Oral health behavioral and social intervention research concepts and methods

Introduction

Oral health affects many aspects of a person's functioning and overall health and well-being, including speaking, eating, and maintaining one's appearance, self-esteem, physical comfort, activity level, and quality of life (1). Behavioral and social factors significantly impact oral health. Nutrition, feeding, and oral hygiene practices, pain management, treatment adherence, dental anxiety, oral health knowledge and literacy, parenting, corporate advertising, and access to healthcare and dental insurance, as well as other socioeconomic factors, are some of the many behavioral and social oral health-related issues. Primary, secondary, and tertiary prevention behavioral and social interventions are needed to target these issues, reduce the incidence of oral health problems, and improve the rates at which people recover from them.

Behavioral interventions are those that educate or instruct individuals about good oral health and disease management practices, or how to handle psychological and social challenges that impact their oral health behavior. Examples include: a) prenatal education and assessment of expectant parents to decrease primary caregivers' mutans streptococci levels and risk of transmission to infants (2); b) motivational interviewing with mothers to prevent early childhood caries (3-5) or with adolescents to reduce dental avoidance behavior (6); c) the 5A's (ask, advise, assess, assist, arrange) in routine dental care to increase tobacco quit rates (7); and d) dental office-based weight control interventions for children and adolescents to reduce dental caries and prevent obesity-related systemic diseases (e.g., diabetes) that negatively impact oral health (8).

Social interventions are those that target groups of people, organizations, or communities to improve oral care. Examples include: a) school-based interventions to promote preadolescents' gingival health (9); b) social marketing campaigns to increase awareness of and screening for oral cancer in African Americans (10,11); c) providing dental homes for pregnant women on Medicaid to improve their access and utilization of dental care (12); and d) training dentists to detect methamphetamine users with dental comorbidities and refer these patients to substance abuse treatment programs (13). Developing and testing behavioral and social interventions to promote oral health and effectively treat diseases and disorders represent important parts of the National Institute of Dental and Craniofacial Research (NIDCR) strategic plan (14).

Purpose of the special issue

Exploring and piloting innovative behavioral and social interventions, testing their efficacy in clinical trials, and establishing their effectiveness when used within community and public health settings are complex processes that require well-considered and executed research plans. Investigators from fields steeped in behavioral and social intervention research traditions, such as mental health, addiction, and public health, have developed conceptual models, theories, methodologies, and statistical and cost analysis approaches that could aid those who intend to conduct this kind of research in the oral health field. This special issue gathers together state-of-the-science guidance from leading experts in behavioral and social intervention research as a means to advance the inclusion of best research practices in the oral health field. Investigators interested in studying oral health behavioral and social interventions can capitalize on these existing research concepts and methods, rather than recreating the proverbial research wheel. This special issue aims to provide these investigators with some of the critical concepts and tools they will need to conduct intervention research of the highest standards and ultimately to improve oral health outcomes.

Topics included in this volume

Topics for this special issue emerged from a NIDCR-sponsored meeting on behavioral and social intervention research held in July 2009, and attended by behavioral and social science investigators within and outside the oral health field (see http://www.nidcr.nih.gov/Research/DER/BSSRB/BehavioralInterventionResearch.htm for more detail). The articles contained in this volume address core areas discussed at the meeting that the collective group of investigators felt needed more attention in psychosocial oral health research and, if applied, could improve its quality and scientific contribution. The articles are written by respective experts in each area. In addition, the special issue includes expert commentaries that expand upon the notions raised by the authors of each article.

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The first article by Richard Crosby and Seth Noar (15) encourages investigators to plan for a long-term program of research when developing behavioral or social interventions to improve oral health. The article highlights the PRECEDE-PROCEED socio-ecological approach as an example of one such planning model used for health promotion. The model describes how to move an intervention from its earliest stages of planning and development (steps 1 through 5) to empirical testing and evaluation in community settings (steps 6 through 9). This is, of course, what we would like to see in oral health; innovative ideas about improving health are translated into behavioral and social interventions, these interventions are established as efficacious, and then are successfully implemented in a variety of community and clinic settings. The commentary by Ralph DiClemente emphasizes how PRECEDE-PROCEDE provides a "blueprint" for systematically drawing investigators' attention to the multiple individual, social, and environmental factors that influence oral health behavior (16). Russell Glasgow notes the importance of integrating the activities used to identify factors at each step, and to have information gained and the related actions reinforce one another, as well as to involve all stakeholders in the entire planning process (17). Lisa Onken briefly describes the Stage Model as an alternative planning approach for guiding the development of innovative, efficacious, and sustainable oral health behavioral and social interventions (18).

The second article by Kay Bartholomew and Patricia Dolan Mullen (19) describes five ways in which health behavior theory is essential to behavioral and social intervention research. The authors suggest that theory identifies the behaviors that are relevant to a particular health problem, describes the causal relationships between these behaviors, identifies the ways behavior change should be made, clarifies how successful behavior change should be assessed, and highlights what methods and data should be reported from the intervention trial. The authors use a framework called Intervention Mapping to ensure that interventions draw from all available relevant studies to maximize the public health impact of interventions being developed. Commentators suggest ways to further enrich this framework. Henrietta Logan emphasizes how a broad theoretical understanding of oral health problems is needed to comprehensively elucidate the many pathways through which behavior change occurs, instead of taking a too narrow focus that excludes "invisible" populations and increases health disparities (20). Donald Chi reminds us that while theory is crucial in guiding intervention development and empirical evidence of effectiveness, practitioners and their experiences using interventions can develop theory that can be used to conceive of new interventions or refine existing ones (21). A bi-directional process might best build the behavioral theoretical foundation of the oral health field and provide, as commented by Sarah Kobrin, more coherence in understanding how to intervene within the interplay of behavioral and social factors to create positive change (22).

The third article by David MacKinnon and Linda Luecken (23) gives a step-by-step tutorial for conducting mediation analyses in behavioral and social intervention research. Mediation analyses can be viewed as the statistical representation of an investigator's health behavior theory. In other words, health behavior theory should specify the hypothesized important behaviors, how they are related to one another, and what sort of outcome is expected from a particular intervention. Mediation analyses are not meaningful without theory, and theory cannot be tested without mediation analyses. In addition to theory-testing for the sake of knowledge-building, the purpose of mediation analyses is to understand the active ingredients or mechanisms of action within behavioral and social interventions, and to fully explore the nuanced ways in which interventions produce outcomes. In the commentaries, James Sheppard expands upon these points using a hypothetical example of an intervention designed to increase flossing (24). Alexander Rothman notes how understanding mediators may be especially important when efficacious interventions begin to move from controlled settings to diverse community ones, in which the interventions' effectiveness may vary depending on the implementation situation and targeted population (25). Mark Litt underscores the need for investigators to measure potential mediators in the first place and how promoting mediation analyses in behavioral and social intervention investigations would be a minor revolution in the oral health field (26).

The fourth article by Belinda Borrelli (27) describes methods for ensuring that a behavioral intervention is delivered as intended, i.e., with fidelity. As the article states, theory is also crucial in establishing fidelity procedures. Theory specifies the essential elements of the behavioral or social intervention and also the potential mediators and moderators of the intervention. These essential elements become the aspects of fidelity that are most important to monitor, and allow for confidence that the essential elements were delivered as intended. Susan Czajkowski remarks that Dr. Borelli's model of fidelity a) brings more focus to the often neglected areas of the extent to which participants receive and make use of the essential intervention elements, and b) how future funding initiatives should require investigators to explicate their methods for monitoring and maintaining fidelity (28). Barbara Campbell and James Neff both note that when interventions move from efficacy (controlled conditions) to effectiveness (real-life conditions) testing, establishing procedures to maintain the fidelity of interventions becomes challenging. Nonetheless, they argue that the diverse samples of providers and participants offer unique opportunities to study practice-level variables that influence fidelity and the

relationship of these multiple factors to intervention outcomes (29,30).

Another essential element of psychosocial intervention research is ensuring that the intervention is acceptable to the target population and to the target interventionists. The fifth article by Guadalupe Ayala and John Elder (31) describes qualitative methods for ensuring the acceptability of behavioral and social interventions, including conducting interviews and focus groups. The article also describes the importance of developing appropriate and acceptable measures for the target population, highlighting methods for ensuring that the reading level and clarity of measures is appropriate for the intended participants. The article introduces the idea that there may be tension between interventions suggested by theory and interventions considered acceptable to the target population and interventionists. Mediation analyses that identify the active ingredients of behavioral and social interventions may help to resolve this tension, distinguishing the aspects of interventions that are essential from aspects of interventions that can be tailored for the target participants. Helen Meissner and Daniel McNeil expand the discussion by advocating for mixed methods in which qualitative methods are used together with quantitative ones. This approach could provide insights about oral health and disease that go beyond what any one approach might offer, and increase the chance that the public will accept and use the interventions (32,33). Amid Ismail cautions that investigators also include acceptability analyses of the final intervention rather than only during the intervention's development, and to be careful not to conduct acceptability research in a manner biased to simply tell researchers what they want to hear (34).

Once an acceptable behavioral or social intervention is developed, and after demonstrated efficacy in a compelling clinical trial, a logical next step for researchers is implementing the intervention in new settings. The sixth article by Dwayne Simpson (35) describes a model for implementing evidence-based interventions, taking into account preparation needed at the organization level, training required for interventionists, factors that facilitate adoption and implementation of the intervention, and how to create long-term practice improvements. Implementation research from other health fields, and especially addiction treatment, highlights important aspects of implementation. In their commentaries, Jane Weintraub and Catherine Demko recommend expanding Simpson's model to include a broader public health perspective (e.g., conditions in the larger system) and more consideration of consumer needs, community input, and strategies for maintaining new dental practices using change management processes (36,37). David Chambers further highlights the challenges of studying intervention sustainability by noting the lack of consensus about appropriate definitions of sustainability (e.g., level of intervention fidelity), timeframes for determining if sustainability has occurred, and methods to capture improvements made to the evidence-based practices over time (38). More research on dissemination and implementation, including sustainability, is needed in the oral health field.

The final article by Joan O'Connell and Susan Griffin (39) provides a primer on how to conduct cost analyses in behavioral and social intervention research. Not surprisingly, the costs of interventions, and assumptions about reasonable cost-benefit ratios, are an important consideration in implementing and sustaining interventions. Richard Manski comments how the perspective taken (individual patients with and without insurance, community or society), metric used (dollar value, quality-adjusted life year, averted caries, tooth years gained), and opportunity costs all affect the determination and meaning of cost analyses (40). Tackling the complex landscape of costs requires a specific expertise, often associated with health economics, and not frequently included in the curricula of behavioral and social intervention researchers. Merging these areas of expertise may be an important step toward developing efficacious and cost-effective behavioral and social interventions to improve oral health. Sarah Duffy advocates that the oral health field is in the unique position to capitalize on the advances made in economic evaluations within other disciplines and to use more standardized methods across studies. This approach would allow for more efficient comparison of findings and well-reasoned decisions about which behavioral and social interventions best meet the oral health needs of society (41).

The special issue concludes with a discussion of how each of the topics addressed in the issue inform the NIDCR behavioral and social intervention research program (42). A conceptual framework is presented that integrates the six topics in this special issue: following an intervention planning model, appropriate use of health behavior theory, conducting mechanisms of action analyses, monitoring fidelity, ensuring acceptability, working toward intervention sustainability, and building economic analyses into intervention studies. The conceptual framework also acknowledges that the relative emphasis on each of these research activities will vary by the stage of intervention development research being conducted.

Concluding comments

Oral health and disease involves the interplay of complex processes, including many behavioral and social factors. It is incumbent upon the oral health field to understand these factors and develop high-quality, empirically supported interventions that address them to improve the oral health of the nation. This special issue is meant to serve as a primary resource for the oral health research community, as well as for researchers in other health fields, to foster more movement in

this direction. The articles within this issue provide many conceptual and methodological tools needed to develop, test, and deliver potent psychosocial oral health interventions to diverse communities and special populations. Moreover, by engaging in this type of research and collaborating with behavioral and social science experts from other disciplines, oral health investigators will raise the quality and relevance of oral health research and be poised to uniquely contribute to the knowledge base about behavior and social change.

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Conflict of interest

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