Continuing Professional Development of Dental Practitioners in Prato, Italy

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Abstract: The three objectives of this study were 1) to evaluate the frequency of access to instruments of continuing education by dental practitioners belonging to the Order of Dental Practitioners of the Province of Prato, Italy; 2) to ascertain their understanding and use of evidence-based medicine; and 3) to identify their preferences for obtaining continuing education in dental therapy. Of the 177 members of this order, 123 (69 percent) responded to a telephone interview. The typical dentist of Prato reads articles in Italian journals once a week, consults colleagues once a week, reads books once a month, accesses the Internet every three months, goes to congresses or courses every six months, and does not read articles published in international journals. Forty-one percent of those interviewed did not know the meaning of the term "evidence-based medicine." Practical training was considered the most important form of update in therapy and reaches statistical significance ($p<0.05$) when compared to consultation with colleagues, videos, and the Internet (which received the lowest score). The conclusions were that dentists of Prato obtain continuing education episodically and in a passive way. They do not understand the concept of evidence-based medicine and often employ it superficially.

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Dental materials and clinical techniques are progressing at an exponential rate; thus, there are more opportunities for improving health, health care, and quality of life.[1] For example, some branches of dentistry, such as implantology, were scarcely practiced twenty years ago, but today have become routine in everyday practice.[2,3] This continuing evolution should compel professionals to stay informed, as ignorance and uncertainty associated with everyday decisions in health care can affect patients' well-being.[4]

In recent years, the American Medical Association's Evidence-Based Medicine Working Group[5] has proposed a new four-step method in evidence-based medicine (EBM) for physicians to stay abreast of technical progress. This method consists of 1) posing a clinical question; 2) searching for the best available evidence using published scientific work; 3) critically appraising the information found, and 4) applying relevant information to solve the clinical problem.[5,6]

EBM is a recently developed field with inherent technical difficulties.[7-10] Although EBM may be the best tool in continuing professional development of dental practitioners, its use has not become widespread worldwide. In fact, different countries and regions with different histories, health care programs, and cultures have developed different systems for continuing professional development.[4,11,12] While the continuing education tools used by dentists in different countries have been surveyed,[13-18] those used by Italian dentists have not yet been investigated.

In Italy, a school devoted solely to dentistry opened in 1980, so the older dentists are Medical School graduates (who hold the M.D.) and have had professional training that is different from that of their younger colleagues (who hold the D.D.S.). To legally work in the field of dentistry in Italy, a dental practitioner must be a member of an Order of Dental Practitioners, which is present in all Italian provinces. At the time of this study, to retain a dental license, there were no continuing education requirements although credits were given for most congresses or courses and the Health Ministry suggested earning a certain number of credits each year.

The three objectives of this study were to

1) investigate the frequency of access to educational tools among dentists belonging to the Order of Dental Practitioners in Prato, Italy;
2) discover the educational tools that dentists of Prato, Italy, prefer for updating their knowledge of new therapeutic methods; and
3) assess the application of evidence-based medicine in the same group of dentists.

Materials and Methods

The group of dental practitioners selected for this research consisted of the members of the Order of Dental Practitioners of the Province of Prato, Italy. Once the order was informed about the objectives of the research, the organization furnished a full list of associates, their addresses, years of birth, and phone numbers.

All the dentists listed were contacted by phone by a trained interviewer during the months of June and July 2006. Every person called was informed about the objectives of the interview and was asked to answer a questionnaire. The items dealt with which fields of dentistry the practitioner practiced and the frequency with which he or she had obtained continuing education information in the last six months in terms of going to congresses, going to courses, reading books, reading national or international articles, accessing Internet sources, or consulting with colleagues. Reading national or international articles refers to articles obtained from both the Internet and paper journals.

Furthermore, the practitioners were asked to assign a number from 0 (no utility) to 10 (maximum utility) to the following educational tools: books, slide presentations, scientific articles, videos, Internet, and consulting with colleagues. One item of the questionnaire asked if the dentists knew the meaning of the term "EBM," and another item asked if they used evidence-based medicine in their clinical practice.

If the practitioner was not available at the time of the phone call, a phone appointment was scheduled. A maximum of seven attempts were made before considering the dentist a "nonresponder." In the event a practitioner's furnished phone number was wrong or no longer in use, a search of local phone books was conducted. The questionnaire was not employed if the dentist had retired, was away from Italy, or refused to collaborate.

A test-retest was carried out two weeks after the first interview with twenty practitioners selected randomly using a computer-generated list of numbers. To test the reliability of the items, the intraclass coefficient of correlation (ρ) was used for continuous variables,[19] the k statistics for binomial variables,[20] and the concordance for polytomic variables. In general, values of ρ or k below 0.4 may be taken to represent poor reliability, values above 0.75 to represent excellent reliability, and values between 0.4 and 0.75 to represent fair to good reliability.[19] To check for the presence of a discrepancy by gender and qualification between responders and nonresponders, the Fisher exact test was used. For age differences between responders and nonresponders, the t-test was used.

Descriptive statistics of responders were calculated using mean ±standard deviation, median and range for continuous variables, and percentage for nominal variables. To recognize specific continuing education methods, analysis of the principal components was carried out on the standardized frequencies of continuing education tools.[21] The variance, the percent of the total variance explained by each individual principal component, and the percent of the total variance explained cumulatively by the first i components were calculated for each i. The correlation between the seven original variables (the frequency with which dentists obtained continuing education information with a specific tool) and the i principal component was calculated. By examining the variables that are highly correlated with a principal component, it can be seen which variables contribute most to the principal component, and often reasonable interpretations can be given to some or all of the principal components.[21]

The central idea of principal component analysis is to reduce the dimensionality of the data set in which there are a large number of interrelated variables, while retaining as much as possible of the variation present in the data set. The first few principal components are important because they may summarize a large proportion of the variability. A biplot was drawn with the values for the first two principal components of the individuals and simultaneous display of the seven original variables.[21] The plot is equivalent to a projection of the seven-dimensional data swarm onto the plane that shows the greatest spread of the points. The resulting two-dimensional representation captures more of the overall configuration of the data than does a plot of any two of the original variables.

The ANOVA test was carried out with the blocks formed by dental practitioners to evaluate their preference in updating their therapeutic skills by employing books, oral presentations, articles, videos, the Internet, and consulting with colleagues or clinical training. In case of statistical significance, the Tukey-Kramer HSD test for post hoc comparison was carried out.

Results

Table 1 shows the results of the reliability tests. All items represented good to excellent reliability except the frequency in accessing the Internet. There were 177 dentists belonging to the Order of Dental Practitioners of Prato as of January 25, 2006, of which 136 were males (77 percent) and forty-one were females (23 percent). The mean age was 46.4 ±9.6 years, and more (57 percent) had graduated in Medicine (M.D.) than those (43 percent) who had graduated in Dentistry (D.D.S.). Of all the people contacted in this telephone survey, there were 123 responders (69 percent) and fifty-four nonresponders (31 percent). Among the nonresponders, five did not practice dentistry (they worked in other areas of medicine or had ended their practice), four were unable to answer (they were abroad or sick), twenty-four had a wrong phone number listed or disconnected so it was impossible to contact them, six did not answer to seven or more phone calls, and fifteen (8 percent of the total number) refused to participate.

Comparisons of gender, age, and title (M.D. vs. D.D.S.) between responders and nonresponders are reported in Table 2; there were no statistically significant differences between the two groups.

The descriptive statistics of the responders are reported in Tables 3 and 4. Seventy-seven of the total number were males. The most common field of interest was conservative dentistry. The mean number of congresses attended in the last six months was 1.7 ±2.5 (the median was 1), and the same mean attendance was found for courses. Forty percent had not attended congresses in the last six months, and 32 percent had not attended courses in the last six months (Figure 1).

The mean number of books consulted in the last six months was 30.8 ±55.0; the median was 6, which is one consultation each month. Twenty-two percent had not consulted books at all (Figure 2). The mean number of consultations of Italian dental journals was 40.9 ±51.5; the median was 24, about one every week. Only 7 percent had not read an Italian article in the last six months (Figure 2). The journals accessed most frequently were *Il Dentista Moderno* and *Dental Cadmos*. The mean number of consultations of international journals in the last six months was 11.5 ±34.5; the median was 0. About 68 percent of the dental practitioners had not read any international articles in the last six months (Figure 2). The international journals consulted most frequently were *Quintessence International Dental Digest*, *American Journal of Orthodontics and Dentofacial Orthopedics*, *International Journal of Oral and Maxillofacial Implants,* and *Clinical Oral Implants Research*.

Mean Internet queries undertaken for clinical purposes tallied 16.0 ±37.7 in the last six months; the median was 2, once every three months. Forty-six percent had not used

Table 1. Results of reliability tests

Variable	ρ, *k*, Concordance
Main field of interest	0.90†
Number of congresses attended	0.96
Number of courses attended	0.81
Number of books consulted	0.80
Number of Italian articles consulted	0.84
Main Italian journals consulted	0.53†
Number of international articles consulted	0.87
Main international journals consulted	0.50†
Number of Internet accesses	0.25
Main Internet website consultation	0.83†
Number of colleague consultations	0.99
Rating of books	0.78
Rating of slide presentations	0.73
Rating of articles	0.79
Rating of videos	0.85
Rating of Internet consultation	0.90
Rating of colleague consultation	0.90
Rating of hands-on training	0.65
Knowledge of the term "EBM"	0.89*
Use of EBM	1.00*

†concordance
**k* statistics
If no symbol is present, the intraclass correlation coefficient (ρ) was used.

Table 2. Differences between responders and nonresponders

	Responders (123)	Nonresponders (54)	p-value
Gender	23% Females 77% Males	24% Females 76% Males	0.8486*
Title	44% D.D.S. 56% M.D.	41% D.D.S. 59% M.D.	0.7433*
Age	46.2 ±8.8	46.9 ±11.3	0.6538†

*Fisher exact test
†t-test

Table 3. Descriptive statistics (n=123) and quantitative variables (frequency refers to the last six months) of responders

Variable	Mean	Median	St. Dev.	Min	Max
Age	46.2	48	8.8	27	71
Number of congresses attended	1.7	1	2.5	0	15
Number of courses attended	1.7	1	1.9	0	12
Number of books consulted	30.8	6	55.0	0	180
Number of Italian articles consulted	40.9	24	51.5	0	180
Number of international articles consulted	11.5	0	34.5	0	180
Number of Internet accesses	16.0	2	37.7	0	180
Number of colleague consultations	44.3	24	60.8	0	180

the Internet in the last six months (Figure 3). The most accessed sites were www.andi.it (Italian National Dental Association) and www.ncbi.nlm.nih.gov/sites/entrez (PubMed).

The mean number of consultations with colleagues was 44.3 ±60.8 times in the last six months; the median was 24, once every week. Nine percent of the dentists did not consult colleagues (Figure 3).

Table 4. Descriptive statistics (n=123) and nominal variables of responders

Variable	Modality	Percent
Gender	Male	77
	Female	23
Title	Medical Doctor (M.D.)	56
	Doctor of Dental Science (D.D.S.)	44
Main field of interest	Conservative	34
	Prosthetics	23
	Oral Surgery	15
	Orthodontics	14
	Others	14
Main Italian journals	Il Dentista Moderno	39
	Dent Cadmos	31
	Riv Ital Stomatol	16
	Others	14
Main international journals	Quintessence Int Dent Dig	38
	Am J Orthod Dentofacial Orthop	13
	Int J Oral Maxillofac Implants	13
	Clin Oral Implants Res	10
	Others	26
Main Internet websites	ANDI	39
	PubMed	35
	Others	26
Term "EBM"	Known	59
	Not known	41
Use of EBM	Used	49
	Not used	51

The variance explained for each principal component and correlations between each original variable and each principal component are reported in Table 5. The first principal component is responsible for 35 percent of the variability and is positively correlated to all the forms of continuing education. It can be considered a component that relates to the "total amount" of continuing education. The second principal component is positively correlated both to the frequency of Internet queries and to consultation of articles and books, but negatively correlated to attending courses and congresses. It can be considered a component of distance learning.[22]

The first two principal components are shown in Figure 4. The figure depicts a heterogeneous group of ten dentists by green stars, which consists of "habitual readers," who frequently consult articles, books, and the Internet. A heterogeneous group of thirteen dentists, marked by blue crosses, comprises the "habitual course takers," who frequently enroll in courses or congresses and consult colleagues. A more homogeneous group of 100 dentists, indicated by fuchsia dots, consists of "habitual low updaters," who are characterized by their low frequency of obtaining updates. The third principal component is positively correlated with consultation with colleagues and negatively correlated with reading books and Italian articles. This component may be interpreted as discriminating between verbalizing and reading.

Forty-one percent of dentists interviewed reported that they did not know the meaning of the term "evidence-based medicine," while 49 percent stated that they use evidence-based medicine in their daily clinical practice.

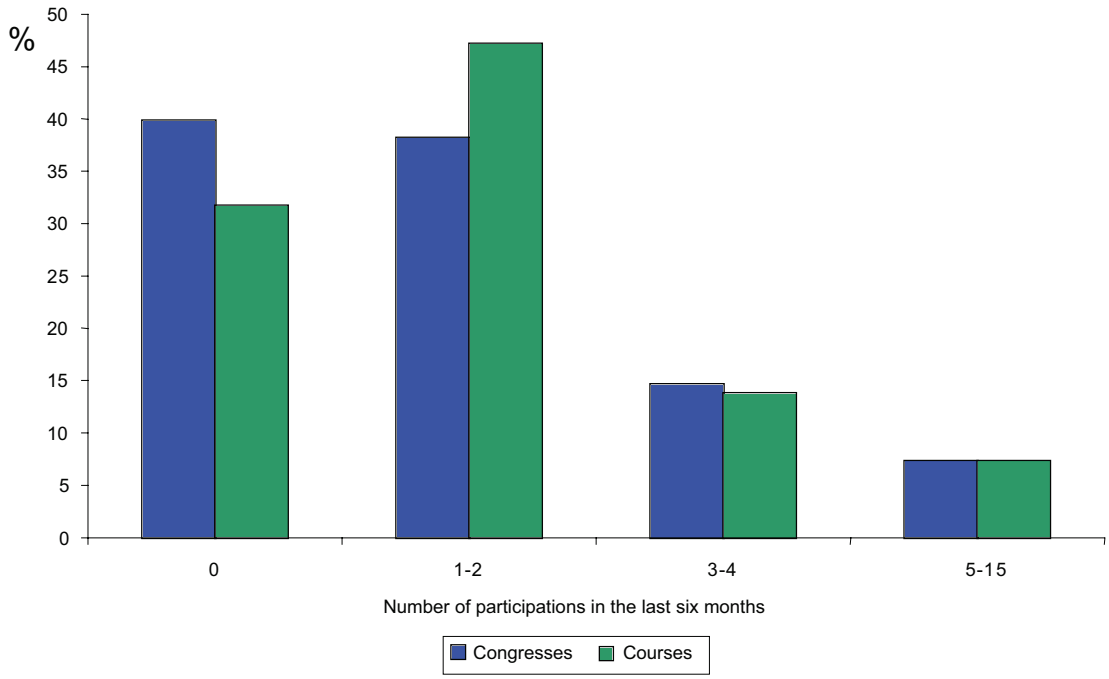

Figure 1. Congresses and courses frequented during the last six months

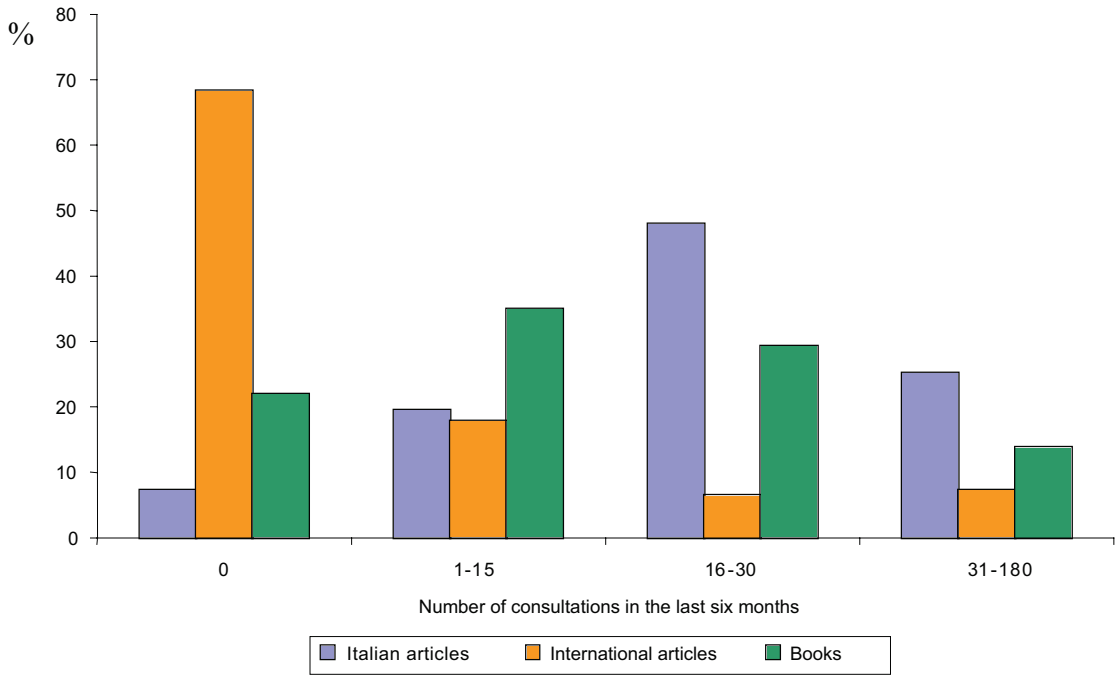

Figure 2. Printed information accessed during the last six months

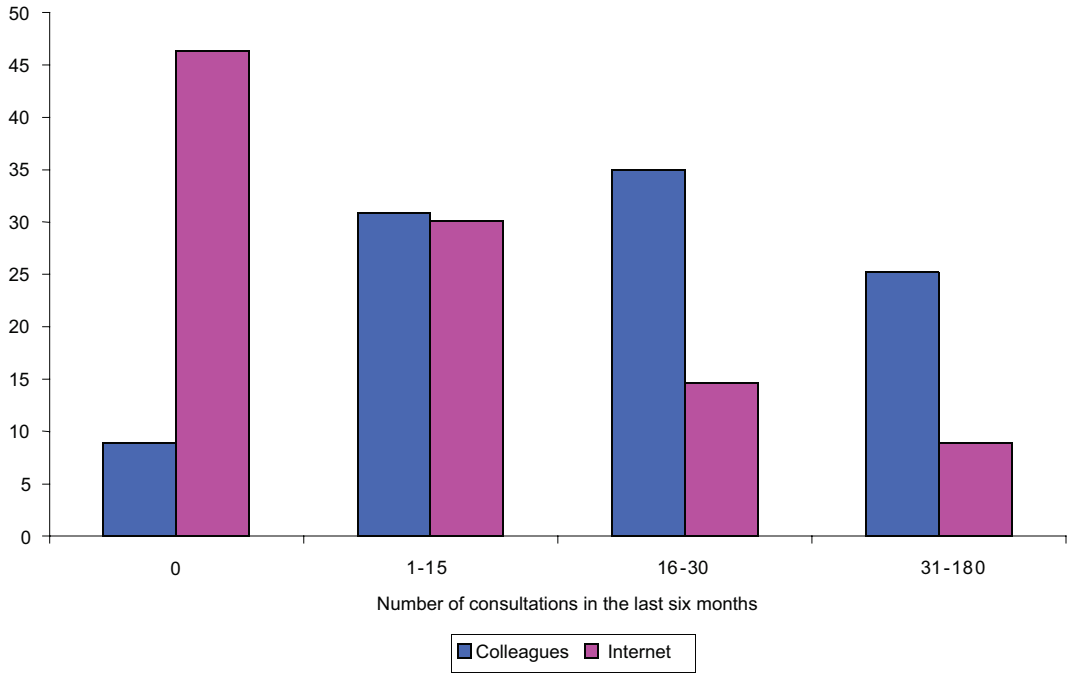

Figure 3. Internet and colleagues consulted during the last six months

Table 6 shows the different preferences in continuing education modalities. Clinical training was considered the most important form of update in therapy. The clinical training modality results were significantly different from consultation with colleagues, viewing videos, and accessing the Internet, which received the lowest score.

Discussion

For this study, a telephone interview of Italian dentists belonging to the Order of Dental Practitioners of Prato was employed to determine which continuing dental education instruments they used, how often (frequency of updating), and if the EBM

Table 5. Principal components

Principal Component	1	2	3	4	5	6	7
Variance	2.47	1.08	0.98	0.72	0.68	0.62	0.46
Percent of variance	35.25	15.49	13.94	10.22	9.75	8.81	6.54
Cumulative percent	35.25	50.74	64.68	74.90	84.65	93.46	100.00
Correlations of the principal components and the original variables							
Congresses	0.39	-0.37	0.01	-0.30	0.68	0.40	-0.09
Courses	0.35	-0.57	-0.08	0.58	-0.09	-0.17	0.41
Books	0.43	0.11	-0.33	0.11	-0.51	0.57	-0.31
Italian articles	0.38	0.22	-0.52	-0.48	-0.05	-0.35	0.42
International articles	0.48	0.09	0.16	0.11	0.07	-0.58	-0.62
Internet	0.28	0.68	0.22	0.41	0.33	0.17	0.32
Colleagues	0.31	-0.08	0.73	-0.38	-0.40	0.06	0.25

Figure 4. Biplot of the first two principal components

Note: The X axis refers to the first principal component, the Y axis to the second principal component. The biplot shows rays corresponding to the variables. "Ita Articles" refers to Italian articles; "Int Articles" refers to international articles. The ten dentists represented by the green stars are the "habitual readers." The thirteen dentists represented by the blue crosses are the "habitual course takers." The 100 dentists represented by the fuchsia dots are the "habitual low updaters."

method was known and put in practice. The number of responders was high (almost 70 percent), and a test-retest showed a high reliability score for most items of the questionnaire. Furthermore, no significant differences were found between responders and nonresponders for gender, age, and title.

In the Province of Prato, males make up 77 percent of the dental practitioners and tend to be older than their female colleagues. In Italy, in the past, the profession was considered one that was typically for males (women constitute only 13 percent of M.D.'s practicing dentistry in Prato); but, in recent years, the percentage of women who have graduated in dentistry has progressively increased (women are now 37 percent of D.D.S.'s in Prato). Women, however, choose orthodontics or conservative dentistry

more frequently than do men. In fact, only one woman in our study decided to practice surgery predominantly, and one other to mainly practice prosthodontics. Of the 177 dentists belonging to the Order of Prato, 57 percent were Doctors in Medicine (M.D.) and 43 percent were Doctors in Dental Science (D.D.S.). There were no differences in the number of responders and nonresponders between the two groups.

Table 6. Continuing education preferences for updates in therapy

Variable	Mean Score	St. Dev.	Groups (Tukey*)
Clinical training	7.9	2.2	1
Articles	7.5	1.4	1,2
Slide presentation	7.5	1.4	1,2
Books	7.3	1.9	1,2
Colleague consultation	7.0	2.2	2
Videos	7.0	2.4	2
Internet	6.2	2.4	3

*Different numbers indicate a statistically significant difference ($p<0.05$) among the groups.

The statistical distributions of frequency of access to continuing education tools were often asymmetric, with few dentists using an updating tool often and many not at all. For example, fifty-seven dentists (46 percent) didn't use the Internet at all, while five dentists accessed the Internet daily for their update. Because of this asymmetry, the median seems to be a more reliable index than the mean.

A typical dentist in the Province of Prato reads articles in Italian journals and has contacts with colleagues at weekly intervals, reads professionally related books at monthly intervals, accesses the Internet every three months, goes to courses or congresses every six months, and does not read articles in international journals.

There are a large number of Italian journals in dental offices because some are free and correspond to throwaway journals.[23] Updating one's knowledge using this tool seems to be mostly passive, since it's not the dentist who searches for a particular article in a national journal, but, on the contrary, it's the journal that chooses the information to provide to the dentist. Italian journals provide good articles in the form of case reports and nonsystematic reviews but rarely randomized controlled trials or systematic reviews, which are considered better guides for good clinical practice decision making in the EBM philosophy. None of the Italian dental journals is rated in the Science Citation Index, so none has an Impact Factor. While there seems to be a willingness among the interviewed dentists to pursue continuing education, the results of our study indicate that, for them, obtaining continuing education seems to be sporadic and mostly based on secondary sources. International journals publish relevant research articles,[24] and national journals often cite or reprint results published in international journals. The dentists interviewed seem to need a "translator journal" so that the complex technical information can be readily understood. None of the dentists interviewed reads international journals that are evidence-based such as the *Journal of Evidence-Based Dental Practice.*

Generally, the innovation of EBM seems not to have reached the dentists living in the Province of Prato since 41 percent of them did not know the meaning of the term. On the other hand, sixty dentists (49 percent) indicated they used EBM in their everyday practice. However, only twenty (33 percent) of these sixty had used the Internet in the last six months and had read international journals. Since the practice of EBM necessitates identifying the best evidence available when evaluating possible solutions to clinical problems, it seems necessary to obtain reliable information available on the Internet and in articles published by peer-reviewed international journals. In light of this fact, we must conclude that most of the dentists interviewed for this study who indicated that they use EBM either ignore the real meaning of this term or do not actually use EBM in their clinical practice.

A study carried out in another country has also shown a low access to evidence-based resources in performing posterior composite restorations.[18] This trend was also found in general medicine.[25] Consequently, it seems necessary to encourage universities to teach their undergraduates how to implement evidence-based medicine.[26]

The principal component analysis showed that most of the dentists belonging to the Order of Prato had a low rate of access to continuing education information, and very few have a high frequency of lifelong learning using most of the educational instruments that are available. In our study, those who frequently seek updates do so employing many of the instruments available, a tendency also reported in another recently published study.[27]

The second principal component examined the distance learning tools available and showed

the presence of many styles of updating. There was a wide gap between those who prefer participating in courses or congresses where a teacher is present and those who prefer using forms of learning that take place without the learner and teacher present in person in the same room (e.g., via the Internet, papers, books).[22,28]

Another source of variability was evident in the third principal component, which discriminates between those who frequently read professionally related books and Italian journals and those who prefer consulting with colleagues. In this survey, young dentists more often than older practitioners consult colleagues, probably to gain immediate reassurances for their clinical choices. This phenomenon may also derive from today's tendency to specialize; thus, consulting with other specialists becomes necessary for managing complex clinical cases.

The questionnaire also asked the dental practitioners to evaluate the effectiveness of various continuing education tools in delivering updates in therapy.[29] Clinical training obtained the highest score, thereby supporting the position that clinical skills do improve with specific feedback as many studies have in fact shown.[30-33] The Internet, on the other hand, obtained the lowest score, probably because this tool, at least for dentists, does not yet constitute a valid learning instrument either for learning new techniques or for gathering important scientific information in therapy.[34] As reported previously, the traditional tools for obtaining continuing education like clinical training, articles, oral presentations, and books seem to be preferred over the more innovative tools such as videos and the Internet.[35,36] On the other hand, one must note that the sources rated most important in theory are not necessarily those most used in practice.[37]

In conclusion, most dental practitioners in Prato seek continuing professional development sporadically and in a passive way, without referring to international peer-reviewed journals or the Internet. They often gather information from national journals, colleagues, and books. There are two fundamentally different styles of obtaining continuing education: employing instruments in which a teacher is present, such as courses and congresses, or using forms of learning that take place without the presence of the teacher, such as the Internet or reading articles or books.

The dental practitioners interviewed consider the traditional tools such as clinical training, journals, oral presentations, and books the most effective for providing them with updates in therapy, while they consider the Internet not relevant for this purpose. The meaning of the term and the application of EBM are not yet well understood, or EBM is used superficially.

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REFERENCES

1. Calman KC. Medical education: past, present, and future. Philadelphia: Churchill Livingstone Elsevier, 2007:3–14.
2. Stillman N, Douglass CW. The developing market for dental implants. J Am Dent Assoc 1993;124(4):51–6.
3. Eckert SE, Koka S, Wolfinger G, Choi YG. Survey of implant experience by prosthodontists in the United States. J Prosthod 2002;11(3):194–201.
4. Gambrill E. Critical thinking in clinical practice. 2nd ed. Hoboken, NJ: John Wiley & Sons, 2005:85–252.
5. Evidence-Based Medicine Working Group. Evidence-based medicine: a new approach to teaching the practice of medicine. JAMA 1992;268(17):2420–5.
6. Straus SE, Sackett DL. Using research findings in clinical practice. BMJ 1998;317(7154):339–42.
7. Marinho VC, Richards D, Niederman R. Variation, certainty, evidence, and change in dental education: employing evidence-based dentistry in dental education. J Dent Educ 2001;65(5):449–55.
8. Ely JW, Osheroff JA, Ebell MH, Chambliss ML, Vinson DC, Stevermer JJ, et al. Obstacles to answering doctors' questions about patient care with evidence: qualitative study. BMJ 2002;324(7339):170.
9. Ely JW, Osheroff JA, Chambliss ML, Ebell MH, Rosenbaum ME. Answering physicians' clinical questions: obstacles and potential solutions. J Am Med Inform Assoc 2005;12(2):217–24.
10. Coumou HC. How do primary care physicians seek answers to clinical questions? A literature review. J Med Libr Assoc 2006;94(1):55–60.
11. Scott J. Dental education in Europe: the challenges of variety. J Dent Educ 2003;67(1):69–78.
12. Best HA, Eaton KA, Plasschaert A, Toh CG, Grayden SK, Senakola E, et al. Continuing professional development: global perspectives. Synopsis of a workshop held during the International Association of Dental Research meeting in Gothenburg, Sweden, 2003. Part 1: access, funding, and participation patterns. Eur J Dent Educ 2005;9(2):59–65.
13. Sambrook P, Thomson D, Bastiaan R, Goss A. Continuing education: the 1998 survey of the Royal Australasian College of Dental Surgeons. Aust Dent J 2001;46(2): 139–42.

14. Buck D, Newton T. Continuing professional development amongst dental practitioners in the United Kingdom: how far are we from lifelong learning targets? Eur J Dent Educ 2002;6(1):36–9.
15. Leggate M, Russell E. Attitudes and trends of primary care dentists to continuing professional development: a report from the Scottish dental practitioners survey 2000. Br Dent J 2002;193(8):465–9.
16. Allison PJ, Bedos C. Canadian dentists' view of the utility and accessibility of dental research. J Dent Educ 2003;67(5):533–41.
17. Bullock A, Firmstone V, Fielding A, Frame J, Thomas D, Belfield C. Participation of UK dentists in continuing professional development. Br Dent J 2003;194(1):47–51.
18. Haj-Ali RN, Walker MP, Petrie CS, Williams K, Strain T. Utilization of evidence-based informational resources for clinical decision related to posterior composite restoration. J Dent Educ 2005;69(11):1251–6.
19. Fleiss JL. The design and analysis of clinical experiments. New York: John Wiley & Sons, 1986:2–8.
20. Dunn G. Design and analysis of reliability studies: the statistical evaluation of measurement errors. New York: Oxford University Press, 1989:34–5.
21. Jolliffe IT. Principal component analysis. 2nd ed. New York: Springer-Verlag, 2002:1–110.
22. Eaton KA, Hammick M. Distance learning materials for dentists: a user's guide to quality. Br Dent J 2003;194(5):253–6.
23. Rochon PA, Bero LA, Bay AM, Gold JL, Dergal JM, Binns MA, et al. Comparison of review articles published in peer-reviewed and throwaway journals. JAMA 2002;287(21):2853–6.
24. Gorman PN, Ash J, Wykoff L. Can primary care physicians' questions be answered using the medical journal literature? Bull Med Libr Assoc 1994;82(2):140–6.
25. Gabbay J, le May A. Evidence based guidelines or collectively constructed "mindlines"? Ethnographic study of knowledge management in primary care. BMJ 2004;329(7473):1013.
26. Werb SB, Matear DW. Implementing evidence-based practice in undergraduate teaching clinics: a systematic review and recommendations. J Dent Educ 2004;68(9):995–1003.
27. Best HA, Messer LB Professional development for dentists: patterns and their implications. Aust Dent J 2001;46(4):289–97.
28. Mann KV, Gelula MH. How to facilitate self-directed learning. In: Davis D, Barnes DE, Fox R, eds. The continuing professional development of physicians: from research to practice. Chicago: American Medical Association Press, 2003:121–43.
29. Maidment Y. A comparison of the perceived effects on Scottish general dental practitioners of peer reviewed and other continuing professional development. Br Dent J 2005;200(10):581–4.
30. Hergenroeder AC, Chorley JN, Laufman L, Fetterhoff A. Two educational interventions to improve pediatricians' knowledge and skills in performing ankle and knee physical examinations. Arch Pediatr Adolesc Med 2002;156(3):225–9.
31. Woodman T, Pee B, Heather F, Davenport ES. Practice-based learning: emerging professional characteristics, self-concepts, and pattern of knowing in dental training. Eur J Dent Educ 2002;6(1):9–15.
32. Boehler M, Rogers DA, Schwind CJ, Mayforth R, Quin J, Williams RG, et al. An investigation of medical student reaction to feedback: a randomized controlled trial. Med Educ 2006;40(8):746–9.
33. Porte MC, Xeroulis G, Reznik RK, Dubrowski A. Verbal feedback from expert is more effective than self-accessed feedback about motion efficiency in learning new surgical skills. Am J Surg 2007;193(1):105–10.
34. Hillenburg KL, Cederberg RA, Gray SA, Hurst CL, Johnson GK, Potter BJ. E-learning and the future of dental education: opinions of administrators and information technology specialists. Eur J Dent Educ 2006;10(3):169–77.
35. Haug JD. Physicians' preferences for information sources: a meta-analytic study. Bull Med Libr Assoc 1997;85(3):223–32.
36. Selvi F, Ozerkan AG. Information-seeking patterns of dentists in Istanbul, Turkey. J Dent Educ 2002;66(8):977–80.
37. McGettigan P, Golden J, Fryer J, Chan R, Feely J. Prescribers prefer people: the sources of information used by doctors for prescribing suggest that the medium is more important than the message. Br J Clin Pharmacol 2001;51(2):184–9.