

# Developing sustainability in a dental practice through an action research approach

J. Grose,<sup>1</sup> L. Burns,<sup>\*2</sup> R. Mukonoweshuro,<sup>3</sup> J. Richardson,<sup>1</sup> I. Mills,<sup>2,4</sup> M. Nasser<sup>2</sup> and D. Moles<sup>2</sup>

## Key points

Reports on the implementation of sustainability improvement measures in a dental practice.

Demonstrates the suitability of 'action research' as a process to enable change.

Highlights the benefits of a participatory approach to developing sustainability interventions.

**Introduction** For dental practices to become more environmentally sustainable, the full co-operation of all practice staff can lead to greater engagement with proposed initiatives. Action research is a participatory approach to change that involves participants in the decisions that affect them. **Aim** The aim of this study was to collaboratively develop interventions to improve environmental sustainability at one dental practice. **Methods** This was a mixed methods study following an action research process for intervention design. The study was set in a mixed NHS/private dental practice in England, UK. **Results** Participants engaged in the process and were able to choose the measures they wished to implement. Feedback showed that whilst some measures had been discarded, others had led to changes both in professional and personal behaviour. **Conclusion** Action research offers an innovative and constructive method of engaging participants in developing their own sustainability strategies and can encourage positive change.

## Introduction

Sustainability in healthcare is gaining greater attention at both national and local level and across all clinical specialities.<sup>1</sup> Sustainable healthcare means improving systems and processes to make them more environmentally responsible, reducing carbon footprint through judicious use of resources and service planning. Global sustainability goals were embedded in UK law through the Climate Change Act 2008 and further ambitious targets were set with the Paris Agreement 2016.

Environmental sustainability goals are aligned with the drive towards quality improvement and financial efficiencies in healthcare. The NHS is projected to spend £120 billion by

2019 and even small efficiency measures could achieve considerable carbon and cost savings if implemented system wide. NHS dental services contribute 3% of the overall total carbon footprint of the NHS.<sup>2</sup> Dental practices in England continue to face significant challenges in terms of delivering NHS efficiency savings. Data from NHS Digital indicate that taxable income for high street NHS dentists continues to decline, with a fall of nearly 35% in real terms since 2006.<sup>3</sup> The potential to make financial savings is likely to be a key factor in delivering environmental sustainability goals within general dental practice.<sup>4</sup>

Despite impelling political goals and financial drivers, there is an argument that top-down approaches to policy and planning leave people feeling alienated and do not adequately motivate behaviour change.<sup>5</sup> Community-based developments are believed to be more effective because they allow solutions to develop which fit the local context.<sup>6</sup>

Our research addresses environmental goals by attempting to reduce the environmental impact of a dental practice through 'action research'; a process for enabling change,

grounded in equality and democracy. Whilst sustainability goals have been enshrined in domestic and international law, they cannot be achieved just by political agreement and legal directives. Climate change is a global concern and requires the engagement of all those who contribute to the carbon footprint. Sustainability science acknowledges the interconnectivity between humans, their resources and the planet, making it therefore a particularly suitable domain in which to undertake action research.<sup>7-9</sup>

Action research is based on the 'realist tradition', adopting the view that people are agents 'acting intentionally in accordance with socially grounded rules and conventions to realise projects'.<sup>10</sup> This philosophical framework places the participants at the centre of decision-making. Using a co-operative approach, researchers interact with participants so that they 'contribute directly to both hypothesis-making, to formulating the final conclusions, and to what goes on in-between'.<sup>11</sup> Action research allows individuals to participate in the decisions that affect them and their environment through the co-generation of solutions.<sup>12</sup> Participants are

<sup>1</sup>School of Nursing and Midwifery, University of Plymouth; <sup>2</sup>Peninsula Dental School, University of Plymouth; <sup>3</sup>Plymouth Business School, University of Plymouth; <sup>4</sup>General dental practice, Devon

\*Correspondence to: Lorna Burns  
Email: lorna.burns@plymouth.ac.uk

Refereed Paper.

Accepted 11 April 2018

Published online 31 August 2018

DOI: 10.1038/sj.bdj.2018.738

**Table 1 Staff roles and numbers of participants in study**

Role	n
Dental nurse	8
Associate dentist	6
Partner of practice	3
Local decontamination operative	2
Receptionist	4
Trainee dental nurse	2
Administrator	1
Hygienist	1
Practice manger	1
Cleaner	1

acknowledged as stakeholders; they collaboratively explore options and are empowered to make decisions. The researcher usually acts as a facilitator, rather than the *defacto* expert who steers the process. Action research is often a cyclical process, allowing all participants to reflect on actions taken before deciding on the next steps.

In 2014 we undertook a feasibility study in one dental practice in North Devon, Southwest England. This involved a scoping exercise, public survey, waste audit and qualitative interviews.<sup>4,13</sup> In 2017 further funding enabled us to return to the same dental practice. We recognised that action research would be an appropriate method for developing solutions to reduce the carbon footprint at the dental practice because it allows staff to engage with climate change issues and become environmentally literate. We anticipated that the

co-generation of local responses to sustainability issues would lead to greater engagement than top-down initiatives at national and international level.<sup>5</sup>

## Aim

The aim of the present study was to collaboratively develop interventions intended to improve sustainability at one dental practice. Our objectives were to engage participants in an action research process and to enable participants to reflect on the process of engagement and subsequent practice changes.

## Methods

This was a mixed methods study using action research to develop interventions and includes both qualitative and quantitative data collection. Action research facilitated full co-operation of the dental practice team in the intervention development and evaluation process. The study followed the code of practice for research of the University of Plymouth Faculty of Health and Human Sciences Research Ethics committee.

The participants were staff at one independently owned dental practice in Devon, United Kingdom, providing both NHS and private dental services. Details of the staff roles are given in Table 1.

Action research was carried out between January and July 2017. The process consisted of a series of steps to engage participants in decision making and gather feedback. A series of action research focus groups took place, facilitated by experienced qualitative researchers (JG & JR). These group sessions

were focused on setting priorities to improve sustainability in the practice and to consider any issues arising from steps taken.

Data were captured by note-taking and digital recording of the group discussions. A reflective logsheet was given to participants in order that they could provide feedback on any issues relating to the sustainability options chosen. Data from the focus groups were analysed using thematic analysis.<sup>14</sup>

## Results

During the focus groups, participants collectively agreed to develop and implement interventions to improve sustainability at the practice. Based on these decisions, a range of options was subsequently presented. Participants chose measures they wished to implement based on what they thought was achievable, and a plan of action was agreed. Participants agreed a 'trial' period of two months during which they would collectively undertake the sustainability improvements within the practice. The researchers provided further information related to the sustainability measures they had chosen. At the final focus group, participants discussed the actions they had taken and their impressions of how well the 'trial' period had gone. This included their perceptions of changes made within the practice, as well as what they thought they could do in the future.

The intervention areas and associated measures suggested by the staff team are detailed in Table 2. It was emphasised that not all suggested interventions would necessarily be possible but that each should be attempted. The research team listened to concerns and

**Table 2 Interventions proposed during focus group discussions**

Intervention area	Aim	Proposed intervention
Glove use	To reduce the number of gloves used without compromising safety	Change of habits to minimise glove use. Habit changing reminders (i) diary reminders integrated into practice software; (ii) reminders in morning meetings
Waste segregation	To reduce the amount of paper in the clinical waste stream	(i) Introduction of non-clinical waste bins into surgery areas; (ii) poster reminder in surgery; (iii) reminders in practice meetings
Procurement of products	To reduce unnecessary purchasing	(i) Review of items bought on a regular basis; (ii) discussion at a practice meeting; consider reducing or stopping ordering items not deemed essential; discussion with suppliers
Energy saving	To implement energy saving opportunities	i) Review of energy saving options, for example light movement sensors/low energy light bulbs (ii) make recommendations for changes
Environmental awareness	To raise awareness about the impact of humans and healthcare on the planet	Watch a video to demonstrate importance of sustainability on a global scale
Sustainability integral to the practice	To embed sustainability into the practice business	Include a standing item on 'sustainability action and top tips' on agenda for practice meetings
Changes in other aspect of their lives	Assess embedded behaviour	The whole process

provided further information to help with initiation of the chosen interventions. A helpsheet about environmental building management was provided, and two environmental awareness-raising videos were signposted.<sup>15,16</sup>

The proposed interventions and subsequent actions were discussed at the focus groups. Examples from the discussions are presented below.

### Glove use

During the action research period glove spend had increased because of increased productivity. However, there was now much greater awareness of the need to reduce glove use and there had been discussion about how processes could be adapted to support this.

*'At the beginning of the year we didn't have so many surgeries but they have increased and so has the glove use.'* (Manager)

*'We can give capacity details to try to assess how many gloves have been used for surgery.'* (Dentist)

### Waste segregation

In line with the decisions made at the first focus group all treatment rooms now had two bins: clinical waste and general waste.

*'...I put a bin next to me and I put a label on saying non-clinical and the other one is clinical... I think we've got 100% compliance'* (Dentist)

There were concerns, however, that in reducing the clinical waste the general waste was increasing.

*'The clinical waste amount has come down. I am still trying to work out how much more our domestic waste has gone up.'* (Manager)

### Procurement

The practice identified a new product supplier that published the provenance of the goods it secures and was willing to work with the practice to enable a more sustainable approach.

*'We are changing our distributor because they are cheaper but also because they have more of a sustainability profile.'* (Nurse)

The practice elected to change their software supplier and a key factor in this decision was a commitment to reduce paper usage and storage. This has been achieved by the introduction of new software which allows digitisation of NHS claim forms and medical history sheets, and facilitates the increasing use of digital communication for appointments and correspondence. The practice is now looking to embrace further changes with the introduction

of an intra-oral digital impression scanner to eliminate the use of impression materials and gypsum models.

### Energy saving

The practice had previously installed solar panels and were reviewing how much electricity had been saved. Following the focus groups, staff planned to introduce movement sensors on the lighting in some areas, and were due to have electric hand driers installed in the bathrooms.

*'The electrician's been in and we are going to put sensors in the hallway and stock room and here.'* (Manager)

### Environmental awareness

At the outset, identifying a workplace sustainability champion was considered to be a good idea, but on reflection it was felt that shared responsibility would be more effective. A member of staff replaced the plastic cups by the water fountain with glassware.

*'That is a little thing but it's massive that somebody did it... I think it's fantastic.'* (Dentist)

### Sustainability integral to the practice

The team were keen to maintain progress and strive to implement all of the changes which had been agreed at the beginning of the research process. Some of these actions had not been addressed, but the team felt that two months was a short timeframe and there had been a variety of mitigating circumstances. There was still an apparent enthusiasm and willingness within the dental team to embrace change and maintain a focus on environmental sustainability.

*'... we have to maintain this momentum'* (Dentist, Nurse & Manager)

*'From a practical point of view it has to be on the agenda of monthly team meetings.'* (Dentist)

Staff admitted that whilst the sustainability project was recognised as important, it was a priority that slipped down the agenda, especially when other issues took precedence.

*'This is really important but it ends up getting shoved to one side because of patient demands because of practice demands and everything else. We have got to find a way of keeping it up there so that it's constant for us.'* (Dentist)

### Changes in other aspects of lives

When asked about their sustainability awareness in their own homes the staff were in agreement that they all recycled but were facilitated to do this by their local council.

*'We all do it by habit at home which is interesting so why is it more difficult at work.'* (Nurse)

Eight reflective logs were collected at the end of the study period. These represented the views of staff from all areas of the practice, from the reception to the treatment rooms. Due to competing pressures of work, staff had been unable to complete weekly reflective log sheets. The logs provided feedback on the interventions and subsequent actions and provided information about what worked well and what was more difficult. The responses grouped by intervention area are presented in Table 3.

The reflective logs showed an increased awareness of the need to save energy, for example by switching off lights. Glove use was a cause for concern as staff did not wish to deviate from infection control guidelines. During the focus groups staff discussed glove use and for which procedures the wearing of gloves is clinically necessary.

### Discussion

In keeping with the principles of action research, we believe staff should be involved in developing new interventions to tackle waste and reduce carbon output. However, we recognise that time for education and development in a busy practice is in short supply. The NHS Sustainable Development Unit has provided an e-learning resource for dentists to guide them through the issues around climate change and sustainability<sup>17</sup> and this could be a first step for practices who are interested in making changes.

Whilst householders are directly impacted by the cost of their own home energy use, the same financial coercion to change environmental behaviours is not present in the workplace. Environment behaviours, like all behaviours are sensitive to contextual and social factors. The science of behaviour change recognises the interaction of a number of internal, environmental, and social factors in driving behaviour.<sup>18</sup> It is not known whether the involvement of the researchers in the dental practice provided an additional motivation to the team to engage with the proposed interventions, and if so, whether the designation of a workplace sustainability champion would have the same effect. A champion-based initiative was shown to be well received by office employees in a large UK construction company and led to changes in workplace environmental behaviours.<sup>19</sup> However, the initiative

**Table 3** Contents of reflective logs

Intervention area	Reflections about adoption of intervention options
Energy saving Environmental awareness	Making sure we're turning chair light off in between pts + main light/fans when we can Turned radiator down Turn lights off whenever possible
Waste	Separated clinical/non clinical waste Recycling paper/magazines Bought glasses, no longer using plastic cups for water Cloth versus tissue for wiping down Reduction in gloves by increased awareness of waste Shredding paper and another work colleague taking it for her chickens
Glove use	Only using gloves when necessary Ensuring computer screen showing X-rays before starting treatment so don't need to change gloves Conscious of unnecessary usage – increased awareness hopefully leading to decreased usage
Procurement of products	Biodegradable peanuts (packaging) We have a group stock order Ordering done centrally
Intervention area	Reflections about rejection of intervention options
Energy saving	Not as good as could be but electrician booked to fit LED and sensor lighting in staff area No way to reduce machine use (Water) not viewed as issue
Waste segregation	As 1 bin on nurses side and 1 on dentists so both use for clinical waste but have a separate bin for packaging I was unaware we did not have yellow bags
Glove use	Don't feel we could use less gloves than we do to be clinically safe LDU do not touch any instruments dirty or sterile without gloves Shredding paper and another work colleague taking it for her chickens

was prefaced by a waste and energy audit to provide baseline information and motivation. High street dental practices are unlikely to have access to the resources required for a waste and energy audit. Instead, they could use previously identified dental services carbon hotspots at the outset of a smaller scale initiative and as an aide to guide intervention choice.<sup>2,20</sup> Taking travel, for instance, as a primary area, it would not be difficult to measure staff miles driven to work before and after the initiative. The workplace champion should ensure that sustainability discussions are included on all business meeting agendas.

## Limitations

This action research project was carried out in one dental practice over a six-month period so the data must be treated with caution and may not be readily generalisable to other settings. It is too early to determine whether the behaviour changes will be sustained and whether or not the practice will continue to improve its environmental sustainability. The interventions

chosen by the team did not address travel, identified to be the biggest contributor to NHS dental services' carbon footprint.<sup>2</sup>

## Conclusions

Involving the practice in an action research project has been a valuable experience for both the staff and the researchers. Although some of the proposed interventions were too ambitious for the time frame, all areas were reviewed and discussed. Staff have committed to further review their local policies on waste, infection control and procurement. The study achieved its core aim of engaging staff in a process of change to improve sustainability. Interventions were chosen as a result of shared decision making and discussion. Increased environmental awareness has led to the implementation of further measures than those initially proposed, and there is a willingness for the practice to continue to improve its sustainability. More practices could run in-house sustainability initiatives using internal champions and standing agenda items to maintain focus.

### Declaration of interests

This study was funded by a grant of £8,000 from Dental Education and Training Ltd (Company number 07796785).

### Acknowledgements

The authors would like to thank the funders for their support of this project and the staff at the dental practice for their participation.

1. Sustainable Development Unit. Sustainable development in the health and care system. Health Check 2017. London: NHS England, 2017.
2. Duane B, Lee M B, White S, Stancliffe R, Steinbach I. An estimated carbon footprint of NHS primary dental care within England. How can dentistry be more environmentally sustainable? *Br Dent J* 2017; **223**: 589.
3. British Dental Association. 35% collapse in earnings undermining NHS dentistry. Available at <https://bda.org/news-centre/press-releases/collapse-in-earnings-undermining-nhs-dentistry> (accessed August 2018).
4. Grose J, Richardson J, Mills I, Moles D, Nasser M. Exploring attitudes and knowledge of climate change and sustainability in a dental practice: A feasibility study into resource management. *Br Dent J* 2016; **220**: 187–191.
5. Smith J L. A critical appreciation of the "bottom-up" approach to sustainable water management: embracing complexity rather than desirability. *Local Environment* 2008; **13**: 353–366.
6. Rogers J C, Simmons E A, Convery I, Weatherall A. What factors enable community leadership of renewable energy projects? Lessons from a woodfuel heating initiative. *Local Economy* 2012; **27**: 209–222.
7. Gottsche J, Kelly M, Taggart M. Assessing the impact of energy management initiatives on the energy usage during the construction phase of an educational building project in Ireland. *Construction Management and Economics* 2016; **34**: 46–60.
8. Lucas K, Hamilton J, Mayne R. Building capacity through action research: reflections on working with low-carbon communities in the UK. *Local Environment* 2016; **6**: 1–21.
9. White R M, van Koten H. Co-designing for sustainability: strategizing community carbon emission reduction through socio-ecological innovation. *Design Journal* 2016; **19**: 25–46.
10. Harre J. The positivist-empiricist approach and its alternative. In Reason P, Rowan J (eds) *Human inquiry: a sourcebook of new paradigm research*. Chichester: Wiley, 1981.
11. Heron J. Philosophical basis for a new research paradigm. In Reason P, Rowan J (eds) *Human inquiry: a sourcebook of new paradigm research*. Chichester: Wiley, 1981.
12. Bradbury H. *The SAGE Handbook of Action Research*. London: SAGE Publications, 2015.
13. Richardson J, Grose J, Manzi S et al. What's in a bin: A case study of dental clinical waste composition and potential greenhouse gas emission savings. *Br Dent J* 2016; **220**: 61–66.
14. Spencer L, Ritchie J, Ormston R et al. Analysis: principles and processes. In Ritchie J, Lewis J, McNaughton C et al (eds) *Qualitative research practice: a guide for social science students and researchers*. London: Sage, 2014.
15. Arthus-Bertrand Y. HOME. Available at <https://www.youtube.com/watch?v=jqxENMKaeCU> (accessed August 2018).
16. Barts Health NHS Trust. The power of sustainability. Available at <https://www.youtube.com/watch?v=FCAsk-WHuye8> (accessed August 2018).
17. Centre for Sustainable Healthcare. New sustainable dentistry elearning resource launched today. Available at <https://sustainablehealthcare.org.uk/news/2016/03/new-sustainable-dentistry-e-learning-resource-launched-today> (accessed August 2018).
18. Michie S, Atkins L, West R. *The Behaviour Change Wheel*. United Kingdom: Silverback Publishing, 2014.
19. Nye M, Hargreaves T. Exploring the social dynamics of proenvironmental behavior change. *Journal of Industrial Ecology* 2010; **14**: 137–149.
20. Duane B, Hyland J, Rowan J S, Archibald B. Taking a bite out of Scotland's dental carbon emissions in the transition to a low carbon future. *Public Health* 2012; **126**: 770–777.