

What can we learn from Australian general practices taking steps to be more environmentally sustainable? A qualitative study

Alex Pavli^{1,2,*}, Victoria Loblay^{3,4,5}, Lucie Rychetnik^{3,6}, Tim Usherwood^{7,8}

¹Speciality of General Practice, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia

²Sydney North Health Network, Chatswood, NSW, Australia

³The Australian Prevention Partnership Centre, Sax Institute, Sydney, NSW, Australia

⁴Menzies Centre for Health Policy and Economics, Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia

⁵Youth Mental Health and Technology Team, Brain and Mind Centre, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia

⁶School of Public Health, The University of Sydney, Sydney, NSW, Australia

⁷Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia

⁸The George Institute for Global Health, Sydney, NSW, Australia

*Corresponding author: Sydney North Health Network, Chatswood, NSW 2067 Australia. E-mail: apavli@snhn.org.au, alexandra.pavli@sydney.edu.au

Background: Climate change is impacting the health of individuals worldwide. At the same time, the healthcare sector contributes to carbon emissions. In Australia, healthcare contributes 7% of the country's carbon footprint. Research into the environmental impact and mitigation of carbon emissions in primary care is an emerging area.

Objective: To explore staff perspectives on facilitators and barriers to environmental sustainability in 3 Australian general practices seeking to reduce their environmental impact.

Methods: We used a qualitative, case-study approach, conducting 23 semistructured interviews with staff across the 3 practices including nurses, administrative staff, and doctors. Observation of systems and staff behaviour relating to environmental sustainability was undertaken at 1 practice. Thematic analysis was conducted to determine themes relating to factors influencing the implementation of environmentally sustainable initiatives within practice settings.

Results: Climate mitigation efforts raised by participants were largely focussed on energy and waste reduction, rather than prescribing pharmaceuticals and staff and patient transport. Three main factors influencing change towards sustainable practice were identified: "Leadership," "Staff Engagement and Workplace Culture," and "Concomitant Benefits." A leadership team and workplace culture that valued environmental sustainability were found to be important facilitators, as were concomitant benefits, in particular financial savings. Barriers included what interviewees described as a lack of knowledge about initiatives with the highest impact, lack of understanding described by staff of the evidence behind particular initiatives, waning staff engagement and infection control concerns.

Conclusions: Our research highlights several important factors that contribute to the implementation of intended environmentally sustainable initiatives in these 3 practices. Further education, research and high-level policy guidance on the potential environmental impact of prescribing pharmaceuticals, staff and patient transport and unnecessary tests and treatments are recommended to further promote environmental sustainability in primary care.

Key words: climate change, environmental sustainability, leadership, nursing, primary care, public health

Introduction

Climate change has been labelled the biggest threat to global health in the 21st century.¹ It is having significant effects on human health, including through prolonged heat waves and extreme weather events.^{2–5} At the same time, the healthcare sector contributes to carbon equivalent emissions, amounting to 7% of emissions in Australia.⁶ While a detailed analysis of the carbon footprint of general practice in Australia is lacking, evidence from other countries suggest a large contribution from prescribed pharmaceuticals⁷ and staff and patient transport.⁸ Low value care including unnecessary investigations and treatments may

also contribute to emissions without improving quality of care.^{9,10}

Several commentators have discussed the potential role of general practice in addressing the climate crisis. It has been suggested that GPs and other primary care workers could set an example by: reducing their personal carbon footprint; providing advice to patients regarding health and environmental co-benefits; reducing their office impact; and using their valued place within the community to advocate for greater climate action.^{11–13} Both the Royal Australian College of General Practitioners and the World Organization of Family Doctors have declared climate

Key messages

- Practices largely focussed on energy and waste over prescribing and transport.
- Leadership valuing the environment was important in facilitating change.
- Staff engagement and workplace culture were also significant facilitators.
- Concomitant benefits including saving money were described as important.
- A key challenge was a lack of understanding of evidence behind initiatives.

emergencies.^{14,15} A toolkit to assist general practices reduce their environmental impact is available for general practices in the United Kingdom.¹⁶

The focus of research on environmental sustainability in general practice has included the carbon footprint of staff and patient transport,¹⁷ patient and physician attitudes to climate change and health,^{18,19} general practice trainee education,²⁰ the environmental impact of social prescribing²¹ and the application of an educational tool to reduce the environmental impact of general practice,²² as well as a review of progress made by primary health trusts in England.²³ Recently a carbon footprint of primary care practices in Switzerland has been published.⁸ To the best of our knowledge, no studies have explored in-depth the experiences of general practices who have taken steps aiming to reduce their environmental impact.

The aim of this study was to explore staff perspectives on barriers and facilitators to environmental sustainability in 3 general practices that had taken steps aiming to reduce their environmental footprint. We used Morelli's definition of environmental sustainability, meaning "meeting the resource and services needs of current and future generations without compromising the health of the ecosystems that provide them."²⁴ Initiatives raised by participants were those intended to improve environmental sustainability, but our research did not seek to assess whether they led to an objective reduction in waste or emissions.

Methods

We undertook case studies of 3 general practices located in different areas of Australia, both rural and metropolitan. AP is a GP practitioner/researcher with an interest in environmental sustainability, VL is an anthropologist with skills in collaborative ethnographic methods, LR is a professor of public health with expertise in climate and health, and TU is a professor of general practice. The 3 practices included in the study were suggested by contacts at the organization *Doctors for the Environment Australia* based on their reputation in aiming to reduce their environmental impact. AP approached 3 practices, and all agreed to participate. The Standards for Reporting Qualitative Research (SRQR) were used as a reference to guide development of the methods.²⁵ Ethics approval was granted by The University of Sydney Human Research Ethics Committee (protocol number 2019/1031).

Ethnographic fieldwork and 23 semistructured interviews were conducted by AP. All clinical and administrative staff in each practice were invited to participate. In practice 1, AP presented the project at a face-to-face all staff meeting, prior to the COVID pandemic. In practices 2 and 3, an email was forwarded by the practice manager to

all staff inviting participation for those interested. Across the 3 practices, AP interviewed 4 nurses, 8 administrative staff (reception/practice management), 9 doctors, 1 student, and 1 allied health professional. The roles of the interviewees in each practice are not reported below due to concerns this would compromise the anonymity of participants. Interviews took place between February 2020 and February 2021.

Interviews ranged from 20 to 60 min and were audio-recorded and transcribed verbatim (see [Appendix 1](#) for Interview Guide). Our interview guide was developed based on McGain and Naylor's literature review into environmental sustainability in hospitals, and adapted by AP to reflect the general practice context.²⁶ This guide was used as a flexible basis for semistructured conversations that encouraged interview participants to reflect on their perspectives on the adoption of environmentally sustainable initiatives within their practice. The order of questioning was fluid and the semistructured interview guide was supplemented by conversations prompted by ethnographic observations. These lines of conversation led to new avenues of inquiry regarding informal initiatives not led by management. Vouchers of AU\$50 were offered to participants in acknowledgement of the time taken for interviews.

Interviews were supplemented with observational fieldwork at practice 1, undertaken across 4 days from February to March 2020. AP observed and wrote fieldnotes on the practice layout, activities in the tea-room, reception/waiting room, and administrative areas and interactions between staff members. Patient consultations were not observed due to concerns about confidentiality. Activities of staff members who did not wish to participate in the study were not documented. Due to the COVID pandemic, participant observation of practices 2 and 3 was not possible and data collection was limited to interviews by telephone or internet.

Participants were also offered their transcripts to review and 9 participants took up this offer. Participants were invited to make feedback on the overall research findings prior to publication, and one participant advised they were enthused to share the study findings with colleagues and other practices. No other feedback was provided.

Analysis

Preliminary thematic analysis²⁷ of qualitative data was conducted by AP to identify and describe major themes and considerations relating to environmental sustainability; with regular review, discussion, and feedback from other members of the research team. Based on AP's experience as a GP practitioner-researcher and our discussion of the literature and priorities in this area, we believed that an analysis of facilitators/barriers would be most useful for identifying lessons for

policy and practice to promote environmental sustainability in primary care.

Interview transcripts were coded by AP in Microsoft Word using the “comments” function. Fieldnotes were reviewed and used to triangulate the interview data. Preliminary analysis to identify core themes, including excerpts from interview transcripts and fieldnotes, was workshopped with the rest of the team. Themes were then iteratively refined through collective analysis during several meetings of the research team over 2020 and 2021.

We developed overviews of the particular issues and dynamics within each practice, but due to concerns about protecting anonymity of participants, elected to present only amalgamated results, similar to an approach discussed by Crowe et al.²⁸ We chose to focus on over-arching themes across the 3 practices, while also appreciating that particular contextual issues influenced the way these themes were expressed within each practice.

Results

A summary of the facilitators and barriers determined through our research are summarized in Table 1. The 3 practices differed in location, staff numbers, and billing methods (Table 2). Table 3 summarizes the environmentally sustainable initiatives raised in interviews by participants at each of the 3 practices, and demonstrates which of these initiatives were adopted across all practices, and those which were undertaken by only 1 or 2 practices.

Notably, we found at each practice at least 1 person in a leadership position who valued environmental sustainability. All 3 practices displayed features of a workplace culture in which environmental sustainability was an important component. Concomitant benefits of environmentally sustainable initiatives such as financial savings were mentioned multiple times in interviews as an important incentive.

Barriers included lack of knowledge described by participants as a sense that they did not have the necessary understanding of the existing research about which initiatives

would be efficacious in reducing emissions or minimizing waste. Other issues included a lack of understanding as described by staff about why an environmentally sustainable initiative was considered to be important. Waning staff engagement over time, inconvenience, and infection control were also reported as concerns by those trying to lead and implement change.

The findings are presented in detail below, arranged broadly under the 3 main factors influencing environmental sustainability: “Leadership,” “Staff Engagement and Workplace Culture,” and “Concomitant Benefits.” The role each factor plays in influencing change is explored, with facilitators and barriers discussed throughout. We found that observational data largely aligned with interview data for practice 1. Where it did not, this has been outlined in the findings below. For the included quotations, the role and practice of the interviewee quoted was omitted in order to ensure anonymity of participants.

The environmental impact of prescribing and transport was not a significant focus of interviewees’ comments.

1) Leadership

A key factor identified in the study was the importance of leadership in implementing environmentally sustainable initiatives at the practices. Within the context of this paper, those in a leadership position are considered to be the individuals with the authority to make decisions regarding the running of the practice business (i.e. practice owners, practice manager). Individual GPs and nurses had authority over their clinical decisions but were not considered part of the leadership team.

All 3 practices were GP-owned practices. None of the practice managers were also owners. Within each of these teams, there was at least 1 person who valued environmental sustainability and drove the environmentally sustainable initiatives at the practice.

Many staff members interviewed commented on the attitudes and approach of the leadership team. One described the practice owners at their practice as “so precise” doing “every

Table 1. Summary of barriers and facilitators to environmental sustainability in 3 Australian general practices aiming to reduce their environmental impact, 2020–2021.

Facilitators	Barriers
Leadership that values environmental sustainability Workplace culture that values environmental sustainability Education of staff regarding environmental sustainability Concomitant benefits e.g. reduced cost, improved efficiency, better quality	Lack of knowledge at management level about the most environmentally sustainable ways to run a general practice Lack of understanding amongst staff regarding rationales behind environmentally sustainable initiatives Inconvenience of some environmentally sustainable initiatives Waning staff engagement over time Infection control concerns

Table 2. Demographics of 3 Australian general practices participating in research evaluating environmental sustainability, 2020–2021.

	Practice 1	Practice 2	Practice 3
Personnel	40 staff members—17 doctors, 1 practice manager, 11 reception/administrative staff, 6 nurses, 5 allied health staff	33 staff—13 doctors, 10 nurses, 9 administrative staff, 1 practice manager	18 staff—9 doctors, 2 nurses, 6 reception/administrative staff and a practice manager
Billing	Mixed billing practice with both private billing and bulk billing	Private billing	Mixed billing practice with both private billing and bulk billing

Table 3. Summary of environmentally sustainable initiatives at 3 Australian general practices attempting to reduce their environmental impact, 2020–2021.

Practice 1	Practice 2	Practice 3
1. Policies and planning		
- The practice did not have a specific environmental sustainability policy or plan at the time of research	- External audit of energy use - Environmental sustainability policy	- Informal internal audit of energy use and waste
2. Education and training of staff		
- The practice did not engage in specific environmental sustainability education/training	- Offered education sessions for some staff, including cleaning staff - Regular meetings to groups of staff e.g. nurses demonstrating what is and is not recyclable	- All new staff have training which includes discussions around waste and recycling
3. Energy		
- Solar panels - Double glazed windows - Shade awnings - Draught proofing - Energy efficient air conditioning - Each room has an individual switch for air conditioning - Limits to air conditioning and heating temperatures - Dishwasher and washing machine used during the day to maximize solar use	- Solar panels - Draught proofing - Energy efficient light globes - Energy efficient air conditioning - “Green” energy provider - Limits to air conditioning and heating temperatures - Setting a timer on the “boiling billy” (the machine that provides readily available boiling water for tea and coffee) so that it is only in use during business hours	- Solar panels - Solar hot water system - “Green” energy provider - Energy efficient light globes - Limits to air conditioning
4. Medical waste		
- Re-use otoscope ear-pieces (cleaned not sterilized) - Re-use kidney dishes (cleaned not sterilized) - Any sheets used in doctors rooms are sent away for washing each week and re-used. Single-use sheets in treatment room - Recycling of immunization boxes	- Re-use otoscope ear pieces (cleaned not sterilized) - This practice uses plastic speculum for cervical screening and sterilized for intrauterine devices. - Sterilization of skin biopsy kits	- Re-use otoscope ear pieces (cleaned not sterilized) - This practice uses plastic and sterilized speculum for cervical screening - Sterilization of skin biopsy kits - Non contaminated gloves recycled (small additional cost)
5. Office waste		
- No fax machine - Recycling trays in each consulting room to encourage recycling - Additional kerbside recycling purchased - Offer electronic referrals, offer e consults for simple prescriptions through apps	- Use of fax minimized - Recycling trays in each consulting room to encourage recycling - “Junk mail” cancelled - Recycle batteries, printer cartridges and offer drop off point for patients to recycle - Offers electronic referrals, offer electronic script	- Recycling areas in each consulting room - Recycle bottle lids and bread tags - Use electronic referrals and electronic fax as much as possible - Some use of e-scripts - ECG uploaded directly to patient file - “Junk mail” cancelled
6. Food waste		
- Scrap bin for organic waste - Recyclable coffee pods	- 2 compost bins at the practice which go into an organics bin which is picked up by the council	- Compost bins
7. Water waste		
- Stormwater collected from the roof and stored in a tank and used to flush the toilets	- The practice did not have any specific strategies to reduce water consumption.	- Sensor taps
8. Transport		
- The practice did not have any specific strategies to reduce the environmental impact of transport.	- The practice did not have any specific strategies to reduce the environmental impact of transport.	- Bike racks supplied
9. Promoting environmental sustainability		
- Posters in the practice in some doctor rooms, some promotion of environmentally sustainable materials on social media	- Poster in the waiting room	- Advertised on website as a ‘green’ practice - All referrals note they are a ‘green’ practice

little thing possible that they can protect the environment.”
Another explained:

Oh, just—the attitude of the leaders, is my opinion... they want to do the best for their patients and they want to do their best for the environment as well.

Many initiatives required decision-making at the practice management level due to the need for financial decisions and changes to procedures. It appeared to be instrumental to have someone within management to recommend and bring these about. One participant said:

So I think you've got to have Practice partners and owners and things like that, that are actually prepared to do an investment for something that they believe in, like the environment, to try to better what they're doing. Because otherwise it's not going to work.

Participants suggested having a person at management level interested in environmental sustainability appeared important in influencing those in the management team who were less engaged. One participant interviewed described how attitudes among their management team ranged from enthusiastic to resistant. The participant (a member of the management team) described how they were able to implement the initiatives they felt necessary due to their own enthusiasm for the changes, and the mutual respect among the management team.

Involvement by the management team seemed key to many of the environmentally sustainable initiatives implemented at the practices, for example, installing solar panels, changing electricity providers and upgrading the air-conditioning system. Initiatives that were suggested by staff and then adopted by management were also described by interviewees as ongoing. Environmentally sustainable initiatives that were initiated by staff without the involvement of the management team were observed to be used less consistently, for example, a vegetable scrap bin mentioned in interviews that was not observed to be used in practice.

Many practice owners and managers described their motivation to make changes at the practice as a deep and long-term concern for the natural environment.

Uncertainty: One of the main challenges identified by management team participants was uncertainty regarding the evidence base for the environmentally sustainable initiatives they wanted to implement. One member of the management team explained:

It's weighing up, is it better to use a recyclable material or use a washing machine that uses energy, you know? Kind of—yeah. It's a fine line, really, isn't it?

Participants described how knowledge of environmental sustainability research may help to address uncertainty felt by those in leadership positions. Similarly, uncertainty was also described by staff members who reported they were sometimes unsure about the rationale and evidence underlying initiatives at the practices, and this is discussed further below.

2) Staff engagement and workplace culture

The leadership team were central to engaging staff and creating the workplace culture, in particular the shared values of staff and workplace practices, and this is the second key factor identified in our study. A participant noted the different roles of management and staff in implementing their chosen environmentally sustainable initiatives:

It certainly wouldn't work if you didn't have people to make that financial commitment for the bigger stuff, like the solar and stuff. And then for the little stuff, if people don't do the right thing, well, it's not going to work.

At 1 practice, a participant described attending lunch and feeling embarrassed at having single-use plastic containers, instead of the re-usable containers used by the other staff:

The culture encourages people to be more sustainable through peer pressure. So I've bought actual Tupperware, 'cos I'm like—it's almost embarrassing to sit with colleagues and have Tupperware that's disposable and—and you don't have—generally you—everyone else has proper glassware or normal Tupperware that can be reused. So, that in itself is a cultural change which I think is positive.

Management actions were described as important in reinforcing a culture of concern for the environment. For example, a participant recalled that when they first started working, they were notified by the management team at the end of the day that they had forgotten to turn off the air conditioner.

Waning staff engagement: A member of the management team noted the challenge of sustaining staff engagement over time. They reported that at their practice, staff were more “conscious and careful” of electricity usage around the time the solar was installed, but that over time, staff began using air conditioning more frequently or leaving computers on overnight. They discussed the importance of constantly reinforcing the need for environmentally sustainable practices, noting: “it's something that you just have to keep doing.”

Ongoing reminders to staff: In order to assist with this issue, all 3 practices had introduced initiatives designed to sustain staff engagement to minimize energy use, clinical waste, office waste and food waste. For example, 2 practices had checklists for reception staff to remind them to turn off lights and appliances at the end of the day and all practices had recycling trays in each consulting room.

Lack of knowledge: A lack of knowledge and convenience appeared to be a barrier to staff engagement. One participant was aware that management liked staff to turn off everything at the power point at the end of the day, but reported not doing this consistently because they did not understand the evidence behind this. They explained:

Everything's turned off at the power point at the end of the day. So in the morning, you have to go around and turn everything back on. So if I know that I'm there the next day, I don't bother turning it off. And that hasn't—no-one's sat down with me and said, “This is why we do it, this is the amount of energy's that saved.” So there's small things like that, which I must admit, I haven't taken on board. And I wonder, if somebody sat down and told me why we do that, then I will probably do it, but nobody's bothered to do that with me.

Similarly, a member of the management team reported sitting down with a staff member who said they did not understand why the practice was implementing environmentally sustainable initiatives. The member of the management team reported:

One of them said, [they were] just a bit, like, “Who cares?” And didn't see that it being important. Then I showed them some pictures down the track of waste in the ocean and that sort of thing, and kind of tugged at the heart strings a bit to try and turn them around. And I actually did have some success and they started recycling at home and staff commented on how they were getting more conscientious at home with their recycling. So that was a really good win.

Importance of education: Both these examples also demonstrate that staff had changed their practice, or indicated they would be inclined to change their practice, if management explained to them the evidence behind following the initiatives. Several interviewees commented on the importance of educating staff. A member of the management team said they spent many staff meetings educating staff, including the cleaner, regarding how to appropriately recycle.

Infection control: Concerns about infection control were also raised, for example, 1 receptionist noted “I think some of the doctors didn’t like the idea of recycling linen, even though it was being washed and ironed, they thought it was more hygienic to have a more disposable option as well.”

3) Concomitant benefits

The third important factor identified in the study was that initiatives considered environmentally sustainable which had other benefits, for example, decreased cost or improved efficiency, were more likely to be adopted by the practices.

Financial benefits: Interviewees commented on the many initiatives which had financial benefits. A practice manager noted it was easier to build consensus in the management team regarding an environmentally sustainable initiative when there were financial savings:

I guess that was the other thing, that for me, as a Manager, you’re looking at the business plan and you’re trying to save the business money as well, so it’s not only environmental, it’s also the fact of, well, we can save money if we do this.

After an environmental sustainability audit, a practice reported they could save about 30% of their energy bill by identifying where energy was being wasted. The same practice reported changing from single to double-sided printing saved about AU\$2000 a year and significantly reduced paper use.

Importantly, practices reported sometimes implementing initiatives that were considered beneficial to the environment which had an additional cost. For example, a member of the management team reported changing to green electricity was more expensive, and noted “*that was probably the one and only thing we’ve done, which was done purely for some sort of altruistic sort.*”

Improved morale: Some participants also commented that the initiatives implemented had a strong “feel-good factor.” One member of the management team said that they improved staff morale and noted:

I think it also implies a certain ethos of the practice. A practice that concerns itself more with environmental-type issues and are willing to put it out there. It’s a sort of an assumption that that practice is probably going to be more thoughtful in the way it runs other things. So, in the way that people—patients and the level of service that’s provided...And I think there’s an implication that you care about that, then you probably care about other things.

Improved efficiency: Participants noted how some initiatives saved time. For example, a practice called pharmaceutical companies and asked to be taken off the list of advertising, saving receptionists time sorting through advertisements. In

another example, the fax machine was removed at 1 practice and this was as much about efficiency and practicality as about environmental concern. Interviewees reported that the fax machine was difficult to use and that the practice aimed to reduce paper consumption. Despite no longer using a fax machine, a considerable amount of paper was observed to be used at the practice.

Initiatives that decreased costs, improved morale or improved efficiency were noted to be more frequently adopted by practices than those which increased cost or substantially reduced efficiency.

Discussion

To the best of our knowledge this is the first study undertaking an in-depth exploration of the practical initiatives adopted by general practices that have taken steps aiming to improve environmental sustainability. Fieldwork for this research took place in 2020, just after the Australian “Black Summer” bushfires and in the early days of the COVID 19 pandemic. As such, the findings of our research could be understood as reflecting “what mattered” at this particular moment in terms of environmental sustainability in general practice. We identified a range of facilitators and barriers faced by staff. We found having someone in leadership at the practice who valued environmental sustainability was important: people in leadership positions were reported to be able to influence other members of the management team as well as other staff, and noted to have an important role setting the tone for a workplace culture that valued environmental sustainability. Concomitant benefits of initiatives, particularly cost savings, were found to be important factors in enabling change. Interviewees also reported the benefits of these initiatives in terms of engaging staff.

Lack of knowledge at management level about the evidence base underlying initiatives they wished to implement was a barrier. Other key barriers identified were staff related, including staff not understanding the evidence behind the chosen initiatives, as well as adherence to initiatives waning over time. Infection control concerns were also noted as a potential barrier.

Similar to our findings, leadership and staff engagement have been identified as key factors in driving environmental projects in state local health districts in Australia.²⁹ Interestingly, while 2 interviewees mentioned prescribing in the context of environmental sustainability, none of the practices had made significant attempts to address the carbon impact of prescribing, for example of metered dose inhalers.³⁰ Addressing transport impact was only attempted by 1 practice. This is despite literature suggesting that a significant contributor to emissions in general practice is prescribing and staff and patient transport.^{7,8} Instead, the practices studied focussed their efforts on energy and waste, including recycling and minimizing office supplies, packaging and food waste.

This potentially highlights a barrier acknowledged by some participants regarding lack of knowledge about the evidence base underlying initiatives in environmentally sustainable primary care and those which might have the most impact. It is important to note with regard to transport that the potential for staff and patients to actively commute would vary depending on the location of the practice, particularly, reduced options for public transport for the rural practice.

Strengths and limitations

Our study had several strengths. It focussed in-depth on practices that have demonstrated an interest in improving their environmental sustainability, in order to learn from their experiences. This approach provided valuable insights from the experience of staff members. It also included practices in different parts of the country, and of different sizes.

Limitations: A limitation of the study was difficulty recruiting from practices 2 and 3 which is thought to be due to the method of communication with AP (email rather than face-to-face) due to the COVID-19 restrictions which were implemented over the period of our research and staff being occupied responding to the pandemic. Observation at practice 2 and 3 was not able to be carried out due to the impact of the pandemic restrictions. In addition, further insights might have been obtained from inclusion of additional practices. However, the 3 areas of leadership, staff culture and concomitant benefits were consistently found across all 3 participating practices, and align with other research into the fundamental requirements for high-performing general practices.³¹

Additionally, clinical consultations were not observed and so it was not possible to triangulate data regarding clinical care obtained in interviews. Our interview guide did not specifically contain a prompt referring to clinical decision making and prescribing. Although we did not directly enquire about this, we believe the lack of discussion reflects that this was not a priority for practices. We recommend that future studies enquire in more detail about prescribing and clinical decision making.

Strategies to improve environmental sustainability in general practices suggested by our study include: establishing an environmental sustainability policy/statement of intent; undertaking regular environmental impact audits; and enrolling staff, particularly the leadership team, in health environmental sustainability education. In terms of reducing office impact, our findings point to a focus on changes that have financial benefits. Our research also suggests practices could focus more substantially on educating staff and patients on the carbon impact of prescribing (particularly metered dose inhalers), and transport impact, and provide greater encouragement of active transport to practices.

Conclusions: Our research suggests several important facilitators and barriers to initiatives intended to improve environmental sustainability in these general practices. We found that the practices largely focussed their efforts on energy and waste reduction as opposed to prescribing and staff and patient transport, despite the literature suggesting the latter have a significant impact on carbon emissions. This reflects a barrier identified in our paper which was uncertainty described by both those in management positions and staff regarding the evidence base for environmentally sustainable initiatives practices chose to implement. Further research is needed into the environmental impact of general practice in Australia, including a carbon footprint for general practice, and research into the impact of prescribing and clinical decision making in general practice. This must inform actions to reduce waste, energy use and carbon impact. Such actions should be supported by national guidelines and education, and by local expertise including at Primary Health Networks. Our research suggests further education is needed within the general practice community on the environmental impact of prescribing, staff and patient transport, and low value care.

Supplementary material

Supplementary material is available at *Family Practice* online.

Funding

Dr Pavli received funding for this research from the Royal Australian College of General Practitioners.

Ethical approval

Ethics approval was granted by The University of Sydney Human Research Ethics Committee (protocol number 2019/1031).

Conflict of interest

None declared.

Data availability

Interview and observational data are not available as they may permit identification of participating practices or individuals.

References

1. Costello A, Abbas M, Allen A, Ball S, Bell S, Bellamy R, Friel S, Groce N, Johnson A, Kett M, et al. Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *Lancet*. 2009;373(9676):1693–1733.
2. Beggs PJ, Zhang Y, McGushin A, Trueck S, Linnenluecke MK, Bambrick H, Capon A, Vardoulakis S, Green D, Malik A, et al. The 2022 report of the *MJA-Lancet* Countdown on health and climate change: Australia unprepared and paying the price. *Med J Aust*. 2022;217(9):439–458.
3. Beggs, PJ, Zhang Y, McGushin A, Trueck S, Linnenluecke MK, Bambrick H, Helen L, Berry HL, Jay O, Rychetnik L, et al. The 2021 report of the *MJA-Lancet* Countdown on health and climate change: Australia increasingly out on a limb. *Med J Aust*. 2021;215(9):390–392.e22.
4. Zhang Y, Beggs PJ, McGushin A, Bambrick H, Trueck S, Hanigan IC, Morgan GG, Berry HL, Linnenluecke MK, Johnston FH, et al. The 2020 special report of the *MJA-Lancet* Countdown on health and climate change: lessons learnt from Australia's "Black Summer". *Med J Aust*. 2020;213(11):492.e2–492.e10.
5. Beggs PJ, Zhang Y, Bambrick H, Berry HL, Linnenluecke MK, Trueck S, Bi P, Boylan SM, Green D, Guo Y, et al. The 2019 report of the *MJA-Lancet* Countdown on health and climate change: a turbulent year with mixed progress. *Med J Aust*. 2019;211(11):490–491.e21.
6. Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian health care. *Lancet Planet Health*. 2018;2(1):e27–e35 [accessed 2022 Mar 17]. <https://www.thelancet.com/journals/lanplh/article/PIIS2542-51961730180-8/fulltext>
7. Tennison I, Roschnik S, Ashby B, Boyd R, Hamilton I, Oreszczyn T, Owen A, Romanello M, Ruysssevelt P, Sherman JD, et al. Health care's response to climate change: a carbon footprint assessment of the NHS in England. *Lancet Planet Health*. 2021;5(2):e84–e92 [accessed 2022 Mar 17]. [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30271-0/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30271-0/fulltext)
8. Nicolet J, Mueller Y, Paruta P, Boucher J, Senn N. What is the carbon footprint of primary care practices? A retrospective life-cycle analysis in Switzerland. *Environ Health*. 2022;21(1):3–3. [accessed 2023 Jan 30]. <https://ehjournal.biomedcentral.com/articles/10.1186/s12940-021-00814-y>

9. Barratt AL, Bell KJL, Charlesworth K, McGain F. High value health care is low carbon health care. *Med J Aust.* 2022;216(2):67–68.
10. Breth-Petersen M, Bell K, Pickles K, McGain F, McAllister S, Barratt A. Health, financial and environmental impacts of unnecessary vitamin D testing: a triple bottom line assessment adapted for healthcare. *BMJ Open.* 2022;12(8):e056997.
11. Blashki G. Climate change and human health, what can GPs do? *Aust Fam Physician.* 2006;35(11):909–911.
12. Pendrey C, Beaton L, Kneebone J. General practice in the era of planetary health: responding to the climate health emergency. *Aust J Gen Pract.* 2020;49(8):520–523.
13. Xie E, de Barros EF, Abelson A, Stein AT, Haines A. Challenges and opportunities in planetary health for primary care providers. *Lancet Planet Health.* 2018;2(5):e185–e187.
14. The WONCA Working Party on the Environment Statement to declare a climate emergency. 2019 [accessed 2023 Jan 3]. <https://www.globalfamilydoctor.com/News/WorkingPartyontheEnvironmentrecogniseClimateEmergency.aspx>
15. Hendrie D. Climate change is a health emergency RACGP declares. *NewsGP.* 19 December 2019 [accessed 2023 Jan 9]. <https://www1.racgp.org.au/newsgp/racgp/climate-change-is-a-health-emergency-racgp-declare#:~:text=The%20college%20has%20joined%20other,and%20consequences%20of%20climate%20change>
16. RCGP's Green Impact for Health Toolkit [accessed 2023 Jan 12]. <https://greenimpact.nus.org.uk/green-impact-for-health/>
17. Andrews E, Pearson D, Kelly C, Stroud L, Rivas Perez M. Carbon footprint of patient journeys through primary care: a mixed methods approach. *Br J Gen Pract.* 2013;63(614):e595–e603.
18. Boland T, Temte J. Family medicine patient and physician attitudes toward Climate change and health in Wisconsin. *Wilderness Environ Med.* 2019;30(4):386–393.
19. André H, Gonzalez Holguera J, Depoux A, Pasquier J, Haller D, Rodondi P, Schwarz J, Senn N. Talking about climate change and environmental degradation with patients in primary care: a cross-sectional survey on knowledge, potential domains of action and points of view of general practitioners. *Int J Environ Res Public Health.* 2022;19(8):4901–4901
20. Wild K, Tapley A, Fielding A, Holliday E, Ball J, Horton G, Blashki G, Davey A, van Driel M, Turner A, et al. Climate change and Australian general practice vocational education: a cross-sectional study. *Fam Pract.* 2022;XX:1–7. doi:10.1093/fampra/cmhc053 [accessed 2023 Jan 30]. <https://pubmed.ncbi.nlm.nih.gov/35616123/>
21. Maughan D, Patel A, Parveen T, Braithwaite I, Cook J, Lillywhite R, Cooke M. Primary-care-based social prescribing for mental health: an analysis of financial and environmental sustainability. *Prim Health Care Res Dev.* 2016;17(2):114–121.
22. Fogarty A, Morrell E, Blashki G, Horton G et al. The GreenClinic pilot: educational intervention for environmentally sustainable general practice. *Aust Fam Physician.* 2008;37(4):681–683.
23. Nichols A, Richardson J. Climate change, health and sustainability: a brief survey of primary care trusts in the south west of England. *Perspect Public Health.* 2011;131(2):82–84.
24. Morelli J. Environmental sustainability: a definition for environmental professionals. *J Environ Sustain.* 2011;1:1. Article 2:1–9.
25. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med.* 2014;89(9):1245–1251.
26. McGain F, Naylor C. Environmental sustainability in hospitals—a systematic review and research agenda. *J Health Serv Res Policy.* 2014;19(4):245–252.
27. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3(2):77–101.
28. Crowe S, Cresswell K, Robertson A, Huby G, Avery A, Sheikh A. The case study approach. *BMC Med Res Methodol.* 2011;11(1):100–100.
29. Charlesworth KE, Stewart GJ, Sainsbury P. Addressing the carbon footprint of health organisations: eight lessons for implementation. *Public Health Res Pract.* 2018;28(4):e2841830 [accessed 2022 Mar 17]. <https://www.phrp.com.au/issues/december-2018-volume-28-issue-4/addressing-the-carbon-footprint-of-health-organisations-eight-lessons-for-implementation/>
30. Woodcock A, Janson C, Rees J, Frith L, Lofdahl M, Moore A, Hedberg M, Leather D et al Effects of switching from a metered dose inhaler to a dry powder inhaler on climate emissions and asthma control; post-hoc analysis. *Thorax.* 2022;77(12):1187–1192. <https://thorax.bmj.com/content/early/2022/01/12/thoraxjnl-2021-218088>
31. Bodenheimer T, Ghorob A, Willard-Grace R, Grumbach K. The 10 building blocks of high-performing primary care. *Ann Fam Med.* 2014;12(2):166–171.