

This is a pre-copyedited, author-produced PDF of an article accepted for publication in *Community Dentistry and Oral Epidemiology* following peer review. The definitive publisher-authenticated version [Sbaraini A, Carter SM, Evans RW, Blinkhorn A. How do dentists and their teams incorporate evidence about preventive care? An empirical study. *Community Dentistry and Oral Epidemiology*. Article first published online: 28 JAN 2013 | DOI: 10.1111/cdoe.12033] is available online at <http://onlinelibrary.wiley.com/doi/10.1111/cdoe.12033/abstract>

## How do dentists and their teams incorporate evidence about preventive care? An empirical study

Sbaraini A, Carter SM, Evans RW, Blinkhorn A. (2013)

### Abstract

**Objectives:** To identify how dentists and their teams adopt evidence-based preventive care.

**Methods:** A qualitative study using grounded theory methodology was conducted. We interviewed 23 participants working in eight dental practices about their experience and work processes, while adopting evidence-based preventive care. During the study, Charmaz's grounded theory methodology was employed to examine the social process of adopting preventive dental care in dental practices. Charmaz's iteration of the constant comparative method was used during the data analysis. This involved coding of interview transcripts, detailed memo-writing and drawing diagrams. The transcripts were analysed as soon as possible after each round of interviews in each dental practice. Coding was conducted primarily by AS, supported by team meetings and discussions when researchers compared their interpretations.

**Results:** Participants engaged in a slow process of adapting evidence-based protocols and guidelines to the existing logistics of the practices. This process was influenced by practical, philosophical, and historical aspects of dental care, and a range of barriers and facilitators. In particular, dentists spoke spontaneously about two deeply held 'rules' underpinning continued restorative treatment, which acted as barriers to provide preventive care: (i) dentists believed that some patients were too 'unreliable' to benefit from prevention; and (ii) dentists believed that patients thought that only tangible restorative treatment offered 'value for money'. During the adaptation process, some dentists and teams transitioned from their initial state – selling restorative care – through an intermediary stage – learning by doing and educating patients about the importance of preventive care – and finally to a stage where they were offering patients more than just restorative care. Resources were needed for the adaptation process to occur, including: the ability to maintain the financial viability of the practice, appropriate technology, time, and supportive dental team relationships.

**Conclusions:** The findings from this study show that with considerable effort, motivation and coordination, it is possible for dental practices to work against the dental 'mainstream' and implement prevention as their clinical norm. This study has shown that dental practice is not purely scientific, but it includes cultural, social, and economic resources that interfere with the provision of preventive care.

Evidence-based dentistry (EBD) is usually conceptualized as dentists making clinical decisions based on the integration of the best available research evidence, their clinical expertise and their patient's values and needs (1–4). Since the beginning of the EBD movement in the late 1980s many models and frameworks have been proposed for embedding EBD in dental practice (1–5).

Most researchers in this area have focused on the facilitators and barriers to implementing EBD in practice (6–17). The published research suggests that dentists are apprehensive and fear losing autonomy, which delays the adoption of EBD in practice (6, 8, 9, 13). Dentists claim that they lack time to seek out research evidence, and argue that this evidence does not provide clear answers to important clinical questions (2, 6, 8, 9, 12–14). Some studies have suggested that dentists' clinical performance does not change as a result of being provided with evidence-based knowledge (7, 15–17); others that evidence-based dental care is more likely to be adopted if already used by dentists' peers (10). These studies reveal some variables associated with adoption or non-adoption of evidence in dental practice. However, few have investigated how evidence-based protocols are implemented in dental practices or how dentists and their teams might experience that process.

In this study, we report on a study of dentists and their teams' uptake of evidence about preventive care in their practices, guided by two research questions:

- How do dentists and their teams incorporate evidence about preventive care into their practices?
- What happened during the process and how people interacted while adopting preventive care?

## Methods

### Background

This study was conducted in New South Wales (NSW), Australia, where more than 80% of dentists work in private general dental practices (18), general dentists provide the majority of care and dental hygienists are employed in only a minority of practices (19). The majority of dentists are independent self-employed practitioners; they own their practices and lead their dental team. Many begin their practicing careers as associate dentists in private dental practices being remunerated by salary or commission before taking on a solo enterprise or forming partnerships with other experienced dentists.

In Australia, most people pay for their own dental treatments or for the private health insurance that partly covers the cost of dental care (20). The majority of adults in NSW visit a private general dental practice for a check-up at least once a year on average (20). Most individuals visit the same private dental practitioner on a long-term basis (21). This study focused on dentists and dental team members working in private practices, that is, in a typical Australian clinical context.

This study was built on a previous Australian randomized controlled trial (RCT) (22). Intervention practices in the RCT were provided with the Caries Management System (CMS) evidence-based preventive protocols to guide their treatment of dental caries (23). During that RCT, the numbers of decayed, missing and filled teeth (DMFT) were monitored. As the RCT unfolded, we observed that practices in the intervention arm were not implementing the preventive protocols uniformly. We were intrigued by this and started to wonder why the implementation of an apparently standardized process was different in different practices. This was the starting point for this study. This study aimed to understand how the protocols used in the RCT had been implemented, including the conditions that led to variation in the process, and the consequences of this variation. This study reports on findings

from interviews with 10 dentists, two dental hygienists, nine dental assistants, and two practice managers from eight dental practices around NSW, Australia (Table 1).

**Table 1:** Characteristics of participants (n=23)

| Site              | Participants  | Previous RCT group | RCT: Randomised controlled trial |
|-------------------|---|--------------------|----------------------------------|
| Dental Practice 1 | 1 dentist, 2 dental hygienists, 5 dental assistants, 1 practice manager | Intervention       |                                  |
| Dental Practice 2 | 3 dentists, 4 dental assistants, 1 practice manager                     | Intervention       |                                  |
| Dental Practice 3 | 1 dentist   | Control            |                                  |
| Dental Practice 4 | 1 dentist   | Control            |                                  |
| Dental Practice 5 | 1 dentist   | Control            |                                  |
| Dental Practice 6 | 1 dentist   | Control            |                                  |
| Dental Practice 7 | 1 dentist   | Intervention       |                                  |
| Dental Practice 8 | 1 dentist   | Intervention       |                                  |

## Research design

In a previous article, we described our sampling, data collection, data analysis, and interpretation in detail (24). We employed Charmaz's grounded theory methodology (25) to examine the process of adopting evidence-based preventive care in dental practices and to understand how participants made sense of this process while interacting with each other. Charmaz's methodology suggests a systematically applied set of procedures to understand social processes, actions, and interactions between individuals (25). Charmaz's methodology led us to be interested in what it meant to dentists to practice dentistry in a certain way, how it felt to adopt new routines, what this process meant to participants, what happened during the process and how people interacted while adopting preventive care.

Grounded theory studies begin with open questions: researchers begin by assuming that they may know little about the meanings that drive the actions of their participants (25). Accordingly, we sought to learn from participants how the RCT process worked and how they made sense of it. We asked research questions that were open and focused on social processes.

The following were our initial research questions:

- What was the process of implementing (or not implementing) the CMS protocols (from the perspective of dentists, members of dental team, and patients)?
- How did this process vary?

These questions were slightly altered during the course of the study, as we will discuss below. Charmaz's grounded theory methodology (25) assisted us to develop a detailed model of the process of adapting preventive protocols into dental practice, and to analyse variation in this process in different dental practices.

## Ethics approval and ethical issues

Initial ethics approval was obtained from the Human Research Ethics Committee at the University of Sydney. Appropriate to grounded theory procedures, our methods evolved during the study, and each evolution was approved via a modification application to the ethics committee. As in any ethical study,

we ensured that participation was voluntary that participants could withdraw at any time, and that confidentiality was protected. All responses were anonymized before analysis, and we took particular care not to reveal potentially identifying details of places, practices, or clinicians. Prior to being interviewed, all participants had the study explained to them and signed a consent form.

## **Sample**

All qualitative research starts with purposive sampling: sampling the participants best-placed to answer the research questions. In grounded theory, this is followed by theoretical sampling (25), in which constant analysis of the data guides further sampling decisions. Participants in the previous RCT (22) – 22 private dental practices in NSW – provided our population. We invited participants from this population, by letter, to participate in this qualitative study. Eight dental practices agreed to participate.

Interviews began with participants from Dental Practice 1, where substantial DMFT reductions were achieved in the RCT, providing the best possible access to the process of successfully implementing the protocols (24). After the analysis of the initial interviews, participants from Dental Practice 2 were theoretically sampled. In this practice, the uptake of the preventive protocols had been very limited according to data from the RCT trial (24). This strategy allowed comparisons between two practices in which outcomes had been different and considered to be a proxy for the degree to which the preventive protocols had been implemented. After analysing interviews from Dental Practice 2, participants from another six practices were recruited. This included two intervention practices that had achieved moderate DMFT reductions, for comparison with Dental Practices 1 and 2. It soon became apparent that some practices had followed, or continued to follow, other preventive protocols. In these practices, the interviewees compared their experiences in implementing the preventive protocols provided during the RCT with those of other protocols. Thus, professionals from four control practices in the RCT were sampled to examine the process of adopting preventive methods in general.

## **Interviews**

Participants were interviewed for approximately 1 h in locations convenient to them such as dental practices, community centres, or homes. Some preferred to be interviewed over the phone, when the same format was used as for face to face interviews. Sturges and Hanrahan (26) have reported that telephone interviews give the same in-depth data as face-to-face interviews. Semi-structured interviews were based on the research questions, were digitally recorded, professionally transcribed in detail, and the transcripts were checked against the recordings.

As the interview process was designed to gain an in-depth understanding of each participant's experience of adopting prevention in their practices, participants were encouraged to talk at length, to tell their story of using protocols or of learning to work preventively, and to explain what this process meant to them. For example, all interviews started with an invitation to describe a 'typical day' in the practice, and then progressed with specific questions about participants' experiences of implementing protocols such as, (i) 'how easily were you able to implement preventive protocols in this practice?' and (ii) 'what did this implementation process entail?' Participants from the control practices were asked similar questions about preventive protocols or guidelines they had applied. As the study progressed, our understanding about how protocols were adopted began to consolidate and we developed a theoretical framework to explain the process. New interview questions were added to further investigate insights developed during the analysis of transcripts from earlier interviews (24). We had the opportunity to contact the participants again to clarify concepts. All dentists were interviewed more than once, which contributed to the refinement of theoretical concepts.

## **Data analysis**

### ***Coding and the constant comparative method.***

Charmaz's iteration (25) of the constant comparative method was used during the data analysis. This involved coding of interview transcripts, detailed memo-writing and drawing diagrams. The transcripts were analysed as soon as possible after each round of interviews in each dental practice. All researchers saw detailed excerpts from the data and two worked together in the development of the early coding frameworks. Coding was conducted primarily by AS, supported by team meetings and discussions when researchers compared their interpretations.

Coding occurred in stages. In initial coding, we generated as many ideas as possible inductively from early data. In Charmaz's form of grounded theory, codes take the form of gerunds (verbs ending in 'ing') which emphasizes actions and processes. In focused coding, we pursued a selected set of central codes throughout the entire data set and the study. This required decisions about which initial codes were most prevalent or important, and which contributed most to the analysis. In theoretical coding, we refined the final categories and related them to one another (25).

### ***Memo-writing***

The primary analyst also wrote extensive memos which documented the development of the codes, what they meant, how they varied, and how they related to the raw data (transcripts). Two types of memos were written: case-based and conceptual memos (24). Case-based memos were written after each interview – containing the interviewer's impressions about the participants' experiences and the interviewer's reactions – memos were also used systematically to question some of our pre-existing ideas in relation to what had been said in the interview. Conceptual memos, on the other hand, were a form of (i) making sense of initial codes; (ii) examining participants' meanings; (iii) understanding processes, including when they occurred and changed and what their consequences were. In these memos, we compared data to find similarities and differences. Ideas were systematically indexed in memos. This process raised new questions, which were investigated in continuing interviews.

### ***Sample size and saturation***

Qualitative data collection aims to achieve saturation, a state determined by the data analyst. When analysts find that new interviews do not add new information to the analysis – that is, become repetitive with prior interviews – and that central concepts are fully understood, they determine that they have reached saturation (27). In this study, the last three participants (three dentists) interviewed confirmed our analysis rather than adding new concepts. We then ceased data collection because our understanding was well-supported by the existing data. It is considered unethical to continue recruiting after saturation, as the additional participants will not contribute significantly to the knowledge produced (27).

During the study, dental hygienists were employed in two dental practices, but only those from Dental Practice 1 agreed to participate. Despite that we were able to recruit 23 participants.

## **Methodological rigor**

A recent review highlighted the need to achieve 'depth of insight and methodological rigor in qualitative dental research' (28). Both were achieved during this study, in keeping with grounded theory procedures and general principles of qualitative research. Throughout the study, it was important to acknowledge that as researchers we had some pre-existing concepts in mind due to our academic backgrounds in dentistry and public health, although we deliberately remained open to what participants would tell us about their experiences. By carefully selecting participants and by modifying the questions asked during data collection, we filled gaps, clarified uncertainties, and tested our interpretations (24).

## Results

Dental practices in this study appeared to be more or less typical of Australian private practices. All dental practices were located in central areas in either major cities or towns in NSW. A previous publication has illustrated in detail the combined characteristics of all eight dental practices that participated in this study and provided a model of how dental practices come to be oriented toward either preventive or restorative care (29). This study presents a component of the analysis that contributed to that more abstract paper.

Each practice was owned by a dentist-in-charge, who was the leader of the dental team and oversaw all activities within the practice; all practices had dental assistants who ensured the smooth running of the practice by supporting and implementing the dentist's decisions; dental hygienists, practice managers, and additional dentists were employed sometimes, but not always. In the absence of a practice manager, the dentist-in-charge shared this task with an accountant. The combination of staff was less important to the outcome than the way in which members of the dental team were led and organized to adapt to prevention. We found that when dental hygienists were employed and given responsibility for oral hygiene instruction and preventive maintenance visits, they freed dentists to concentrate on more complex restorative work and made preventive care more sustainable. Despite participating in a previous RCT, the majority of participating dentists were not usually involved in research projects or dental faculties' activities. However, they did attend continuing education and practice management courses regularly, and some participated in community projects with a focus on oral health, so they may have been more open to prevention than a 'typical' private practice dentist.

The patients in the study had private dental insurance; they were used to visiting the dentist once to twice a year for check-up appointments and for restorative treatment when needed. They were not used to being treated by a dental hygienist. These practice and patient characteristics are similar to the Australian average, based on the results of The National Survey of Adult Oral Health 2004–06 NSW (20).

### Being preventively-oriented

At the beginning of this study our focus was on understanding the process of adopting the CMS protocols used in the previous RCT (22). However, we soon realized that dentists talked about how 'preventively-oriented' they were, independent of whether they were using the CMS protocols. Our focus rapidly moved from explaining the process of implementing the CMS protocols, to explaining the process of implementing preventive care in general. The concept of being 'preventively-oriented' was defined by dentists as 'putting patients first', while educating them about their mouths, the role of saliva, lifestyle issues (diet, smoking, alcohol consumption, and exercise) and about how patients could prevent and stop oral disease progression via oral hygiene and preventive products applied at home or by the dentist. Avoiding the unnecessary removal of tooth structure during a restorative procedure was also a prerequisite for being a 'preventively-oriented' dentist. Participants said that 'most dentists' were supportive of these practices:

*On the whole, most dentists are conscientious and put the patient first, which means you must practice preventively. At the end of the day, we probably gain monetary wise from performing restorations and more complex treatments, rather than preventively, because we are not paid for the time that we spend doing prevention. But, ethically and morally, we have to; and most dentists do. (Dentist)*

Although most dentists talked about themselves as being 'preventively-oriented', actual practice varied widely. Such practices included: (i) using the CMS or other preventive protocols; (ii) seeking out and using other, less formal, preventive guidelines – for example, from continuing education courses; and (iii) not using the CMS, other protocols or guidelines despite defining oneself as 'preventively-oriented'.

## The adaptation process: before, during and after

When dentists and their teams changed their practices in line with the CMS or another preventive protocol, they did not follow protocols slavishly. Rather, they adapted protocols to incorporate them into their established practice management systems. Dentists and their teams talked about the periods before, during and after this adaptation process (Table 2). They discussed the adaptation process itself, and the consequences of adaptation. We will first discuss participants who were able to change their established practice systems to become more preventive; we will later discuss reasons why some practices were not able to make such changes.

**Table 2:** The adaption process

| Before  | During   | After  |
|---|--|--|
| <i>Assessing patients and selling restorative treatment</i><br>Making money<br>Being too busy to adopt protocols<br>Spending unproductive time<br>Having a restorative background<br>Being focused on cutting cavities<br>Being slow to change<br>Being biased toward prevention<br>Not having a system for providing preventive care | <i>Learning by doing:</i> dentists and team members had to learn the protocol system to implement it<br><i>Educating patients:</i> about why oral hygiene and home care are important<br><i>Establishing new routines:</i> shifting of dental practice logistics, solving of scheduling issues<br><i>Barriers to adaptation</i><br>Patients being too 'unreliable' and thinking that only tangible restorative treatment offered 'value for money.'<br><i>Facilitators of adaptation</i><br>Dentists' leadership<br>Dentists' trust in dental team<br>Having good communication with dental team<br>Having technology for prevention | <i>Becoming a different dental practice</i><br>Experiencing new patient referrals<br>Learning that the system works<br>Experiencing less emotional stress during visits<br>Breaking the circuit and getting rewards<br>Seeing results in patients' mouths<br>Simplifying dentistry<br>Looking at the whole picture<br>Empowering staff<br>Being in a stronger medico-legal position<br>Never being able to go back |

## Before the adaptation process

Before being exposed to the CMS or other preventive protocols, dentists talked about themselves as 'assessing patients and selling restorative treatment'. They discussed practical/financial, historical, and philosophical facets of their situations (Table 3). Practically, the need to secure financial viability was critical: private dental practices are small businesses and dentists are subject to financial drivers. Historically, restorative care was strongly embedded in the dental culture, and this created a conflict within individual dentists. They would describe themselves as being biased toward prevention, but conditioned to deliver restorative care. When no established system existed in a practice for providing preventive care, it was difficult to move away from restoration and toward prevention.

**Table 3:** Dentists' and team members' experiences before the adaptation process

## Assessing patients and selling restorative treatment

| (1) Practical/financial   | (2) Historical   | (3) Philosophical   |
|---|--|---|
| <p><b>Making money</b><br/> <i>'The bottom line is that you need to make money', Dentist</i></p>  | <p><b>Having a restorative background</b><br/> <i>'It has always been like that, where dentistry, historically, has been an intervention. We are dental surgeons; we perform surgery', Dentist</i></p>   | <p><b>Being biased toward prevention</b><br/> <i>'My bias has always been prevention, I think', Dentist</i></p>   |
| <p><b>Being too busy to adopt protocols</b><br/> <i>'We are far too busy to spend the time. If I feel like I have not time because I already have to fulfil a certain treatment in that ½ hour I tend to just think "Oh well I will do that [preventive care] next time, " so it is probably a time issue', Dentist</i></p> | <p><b>Being focused on cutting cavities</b><br/> <i>'Well I think you realise when you cut a cavity that the more cavities you cut the better you are going to be at it, and you want to feel comfortable doing that and you want to be able to do them in different situations. It is what you want to keep doing because you want to get better at it every time you do it', Dentist</i></p> | <p><b>Not having a system for providing preventive care</b><br/> <i>'For any adult patient who presented with heaps of decay, I would get them to use high [F] toothpaste 2× daily, with absolutely no suggestion of when and if they should ever stop it', Dentist</i></p> |
| <p><b>Spending unproductive time</b><br/> <i>'We are not paid for the time that we spend doing preventive care', Dentist</i></p>  | <p><b>Being slow to change</b><br/> <i>'Dentists are good at going to conferences, listening to lectures, buying new equipments, but slow to change their mode of practice', Dentist</i></p>   | <p><i>'Prevention always interested me, but I did not have it logically placed in my mind', Dentist</i></p>   |

### Barriers to adaptation

Dentists spoke spontaneously about two 'assumptions' or 'rules' underpinning continued restorative treatment. They said that these assumptions were deeply held, and acted as a barrier to preventive care. The first 'assumption' that some dentists held was that some patients were too 'unreliable' to benefit from prevention:

*Is it worth to put the effort in to prevent, repair or save a tooth? Or are they somebody who is just not interested and you are better off taking out the tooth rather than putting any effort into trying to make it better for them. So, if I thought they were absolutely unreliable, I would probably just do a filling. (Dentist)*

The second 'assumption' that some dentists held was that patients thought that only tangible restorative treatment offered 'value for money'. They said that patients perceived oral hygiene instruction or preventive treatments as intangible treatments and did not wish to pay for these or any other preventive care:

*Some patients may not want preventive when you mention about doing fluoride, duraphat varnish. It all takes time, and they may not want that if they are not getting anything back from their health fund. (Dentist)*

In addition to these assumptions, some of the elements listed in Table 3 acted as barriers, such as: making money from prevention; being too busy; having a restorative background; being focused on cutting cavities; and not having a system for providing preventive care.

### The adaptation process

Despite facing the barriers mentioned above, many dentists did try to implement preventive protocols, including the CMS protocols. The adaptation process involved is illustrated in Table 4. Dentists became familiar with the information and procedures contained in the protocols and worked out how to lead their teams to incorporate them within their established practice systems. We note that this section reports on practices that had been able to implement preventive care.

**Table 4:** Dentists' and team members' experiences during the adaptation process

|  |   |
|--|---|
| <i>Learning by doing:</i> dentists and team members had to learn the protocols' system to implement it | <i>'Well, the more you did, the better you got at it. So, when patients were coming in 3 monthly intervals, by the time you had done ... when you first started, you were a bit tentative, whereas toward the end you were more confident. Very tentative at the beginning, but now it is just second nature', Dentist</i>                                |
| <i>Educating patients:</i> about why oral hygiene and home care are important                          | <i>'I mean that is the main thing, we need to educate patients. We are not here just to take people's money and put fillings and put bigger fillings in their teeth', Dental assistant</i>  |
| <i>Establishing new routines:</i> shifting of dental practice logistics, solving of scheduling issues  | <i>'There were suddenly less fillings to be done, or people I had booked in for a longer time that I needed because I was being more preventive. Even though I had thought I was being preventive in the past. It made me reassess my treatment plan for everyone, not just the patients in the program. And that was a good thing, I think', Dentist</i> |

During the adaptation process, some dentists ran training sessions for their teams. In these sessions, they shared knowledge about preventive care and discussed step-by-step descriptions of how to implement it in the practices. As a result, these dentists became aware of each team member's abilities to execute different preventive care responsibilities. This allowed the delegation of preventive tasks to other team members, so that dentists could concentrate on complex restorative work and, hence, their working day flowed more efficiently.

*It is a team effort. Patient starts off for a recall exam in my chair, in my room, and I introduce myself and say what we do because most of the patients here have never even heard of a hygienist. I explain to them about the gingival condition and I say "[the dentist] is going to come in and interrupt us and [the dentist] is going to do a check up and when [the dentist] comes in [the dentist] is going to ask me what I have found". [The dentist] says, "So, what are things looking like in here?" And what that does for me as a hygienist is that gives me confidence, it is demonstrating to the patient that [the dentist] is highly confident in me – and [the dentist] verbalises that all the time, and it makes the patient feel better that they are in good hands and it demonstrates we work together. (Dental Hygienist)*

In some dental practices, dental hygienists were given responsibility for oral hygiene instruction and preventive maintenance visits, becoming a fundamental part of the adaptation process. As a result, team members felt empowered, enjoyed their daily work, and felt recognized by patients as someone who was truly interested in delivering the best dental care; dental assistants saw the importance of preventive care, understood why less restorative work was being carried out and were able to adjust to the new routine. Patients were also educated about the importance of oral hygiene and fluoride applications.

*I think the staff was really keen; they liked doing the saliva tests, learning about fluoride and being part of it. I got the feeling, they were really quite enthusiastic to have some variety and something interesting and to know what was going on. (Dentist)*

*If we got to do a saliva test or got to talk to patients about their diet and fluoride a bit more, we thought, "Oh, there is something different than what we did yesterday and it was fun." (Dental assistant)*

In addition to education and role changes, new practice routines were required to ensure the financial viability of the practices. Dental assistants and practice managers were responsible for establishing new practices according to instructions given by the dentist-in-charge. New practices included reorganizing the materials supply, physical space and the schedule of the practices. For example, surgeries had to be stocked with preventive materials, and if formal protocols were being used, laminated copies of the protocols were needed in practice rooms. New arrangements for ordering

supplies had to be put in place. To allow for efficient time use of rooms, dedicated space for coaching tooth brushing and flossing had to be found. The length of appointments changed, and this had implications for practices' schedule of fees. Appointment lengths had to be adjusted to accommodate explanations of the new treatment approach and for caries risk assessment. Initially, the fee for the first appointment tended to be maintained at the previous rate, despite the consulting time being longer, because dentists felt that this was what patients expected. Conversely, monitoring and maintenance visits were shorter than the typical restorative care appointment, fees for this follow-up service tended to initially be scaled down. It took some time for the practices to figure out the time schedule for the new services and to adjust their fee schedules accordingly. These are examples of ways in which practices did not adopt protocols in a simple way, but needed to adapt them and their own routines as they moved toward a more preventive practice.

*So, I had to have that basic belief that at some point soon, which I did, I would work out appointments systems and work out a way of making it pay and making it more in my comfort zone in terms of I knew what I had to do quicker so it did not take so much of my time, and time is money. So, I guess I did not expect it to take so much time. Then, after I think it has helped me make more money, which I had not expected because I think we put fluoride on more often and we get people back more often. (Dentist)*

## **Facilitators of adaptation**

At the beginning of the adaptation process, dentists said that they had underestimated how difficult it would be to change their established practice systems. Despite this difficulty, they remained open to change. Dentists needed to provide leadership, but also relied on team communication and trust for the adaptation process to develop. Those who followed the CMS protocols valued the step-by-step guidance, which eased the task of adaptation:

*I guess the protocols gave some structure to something that we have always paid lip service to and done in an ad hoc sort of way. (Dentist)*

*Now I have this plan and because I like systems, I like the plan that there are both medium, or low or high risk patients and this is the plan and this is the system and this is what we will do. And this suits me; this is how we run the practice. (Dentist)*

Technology also played an important role in adaptation, as it facilitated dentists' communication with their patients. For example, digital X-rays and intraoral cameras were used in the majority of practices as a communication tool to educate and show patients images of whether their carious lesions were or were not progressing over time. Dentists and team members reported that it was easier for patients to understand what needed to be done when they saw images on a computer screen: patients started to think about what was going on inside their mouth and were more motivated to undertake home care to retain their teeth and keep their mouths healthy.

*I think the main thing is to try and get patients to give you the answers. So, try and get them to ask, "What is 'demineralised'?" and I have digital imaging. I tend to show them all on the x-ray. And especially ones that I put fluoride on and I tile the images in the computer screen so I can show it getting better. But you do not tell them, you show both images and say, "This is this part of the tooth last year. And this, when it is black it means, you know the decay has gone through. And this is the tooth now. So, what do you think?" Because you need patients to say it; and that all takes time ... So they have to take ownership of it. And I had to work out how to do that in a limited time in my practice. (Dentist)*

## **Consequences of the adaptation process**

Dentists and team members talked about the adaptation process as transformational. They said that following adaptation they realized that their practice philosophy had metamorphosed, it was a 'different practice'. As shown in Table 5, participants described practical/financial, historical, and

philosophical aspects of this new state. Dentists had integrated preventive protocols within their established practice systems, and team members had found their own way of practicing prevention. For example, in practices where the CMS protocols were in use, dentists incorporated fluoride varnish as a preventive tool – as prescribed – but continued, concurrently, to use other preventive agents that were not part of the protocols. This is another example of adaptation of formal protocols.

**Table 5:** Dentists' and team members' experiences after the adaptation process

| (1) Practical/financial  | Becoming a different dental practice<br>(2) Historical  | (3) Philosophical  |
|--|---|--|
| <p><b>Experiencing new patient referrals</b><br/><i>'People will send me at risk patients because they feel that I, we will assess them or treat them differently than other practices', Dentist</i><br/><i>'Patients perceived value in it and recommended it to their friends', Dentist</i></p>  | <p><b>Breaking the circuit and getting rewards</b><br/><i>'Dentists need to have the courage to get off the little rat wheel and most break that circuit and take that decision knowing that they are not going to see instant results; and most of the rest of the time we see quick results on a lot of things, so that they can trust that down the track there will be rewards for that', Dentist</i></p>   | <p><b>Empowering staff</b><br/><i>'Patients did not just get told that they had holes and we will fill them and fix them. It was interesting for us to see that we could help find a solution, it was very interesting', Dental assistant</i></p>                |
| <p><b>Learning that the system works</b><br/><i>'When patients started coming back, I learnt that the preventive system worked, with exceptions when people did not comply', Dentist</i></p>   | <p><b>Seeing results in patients' mouths and simplifying dentistry</b><br/><i>'Once you start seeing the results and the benefits in patients' mouths, you see that patients are really open to the information and quite excited about it; you suddenly realise that you could actually simplify. It's very easy to over complicate the whole thing and I think the dental profession thinks that it has this great big thing that they are going to have to do, when in fact it is really not much more complicated than taking a set of bite-wings, assessing patients risk and applying fluoride; but we are just not used to thinking of it that way', Dentist</i></p> | <p><b>Being in a stronger medico-legal position</b><br/><i>'I think because of this program we have a more systemized way of being a more preventive practice. I think that is certainly ... medico-legally; I think that is a very good thing', Dentist</i></p> |
| <p><b>Experiencing less emotional stress during visits</b><br/><i>'It takes a lot of stress off a patient, because there are a lot of dental phobic patients around; so if they know they are just coming in to see us and have fluoride put on their teeth rather than having a needle, that is less stressful', Dental assistant</i></p> | <p><b>Looking at the whole picture</b><br/><i>'We are taking more of an interest possibly in preventive ... there are options for patients rather just than having things filled – that you look at diet, saliva, oral hygiene – that you look at the whole picture', Dental Hygienist</i></p>  | <p><b>Never being able to go back</b><br/><i>'Certainly doing this is one of the things that I would say is one of the top 20 things I have done in dentistry, that I have learned from, that I would never go back to how it was before', Dentist</i></p>       |

Practically, practices were rewarded when they developed a reputation for prevention, and thus gained new patient referrals; they also experienced increased sales of preventive products. Dentists felt stronger medico-legally as a consequence of adapting to the protocols. They were no longer as concerned about patients searching the Internet, comparing what dentists did, and criticizing them for doing too many restorations.

In comparison with their prior historical situation – being biased toward prevention but trained to deliver restorative care – dentists talked about breaking the automated circuit of 'cutting teeth'. They had learned to trust that if they resisted 'cutting teeth', they would be rewarded by preservation of tooth structure. All participants talked about moving to a more holistic view – monitoring disease activity, quality of patients' saliva, diet, and the practice of oral hygiene and avoiding unnecessary restorative treatment. Clinical outcomes provided important reinforcement. Dentists and team members who had implemented the CMS or other protocols said that while they learned the steps to

follow, they did not believe in the efficacy of the procedures until they saw concrete positive results in their patients' mouths.

Dentists saw benefits both for patients and their staff who were involved in the process. They observed that their patients were starting to take ownership of their oral health and were less emotionally stressed during visits. Dental team members felt empowered by the adaptation process. Most dentists who had implemented the CMS protocols concluded that they could not go back to the way they had practiced before. However, dentists still believed that some patients continued to be too unreliable to benefit from a preventive program. We observed that dentists offered prevention only to patients who they judged to be motivated, cooperative, and who valued preventive care.

*People walked in the door who I knew would not be appropriate for prevention and I knew they were not reliable. Even though they said, and that was the interesting thing, some of them clearly said, "I will be fine; I will do that. And I am happy to turn up for three years of this research." And I thought, "I am not sure about you." And they have not. So, when we picked the patients, we tried and picked ones that we thought would be reliable and who valued prevention. (Dentist)*

### **Not adapting to preventive protocols**

As previously noted, in some practices, there was little evidence of preventive activity. This was attributed by dentists and their teams in part to the barriers mentioned previously: perceiving patients as 'unreliable' and as not valuing preventive care; needing to make money from prevention; being too busy; having a restorative background; being focused on cutting cavities; and not having a system for providing preventive care.

*The reason that you had a lot of dentists that probably was not quite so keen to put the effort in would have been a lot to do with the financial side of it. Effectively, the dentist who is in the program would be partially funding the cost of it through reduced income for the period that they are involved. It is their money and they are choosing either to have a reduced income or have to work longer hours to get the same income. (Practice manager)*

*Opening the doors, there is a cost involved, so you have got to figure out how you can make it work. So that is pretty simple from my side, but to get a patient to accept it, it is a bit difficult. There is no point in me telling patients anything, if they are not going to listen. (Dentist)*

*A problem was had to spend more time talking about disease prevention I think, yeah, because traditionally we have seen that as non-productive time and I tend not to charge for that. (Dentist)*

However, it was also a product of problems related to dental practice logistics and dentist–dental team relationships. In these practices, it was claimed that there was not enough physical space to accommodate all activities needed for the adaptation to preventive protocols. Preventive activities were perceived as being outside their usual routine and not able to be integrated into established practice systems. Although dental assistants in these practices worked together to make daily tasks run smoothly, the dentists appeared to have poor communication among themselves and with their staff. For example, rather than the practice operating as a team, in which everyone provided coordinated care oriented toward prevention, where spaces were dedicated to preventive procedures, dentists in these practices would work in isolation in their dedicated rooms. This meant that one dentist might use fluoride on a tooth surface, while the dentist in the next room would provide restorative care. These inconsistencies revealed that failing to involve all staff in the preventive adaptation process could be a major setback for a practice. For example, in one intervention practice, only one dentist was aware of the CMS protocols (Dentist A). Two other dentists and a hygienist also worked in the practice. A patient who was being managed preventively by Dentist A returned for a maintenance visit and was seen by one of the other dentists. Unfortunately, during this visit, tooth

surfaces that were previously being managed preventively were restored, thus eliminating the potential benefit of the preventive care.

*I think, we did not institute it [protocols] as well as we could have done, looking back, and there are a number of reasons for that. One is being far too busy all the time to spend the time with people doing these preventive things. We see a lot of patients and there is a lot of pressure for us to see more patients because there are people who are making demands on our time. Also, I think my own understanding of the program was not good. The other thing was that I did not get the whole staff involved, which would have been good, preferably all the dentists, too. In my practice, spending that extra time with patients in the study and not charging for this time was a big issue. And now even if we wanted to try again, not that we do, we do not have a spare room now to accommodate such activities. So that is a consideration, there is not as much space. There is more staff but they are not allocated to do that. (Dentist)*

## Discussion

A deeper understanding about incorporating research evidence into dental practices was gained during this study. Our findings have shown that adapting research evidence into practice is a slow and complex process, requiring more than the removal of barriers. We began by asking: (i) How do dentists and their teams incorporate evidence about preventive care into their practices? and (ii) How can we explain variation in this process? We will now summarize the answers to these questions and consider their implications for practice.

### **How do dentists and their teams incorporate evidence about preventive care into their practices?**

First, we note that even within the formal structure of a RCT of a specific preventive protocol, dentists and their staff drew on a wide range of preventive protocols and guidance. Although all participants said they were committed to prevention, the degree to which prevention was practiced varied widely. The RCT protocol (the CMS) was not ‘transferred’ into practice in a straightforward way. Rather, through our analysis, we concluded that dental practices underwent a slow process of adapting a range of protocols and guidelines to existing practice logistics.

This was not just a matter of removing expected barriers to EBD. Adaptation occurred over time and involved practical, historical, and philosophical aspects of dental care. Participants transitioned from their initial state – selling restorative care – through an intermediary stage – learning by doing and educating patients about the importance of preventive care – and finally to a stage where they were a ‘different practice’ and offered patients more than just restorative care. During this adaptation process, ‘finding the balance between preventive nonsurgical care (curing of disease) and restorative treatment (making up for lost tissues)’ was a daily challenge – ‘regaining profit, reassessing team work and surgery logistics, and mastering the scheduling art to maximize financial and clinical outcomes were important practical issues tackled in some of these practices’ (24, p. 7).

### **How can we explain variation in this process?**

We propose that the mechanism that explains variation in the implementation of evidence-based preventive care is a differing ability to adapt, or not adapt, new protocols into established practice systems. To achieve optimal preventive practice, dentists-in-charge had to be open to change, to be able to communicate with and to engage all members of the dental team. Successful adaptation was contingent upon whether (i) the dentist-in-charge brought the whole dental team together – including other dentists – and got everyone interested and actively participating during preventive activities; (ii)

whether the physical environment of the practice was re-organized around preventive activities, (iii) whether the dental team was able to devise new and efficient routines to accommodate preventive activities, and (iv) whether the fee schedule was amended to cover the delivery of preventive services, which hitherto was considered as 'unproductive time'.

Previous studies support our findings about barriers to EBD, including the historical professional tradition of restorative intervention; time constraints; dentists' inertia; financial risk, patients' treatment preferences and inappropriate health funding systems (8, 9, 12, 13, 30–36). In this study, participants described some patients as being too 'unreliable' to benefit from preventive care. This is consistent with previous research that shows that dentists may find it difficult to treat patients who do not value oral health, are disinterested or 'uncooperative' (36–38), providing them with a different quality of dental care (36, 39). This study provides evidence that this is particularly salient to how dentists' approach prevention – that their deeply-held beliefs about the motivation, values or cooperativeness of patients may be an important explanatory factor in determining whether or not prevention is offered. Watt et al. (11) showed that patients were also described as a potential barrier to the provision of evidence-based care or to change dental practices in general. According to the authors, dentists think that patients demand services that they are accustomed to even when there is no need for it, and that patients lack interest in oral health and have irregular attendance patterns (11). In this study, regular attendance was shown to be important for both maintaining a dental practice financially viable and for motivating dentists to offer preventive care.

In this study, dentists also argued that some patients chose not to have preventive care because of the limitations imposed by the regulations of health insurance companies. This is consistent with Brennan and Spencer's observation that in Australia there is a 'lack of incentives' to adopt preventive non-operative approaches 'under a fee-for-service remuneration system' that encourages restorative care (38). Elsewhere, dentists have also cited limitations imposed by the regulations of insurance companies as a barrier to provide evidence-based dental care (9). Insurers' regulations may be contrary to evidence obtained from well-designed studies; however, as these limitations determine the degree to which patients are reimbursed for treatment, they are strong drivers for patient satisfaction and motivation and can thus become important in clinical decision making (8, 9, 11). Conversely, some work has suggested a modest effect of financial inducements in achieving preventive care. Among dentists working in the Scottish National Health Service for example, introduction of a financial reward (fee per sealant) increased the likelihood of fissure sealant placement by 10% compared with education on evidence-based practice only or no intervention (32).

Finally, some of the problems in changing dentists' practice may be also attributable to a failure in active knowledge translation. Research has shown that evidence-based guidelines increase dentists' knowledge, but do not create intentions to act differently (7, 15–17) Only a few authors have suggested that by applying tailored knowledge translation strategies change in dentists' clinical practice may be achieved (39). In a recent study, Bonetti et al. (39) concluded that dentists were more likely to decide to carry out a specific clinical procedure when they 'had a prior action plan' about the procedure and if the procedure was something they were familiar with. The authors recommended that future interventions should be developed for assisting dentists to alter 'their beliefs about the consequences' of a specific procedure – these interventions might facilitate dentists to routinely incorporate desired clinical procedures into their usual routines (39).

## **Concluding remarks**

Based on our findings, we suggest some practical strategies for getting evidence-based preventive care into private dental practices. This study suggests that flexibility may be needed from both dental academics and dentists-in-charge of practices to advance preventive care in general dental practice. Adapting evidence into dental practice was shown to be a slow and complex process, requiring more than just the removal of barriers. Research evidence offered by academics will have to be

incorporated somehow into existing dental practice systems. This process might not happen identically in all practices. Dentists will need to adapt their everyday practices to conform more closely to evidence-based recommendations. They should be encouraged to look at preventive care as a central part of their practices and not simply as advice given to patients, usually referred to as 'unproductive/ not reimbursed' time. Hiring dental hygienists can facilitate the adaptation process and free dentists to focus on more complex cases.

This group of dentists and their dental teams trusted preventive protocols, including the CMS protocols, only after they saw results in patients' mouths. RCTs will remain the key source of evidence for evaluating the efficacy of dental treatments, but this study suggests that their results may be better trusted and adapted into practice if the statistical results are presented alongside concrete clinical illustrations (e.g., case reports showing before and after scenarios).

These strategies conform to the findings from a recent study, which showed that 'variation and even contradictions' present in clinical settings can be used as 'real opportunities for learning' if participants are able to 'abandon old ways of addressing problems and try new ways of working' (40, p. 1, 6, 7) to attain common aims. This study has provided new, practical insights into the implementation of preventive care in dental practice. Future intervention research could examine the usefulness of these strategies across a wide range of dental practices and contexts.

**Acknowledgements:** This study was funded by the National Health and Medical Research Council Project Grant 632715; Oral Health Foundation, University of Sydney; Dental Board New South Wales; and Australian Dental Research Foundation. We thank participants for their invaluable contributions.

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