

Clinical Inertia in Dentistry: A Review of the Phenomenon

D. Brad Rindal, DDS; William A. Rush, PhD;
Raymond G. Boyle, PhD, MPH



Abstract

Aim: Dentistry has been slow to adopt innovations in dental practice even when they are recommended by national organizations and supported by evidence-based guidelines. The objective of this review is to describe clinical inertia, a concept described frequently in the medical literature, and to use findings from tobacco cessation and dental sealant studies as evidence of its existence.

Methods and Materials: A review of the literature published during the past 30 years was conducted to determine the state of affairs of two very different areas of dental practice, tobacco cessation intervention and application of sealants, to demonstrate the concept of clinical inertia in dental practice. Factors such as over estimating services provided, unfounded reasons not to act, lack of adequate training, and competing demands that account for the inertia were examined.

Discussion: Clinical inertia is a complex concept that needs more attention in dentistry. A variety of strategies will be required to overcome it in order to provide the best care for the public.

Conclusion: Clinical inertia is a useful paradigm for explaining delays in the incorporation of new knowledge into clinical practice. It offers a model against which the broader dental community can develop and test strategies to reduce the delays in translating best practices into daily practices.

© Seer Publishing

Clinical Significance: The path to providing state-of-the-art care for the public is to engage in the discovery, dissemination, and acquisition of new knowledge then transform it into evidence-based best practices to be used in daily clinical practice.

Keywords: Literature review, clinical competence, dental care, patient care, practice patterns, pit and fissure sealants, tobacco use cessation

Citation: Rindal DB, Rush WA, Boyle RG. Clinical Inertia in Dentistry: A Review of the Phenomenon. *J Contemp Dent Pract* 2008 January; (9)1:113-121.

Introduction

Improvement in clinical care can be limited by delays in the translation of new scientific knowledge into clinical practice. Such delays are not unique to specific healthcare disciplines, countries, or healthcare delivery systems. All healthcare disciplines, including dentistry, have multiple examples of the slow incorporation of new knowledge and techniques into clinical practice. Researchers and leaders in dentistry struggle with how to address this translation issue. Improvements can only occur if the factors that contribute to this delay are understood.

Recent efforts to facilitate an understanding of new knowledge have focused on the concept of Evidence-based dentistry (EBD) which includes the use of systematic reviews and clinical guidelines to assist clinicians with the best evidence available in support of clinical practice.¹ The EBD effort is designed to provide clinicians with timely summaries of the current best evidence available in the literature. However, if we limit our efforts to these solutions, only modest improvements will result and other barriers to translation of research into practice will not be addressed.²

Clinical inertia appears frequently in the medical literature.³⁻⁷ It is defined as recognition of a problem but not acting to treat or prevent the problem in the desired manner based on current evidence.⁷⁻⁹ It is manifested in either the failure to appropriately treat an existing clinical problem or the failure to introduce preventive regimes to reduce the risk of future disease.⁸ Clinical inertia is a problem of the healthcare provider and the healthcare system separate from patient related issues of adherence and other barriers to care. The cardinal feature of clinical inertia is the failure of clinicians to recognize the presence of clinical inertia in their practice patterns.⁸



Phillips⁸ described clinical inertia as having the following three underlying components:

1. Overestimation of the treatment and/or prevention provided.
2. Use of unfounded reasons to justify not acting. These often manifest themselves as blaming the patient or attributing inactivity to lack of reimbursement.
3. The lack of adequate education or training when newer, more suitable methods are developed.

In addition to these three primary factors, the impact of competing time demands^{10,11} is proposed as an additional component of clinical inertia. Appointment time is limited so any treatments or preventive actions viewed as a lower priority may not occur.

In medicine physicians are often tempted to lay the blame for clinical inertia on their patients.⁸ However, there is evidence to suggest the balance is more heavily weighted toward the physician than the patient.⁷

The concept of clinical inertia and its components might be better explained using the tobacco

cessation and sealants as examples. These examples were chosen because of the availability of data to facilitate an understanding of the reasons for slow implementation into clinical practice. Other examples exist but are not as well studied.

Methods and Materials

A search of the scientific literature published during the past 30 years was conducted to locate articles on tobacco cessation and sealants focusing on issues of implementation and translation of research into practice. Articles that surveyed knowledge, attitudes, and behaviors of dentists were reviewed. Reports of patient experiences and perceptions were also included. All articles were reviewed for evidence of clinical inertia. The search resulted in 143 smoking/tobacco use articles and 251 sealant related articles.

Results for Tobacco Cessation

Tobacco users experience increased risk for oral diseases. Tobacco is a risk factor for oral mucosal lesions, oral cancer, periodontal disease, and impaired healing after periodontal treatment.¹²⁻¹⁵

The U.S. Public Health Service (USPHS) clinical practice guidelines for smoking cessation recommends a series of steps clinicians can take to help their patients quit tobacco.^{16,17} Despite these suggestions for treating tobacco use, assistance and support for quitting are inconsistently delivered to tobacco users in both medical and dental practices.^{14,18}



Overestimation of Tobacco Cessation Services Provided

The evidence suggests dentists are under the impression they are intervening more often with tobacco users than the data indicate. Surveys of dentists routinely find a majority of respondents endorsing the role of dentists in helping patients to stop smoking. For example, 82.1% of dentists in Maryland believe quitting advice is a dentist's responsibility.¹⁹ In addition, a recent survey of dentists found strong support (82%) in favor of dental patients being encouraged to stop smoking.²⁰ In contrast, the results from recent regional and national surveys suggest interventions with tobacco-using patients are not yet a routine part of dental practice with current estimates of how often dentists routinely ask patients about tobacco use ranging from about 20% to 55%.²¹⁻²⁴ Furthermore, only 25% of dentists report advising patients to quit smoking at every visit and only half of these dentists had a strategy to help patients quit.²¹

Unfounded Reasons to Justify Inaction

Unfounded or soft reasons for not providing treatment are often ascribed to perceptions of patient reactions. The most frequently cited reasons in surveys of dentists involve perceptions of patient resistance.²⁵⁻³¹ Lack of patient motivation has also been reported as a source of concern.^{28,30,32} Dentists' concerns regarding the resistance of patients to professional help is not supported by patient surveys. In fact, many patients are interested in quitting and expect dental providers to discuss their tobacco use.³³ Campbell et al.³⁴ provide evidence of a wide discrepancy between dentists and their patients' views of cessation counseling. They found 58.5% of patients believed tobacco should be routinely discussed compared to 61.5% of dentists who believed patients were not expecting tobacco cessation services. Solberg et al.³⁵ observed

increased patient satisfaction with healthcare among smokers who were advised to quit compared to smokers who reported no such discussion of tobacco use.

Another unfounded reason used by dentists to support a lack of action with tobacco-using patients is low counseling efficacy.^{25,36,37} Blaming counseling efficacy may be the product of a focus on quit rates at the expense of treating tobacco use as a chronic condition requiring multiple quit attempts and long-term support.²⁵

Need for Adequate Training

Dentists consistently identify lack of training as a key issue in addressing tobacco with their patients.^{26,38} However, surveys of dentists routinely find an interest in tobacco education or counseling.^{27,30,32} In a recent study involving fourth-year dental students, Yip et al.³¹ reported formal training in smoking cessation was associated with a greater amount of counseling and more favorable beliefs concerning the role of dentists in promoting smoking cessation. The conviction tobacco treatment is beyond their scope of expertise^{26,28,32} relates to a lack of tobacco cessation education.

The Impact of Competing Demands

Beyond a perception of patient reactions to cessation services in the dental office, competing demands are a frequently-reported concern with dentists. In the context of tobacco cessation services, competing demands may take the form of a concern with lack of reimbursement when there is just enough time to provide other services. The issue of remuneration as a barrier to providing cessation services is reported by dentists in many countries.^{26,27,32} Similarly, the time required to provide services is often cited by dentists.^{22,25,27,29,31,38} However, dentists routinely provide preventive counseling (e.g., brushing and flossing), for which they are not directly reimbursed, as part of their normal practice patterns. Dentists simply include these services into the fee for the preventive visit.

Results for Dental Sealants

Dental sealants were promoted as a way to prevent pit and fissure caries by the Council on Dental Materials of the American Dental Association (ADA) in 1976. More than a decade



later, NHANES III, 1988-91 reported among children ages 5 to 17, only 18.5% had sealants on any permanent teeth.³⁹ The sealant objective for Healthy People 2000 was 50% of all children under age 14 having at least one permanent tooth sealed.⁴⁰ This goal was not achieved and has been pushed forward to the year 2010.

Recent data from the National Oral Health Surveillance System found seven of the ten states surveyed above are approaching 50% of third graders with at least one permanent molar having a sealant.⁴¹ It has taken 30 years for the United States to finally approach the goal of 50% of its children receiving a service estimated to be effective at preventing 80% of caries.⁴²

Overestimation of Sealant Services Provided

Surveys of dentists since the introduction of sealants as an effective method of caries prevention have continued to find a higher proportion of dentists reporting the use of sealants than the percentages of patients found with sealants.^{39,43-47} This suggests even when dentists are making very limited use of sealants they perceive themselves as making greater use of them. This discrepancy might also be explained if dentists were found to be targeting sealant placement for those children at greatest risk of developing caries. However, the opposite has been observed. Children with the highest sealant rates are those with the least risk.^{45,48-50}

Unfounded Reasons to Justify Inaction

Often when dentists are asked why they haven't been applying sealants, they have responded parents don't want them used.^{43,51} However, when parents of children with sealants are asked where they learned about sealants, they are more likely to indicate it was from the dentist.⁵² In fact, it was found that parents who found out about



sealants from other sources were less likely to have children with sealants.⁵² This suggests many dentists are not discussing sealants with parents assuming they don't want them used on their children. Dentists have also explained low sealant use rates are a result of the lack of insurance coverage for sealants.⁴⁴ This may have been the case in the early years of sealant use, but because of the demonstrated cost-benefit of sealants all state Medicaid programs and most private dental insurance policies now cover sealant services. Dentists often suggest sealants don't work.^{43,48} The literature does not support this belief, provided sealants are monitored and repaired as needed.⁵³

Need for Adequate Education

Dentists who graduated before the acceptance of dental sealants as an efficacious method for preventing caries are less likely to report they use sealants.⁴³ It also has been reported the more continuing education on sealants a dentist receives, the more likely they were to administer dental sealants to their patients.⁴³ Dentists who were misinformed and reported a fear of placing a sealant over a potentially carious pit or fissure and were worried about poor sealant retention were also less likely to seal children's teeth.⁴³

The Impact of Competing Demands

It is difficult to determine from the sealant survey data whether dentists provided an alternate treatment to a sealant. However, the data suggest dentists who employ hygienists reported they were more likely to use sealants (80% vs. 92% to 97%).⁴³

Discussion

The data support the conclusion that clinical inertia exists within the practice of dentistry. The most important first step is to acknowledge

that clinical inertia exists. Without this acknowledgement the dental profession is not likely to make the effort necessary to reduce clinical inertia.

It is important for dentists to have access to summaries of the current best knowledge. Evidence-based dentistry is an effort to provide a summary of the evidence through the use of systematic reviews and clinical guidelines. As dentists, we need to examine our beliefs and current practice patterns when scientific evidence tells us something different. Forums for groups of dentists to discuss the evidence and the implications for clinical practice might be useful in examining current practices in light of the evidence and generate suggestions on how to align clinical practice with current evidence. Discussion forms could become part of a continuing education course or they could be organized through local dental societies.



The introduction of Electronic Oral Health Records (EOHR) into general practice will not only affect the structure of the dental visit, it can be used as a tool to reduce clinical inertia. When properly used, EOHRs can provide the dentist with automated clinical reminders that are focused and appropriate to each patient's needs.

When lack of knowledge is determined to be a cause of inertia, dentists must then adjust their continuing education priorities to deal with the areas of inertia. Ideally, this training would become a required part of continuing education offerings.⁵⁴ It is important for dentists to have the most current and accurate information in order to feel comfortable in applying dental sealants. Dental practitioners need to re-examine their beliefs when scientific evidence suggests

something different. Dental schools play an important role in the education of practicing dentists. They also conduct much of the research. Therefore, dental schools need to take a more active role in the educational efforts required to accelerate the translation of research findings into clinical practice.¹⁰

Medicaid, dental insurance, and public program reimbursement needs to be synchronized with desirable practice patterns. Incentive systems that encourage best practices need to be developed. Such systems will facilitate and reinforce the forces of change.⁵⁵ When dentists are adequately reimbursed for using best practices, they are more likely to adopt them. The development of simple quality measurements could be used to provide the dentist with a concrete way to measure elements of their practice and compare them to the broader dental community.

Conclusion

The examples of tobacco cessation and sealants provide data suggesting the existence of clinical inertia in dental practice. Clinical inertia offers a model against which the broader dental community can develop and test strategies to reduce the delays in translating best practices into daily clinical care.

References

1. Kao RT. The challenges of transferring evidence-based dentistry into practice. *J Evid Based Dent Pract.* 2006; 6(1):125-8.
2. Goff DC Jr, Gu L, Cantley LK, Sheedy DJ, Cohen SJ. Quality of care for secondary prevention for patients with coronary heart disease: results of the Hastening the Effective Application of Research through Technology (HEART) trial. *Am Heart J.* 2003; 146(6):1045-51.
3. Ziemer DC, Miller CD, Rhee MK, Doyle JP, Watkins C Jr, Cook CB, Gallina DL, El-Kebbi IM, Barnes CS, Dunbar VG, Branch WT Jr, Phillips LS. Clinical inertia contributes to poor diabetes control in a primary care setting. *Diabetes Educ.* 2005; 31(4):564-71.
4. Shah BR, Hux JE, Laupacis A, Zinman B, van Walraven C. Clinical inertia in response to inadequate glycemic control: do specialists differ from primary care physicians? *Diabetes Care.* 2005; 28(3):600-6.
5. Kennedy AG, MacLean CD. Clinical inertia: errors of omission in drug therapy. *Am J Health Syst Pharm.* 2004; 61(4):401-4.
6. Wofford JL. Clinical inertia. *Ann Intern Med.* 2002; 137(6):547-8; author reply 47-8.
7. O'Connor PJ. Overcome clinical inertia to control systolic blood pressure. *Arch Intern Med.* 2003; 163(22):2677-8.
8. Phillips LS, Branch WT, Cook CB, Doyle JP, El-Kebbi IM, Gallina DL, Miller CD, Ziemer DC, Barnes CS. Clinical inertia. *Ann Intern Med.* 2001; 135(9):825-34.



Clinical inertia is a complex phenomenon with several underlying causal factors. It will not be reduced by a single strategy, but it will require the coordinated impact of multiple approaches. Dentistry would benefit by considering the concept of clinical inertia in the efforts to improve clinical care.

Clinical Significance

The path to providing state-of-the-art care for the public is to engage in the discovery, dissemination, and acquisition of new knowledge. The path is not complete until the barriers to transforming this knowledge into daily clinical practice are identified and removed.

9. Grant RW, Cagliero E, Dubey AK, Gildesgame C, Chueh HC, Barry MJ, Singer DE, Nathan DM, Meigs JB. Clinical inertia in the management of Type 2 diabetes metabolic risk factors. *Diabet Med.* 2004; 21(2):150-5.
10. McGlone P, Watt R, Sheiham A. Evidence-based dentistry: an overview of the challenges in changing professional practice. *Br Dent J.* 2001; 190(12):636-9.
11. Clarkson JE. Getting research into clinical practice - barriers and solutions. *Caries Res.* 2004; 38(3):321-4.
12. Suarez P, Batsakis JG, el-Naggar AK. Leukoplakia: still a gallimaufry or is progress being made?— A review. *Adv Anat Pathol.* 1998; 5(3):137-55.
13. Winn DM, Diehl SR, Horowitz AM, Gutkind S, Sandberg AL, Kleinman DV. Scientific progress in understanding oral and pharyngeal cancers. *J Am Dent Assoc.* 1998; 129(6):713-8.
14. Tomar SL, Asma S. Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and Nutrition Examination Survey. *J Periodontol.* 2000; 71(5):743-51.
15. Kinane DF, Chestnutt IG. Smoking and periodontal disease. *Crit Rev Oral Biol Med.* 2000; 11(3):356-65.
16. Fiore MC, Bailey WC, Goldstein MG, Jaén CR, Mecklenburg RE, Robinson L, Villejo L, Cohen, SJ, Gritz ER, Kottke TE, Mullen PD, Stitzer ML, Wewers ME, Dorfman SF, Heyman RB, Lando HA, Nett LM, Tommasello AC. Treating Tobacco Use and Dependence: A Clinical Practice Guideline. Rockville, Md, US. Of Health and Human Services. 2000 AHRQ Publication No. 00-0032.
17. Fiore MC. Treating tobacco use and dependence: an introduction to the US Public Health Service Clinical Practice Guideline. *Respir Care.* 2000; 45(10):1196-9.
18. Thorndike AN, Rigotti NA, Stafford RS, Singer DE. National patterns in the treatment of smokers by physicians. *Jama.* 1998; 279(8):604-8.
19. Fried JL, Cohen LA. Maryland dentists' attitudes regarding tobacco issues. *Clin Prev Dent.* 1992; 14(2):10-6.
20. John JH, Yudkin P, Murphy M, Ziebland S, Fowler GH. Smoking cessation interventions for dental patients—attitudes and reported practices of dentists in the Oxford region. *Br Dent J.* 1997; 183(10):359-64.
21. Albert D, Ward A, Ahluwalia K, Sadowsky D. Addressing tobacco in managed care: a survey of dentists' knowledge, attitudes, and behaviors. *Am J Public Health.* 2002; 92(6):997-1001.
22. Dolan TA, McGorray SP, Grinstead-Skigen CL, Mecklenburg R. Tobacco control activities in U.S. dental practices. *J Am Dent Assoc.* 1997; 128(12):1669-79.
23. Hastreiter RJ, Bakdash B, Roesch MH, Walseth J. Use of tobacco prevention and cessation strategies and techniques in the dental office. *J Am Dent Assoc.* 1994; 125(11):1475-84.
24. Jones RB, Pomrehn PR, Mecklenburg RE, Lindsay EA, Manley M, Ockene JK. The COMMIT dental model: tobacco control practices and attitudes. *J Am Dent Assoc.* 1993; 124(9):92-104; discussion 06-8.
25. Campbell HS, Simpson EH, Petty TL, Jennett PA. Addressing oral disease--the case for tobacco cessation services. *J Can Dent Assoc.* 2001; 67(3):141-4.
26. Clover K, Hazell T, Stanbridge V, Sanson-Fisher R. Dentists' attitudes and practice regarding smoking. *Aust Dent J.* 1999; 44(1):46-50.
27. McCann MF, Macpherson LM, Binnie VI, Stephen KW. A survey of Scottish primary care dental practitioners' oral cancer-related practices and training requirements. *Community Dent Health.* 2000; 17(1):24-30.
28. Rikard-Bell G, Ward J. Australian dentists' educational needs for smoking cessation counseling. *J Cancer Educ.* 2001; 16(2):80-4.
29. Simoyan OM, Badner VM, Freeman KD. Tobacco cessation services in dental offices. Are we doing all we can? *N Y State Dent J.* 2002; 68(7):34-40.
30. Trotter L, Worcester P. Training for dentists in smoking cessation intervention. *Aust Dent J.* 2003; 48(3):183-9.
31. Yip JK, Hay JL, Ostroff JS, Stewart RK, Cruz GD. Dental students' attitudes toward smoking cessation guidelines. *J Dent Educ.* 2000; 64(9):641-50.

32. Block DE, Hutton KH, Johnson KM. Differences in tobacco assessment and intervention practices: a regional snapshot. *Prev Med.* 2000; 30(4):282-7.
33. Rikard-Bell G, Donnelly N, Ward J. Preventive dentistry: what do Australian patients endorse and recall of smoking cessation advice by their dentists? *Br Dent J.* 2003; 194(3):159-64; discussion 50.
34. Campbell HS, Sletten M, Petty T. Patient perceptions of tobacco cessation services in dental offices. *J Am Dent Assoc.* 1999; 130(2):219-26.
35. Solberg LI, Boyle RG, Davidson G, Magnan SJ, Carlson CL. Patient satisfaction and discussion of smoking cessation during clinical visits. *Mayo Clin Proc.* 2001; 76(2):138-43.
36. Gregorio DI. Counseling adolescents for smoking prevention: a survey of primary care physicians and dentists. *Am J Public Health.* 1994; 84(7):1151-3.
37. Warnakulasuriya K, Johnson N. Dentists and oral cancer prevention in the UK: opinions, attitudes and practices to screening for mucosal lesions and to counseling patients on tobacco and alcohol use: baseline data from 1991. *Oral Disease.* 1999; (5)10-14.
38. Gerbert B, Coates T, Zahnd E, Richard RJ, Cummings SR. Dentists as smoking cessation counselors. *J Am Dent Assoc.* 1989; 118(1):29-32.
39. Selwitz RH, Winn DM, Kingman A, Zion GR. The prevalence of dental sealants in the US population: findings from NHANES III, 1988-1991. *J Dent Res.* 1996; 75 Spec No(652-60).
40. U.S. Public Health Service. Healthy people 2000: national health promotion and disease prevention objectives: full report, with commentary. Series Washington, D.C.:Department of Health and Human Services, Public Health Service, 1990
41. CDC. Dental Sealants: National Oral Health Surveillance System. 2003;
42. Siegal MD, Farquhar CL, Bouchard JM. Dental sealants. Who needs them? *Public Health Rep.* 1997; 112(2):98-106; discussion 07.
43. Cohen L, LaBelle A, Romberg E. The use of pit and fissure sealants in private practice: a national survey. *J Public Health Dent.* 1988; 48(1):26-35.
44. Main PA, Lewis DW, Hawkins RJ. A survey of general dentists in Ontario, Part I: Sealant use and knowledge. *J Can Dent Assoc.* 1997; 63(7):542, 45-53.
45. Rozier RG, Spratt CJ, Koch GG, Davies GM. The prevalence of dental sealants in North Carolina schoolchildren. *J Public Health Dent.* 1994; 54(3):177-83.
46. Dasanayake AP, Li Y, Philip S, Kirk K, Bronstein J, Childers NK. Utilization of dental sealants by Alabama Medicaid children: barriers in meeting the year 2010 objectives. *Pediatr Dent.* 2001; 23(5):401-6.
47. Gonzalez CD, Frazier PJ, Messer LB. Sealant use by general practitioners: a Minnesota survey. *ASDC J Dent Child.* 1991; 58(1):38-45.
48. Robison VA, Rozier RG, Weintraub JA, Koch GG. The relationship between clinical tooth status and receipt of sealants among child Medicaid recipients. *J Dent Res.* 1997; 76(12):1862-8.
49. Siegal MD, Miller, DL, Moffat D, Kim S, Goodman P. Impact of Targeted, School-Based Dental Sealant Programs in Reducing Racial and Economic Disparities in Sealant Prevalence Among Schoolchildren—Ohio, 1998–1999. *MMWR.* 2001; 50(34):736-8.
50. Cherry-Peppers G, Gift HC, Brunelle JA, Snowden CB. Sealant use and dental utilization in U.S. children. *ASDC J Dent Child.* 1995; 62(4):250-5.
51. Albert DA. Sealant use in public and private insurance programs. *N Y State Dent J.* 1999; 65(2):30-3.
52. Selwitz RH, Colley BJ, Rozier RG. Factors associated with parental acceptance of dental sealants. *J Public Health Dent.* 1992; 52(3):137-45.
53. Feigal RJ. The use of pit and fissure sealants. *Pediatr Dent.* 2002; 24(5):415-22.
54. Zuckerman IH, Weiss SR, McNally D, Layne B, Mullins CD, Wang J. Impact of an educational intervention for secondary prevention of myocardial infarction on Medicaid drug use and cost. *Am J Manag Care.* 2004; 10(7 Pt 2):493-500.
55. Berthiaume JT, Tyler PA, Ng-Osorio J, LaBresh KA. Aligning financial incentives with “Get With The Guidelines” to improve cardiovascular care. *Am J Manag Care.* 2004; 10(7 Pt 2):501-4.

About the Authors

D. Brad Rindal, DDS



Dr. Rindal is a Research Investigator at the HealthPartners Research Foundation in Minneapolis, MN, USA. He divides his time between clinical practice and research. His clinical interest is in TMJ disorders and orofacial pain while his research interests include the impact of chronic illnesses on oral health and testing new approaches to improve the translation of research into daily practice. He is part of the dental practice-based research network recently funded through the University of Alabama and is responsible for the Minnesota component of that network. Dr. Rindal is a member of the ADA, Minnesota Dental Association, St. Paul District Dental Society, IASP, IADR, AADR, and the American Academy of Orofacial Pain.

e-mail: D.Brad.Rindal@healthpartners.com

William A. Rush, PhD



Dr. Rush is a Research Associate at the HealthPartners Research Foundation in Minneapolis, MN, USA. His research interests are centered in diabetes health services research involving investigations into how the healthcare systems and patients deal with diabetes. He is also involved in dental health services research to investigate how the dental system and other factors affect people's dental health. Dr. Rush is a member of the IADR.

Raymond G. Boyle, PhD, MPH



Dr. Boyle is a Principal Clinical Trial Leader at Medtronic in Minneapolis, MN, USA. Prior to his current position he was an Independent Investigator with HealthPartners Research Foundation. His research interests include tobacco policy, tobacco cessation studies, health promotion, and disease prevention.