047	1.91	0.06
Graduation year ^c	1.36	0.06	1.52	0.06	0.93	--	1.19	0.098

^aPDA in WA/OR and HP in MN; SK: Scandinavia

^bCDE: Continuing dental education

^cYear of dental school graduation, per 10 years

^dp's presented if <0.10

Table 3

Dental journals read by participating dentists overall and according to indicators of using online sources of information for practices guidance.

Journal	ALL n=657	Read Journals Online		CDE ^a online		Frequently use an online source		Online source most influential	
		Yes n=34	No n=623	Yes n=17	No n=640	Yes n=87	No n=570	Yes n=89	No n=568
<u>Peer reviewed</u>									
J American (or other nation ^b) Dental Association	71%	53%	72%	41%	72%	66%	71%	68%	71%
Compendium of Continuing Education in Dentistry	53%	27%	55%	59%	53%	45%	55%	45%	55%
J Esthetic/Restorative Dentistry	22%	21%	22%	42%	21%	25%	21%	24%	21%
General Dentistry	42%	21%	43%	29%	42%	48%	41%	37%	43%
Operative Dentistry	3%	3%	3%	0%	3%	2%	4%	4%	3%
J Prosthetic Dentistry	7%	15%	7%	6%	7%	13%	6%	15%	6%
Quintessence	7%	12%	7%	12%	7%	12%	7%	13%	6%
<u>Non-peer reviewed</u>									
American Dental Association News	65%	41%	66%	53%	66%	58%	66%	58%	66%
Dentistry Today	44%	24%	45%	41%	44%	44%	44%	43%	44%
Inside Dentistry	18%	12%	19%	29%	18%	22%	18%	13%	19%

^a CDE: Continuing dental education

^b National association of either Sweden, Denmark or Norway

Bold: p<0.05