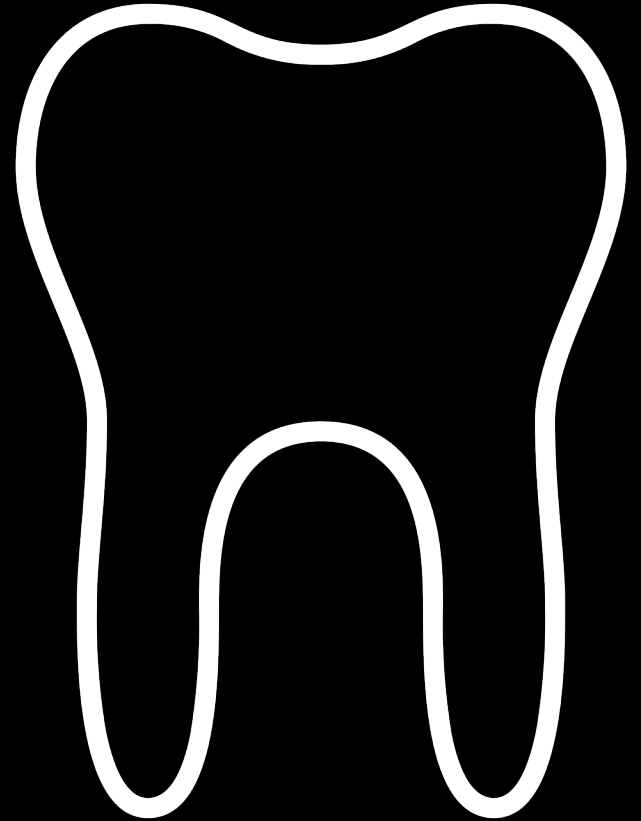
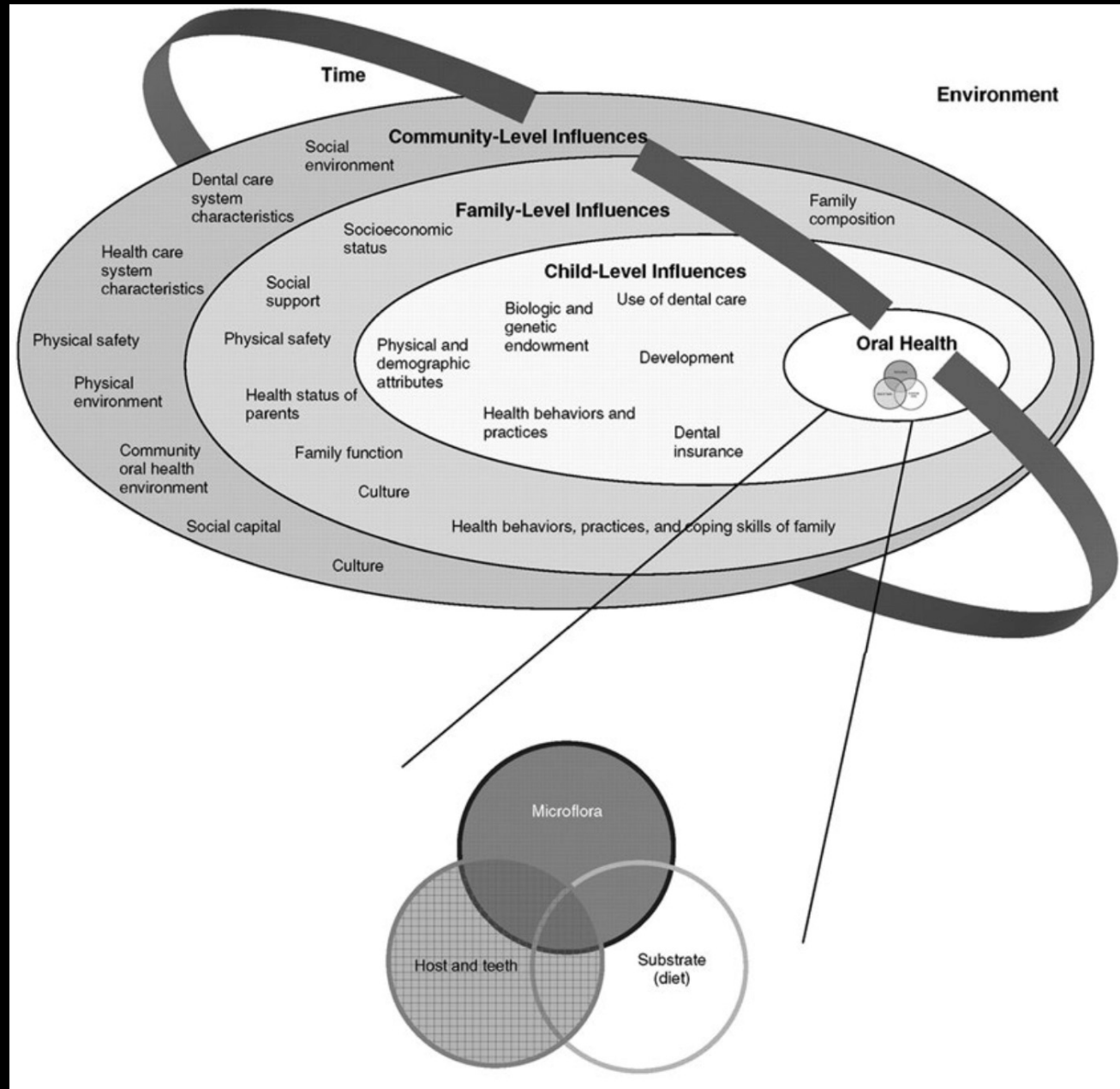


Improving Dentistry with Behavioral Science

The Case of Implementation Research
to Translate Evidence to Practice







Understanding dental caries as a non-communicable disease

Nigel B. Pitts,¹ Svante Twetman,^{*2} Julian Fisher³ and Philip D. Marsh⁴

Key points

Advances in the understanding of microbiome and the caries process for re-evaluation of caries prevention management.

 Frontiers in Oral Health

TYPE Review
PUBLISHED 24 August 2022
DOI 10.3389/froh.2022.764479

Abstract

The recent developments the subsequent behaviour understanding the humar balancing protective and risk factors to maintain a the frequent consumptior microorganism. Further, tl disease (NCD), which is vit shares similar risk factors v common prevention strat preventing and controllin levels and these activities

 Check for updates

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Understanding dental caries as a non-communicable and behavioral disease: Management implications

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New paradigms in caries conceptualization have emerged during the last decades, leading to intense debate and discussion on how to approach the disease, both from a preventive and a therapeutic perspective. Among many new ideas, research discoveries and technologies, one major concept can be highlighted that created a deep frontier between the old and the new paradigm in caries conceptualization; the non-communicable nature of the disease, firmly associated with behaviors and lifestyles. This article synthesizes the conceptual construction of dental caries as a non-communicable disease (NCD) based on the current evidence and discusses the appropriate management of the disease in this context. Dental caries has shifted from being considered transmissible and infectious to an ecological and non-communicable disease. Environmental factors such as frequent sugars intake, disrupt the symbiosis of the dental biofilm leading to a dysbiosis, which favors caries lesion initiation and progression. As an NCD, dental caries shares characteristics with other NCDs such as cardiovascular and chronic respiratory diseases, cancer and diabetes, including long duration and slow progression, not being transmissible from person-to-person, being strongly related to modifiable behavioral risk factors, and affecting preferentially disadvantaged

Community Dental Health (2019) 36, 3–4



Editorial

‘No simple solutions, no single ingredient’: Systems-orientated approaches for addressing Wicked Problems in population oral health

Sarah R Baker

Unit of Oral Health, Dentistry and Society, School of Clinical Dentistry, University of Sheffield, UK

A *Wicked Problem* is a problem that is impossible or difficult to solve partly because of its multi-component nature and its interconnection with other problems (Rittel & Webber, 1973). There are many *Wicked Problems* in the field of population of biology (destruction of physical environment (availability of sugar sweetened food services); a function of oral hygiene and sugar consumption habits, visiting the dentist use of fluoride, dental education, tax on sugar, dental payment systems decay) therefore involve occurs in a vacuum. Ther studying them in a vacuum we continue to do so. We gradients in tooth decay occupation (socio-economic changes in tooth decay or individual risk factors (‘experience’). These tradit disease causation in the environment are reduced will not be sufficient for a & Gibson, 2014). Complex interdependent influences Systems science em Stamatakis, 2012; Mabry focusing solely on the big to predict the progression approach would seek to attitudinal, demographic, age points for intervention Systems science approach approaches as they are

EDITORIAL

The wicked problem of the oral health care system

The structure of the oral health system in the United States and globally has created sustained inequities and disease burden stemming from largely preventable diseases.¹ Those higher risk for oral diseases face challenges in accessing and affording care.^{2,3} Social determinants of health have significant impacts on outcomes.¹ Dentistry is siloed from overall healthcare, even though the oral/systemic connection is well documented.^{4–10} Providers are compensated based on procedures (fee-for-service) rather than outcomes,¹¹ in spite of evidence that alternative payment models can both reduce costs and improve access.¹² Workforce challenges also persist, with dentistry by and large not utilizing the same extended workforce model as medicine.¹¹ The oral health system was not engineered with purpose, and has resulted in a patch-work landscape which is no longer a good fit for the need.¹¹ The system’s purchasers – be it government, business, families, or individual consumers – continuously invest in this patchwork system of care. Thus, addressing the oral health system is a wicked problem.¹³

The overall concept of a wicked problem was articulated by Rittel and Webber in 1973.¹⁴ A wicked problem is one that has numerous and complex causes, is difficult to describe, has multiple players or stakeholders, is interconnected with other problems, and is tough to solve – and may in fact not have a right answer.¹⁵ There are several characteristics of our oral health system that are in concordance with a wicked problem.^{15,16,16}

- There is no definitive description of the problem or its root causes – stakeholders have differing views on the problem and its causes depending on their unique perspectives.
- The problem can be a symptom of another problem – social determinants of health, incentivizing volume of care rather than value, affordability of care, and healthcare system reform represent individual wicked problems that influence oral health care.^{16–18}
- Wicked problems have no stop date.^{16–18}
- Completely solving a wicked problem is also not possible.

and dependent on multiple influencers.¹³ There is not one solution to the problem,¹³ but there are multiple approaches that collectively can help move in a positive direction and provide hope. One such approach involves integrating oral health care with the wider healthcare system and incentivizing optimal health outcomes.¹¹ This approach can be described as value-based care.

Value-based care is typically defined as a reimbursement model in which providers are incentivized based on patient health outcomes, with value described as improved quality at lower costs.¹⁹ However, although reimbursement presents one opportunity, this alone does not encompass the complexity needed to fully achieve a value-based approach to health care. Three areas of transformation, acting individually or synergistically, advance value-based care in support of true health systems change.

- **Care transformation:** The provision of care transitions from a siloed model toward a whole-health approach based on an integrated *interprofessional* transformed healthcare system engages patients through health promotion and improved outcomes, with a focus on disease prevention, and has a concerted effort to address health inequities and social determinants of health. This transformation includes strategies to reduce clinical variation, increase quality, improve cost savings, and enable patients to live healthier lives in an evidence-based way.
- **Data and analytic transformation:** Health IT systems sharing of electronic health records across disciplines and providers to coordinate care. A data and analytic platform also
- **Payment and transformation:**

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Understanding dental caries as a non-communicable disease

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Key points

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frontiers | Frontiers in Oral Health

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Oral Health in America



Advances and Challenges



Und
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not being transmissible from person-to-person, being strongly related to modifiable behavioral risk factors, and affecting preferentially disadvantaged

Health (2019) 36, 3-4

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Multiple solutions, no single ingredient': Systems-based approaches for addressing Wicked Problems

Dentistry and Society, School of Clinical Dentistry, University of Sheffield, UK

It is impossible or difficult to solve a problem because of its component nature and its interactions with other problems (Rittel & Webber, 1973) — in this way they can explore dynamic non-linear processes including emergence, feedback and adaptation related to oral

EDITORIAL

The wicked problem of the oral health care system

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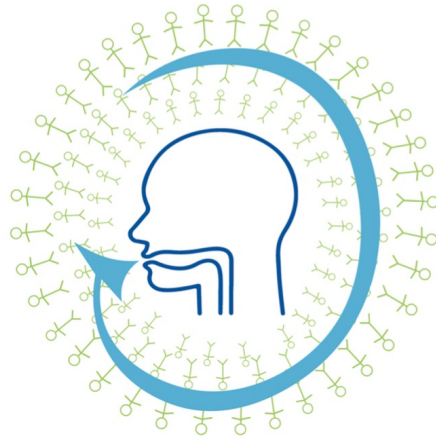
The structure of the oral health system in the United States has created sustained inequities and disease stemming from largely preventable and disease risk for oral diseases face challenges in affording care.^{2,3} Social determinants of significant impacts on outcomes.¹ Dentistry is well documented.⁴⁻¹⁰ Providers are based on procedures (fee-for-service) rather than in spite of evidence that alternative pay- models both reduce costs and improve access.¹² Challenges also persist, with dentistry by and through the same extended workforce model as oral health system was not engineered a good fit for the need.¹¹ The system's government, business, families, or individuals continuously invest in this patchwork addressing the oral health system is a

and dependent on multiple influencers.¹³ There is not one solution to the problem,¹³ but there are multiple approaches that collectively can help movement in a positive direction and provide hope. One such approach involves integrating oral health care with the wider healthcare system and incentivizing optimal health outcomes.¹¹ This approach can be described as value-based care.

Value-based care is typically defined as a reimbursement model in which providers are incentivized as a reimbursement health outcomes, with value defined as reimbursement at lower costs.¹⁹ However, although reimbursement presents one opportunity, this alone does not encompass the complexity needed to fully achieve a value-based approach to health care. Three areas of transformation, acting individually or synergistically, advance value-based care in support of true health systems change.

- **Care transformation:** The provision of care transitions from a siloed model toward a whole-health approach based on an integrated *interprofessional* practice model that leverages a health home.^{19,20} A transformed healthcare system engages patients through health promotion and improved outcomes, with a focus on disease prevention, and has a concerted effort to address health inequities and social determinants of health. This transformation includes strategies to reduce clinical variation, increase quality, improve cost savings, and enable patients to live healthier lives in an evidence-based way.
- **Data and analytic transformation:** Health IT systems need to be interoperable and coordinated to allow sharing of electronic health records across all disciplines and providers to coordinate care. A data and analytic platform also is needed.
- **Payment transformation:** Payment models need to be redesigned to support value-based care. A wicked problem was articulated in 1973.¹⁴ A wicked problem is one with complex causes, is difficult to solve, and is tough to solve — there is no right answer.¹⁵ There are many oral health system that are in problem.^{15,16,16}

Description of the problem or its causes may differ depending on their unique perspective of another problem — incentivizing volume of care, and, to represent individual wicked problems, is difficult to solve — completely solve it.¹⁶⁻¹⁸



BEHAVIORAL AND SOCIAL ORAL HEALTH SCIENCES SUMMIT

October 29-30, 2020 // Hosted virtually

VISION

Promote oral health globally by
advancing the robust application of
behavioral and social sciences

MISSION

Maximize the impact of behavioral
and social sciences for the
promotion of oral health by
building consensus among health
scientists and clinicians about
essential foci, identifying critical
next steps, and fostering
transdisciplinary collaboration

Consensus Statement on Future Directions for the Behavioral and Social Sciences in Oral Health

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D.W. McNeil¹* , **C.L. Randall²*** , **S. Baker³**, **B. Borrelli⁴**, **J.M. Burgette⁵**, **B. Gibson³** , **L.J. Heaton²**, **G. Kitsaras⁶** , **C. McGrath⁷**, and **J.T. Newton⁸**

Abstract

The behavioral and social sciences are central to understanding and addressing oral and craniofacial health, diseases, and conditions. With both basic and applied approaches, behavioral and social sciences are relevant to every discipline in dentistry and all dental, oral, and craniofacial sciences, as well as oral health promotion programs and health care delivery. Key to understanding multilevel, interacting influences on oral health behavior and outcomes, the behavioral and social sciences focus on individuals, families, groups, cultures, systems, societies, regions, and nations. Uniquely positioned to highlight the importance of racial, cultural, and other equity in oral health, the behavioral and social sciences necessitate a focus on both individuals and groups, societal reactions to them related to power, and environmental and other contextual factors. Presented here is a consensus statement that was produced through an iterative feedback process. The statement reflects the current state of knowledge in the behavioral and social oral health sciences and identifies future directions for the field, focusing on 4 key areas: behavioral and social theories and mechanisms related to oral health, use of multiple and novel methodologies in social and behavioral research and practice related to oral health, development and testing of behavioral and social interventions to promote oral health, and dissemination and implementation research for oral health. This statement was endorsed by over 400 individuals and groups from around the world and representing numerous disciplines in oral health and the behavioral and social sciences. Having reached consensus, action is needed to advance and further integrate and translate behavioral and social sciences into oral health research, oral health promotion and health care, and the training of those working to ensure oral health for all.

Keywords: behavioral science, social determinants, psychosocial factors, dental public health, health services research, psychology



1. behavioral and social theories and mechanisms related to oral health
2. use of multiple and novel methodologies in social and behavioral research and practice related to oral health
3. development and testing of behavioral and social interventions to promote oral health
4. dissemination and implementation research for oral health

Transdisciplinary Research: The Virtuous Cycle of Research Translation to Improve Oral Health

E.C. Reynolds¹

Keywords: risk factor(s), fluoride(s), social determinants, caries, behavioral science, COVID-19

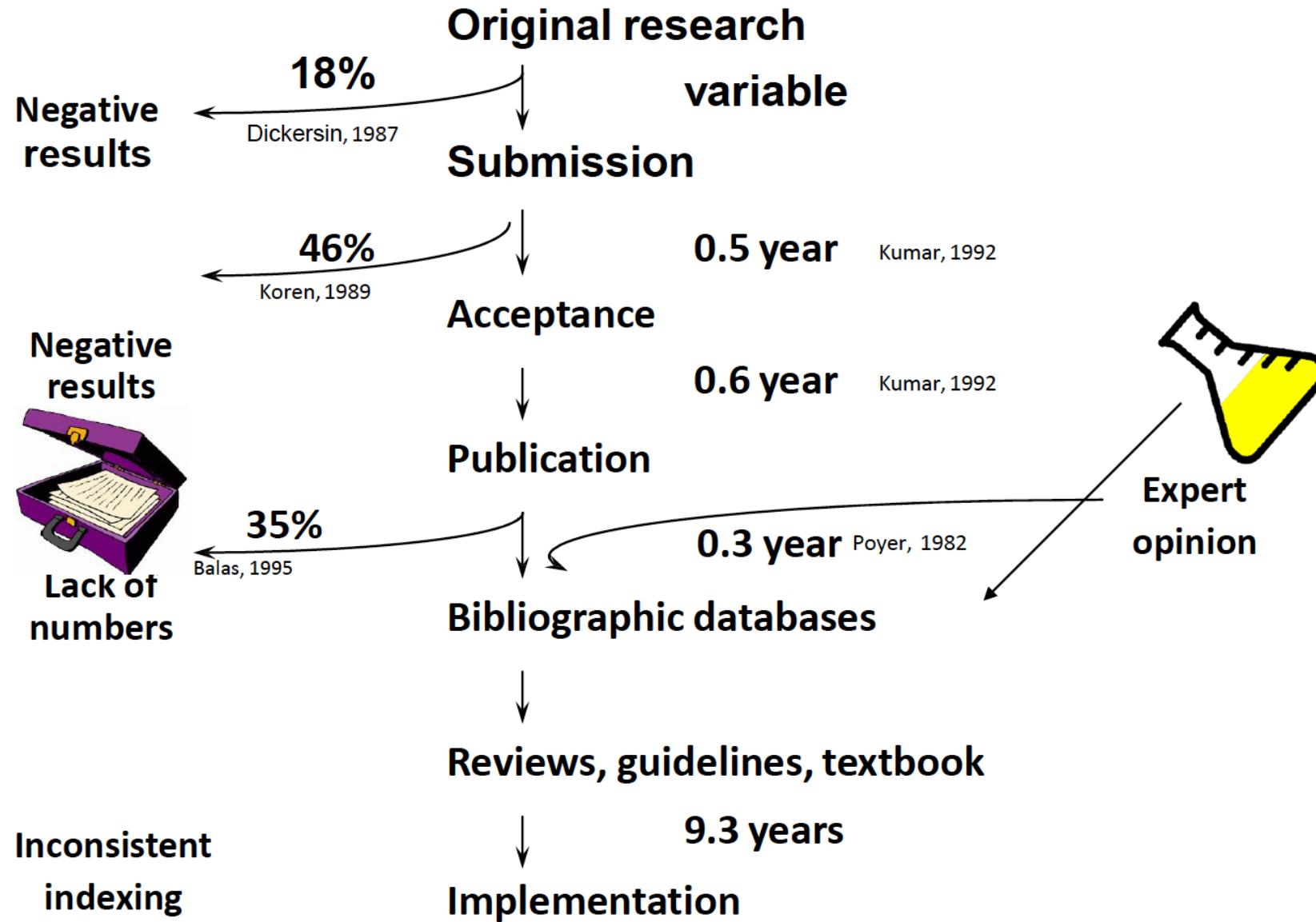
A consensus statement on the future directions for the behavioral and social sciences in oral health is published in this issue of the journal (McNeil et al. 2022). The consensus statement is a product of a behavioral and social oral health sciences summit sponsored by the Behavioral, Epidemiologic and Health Services Research scientific group of the International Association for Dental Research (IADR). A major aim of the summit was to establish consensus about how to advance behavioral and social sciences research to improve oral health. All members of the IADR's Behavioral, Epidemiologic and Health Services Research group and other summit attendees and relevant stakeholders were given the opportunity to provide feedback, and more than 400 groups and individuals have endorsed the statement. The statement concludes that multi- and transdisciplinary collaborative and integrative research is critically required to achieve the aims of the consensus statement to improve oral health. The aim of this perspective article is to discuss the important role of transdisciplinary research in research translation, to show how it can form a virtuous cycle of continuous improvement, and to highlight the pivotal role of the IADR in facilitating this virtuous cycle. In this context the term *transdisciplinary research* is used to describe research that crosses disciplinary boundaries to create a holistic approach to research translation. A virtuous cycle is a recurring cycle of steps where each step/cycle can reinforce the previous one in a positive feedback loop of continuous improvement. This virtuous cycle of research translation is shown in the Figure. Epidemiologic, behavioral, and social sciences and/or basic science is often involved in making the original association or discovery. The behavioral and social sciences are also critical in the social, legal, and ethical considerations and behavioral aspects of knowledge, attitudes, and action in the implementation of the research to have the best impact at the population or patient level. Epidemiologic, clinical, and behavioral and social sciences are then again required to evaluate the implementation, intervention, and so on, in a virtuous cycle of improvement. Hence the behavioral and social sciences are integral to transdisciplinary research and can have an important role in each step of the virtuous cycle of research translation. There are two related but clearly different virtuous cycles of research translation in dental, oral, and craniofacial research and other health research (Zhang et al. 2016; Akarowhe 2019). One is a patient-centered clinical pathway of a basic science

discovery leading to the development of a new dental material or pharmaceutical intervention and/or a clinical procedure or advance in the development of a new clinical procedure or approach. The new material, drug, or clinical procedure is then tested in multicenter clinical trials and then approved, incorporated into oral health care policy and clinical practice protocols, and used to treat a particular patient population (Zarbin 2020). In this virtuous cycle, dissemination and implementation science, a discipline within the behavioral and clinical sciences, significantly contribute to the implementation and clinical practice step. The second virtuous cycle of research translation is a population-centered preventive pathway, which is used to improve oral health at the population level. This pathway usually starts with epidemiologic research identifying risk factors for disease (e.g., smoking, free sugars) or environmental and protective factors (e.g., fluoride) associated with health (health promoters). Preventive measures to reduce the risk factors and implement the health promoters can then be properly tested in randomized field trials, if appropriate or feasible. However, implementation of these preventive measures and interventions for oral health requires a detailed understanding of the population-level preventive systems, oral health education and behavior modification, and oral health economics, as well as social determinants of oral health, oral health education and regulatory, legal, and ethical considerations. This understanding can come about only through behavioral and social scientific input to effect knowledge transfer and influence public oral health policy for the successful implementation of the preventive strategy to improve oral health at the population level. The population-centered virtuous cycle has traditionally turned around relatively slowly from the identification of risk factors to the implementation of successful preventive programs to improve health at the population level. An example of this slow turnaround is the identification of cigarette smoking as a risk factor for cancer and the slow implementation

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“the behavioral and social sciences are integral to transdisciplinary research and can have an important role in each step of the virtuous cycle of research translation”



“PUBLICATION PATHWAY”

17 years

140%

dissemination and implementation science

Randall, C. L. (2023). Dissemination and implementation research for oral and craniofacial health: Background, a review of literature and future directions. *Community Dentistry and Oral Epidemiology*.

EVIDENCE

What evidence-based practice are you wanting to translate? Is it worth translating?

AUDIENCE

Who is the group(s) targeted for behavior change? Who else is affected? Who has the power to enact change?

the
D&I
plan

TRANSLATION

How can you frame your intervention so it speaks to the needs of your audience? Have you addressed potential barriers? Have you leveraged potential facilitators?

ENGAGEMENT

What are the knowledge, attitudes, beliefs, and norms of your audience?

pain >>>

distress

lengthier procedures

difficulty with behavior guidance

provider reluctance to treat children

the strongest predictor of child-onset dental anxiety is
pain

(Carter et al., 2014; Locker et al., 1999; McNeil & Randall, 2014; Seligman et al., 2017; Shim et al., 2015)

AMERICAN ACADEMY OF PEDIATRICS

Committee on Psychosocial Aspects of Child and Family Health

AMERICAN PAIN SOCIETY

Task Force on Pain in Infants, Children, and Adolescents

The Assessment and Management of Acute Pain in Infants, Children, and Adolescents

ABSTRACT. Acute pain is one of the most common adverse stimuli experienced by children, occurring as a result of injury, illness, and necessary medical procedures. It is associated with increased autonomic symptoms, and increased distress. In spite of the magnitude of effective analgesia, a child, it is often under-treated. Numerous studies have given...

and address chronic pain, and pain assessment. American Academy of Pediatric Pain Society leaders recommend...

Guideline Statement

Management of procedure-related pain in children and adolescents

Paediatrics & Child Health Division, The Royal Australasian College of Physicians

Policy on Pediatric Dental Pain Management

Latest Revision 2022

Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that children vary greatly in their cognitive and emotional development, medical conditions, and responses to pain and interventions. This policy is not intended to provide clinical recommendations, which can be found in AAPD's best practice on pain management¹; rather, the purpose of this document is to support efforts to prevent or alleviate pediatric pain and complications from pain medications. Infants, children, adolescents, and those with special health care needs can and do experience pain; dental-related pain in most patients can be prevented or substantially relieved. The AAPD further recognizes many therapeutics are available to treat pain with varying regimens. Recent concerns have developed about toxicities associated with codeine and the adverse effects of opioid analgesics.

Methods

This policy was developed by the Council on Clinical Affairs, adopted in 2012², and last revised in 2017³. This document is an update of the previous version and is based on a review of current dental and medical literature pertaining to pediatric pain management, pediatric dental pain management, pediatric analgesic overdose; fields: all; limits: within the last ten years, humans, all children zero to 18 years, clinical trials, and literature reviews. The search strategy includes articles, when data did not appear in the literature, a comprehensive, inclusive, information including expert and/or consensus and clinical...

How to Cite:

American Academy of Pediatric Dentistry. Policy on pediatric dental pain management. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022:139-41.

- Ensure that all procedures undertaken are necessary that is, the benefit outweighs any negative impact caused by the procedure.
- That all procedures are carried out in order to maximize the child's comfort in a child friendly environment, away from the dental office.
- The procedure has appropriate analgesia administered by someone other than the dental professional.
- Pharmacological and non-pharmacological approaches to manage pain and anxiety.²²
- Increases distress but too much sedation increases anxiety. Time required for the procedure is increased.
- Anticipatory anxiety is premedicated with this executive summary.
- Maximize the intervention to the first procedure (e.g., general anesthesia).

BEST PRACTICES: PAIN MANAGEMENT

Pain Management in Infants, Children, Adolescents, and Individuals with Special Health Care Needs

How to Cite: American Academy of Pediatric Dentistry. Pain management in infants, children, adolescents, and individuals with special health care needs. The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2022:392-400.

Revised 2022

Abstract

This statement provides dentists and stakeholders with current best practices for pediatric pain management. Infants, children, adolescents, and individuals with special health care needs may experience pain resulting from dental/orofacial injury, infection, and dental procedures. Dental pain is an inflammatory condition that can be categorized as somatic (i.e., periodontal, alveolar, mucosal) or visceral (i.e., pulpitis). Psychological consequences for patients. Inadequate pain management may lead to significant physical and psychological consequences for patients. Perioperative pain management approaches include pre-emptive pain management (e.g., acetaminophen and nonsteroidal anti-inflammatory drugs, distraction and imagery (e.g., counting, video games), and pharmacologic control agents including non-opioid analgesics (e.g., acetaminophen and nonsteroidal anti-inflammatory drugs) and opioid analgesics. Acetaminophen and nonsteroidal anti-inflammatory medications are first line pharmacologic therapies for pain management. Opioid analgesics for pediatric dental patients should be rare, and steps to mitigate opioid misuse are discussed.

This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Council on Clinical Affairs to offer updated information and guidance on pain management in infants, children, adolescents, and individuals with special health care needs.

KEYWORDS: PAIN MANAGEMENT; ACUTE PAIN; CHRONIC PAIN; POSTOPERATIVE; FACIAL PAIN; TOOTHACHE

Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that children, adolescents, and individuals with special health care needs can and do experience pain and dental procedures, which can have significant psychological and physical consequences. The purpose of this document is to provide information and guidance on pain management in infants, children, adolescents, and individuals with special health care needs. This document is intended to support efforts to prevent or alleviate pediatric pain and complications from pain medications. Infants, children, adolescents, and those with special health care needs can and do experience pain; dental-related pain in most patients can be prevented or substantially relieved. The AAPD further recognizes many therapeutics are available to treat pain with varying regimens. Recent concerns have developed about toxicities associated with codeine and the adverse effects of opioid analgesics.

survey of chairs and directors

methods

- cross-sectional survey administered online
- eligibility: US pediatric dentistry department chair or residency director
- analytic approach: descriptive statistics and inductive analysis

survey of chairs and directors

results: participants

- n=41 (62%) chairs, n=61 (64%) directors
- board certified: 88% of chairs, 98% of directors
- years in academic dentistry
 - chairs: $M=21.4$ ($SD=11.5$)
 - directors: $M=15.4$ ($SD=10.3$)
- years in current role
 - chairs: $M=7.1$ ($SD=5.7$)
 - directors: $M=6.5$ ($SD=6.1$)

survey of chairs and directors

results: approaches and tools taught

Approaches	Predoctoral (%)	Residency (%)
Clinical judgement	95	100
Child-rated	93	98
Parent-rated	56	77
Behavioral coding	41	48
Physiologic (e.g., heart rate)	15	36

- tools

- predoctoral: Wong-Baker (56%), NRS (39%), VAS (27%)
- residency: Wong-Baker (80%), NRS (72%), VAS (33%)

survey of chairs and directors

results: barriers

- predoctoral

- lack of curriculum time
- few clinical opportunities
- lack of faculty expertise and calibration

- residency

- lack of time for instruction and clinical use
- limited faculty observation/enforcement
- lack of faculty calibration

survey of chairs and directors

results: facilitators

- predoctoral
 - student clinical experience
 - Availability of scripts and demonstration materials
 - interdepartmental collaboration
- residency
 - clinical experience
 - direct observation by faculty
 - clear institutional guidelines

so, where to from here?

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