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## Thinking with care infrastructures: people, devices and the home in home blood pressure monitoring

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**Abstract** The growing consumer market in health monitoring devices means that technologies that were once the preserve of the clinic are moving into spaces such as homes and workplaces. We consider how one such device, blood pressure monitors, comes to be integrated into everyday life. We pursue the concept of ‘care infrastructure’, drawing on recent scholarship in STS and medical sociology, to illuminate the work and range of people, things and spaces involved in self-monitoring. Drawing on a UK study involving observations and interviews with 31 people who have used a consumer blood pressure monitor, we apply the concept beyond chronic illness, to practices involving consumer devices – and develop a critical account of its value. We conclude that the care infrastructure concept is useful to highlight the socio-material arrangements involved in self-monitoring, showing that even for ostensibly personal devices, monitoring may be a shared practice that expresses care for self and for others. The concept also helps draw attention to links between different objects and spaces that are integral to the practice, beyond the device alone. Care infrastructure draws attention to the material, but ensures that analytic attention engages with both material and social elements of practice and their connections.

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**Keywords:** care work, consumerism, heart disease, place, self help/care

In recent work the editors of this special issue have drawn attention to ‘the buildings where healthcare work takes place’ as an important topic for sociological investigation. Using work from both the sociology of health and illness (SHI) and science and technology studies (STS), Martin *et al.* (2015) argued that the built environment shapes medical practice, embodies its ideologies, and affects ‘the efficacy of care’ on offer in hospitals and clinics. In this article we wish to respond to their challenge but do not consider ‘the home’ as another site for health work and care. The home has long been a theme in studies of lay experiences of illness within SHI, as the place where a lot of prevention and treatment takes place. This is particularly true in the study of medication, as a medical technology that frequently travels from clinical sites to domestic ones. The home is also important in studies of interventions that sit on the boundary between ‘health’ and ‘social care’ and recent work on telecare and telemedicine from STS. In this article we will draw briefly on these literatures to contextualise Danholt and Langstrup’s (2012) proposal that we apply the concept of ‘infrastructures of care’ to health work at home. We then interrogate the value of these infrastructural accounts for the debates on ‘materialities of care’ using our own data which – unlike most previous studies – is focused on technologies acquired independently of formal health services.

## Materialities of home health: attending to technology and place

Sociologists have long been interested in medication as negotiated in the life world of the patient (Britten 2008), while studies in STS have foregrounded its use as an everyday technology. For example Prout *et al.* (1999) wrote about the ways in which inhalers were used in a family to maintain ‘ordinariness’ for children with asthma, while Willems (2000) explored their use as a technology of self care. In SHI, debate has recently returned to the meaning and use of medicine, putting space back in more explicitly. For example Hodgetts *et al.* (2011) researched the ‘spatial, material and relational practices’ of New Zealanders using drugs to manage long-term conditions or care for young children. Using the notion of ‘emplacement’ they argued that the location of drugs helped people remember and routinise medicine use, and negotiate it as part of ‘caring practices’ (Hodgetts *et al.* (2011: 358) within the household.

Further discussions of the spatial organisation of the home, and health work within it, may be found in studies of telecare and telemedicine. These may include monitoring and/or treatment technologies to encourage ‘self care’ or ‘care at home’ for older people. Studies of their introduction into domestic spaces and relationships have explored ‘who cares where’ (Milligan *et al.* 2011), and responded to the expectations that accompanied these technologies by insisting on the work of ‘negotiating’ technologies relocated from the clinic and ‘mediation’ of these devices by people and objects already in the home as part of a process of domestication (Oudshoorn 2012). Oudshoorn emphasised how partners might be drawn into monitoring work, though she suggested men helped female partners with technical aspects, and women helped male partners deal with the emotional aspects of monitoring. Here the ‘device’ was understood as the result of a network of people and things, however there was a risk that introducing clinical technology was spoiling a sense of ‘home’.

## Care infrastructures, work and the home

Returning to medication Danholt and Langstrup (2012: 513) suggested that people with chronic conditions such as asthma, diabetes and haemophilia live within an ‘infrastructure of care’:

‘The “self” . . . is an actor who is highly dependent on, and inter-twined with infrastructures of care, in order to be self-caring’.

In this work the authors aim to give accounts of the mundane elements that underpin the practice of selfcare, including objects (boxes of medicines, pens, paper, phones, cupboards, fridges) and people (nurses, pharmacists, taxi drivers and family members) that allow for the procurement, emplacement and use of medication. Placing medication by the bathroom sink helps remind people to take it (see also Hodgetts *et al.* 2011) and to brush teeth afterwards to prevent oral fungi that can follow the use of asthma medication. The spatial organisation of the home helps make care possible (Danholt and Langstrup 2012). In her more recent paper Langstrup (2013) developed an account of these elements working together in what she called ‘chronic care infrastructures’ – arrangements of people, spaces and mundane objects that enable the negotiation of chronic illness at home.

Infrastructure in STS is a way of drawing attention to spaces and routines, as ‘embedded’ and ‘installed’ elements that shape and enable practice (e.g. Star and Ruhleder 1996). Infrastructures are created by materials and the routine activities, conventions and ‘work’ required to maintain them (Star 1999). In this early use, the concept was close to medical sociology: Star wrote with

Strauss on invisible and articulation work, e.g. Star and Strauss (1999). Langstrup's suggestion about 'care infrastructure' thus lays the foundation of a renewed conversation between SHI and STS. For example Cheraghi-Sohi *et al.* (2015) have written about work by patients, friends, family members and health professionals, including medication-articulation work (ordering, collecting, or emplacement of medicines); surveillance work (keeping track of progress across the day); emotional work (supporting taking medicines); and informational work (for example around new medicines) that come together to maintain the care infrastructure.

Like Oudshoorn, Langstrup also drew out some of the symbolic importance of 'home'. While emplacement may enable health work in domestic spaces, it may also be used by patients to 'keep disease in its place' when putting things out of sight helps avoid unwelcome reminders of illness (Langstrup 2013: 1016). Other authors have explored how a sense of home can be threatened by incursions from the clinic. For example Twigg (2000) noted the risk when bathing became defined as a purely practical matter by care workers in the community. More recently she and Christina Buse have explored how residents of care homes (who have left their own domestic space) attempt to use dress and objects like handbags to keep a sense of 'home' and privacy (Buse and Twigg, 2014, 2016). However Langstrup (2013) was particularly clear on the way in which this sense of home has to be negotiated with family as well as with clinical workers, for example when family members wanted candles on a Christmas tree although they worsened asthma symptoms. She reminds us home is often a shared space already.

How then should we account for materiality? Both STS and SHI have started with clinical objects (medicines, monitors) to explore health work, but addressed materiality in the technology and its spatial location. Though starting our own study with the device – home blood pressure monitors – in this article we sought resources to consider the 'home' as the coming together of people, devices and spaces. We suggest that the 'care infrastructure' concept may help here through its attention to materials, spaces, routines, conventions and work. As Langstrup (2013) suggests, thinking in terms of infrastructures allows us to see the socio-technical relations behind care, but such infrastructures are always emergent and develop in different ways for different conditions depending on the contribution of the clinic. In our own account of self-care with technologies acquired independently of the clinic, we wish to test the value of this particular conceptualisation.

In contrast to the context of chronic care, self-monitoring devices as consumer technologies have no formal links to the clinic or clinicians. Furthermore they have tended to be portrayed as personal or individual devices (Fox 2017). Where self-monitoring has been considered as a collective endeavour, this has been with reference to communities of trackers sharing data and experiences (Lupton 2014, Sharon and Zandbergen 2016), rather than the more local mediation work encapsulated by the notion of 'care infrastructure'. In thinking about how this concept might illuminate home blood pressure monitoring, we are particularly interested to explore: the kinds of work and range of people that might be involved in self-monitoring practices, even those involving consumer devices; the nature and stability of infrastructures where procurement, emplacement and use is neither directed nor set in place by the clinic; and the potential for consumer devices to threaten a sense of home compared with technologies imported from and/or installed by the clinic.

### **The case of home blood pressure monitoring**

The first automated blood pressure monitor was launched in the early 1980s in Japan and there is now an established international consumer market. Monitors are available in the UK in

supermarkets, pharmacies and online retailers and are relatively cheap, with basic models currently costing around £10–£20. Somewhat outdated market research reported that one in six people claimed to have measured their own or a family member's blood pressure at home (Mintel 2007). The practice has received increasing clinical support in response to known problems with clinic-based measurement, in particular white coat hypertension. Current clinical guidance in the UK sees a role for home blood pressure monitoring in the diagnosis and monitoring of hypertension (NICE 2011), and offers guidance on how measures should be taken: 'when measuring blood pressure in the clinic or in the home, standardise the environment and provide a relaxed, temperate setting' (NICE 2011: 7). Existing studies of home blood pressure monitoring have been largely undertaken within clinical populations, considering how people understand blood pressure, their motivations for undertaking monitoring and their communications with clinicians (e.g. Jones *et al.* 2012, Vasileiou *et al.* 2013, Tyson and McElduff, 2003). Rather than focusing on how people understand and interpret blood pressure numbers or how they respond to these numbers, we are interested here in the material and mundane aspects of independently undertaken blood pressure monitoring.

## Methods

This research was undertaken as scoping work for a larger collaborative project concerned with the practices of self-monitoring. The aims were to explore blood pressure monitoring as an everyday practice, considering who and what is involved, the kinds of projects, data and knowledge associated with this practice, and the way these connect (or not) with formal health care provision.

The research was based on interviews with people who have monitored their own blood pressure using a device acquired independently of formal health services.<sup>1</sup> Following approval provided through Weiner's institutional research ethics review procedures, recruitment was through email, leaflets and posters addressed to staff at the University of Sheffield. This garnered a large number of responses (64). Weiner then selected from within this group to include roughly equal numbers of men and women, and a range of ages and backgrounds. A total of 27 interviews was undertaken, involving 31 participants (4 couples), between May 2014 and July 2015. Participants consisted of 17 women and 14 men aged between 27 and 82. They had a range of occupational backgrounds, including academic, professional, administrative, technical, and hospitality and buildings management. When feasible interviews were undertaken at participants' homes (10), or at a location convenient to them, including in Weiner's office (7), at the interviewees' work place (8) and by Skype (2).

Interviews covered how people came to monitor their blood pressure and chose or acquired the monitor they use, how they monitor in practice including accounts of the frequency, location and prompts for monitoring, records kept, and people included, as well as other aspects of their life they may track. Interviews have their limitations in researching everyday life, in particular for gaining insights into tacit, affective or embodied elements of practices (Hodgetts *et al.* 2011, Martens and Scott, 2004). Material prompts can be useful in these situations, helping to anchor reflections in concrete ways (Harper 2002). We therefore invited all interviewees to demonstrate their monitor and talk through any records they kept and, where possible, show where these were stored. Looking over records or reviewing a device's in-built memory proved helpful in prompting reflection and tying practices to particular time periods and events. Interviews were transcribed professionally and subject to a thematic analysis (Hamersley and Atkinson, 1995). This involved both authors reviewing transcripts in relation to existing scholarship and emerging ideas, and agreeing on overarching codes and concepts to

categorise the data. Here we discuss data pertaining to the people, materials, routines and locations involved in blood pressure monitoring, as well as the symbolic significance of these.

Interviews included a variety of accounts of how people came to monitoring. Some participants had been diagnosed with hypertension (occasionally cardio-vascular disease), others were prompted by a high reading in the clinic or elsewhere, which was not necessarily sustained in home readings. In some accounts, clinicians did not feature at all, where monitoring fitted with an interest in fitness or more general health awareness. Thus, while the research revolves around consumer devices, the interviews did generate talk about interactions with clinicians (doctors and nurses). We bracket this data in the current article to focus on the more proximal people, things and spaces involved in home blood pressure monitoring. Because of this focus on local delineated spaces, it could be suggested that domestication (Silverstone *et al.* 1992) offers an alternative analytical lens. While this would lend itself well to a focus on symbolic meanings, we pursue care infrastructures because we think it is useful in foregrounding care, work and the potentially collective nature of monitoring practices. We think this lens of care infrastructure is specifically useful here in bringing into focus these elements of self-monitoring somewhat neglected in clinical and social research in this area.

## Findings

### *Procuring and providing devices*

We started this article by emphasising that we were interested in monitoring using devices that were not provided by the clinic, drawing a strong distinction between these and telecare technologies for example, though medication might of course be either directly purchased or prescribed. Langstrup's (2013) paper focused on medication that needed to be sourced from healthcare settings or on prescription. Blood pressure monitors were procured in different ways. Though some people bought their own in high street pharmacies, supermarkets or online, others talked about acquiring devices, either bought or lent, through relatives (mothers, partners, children) or neighbours, colleagues and friends.

For example, Irene discussed asking her daughter to buy her a blood pressure monitor:

Irene: I think I told my daughter to buy it for me. I think she has an [inaudible] account and she bought it for me from London yes.

Kate: Did you choose it or did you just say you buy it for me?

Irene: No my son-in-law had it . . . And I think one of the reasons, he bought a monitor and he knew which one to buy and that's why I told them okay you know which one to buy, so they bought the same thing. (63, accountant).

Here Irene defers to her daughter and son-in-law's knowledge, short-circuiting any research or informational work she would have had to undertaken in order to choose a monitor on her own.

Many people talked about members of their family or household occasionally using a monitor, and some also described borrowing or lending machines over a period of time. For example at the time we interviewed Angela, she had lent her blood pressure monitor to her daughter. She also recounted that on other occasions she had also lent it to another daughter and also to a colleague:

Angela: I haven't got a blood pressure machine at the moment, my daughter has just been using it . . . she finds, she loves her job, she loves teaching but she finds it's quite stressful sometimes. She's on the pill so she goes and obviously has

her checks and her blood pressure has been a bit high but she's also been feeling as though her blood pressure might be going up a bit and she's been going blotchy and all that kind of stuff and her head has been banging and stuff. So I've said it's probably nothing but just to keep monitoring it and just get an idea . . . she said 'I don't know whether I should be on the tablets' and things, I said 'oh it's not for me to say but it's very early days now so just keep an eye on it'. (56, clerical officer)

Angela's lending of her blood pressure monitor to her daughter (i.e. articulation work through providing the device) and encouragement to 'keep monitoring' and to 'just keep an eye on it' (i.e. emotional work, through encouraging the continued practice) (Cheraghi-Sohi *et al.* 2015) here might be seen as expressions of maternal care, and are in line with long-standing sociological ideas about the gendered aspects of family health work. In another interview a young woman recounted that her husband had bought a monitor for her in part to persuade her to take her blood pressure seriously. These examples of the providing or lending of monitors resonate with work on the mediation of older people's technology use in domestic settings (Greenhalgh *et al.* 2013, Wyatt *et al.* 2005), where household members and wider personal networks may provide and set up technologies. Notably in the examples we have recounted mediation flows both down as well as up generations. Furthermore, in contrast to recent discussions of 'personal health technologies' (Fox 2017), once these devices have entered the home, devices are also readily shared.

#### *Emplacement and staging devices in and out of use*

Once acquired, the familiar spatial organisation of the home might be used to encourage or discourage monitoring, by keeping the device close to hand or relegating it to more peripheral spaces. This was clear in Shirley's account of her continued monitoring, as well as the monitoring of a family visitor, which followed from the visibility of the device:

- Kate: It seems astounding that you stuck it out for 6 or 7 months that you were doing it every day, given that [your blood pressure] was alright. Have you got any reflections on why? I mean you know I could imagine doing it for like a month or something, but to have done it for that length of time.
- Shirley: Yeah I don't know it was just the fact that it was there I suppose and like you know you go and sit down in the chair, I sat there in my armchair and I saw it. I mean if it was there now I'd probably do it. Because I think it's just the fact that you can see it . . .
- Kate: Did anybody else ever use your blood pressure monitor?
- Shirley: No, no, well I'm saying no, like if the kids come up and it was there they might sort of say 'oh what's this'? They'd say 'oh go on we'll take my blood pressure' you know. And I think my eldest son, I think his was sort of mild, so we were all like saying 'Oh you should go to the doctors'. (68, secretary)

This echoes data from the literature on medication and its emplacement, by emphasising the importance of location as a reminder about the technology, as well as showing how the location in the home enabled sharing. Gill and Ed, a couple in their 40s, similarly described emplacement as being important. 'You know once that device is out then *we* will use it while it's sat there until *one of us* decides to put it away', (emphasis added). However Shirley also

described the movement of the monitor as her interest waned through a series of less visible locations, narrating its staging out of use:

Kate: How often did you take it after that?

Shirley: Oh very occasionally because then I actually put it away. I didn't have it on, it went from the top, I've got like a nest of tables so there was the top of the table, then there was a little table, there was a little thing underneath. So when I was doing it like obsessively it was on the top and then when I got a bit fed up it went underneath so I couldn't see it. And then I moved it from there into the drawer, so at that point it was, then it wasn't seen and it was forgotten . . . it did like sort of go from you know out there in your face to out of sight and then in the cupboard out of mind. . .

Kate: What else is in the drawer?

Shirley: Oh all sorts of rubbish. All my bank cards and it's like my passport. All documents really and it was just somewhere where it would fit.

Shirley felicitously describes the monitor moving from being 'out there in your face' to 'out of sight' to 'out of mind' and 'forgotten'. The monitor is now housed in a space 'just somewhere it would fit' rather than connected to any intention to use. Another respondent, Kathy describes the migration of her blood pressure monitor from when used being stored in a cupboard under the stairs to now being 'in the garage somewhere but it's absolutely buried'. Unlike some telecare devices, blood pressure monitors could be moved around the home, and their emplacement closely connected to their use or non-use.

Occasionally the visibility of a monitor might be more problematic, and emplacement related to a desire for privacy or minimising awareness of a health issue. So for example one interviewee suggested that she kept the monitor in her bedroom and tended to monitor there, although she might monitor in the lounge if she was at home on her own. In another interview, Joanne, a 31-year old secretary explained that she had carried her monitor in her handbag so that it was always to hand, and sometimes monitored 'in secret' for three reasons: first to avoid the disapproval of her family, who thought she had become overly concerned with her blood pressure (here Joanne wanted to avoid their unwanted surveillance work); second because she associated high blood pressure with poor lifestyle and high readings were a 'reflection on how I was looking after myself'; and third because for Joanne, monitoring was associated with anxiety and panic attacks, thus the monitor risked disclosure of stigmatising states. Joanne's account, while singular, is important as it illustrates that family and personal networks may not always encourage and support monitoring, and that the presence of a monitor may open up sensitive issues to unwanted scrutiny.

In contrast, Jack described putting away his monitor 'to make the condition disappear' for himself:

Jack: This last measurement there June 2011 was probably the last time.

Kate: Okay so what changed, why did you stop?

Jack: I felt like the machine might've been a sort of stress contributor, I sort of wanted to make the condition disappear, not have it be a sort of daily thing yeah. Because it does make you feel ill, not feel ill but you feel like someone who is ill when you have to use it, having medical lying round in your bedroom when you're sort of 20 something you kind of think well, so I sort of ditched it and put it back in the suitcase. (27, academic)



In this case having a monitor in the bedroom did not equate with privacy, but was experienced as an intrusion in daily life and sense of self. A suitcase appeared as a resource to help make the condition less present.

#### *Systems of objects and interlinking practices*

When monitors were being used other things appeared to help with the work of taking a reading. Shirley's account also showed how emplacement located the monitor as part of what Shove *et al.* (2007) call 'durable systems of objects' – a phrase that seems close to the concept of infrastructure. She described how on the days she does not work:

at 11 o'clock-ish I go and have a cup of tea or a cup of coffee and sit down and just read the paper or do something and I'd just think oh I'll take my blood pressure . . . and then I'd like do it at night, you know you get sat down, you know after you've had your tea and you're watching the television, I used to have it on the table at the side of my chair. So it was just sort of like easy to whip it on and you know pump it up.

This illustrated the way in which monitoring might be inserted into existing routines and devices bundled with other objects such as chairs, cups of tea, newspapers or televisions that were linked to relaxation. Resonating with clinical guidance, the convivial and relaxing effects of the home were sometimes narrated as integral to achieving proper blood pressure readings. In other words the affective aspects of the home helped achieve good self-monitoring:

Sometimes, I do believe that you get a different reading when you're relaxed than when you're up and about so it would, it could be, I mean if I was taking it every day and I wanted to watch television typically I'd have it in here so that I can put my feet up and watch television and take it. (John, 77, retired academic)

The importance of domestic space in creating the right mood is also implied in Bob's account of his monitoring practices:

I usually do it in the conservatory, which is next to the dining room . . . It's where I sit in the morning for my early morning cup of tea. It just happens to be where I am at the time and it's a relaxing place to be because you know you're overlooking the garden and so it just seems a logical place to do it. (62, retired housing manager)

In Bob's account monitoring is inserted into his morning routine – the cup of tea in the conservatory – and makes sense or is 'the logical place' both because it fits with the routine (it happens to be where I am) and because 'it's a relaxing place'.

In our study most devices operated with batteries, so that electricity sockets were rarely invoked as being part of the emplacement or installation of a device, and this made them easy to pick up or put down. Inserting or removing batteries signalled periods of use and non-use or an end of engagement, as Betty (58, team leader, accommodation services) described:

Kate: Can you remember the last time it was used?

Betty: Crikey, I'd say at least four years ago, we took the batteries out of it

#### *Taking a reading: a relational achievement*

We have observed above that the familiar spaces and routines of domestic life enabled home blood pressure monitoring and helped produce a good reading. In addition taking readings

(like procurement) might also involve family members, especially partners. In the case of Betty and her husband, as narrated by Betty, the decision to monitor seems to have been initiated by her husband, but then adopted as something to do together, with different elements of the practice shared between the couple (purchasing the monitor, operating the machine, keeping records). Here we offer a condensed version of this account, which starts with Betty explaining how they came to purchase a monitor:

- Betty: Because he'd been having these problems and as I say we just saw that, it had come on offer in the chemist and so he says "We'll get one and we'll keep it if we need to use it, that's what we'll do," and that's what we did. . . [Talking about keeping records] I'm almost sure, I'm almost certain I kept some kind of a thing down, I just can't find it.
- Kate: Would that be for you and your husband?
- Betty: Both of us, yeah. I would have recorded it, I'm sure I would have done yeah, I just can't find it.
- Kate: And did you have a particular place where you would
- Betty: We'd just do it at the kitchen table, that's all. We'd just sit there . . . if one did it then the other one did it yeah . . .
- Kate: When you did it, did one of you kind of take a lead really?
- Betty: Yeah probably me because my eyes are slightly better and I could read all the things so that's probably yeah

This account is characterised by the mutuality of the practice, referring to doing it together (if one did it then the other one did it), Betty nearly always speaking in the first person plural (we), and the impression of reciprocity. While Betty suggests it was her husband's health problems that had prompted the monitoring, the practice is taken up together, though in some respects Betty takes a leading role, keeping records, reading the monitor and the instruction manual, because of her 'better eyesight', and might be read as supporting her husband's health.

On the other hand, Frank describes his wife occasionally using his blood pressure monitor, with his permission and help, because she is 'not a technical person':

every now and again she'll come to me and say 'oh can I take my blood pressure'? We don't keep a record of it, if it's reasonable she's quite happy. That's about once every six months she takes it . . . well she sees this as "my piece of equipment" if you like so she wouldn't use it without and also she's a little bit, she's not a technical person so she likes me to do it, set it up for her and do a bit with her make sure the cuff is on in the right place and such like so she's a little bit reluctant to do it herself. (55, electrical technician)

In this example, Frank is clearly cast as the knowledgeable helper undertaking articulation work.

## Discussion

Like many previous studies, our research began with a device or technology that promised to improve health. In this article we started to consider materiality in a wider frame, examining the importance of 'home' in the practice of home blood pressure monitoring and the value of the concept of the 'care infrastructure'. Unlike previous studies, we focused on a case where health professionals were less central to the action and people (largely) left to their own

devices. In this discussion we draw together some of our observations and implications for sociological work on the material shaping of care.

Though we are not relating our work to chronic illness we find the concept of a care infrastructure useful in illuminating the range of people, things and spaces involved in any health practice, showing that devices and individuals rarely act alone. Previously the concept has been enrolled to understand the provision of formal or clinical care in new spaces, for example in relation to medicines management. We have applied the concept in a new context, looking at consumer monitoring, and find that our analysis resonates strongly with other scholarship, though with some important differences.

Unlike telecare technologies (see for example Milligan *et al.* 2011, Oudshoorn 2012), the home blood pressure monitor is rarely networked, and has no formal link to the clinic. In this case the device does not bring with it a set of health professionals making new connections between clinics and homes. Nevertheless as with technologies provided by the clinic, the use of this consumer health device may rely on family members who undertook articulation, emotional and informational work (Cheraghi-Sohi *et al.* 2015) by gifting, buying or lending monitors and providing encouragement and support for their use. One aspect that emerges in our research which has previously been less in focus is the potential for personal networks to discourage monitoring. Where Langstrup (2013) discusses the way different householders' values and priorities may come into tension in the management of asthma, we suggest that family members may discourage monitoring for fear that it will bring about anxiety or over-involvement with health. This might be seen as a form of emotional work (Cheraghi-Sohi *et al.* 2015).

Previous scholarship has discussed these forms of mediation work in both gendered and generational terms (Greenhalgh *et al.* 2013, Oudshoorn, 2012, Wyatt *et al.* 2005) but here we found that these might cut across such distinctions. Thinking of a care infrastructure helps keep these contributions in view. It shows that such relationships help to 'embed' monitoring and enable it (or more rarely discourage it), and also makes space for the practices to be shared or collective.

The material ordering of the home and its space was still a significant theme in our data – and encouraged us to think about the device in new ways. The emplacement of blood pressure monitors mediated their use (as in Hodgetts *et al.* 2011) and non-use (see also Greenhalgh *et al.* 2013). Apart from the networking capacities of devices, the more mundane fact that most monitors could run on batteries rather than mains electricity and were relatively small meant they were reasonably portable. Yet they were not so small that they moved with the user like a mobile phone. Once put down they often stayed in place. Finding an appropriate and visible location for a monitor – for example in a kitchen or sitting room – meant the device itself could act as a prompt or reminder for use, or be read as an invitation for other household members or visitors to 'have a go' or monitor their blood pressure, a facet of emplacement that has not been discussed in relation to pill-taking.

On the other hand privacy might be sought for the practice of monitoring, as the device had the potential to invoke discrediting or sensitive aspects of the user's identity (see also Oudshoorn 2012). When privacy was important to the user, the device might be relocated into cupboards or bedrooms. Putting it away, at a distance, out of sight, or in an unordered place, could also mean the end of monitoring, at least for a time. The use of the care infrastructure concept with its emphasis on routine action should not lead us to assume that a practice will last forever. Home blood pressure monitoring could become routine for some, but could also be quite episodic, as people were able to set aside devices or reinstall them easily.

Emplacement also had symbolic meaning: out of sight might mean out of mind. Putting a device away might mean not just protection from the surveillance of others, but also

preserving a sense of self. But a sense of 'home' was not necessarily threatened by installing devices in domestic spaces. These spaces were already used for care of self and others and the placement of the device worked to connect monitoring with relevant practices (for example for watching television as a source of relaxation).

As in other studies, the practice of monitoring involved enrolling devices into bundles or systems of (other) objects (Shove *et al.* 2007, Weiner and Will 2015). Langstrup (2013) and Hodgetts *et al.* (2011) both described the bundling of breakfast with pill-taking and tooth-brushes with asthma inhalers, which helped to create routines and engender good medication practices. In the case of blood pressure monitoring, emplacement and bundling with other everyday objects also helped create routines and might be understood as integral to doing monitoring well. Here, in contrast to pill-taking, this material ordering gave an important place to the body. Sitting on the sofa, drinking tea, and watching television could all be seen as engendering an appropriate mental or physical state for taking an accurate reading. As acknowledged in the NICE guidelines for taking blood pressure, having a monitor to hand is just the start, for taking a reading involves work to position and prepare the body. The user's physical being, and mundane domestic objects, then become part of the care infrastructure. In our data family members might help with the work of placing and settling the body and with the other physical steps for taking a reading.

As mentioned above, our data helps counter any easy assumptions that health technologies or practices will threaten people's sense of home. Though this is certainly possible and documented in the cases of telecare, social care and medicine use (Britten 2008, Langstrup 2013, Oudshoorn 2012, Twigg 2000), in our case such a threat did not appear as a strong theme. The emphasis in our respondents' accounts was less on reordering or reworking 'the home' than on fitting monitoring into embedded and established practices and using the home and other people within it as a resource for this. The continued sense of relaxation and sociability that the home allowed was seen as helping monitoring happen. Home was already defined for many of our respondents as the place where 'care' was located, as both affective and practical action. The monitoring device might be drawn into this care, but the existing infrastructure of the home was already strong, and the monitor was not usually experienced as disruptive.

Our analysis helps illustrate how the home, and the objects and people it brings together, may be a resource for particular health practices, allowing the staging of devices in and out of use and shared activities to generate good readings. What does this add to the growing interest in health-related self-monitoring? We suggest that emerging scholarship has until recently been rather preoccupied with data practices (Lupton 2014; Sharon and Zandbergen 2016) and has seen devices as personal or individual (Fox 2017). We suggest that starting with infrastructures of care helps to widen the focus from data and device. Specifically, our analysis has drawn attention to the range of local actors and work involved in the practice of self-monitoring, even in the case of consumer technologies. Through this attention to work, monitoring may also come to be seen as involving not just data, but also care amongst kin, family and colleagues. The analysis also raises the possibility that both the device and the act of monitoring may be shared. Though monitors were usually procured for a particular individual, their installation in the shared space of the home enabled their collective and collaborative use through mutual care practices. Indeed devices appeared not only portable and flexible, but even promiscuous in their involvement with different people and projects.

We have related emplacement to the use and non-use of monitors, but also considered this in terms of people's willingness or desire to display devices to themselves or others. Although a limited theme in our analysis, this and previous scholarship suggests that emplacement has the potential to impinge on a sense of home or sense of self. This extends discussions of self-monitoring beyond concerns about data privacy (Lupton, 2014) to consider privacy in relation

to the visibility of material objects (e.g. devices, apps, etc.) and the home as a set of more or less private spaces.

We have started to illuminate an infrastructure of care in relation to self-monitoring, reacting to what we see as omissions in existing clinical and social research in this area. We hope to stimulate debate about the value of the concept, as well as the use of the language of 'work' for health (or care) practices in the home and the best way to attend to the material elements of these practices. Bringing a material sensitivity, we argue, means thinking about devices and spaces, about technologies-in-practice (Timmermans and Berg 2003) and in-place, and about much more mundane objects that make domestic routines for caring for the self and others. Finally we would argue that any new material sociology of health and illness needs to keep materiality itself in its place, recognising the importance of other people in care, and the social as well as spatial embeddedness of our devices.

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## Note

1 That is, not a device lent by their primary care practice or issued for automated 24 hour monitoring.

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