



Curating the digital space: Structural gate-keeping and boundary work in maternity care



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ARTICLE INFO

Keywords:

Digital
Uncertainty
Risk
Maternity
Lay-professional
Narrative review
Digital health
Maternity care
Maternal health
Reproductive health

ABSTRACT

Digital health occupies an increasingly important role within the context of managing risk and safety in pregnancy. Women routinely use websites, mobile phone apps and social media platforms to learn about 'normal' pregnancy related changes and potential signs of a complication. This paper shifts attention from *women's* digital experiences to explore staff responsibilities in relation to women's online practices during pregnancy. We draw on Thomas Gieryn's work as an interpretive aid to enable us to understand how staff protect the boundaries of science in the face of circulating competing epistemic claims within the digital maternal health space. We focus on interview data from midwives and obstetricians exploring technology-in-use, drawn from a mixed methods study conducted in 2019, across three UK NHS Trusts. We found that online health information supplemented 'the clinic', providing an additional layer of support to professionalised, bounded forms of care. However, staff drew on relational and material aspects of *being with* women to legitimate and distinguish in-person from digital forms of care. Digital resources represented different forms of knowledge and communities. Staff were aware of associated credibility claims linked to these resources and expressed concerns that signposting women to online resources legitimised particular forms of authority and expertise implicit within these networks and tools. Staff were also drawn into reassurance practices and digital caregiving as part of uncertainty absorption. This paper offers nuanced understanding of the implicit boundary work associated with digitally mediated care, and how this links to discourses around 'being with women', responsibility and blame.

1. Introduction

Within the global healthcare landscape, digital health promotion, digital care and digital medicine are being mainstreamed within service provision on the grounds that digital technologies enable democratisation and empowerment of both patients and clinicians (Topol, 2016; WHO, 2018). Self-care apps are part of the UK NHS long-term plan for a new service model for the 21st century (DoH, 2019; Self-care apps likely among long-term plan's top digital priorities, 2022) and medical authors suggest that 'the medicalisation of the smartphone is on an inevitable path forward' (Topol, 2016). However, digital technologies are different from traditional healthcare interventions, as they are often rapidly developed and tend to 'iterate, update, and improve, rather than provide

a stable common intervention' (Greaves et al., 2018). A hallmark of digital medicine is the blurring of boundaries between providers and products. Digital practices intersect with risk perceptions, dependencies and obligations, and shape new forms of digitally mediated care (Henwood & Marent, 2019; Mackintosh et al., 2021).

This paper takes as its focus the notion of digital health as the 'mutually constitutive relationship between digital technologies and healthcare practices' (Henwood & Marent, 2019). Digital technologies include the Internet, mobile technologies (mobile software applications or apps, wearables and text messaging) and social media. Digital media and mobile ubiquitous computing devices have enabled blended use of a range of digital media such as websites, blogs, podcasts, video sharing sites and social media platforms for health (Facebook, Twitter and

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<https://doi.org/10.1016/j.ssmqr.2022.100145>

Received 17 January 2022; Received in revised form 25 July 2022; Accepted 25 July 2022

Available online 5 August 2022

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Instagram). Our lens is maternity care where women engage with digital resources to manage pregnancy and seek reassurance around understanding normality and potential complications (Mackintosh et al., 2021). Research has shown how women in pregnancy use apps to access information, chart their own bodily changes and monitor fetal development as part of self-care and ‘mothering’ in terms of protecting, and creating optimum conditions for the development of their children (Johnson, 2014). Social media provides a means of social support (Baker & Yang, 2018) and provides safe spaces for women to negotiate medical authority, challenge heteronormativity and manage the hidden labour (physically and emotionally) of self-care and self-diagnosis (Holland, 2019; Johnson, 2015; Ruppel et al., 2017). Self-tracking technologies have been found to offer opportunities for re-gaining a sense of control for women categorized as high risk (Grönvall & Verdezoto, 2013) and many women are now choosing to self-monitor their blood pressure during pregnancy (Tucker et al., 1999).

In terms of digitally mediated care, digital health studies have explored the relationship between democratisation and increased service expectations as digitization has the potential to level up the power divide between professionals and patients (Steinhubl et al., 2015). A recent systematic review found that previous supportive patient-physician relationships enabled patients to feel able to discuss their online findings with their physicians, and physician receptiveness to patients' online work positively influenced the lay-professional relationship in the clinic (Tan & Goonawardene, 2017). In maternity, midwives report holding ambivalent views towards women's use of eHealth and mHealth technologies in antenatal care amid concerns about challenges to the patient-professional relationship (Vickery et al., 2020), and becoming a ‘questioned authority’ (Wennberg et al., 2015).

Sociologists have facilitated critical thinking away from binary divisions between digital enabled patient empowerment and disempowerment, towards nuanced relationships, for example how trust and distrust intersect with both online resources and professional care (Kivits, 2013). Studies have shown how lay knowledge enabled by digital information retrieval may bring with it both a new form of expertise, challenging the authoritative knowledge of the professional in the patient-professional relationship (Ziebland, 2004) as well as complementary forms of expertise, aligning with professional service provision (Henwood et al., 2003). Digital health combines elements of patient empowerment and simultaneous (self-)discipline which ‘opens up the potential for a de-centering of medical knowledge and its subsequent communalization’ (Petракaki et al., 2018, p. 146). Patient self-management represents a form of ‘de-medicalisation’ as patients are encouraged to take care of themselves through targeted digital programmes. However, health service and commercial providers often still manage access to these healthcare and communication systems and ‘rules’ of communication (Tjora, 2014, p. 137), which can be seen as a form of expanding penetration of the clinical gaze into citizens' everyday lives (Lupton et al., 1998).

Studies have additionally focused on the affective atmospheres of digital health, and the implications of this, for care providers and patient-provider relationships (Lupton, 2017a, 2017b). Women engaged in self-tracking can feel reassured and comforted through numbers (Grönvall & Verdezoto, 2013), but women managing chronic conditions such as diabetes in pregnancy also describe the burden of self-management and lack of support from healthcare professionals (Jakubowski et al., 2022). Self-tracking, self-monitoring and self-diagnosis also have the potential to foster an increasing demand for professional services, and the blurring of boundaries between ‘the worried-well, the worried-and-maybe-not-well, and the not-worried-but-think-maybe they-ought-to be’ (Chrysanthou, 2002). Reproductive ‘imaginaries’ are becoming increasingly significant as anxiety about the unknown assumes greater significance than the fear of ‘known threats’ (Furedi, 2011 p.97). An unfocused sense of anxiety can accompany a risk consciousness in pregnancy, creating a need for greater self-monitoring and self-regulation, and increasing medicalisation and

moralization of individual behaviours (Hunt et al., 2003). There are moral obligations associated with the surveillance aspects of self-monitoring in pregnancy (Lupton & Pedersen, 2016; Thomas & Lupton, 2016) associated with having to be accountable for the health of the baby alongside women's own health (Jakubowski et al., 2022).

Digital practices intersect with organisational and care infrastructures in different ways. For example, Piras and Miele found in their study of remote monitoring for Type 1 diabetes, that digital intimacy is linked to remote monitoring practices (Piras & Miele, 2019). Their study included pregnant women with previous experience of diabetes self-management and focused on the text message exchange between patients and providers (doctors and nurses at the hospital). They found that the sharing and discussing of clinical data through messages leads to a form of ‘closeness’ and continuity in the relationship for both patients and providers, made possible by the use of the technology. Providers come to understand patients' emotions and perceptions about their illness, while patients develop more nuanced insights into rationales shaping providers' guidance. The intimacy associated with remote monitoring also ‘trickles down into the other practices that form the texture of the patient-provider relationship (i.e. routine face-to-face clinical encounters)’ (Piras & Miele, 2019, p. 127). In another study, providers expressed concern about the implications of women's self-monitoring practices on patient-provider relationships and trust, given lack of continuity of care and the context of complex care pathways for hypertension in pregnancy (Hinton et al., 2020). Distinctions between lay and professional forms of expertise surface as women take on the hidden labour of self-diagnosis in pregnancy (Holland, 2019; Johnson, 2015). The acquisition and control of specialist knowledge provides the basis of professionalization (Freidson, 1970). Diagnostic work involves expert skills, ‘scientific’ epistemic practices (hypothesis formulation, measurements or comparisons) and creative, affective and intuitive ways of knowing (Büscher et al., 2010, p. 8).

The COVID-19 pandemic has led to large-scale provider level reconfigurations, increasing digitalisation of services and innovative shifts to online practices. This has further focused attention on digitally mediated forms of care and questions about new forms of interaction between health professionals and patients, and shifting roles and responsibilities (Marent et al., 2021). In this paper (which was conducted pre-COVID), we explore professional jurisdictions and staff responsibilities in relation to women's online practices (self-diagnosis and symptom checking) during pregnancy. Previous studies have tended to focus on women's experiences and practices (Maslen & Lupton, 2019; Wright et al., 2021). We shift the focus to staff working in maternity care, and to the professional boundary work that they engage in within the context of digitally mediated care. We draw on Thomas Gieryn's work to act as an interpretive aid to understand how staff seek to sustain and protect the boundaries of science in the face of circulating competing epistemic claims and contestations within the digital maternal health space.

1.1. Boundary work and epistemic authority

Gieryn's work (1983, 1995, 1999) focuses on ‘how the boundaries of science are established, sustained, enlarged, policed, breached, and sometimes erased in the defence, pursuit, or denial of epistemic authority’ (Gieryn, 1999 p.xi). Science is construed as a cultural space. Of analytical interest is how scientific claims are maintained, on what basis they are reshaped, and how these claims act as distinction practices to set science apart from non-science. ‘Epistemic authority is the legitimate power to define, describe and explain the bounded domains of reality’ (Gieryn, 1999, p. 1).

Gieryn's notion of boundary work provides a conceptual frame for understanding how professional differences *within* science are negotiated and the ways in which scientists promote, expand and protect their resources and autonomy through distinction and legitimising practices (Burri, 2008; Håland, 2012). The epistemic authority of science is historically situated, locally enacted, structurally configured and shaped

downstream, through the routine accomplishments of demarcation in practice. Gieryn's work provides a way of examining the 'relations between things that comprise stratification and hierarchy (material resources, power, control, prestige, influence) and things through which people make sense (culture, meanings, interpretative frames cognitive schema, maps)' (Gieryn, 1999, p. 12).

Digitization can be seen to intersect with the allocation of the epistemic authority of science, in terms of representation of credibility claims, and legitimate forms of knowledge and trustable forms of reality. Peterson and colleagues have applied Gieryn's concept of the 'cultural cartography' to examine how patients and carers examine online treatment claims and navigate credibility claims and rival sources of epistemic authority, both science-based and non-science-based (Peterson et al., 2019). Our paper extends this by focusing on professional rhetorical boundary work, shifting the gaze to staff managing competing epistemic claims and contestations within the digital maternal health space (Gieryn, 1999).

Our paper adds to the rapidly developing sociological literature on digital health (Henwood & Marent, 2019; Lupton, 2020). Until recently, the focus has largely been on patients' digital activities and roles, but studies are increasingly starting to explore how healthcare professionals work with online resources. Stevenson et al., 2019's interactional study of GP consultations highlights how GPs transform information from the Internet into a medically sanctioned resource to maintain the legitimacy of their position as experts (2019). By examining how women's digital use intersects with midwifery and obstetric professional expertise, our paper contributes to understandings of the local and emergent nature of maternity care. Through our findings, we explore how the borders and landmarks that give the professions meaning are sustained, reshaped and threatened in the defence or denial of epistemic authority (Gieryn, 1999 pxi). This lens enables us to explicate the consequences of boundary disputes and jurisdictional tensions, and how responsibility and blame are interwoven with accountability practices.

2. Methods

2.1. Study design

We draw on data from a 12-month UK-based project on the role of online resources and apps during pregnancy. The project explored women's use of digital resources within the wider social practice of self-diagnosis and help-seeking for pregnancy complications and comprised: i) a survey to scope use of available tools for self-diagnosis and help-seeking amongst the maternity population (Mackintosh et al., 2020); ii) interviews with women and healthcare professionals to understand technology-in-use; and iii) social semiotic analysis of digital resources to explore content and messaging for self-diagnosis and help-seeking practices. This paper specifically draws on interviews with healthcare professionals conducted in part ii.

2.2. Setting

We purposively selected three 'information-rich cases' within the UK, (two large urban and one rural district general hospital) across two geographic locations (London and the East Midlands), for the survey and interview study. Site 1 delivers 6,500 babies annually; services include an obstetric unit, a midwife-led unit and a private maternity suite. Site 2 delivers 11,000 babies annually; services include two obstetric units and three midwife led units). Site 3 delivers 3,700 babies annually; services include an obstetric unit. All sites served areas with varying levels of deprivation and diverse populations of women from different socio-economic, cultural and ethnic backgrounds.

2.3. Types of technology

The study focus included different types of digital technologies: (1) interactive symptom checkers using computerised algorithms; (2)

pregnancy webpages displaying specific 'red flag' signs and symptoms; and (3) self-monitoring apps which include diagnostics on pregnancy complications. Symptoms identified as potentially indicative of serious conditions were used as 'red flags'. These included: vaginal bleeding; vaginal discharge; diarrhoea and vomiting; fever; severe headache; blurred vision; change of baby's movements; abdominal/stomach pain; swelling in hands and feet; breathing difficulties; itching that is particularly noticeable at night; sudden onset of feeling thirsty; and a feeling that 'something is wrong'. These red flags provided reference points for us to focus on as distinct from more generic online applications e.g. breastfeeding, forms of online social support.

2.4. Participant recruitment

Sampling for the staff interviews was based on three maternity service access points: (1) antenatal bookings, i.e. community midwives involved in disseminating pregnancy information at booking; (2) urgent assessment/triage, i.e. midwives working in day assessment units or on help-lines; (3) specialist high risk clinics, i.e. midwives/obstetricians working in diabetes, hypertension and preterm birth (see Table 1). Research midwives, nurses and support officers facilitating the wider study helped with recruitment of staff for interview at each site. Staff who expressed interest in the study were referred to [x] who emailed the participant information sheet and arranged a face-to-face interview. We were guided by principles of code and meaning saturation (Hennink et al., 2017). Fifteen staff members participated in the interviews, including obstetricians, community and specialist midwives across the 3 sites which provided us with a richly textured understanding of issues associated with women's use of digital resources from staff perspectives (Malterud et al., 2016).

2.5. Data collection

Face-to-face, in-depth, semi-structured interviews were conducted by [SA] (an experienced qualitative researcher). Interviews took place from July–October 2019 and lasted on average about 50 min. Participants chose the interview time and place; most took place at work in a quiet office. The topic guide focused on staff's experiences of women's digital use, including: which online resources and apps they were familiar with, how these featured in consultations with women during pregnancy, and their role in self-diagnosis and help-seeking. The interviews also involved an elicitation component, whereby the researcher invited the interviewee to engage interactively with a selection of the digital resources identified from findings from the survey to assess perceptions around their textual and visual features.

2.6. Ethical considerations

The study was approved by the West Midlands-Coventry & Warwickshire NHS Research Ethics Committee on March 18, 2019 (IRAS 253639). Prior to each interview, participants received a detailed explanation of the study, provided their informed consent in writing, and agreed to the audio-recording of their interviews. Names and other potentially identifying details were removed during transcription to protect confidentiality and anonymity.

2.7. Data analysis

The interviews were recorded, transcribed verbatim and analysed

Table 1
Staff interviewees.

	Site 1	Site 2	Site 3
Staff role			
Obstetric staff	3	2	2
Midwifery staff	4	2	2
TOTAL	7	4	4

using a blend of inductive and deductive approaches informed by the constant-comparison method (Charmaz, 2006). This approach is derived from grounded theory with the aim of identifying 'hypotheses' from the start of analysis and searching for cases that support or refute them, as well as using early findings to inform the content of future interviews (Boeije, 2002; Charmaz, 2006). We used NVivo software to aid data management and analysis. Analysis was undertaken by two authors (SA and NM) and further guided by discussions with the study's co-investigators and PPI advisory group.

Glaser (1998) recommends three codes of increasingly abstract categorisation: substantive, theoretical and core. Seven substantive codes were generated from the full dataset: (1) how digital resources 'work'; (2) distinctions between different types of digital resources; (3) women and staff's digital roles and responsibilities; (4) condition specific factors; (5) affective experiences of using digital resources; (6) influence of maternity service delivery and organisation; and (7) digital shifts in power and authority. We developed three theoretical codes: enactment of diagnostic work; boundary work; and socio-technical representations. Digitally mediated care formed the core code. The findings reported in this paper focus on the 'boundary work' theoretical code and link to four of the substantive codes (3, 5, 6, 7).

2.8. PPI advisory group

Our Patient and Public Involvement (PPI) Advisory Group comprised representatives from four parent organisations (Mama Academy - a pregnancy charity set up to reduce stillbirth; ICP Support - a charity supporting diagnosis and care of intrahepatic cholestasis of pregnancy; the Good Things Foundation - a digital inclusion charity; and Sands - Stillbirth and Neonatal Death charity). These organisations provided a consultation committee for the research team, bringing digital, normal pregnancy and pregnancy complications expertise. The group met twice during the project, first to discuss survey design and interview sampling and second to discuss early findings from the study and to plan for dissemination and publications.

3. Results

Implicit within the data was the finding that online resources are no longer a 'novelty add-on' but are now accepted as 'part and parcel' of everyday maternity care. However, staff did make distinctions around the legitimacy of different types of digital resources for different forms of digital work (e.g. information retrieval, self-monitoring, self-diagnosis and social support). We present five themes included within the 'boundary work' theoretical code: task shifting and managing the boundaries of professional care; supporting the work of the clinic; jurisdictional threats; diagnostic jurisdiction; and managing women's anxieties and guilt.

3.1. Task shifting and managing the boundaries of professional care

Within the context of the clinic, staff reported increasing organisational pressures to manage face-to-face consultations within tight time constraints. 'Accountability work' (Strathern, 2000), enacted largely via computer work, formed a large part of staff's time. Standardised processes were built into computer systems as part of organising for quality and making healthcare more accountable.

'We don't have enough time in our appointments to be able to go through everything that women need. We have just changed to having longer appointments, partly because of more computer work that we've got to do. [...] And [there is] not enough time [to cover] different sources of information, sources like, online things like La Leche League, (...) Babies, local peer support. So I will encourage people to look at those things, like breastfeeding support online, because of lack of time to talk about that (Site 2, midwife, S14).

Staff managed these time-limited appointments by making trade-offs in terms of prioritising certain types of activity (assessment) over others (information work). Staff noted how information consumption increasingly was part of women's self-care.

'People will try and find out anything, any walk of life, [they're] going to turn to [digital resources], rather than asking someone, (...) oh, you know, I'll Google that, I'll pop that into (...) and I'll find out what the answer is, so I think it's just more ingrained in how people are' (Site 2, midwife, S14).

Staff encouraged women to keep informed as part of their responsibility for 'doing health' as 'back-up for what they receive face-to-face from healthcare professionals' (Site 3, midwife, S15). This was reflective of cultural shifts in responsabilisation practices to self-care and online information retrieval as a 'norm of conduct' (Rose, 1999).

Staff acknowledged what *could* be provided within the boundaries of 'caring'. Online health information supplemented 'the clinic', providing an additional layer of support to more professionalised, bounded forms of care. The social and ubiquitous nature of online information, which circulates and permeates everyday life indicates dynamic relationships between expert systems and social orders (i.e. information systems, social structures, cultural norms and interpersonal relationships) (Knorr Cetina, 2007).

Online portals acted as repositories for health information, extending the production and reach of the clinic. Staff could signpost women to professionally legitimised resources and information. This signposting became part of the wider infrastructure of staff accountability work.

'We have the app for the maternity unit that I've got on my phone so I advise women to use that, because there's lots of information there that we've put together, it's localised information' (Site 3, midwife, S15).

Professionally-endorsed resources presented a form of digitised biomedicalisation. Notions of professionalism and care were folded into these epistemic practices. At one site, formalised forms of digital self-care were being introduced to meet the increasing demands of clinic-based care. Digitally mediated forms of self-monitoring were planned to enable a shift to the introduction of virtual clinic visits.

'The number of women who have been diagnosed with gestational diabetes is increasing rapidly. [...] In the last 9 years they've doubled. But our clinic provision hasn't doubled, we're just squeezing, and trying to work smarter, but actually it's really hard. So next month we're starting to use an app. Women's blood glucose measurements can be transported to the Cloud. We are going to start virtual clinics, where we look through their blood glucose levels' (Site 2, obstetrician, S12).

This use of the app for women to self-monitor presented an adjunct to the clinic in the form of digitised caregiving (Lupton, 2017a, 2017b). The focus had shifted to the generation and review of blood glucose as a metric, enabling surveillance and oversight from afar.

3.2. Supporting the work of the clinic

Embedded within staff narratives was a sense of demarcation between online forms of support in terms of their legitimacy to support the work of the clinic. Boundaries were not necessarily linked to the online activity itself (e.g. distinctions between self-monitoring or information seeking practices). Our data suggests it was more nuanced than this as it depended whether the self-monitoring was part of clinical care (e.g. gestational diabetes care) or self-directed (e.g. tracking foetal movements). Digital resources represented knowledge objects or epistemic proxies, and staff determined legitimacies based on certain forms of knowing. Professional affiliations and links to academic centres promoting evidence-based research were seen to offer women legitimate

forms of knowledge and could support the professional work of the clinic.

'I think [this website] has good sort of information leaflets. It doesn't necessarily have a lot of detail, or it doesn't have specifics. It's quite generalised, the resources. But I still think it's useful, because if someone has had for example a poor obstetric history, and they're wanting some information, it will go through what are the statistics, what are the main causes ... And sometimes that's all that's needed, and then the specific kind of information can be discussed in my clinic' (Site 1, midwife, S1).

'When [online websites and apps] are properly ... resourced with healthcare professionals, I think ... they're fantastic, and they're complementary to the service that we can offer (Site 3, midwife, S8).

Staff assessed sources of epistemic authority (Gieryn, 1983) within online resources, distinguishing between 'valid evidence' as distinct from 'non-science'. Social institutions and categorisations act as reference points to illustrate the national knowledge culture (Knorr Cetina, 2007). Individuality, subjectivity, intuition and tacit knowledge were seen as less credible than biomedical scientific ideals, which were framed by terms like objectivity, reproducibility, and evidence. Aesthetic features such as logos, language and imagery on websites and apps provided symbolic capital, conferring legitimacy and clinical authority. In terms of 'credible knowers and authentic claims' (Gieryn, 1999, p. 22), staff generally regarded individual patient stories and personal experiences as less credible and less authoritative forms of knowledge.

'It's a regulated website ... it's a charity so then you would put a bit more trust in the information. It's got links to like journals and stuff' (Site 1, midwife, S3).

'I worry about websites where a lot of the advice being given to women is through non-medically qualified people, just from peers. A lot of it's based on personal experience and anecdotal evidence' (Site 3, obstetrician, S9).

However, a few staff drew attention to specific cases where online experiential accounts had provided socio-material capital enabling women to push back against biomedical advice. In these cases, staff highlighted the agency and ability of the individuals to situate subjectivity and tacit knowledge within the context of scientific evidence. For instance, a midwife reflected on how a Facebook group provided a means of support for a woman to decline an induction of labour, due to overdue dates, against medical advice.

'She felt really bullied and pressurised by the medical staff. And there was, there's a group on her Facebook. It's a bit like a support group. Just lots of women saying 'I'm like 42 weeks and five days, someone tell me this is alright'. Lots of story sharing. She had read every journal possible, like she knew the statistics ... And the risks ... so well. Better than the doctors that were counselling her. What she felt she needed was just to know that what she was doing wasn't as terrible as what the doctors were saying she was doing. So for her it was like "I know the facts and figures. And instinctively I know that I'm not making a crazy decision. The doctors are making me feel like I am. So I want something that holds a bit of an emotional space for me"' (Site 1, midwife, S3).

Staff described how some women needed help to situate online health information in relation to their individual circumstances. This form of mediation work was argued to require professional skill and expertise, in order to assess women's 'material risk' and to help women gain confidence managing their health. Without this professional mediation, technologies were perceived to provide limited forms of reassurance and to place women at risk of misinterpreting information that was circulating freely online.

'I always say just be careful of where you're looking at information, and if you're not (certain) always contact us. It is difficult because

anyone could put anything on the internet, and we can't control that' (Site 2, midwife, S14).

'You can't replace, in any healthcare setting, patient professional interaction, because you get a lot of information just from sitting with someone. Just making sure that the information that they're receiving, that they're picking up in the right way, because anyone can go to a website or an app, and read information, and their perception of what that information is saying might be different to the next person. [...] So sometimes a healthcare professional needs to be there to say "Yeah, you are right in your assumption" or "maybe need to think about that in a different way"' (Site 3, midwife, S15).

The majority of staff narratives referred to the Internet as a potentially dangerous place that women needed protection from, as the space was largely unregulated. At a macro-level, this links to wider risks associated with the online environment including the circulation of conspiracy theories and the anti-expert climate of epistemic populism (Numerato et al., 2019). This wider social context shaped professional roles as staff were drawn into helping women manage their exposure to low-quality or unreliable on-line information on account of it potentially leading to risky offline behaviour as a result. This framing of risk within staff narratives foregrounds women's potential 'vulnerability' and serves to expand the remit of professional jurisdiction to encompass women's on-line behaviour. This framing draws staff in to act as protector and enabler (Koteyko et al., 2015). The focus is on the information itself, rather than the agency and situated use of the users themselves (Armstrong & Powell, 2009; Maslen & Lupton, 2019).

3.3. Jurisdictional threats

Professionally mediating women's online practices, however, was difficult to manage in practice. Signposting to online resources brought with it a sense of responsibility for staff as these digital networks potentially extended caregiving and accountability practices. Staff reported struggling to keep on top of the plethora of available online resources and determine boundaries around digital care giving roles. Signposting women to professionally legitimised resources offered a *bounded* way to extend the clinic, as a midwife explained.

'My job is to give them advice and point them in the right direction. I can't control whether they listen to me ... or follow anything I'm saying, but if I'm pointing them in the right direction, and I'm telling these things, and advising them, then I'm doing my job' (Site 2, midwife, S14).

However, this extension of care giving also brought its challenges. Staff had to consider whether this signposting legitimised potential claims to truth, authority and expertise implicit within these networks and tools.

'I think it's a professional accountability thing, because, when you're in a profession, you have to be so careful about information that's being passed from person to person. So, confidentiality and accountability and all of that comes into it. And, again, maybe I'm just a bit over the top, other people might argue that I'm not. But, you know, I'm keeping my professional integrity safe' (Site 3, midwife, S15).

A few staff shared their discomfort about being drawn into these information circuits (Knorr Cetina, 2007) and associated knowledge claims. One midwife reflected on the online support networks her Trust was actively engaging with, as part of antenatal care. She reported that staff routinely printed information from a website about babies' movements and added this in the women's notes as a resource from them to draw on. The webpage indicated that women should be feeling their baby move from 16 weeks. The midwife reflected questioningly on this:

'so few women are feeling their baby move at 16 weeks. Because it says somewhere that they should be, then you create this culture of fear that "oh god, I'm 20 weeks and I'm not feeling my baby move". [...] It's a fully accredited site, it's not that it's wrong, but it's just so ... definitive' (Site 1, midwife, S3).

She went on to express concern that putting this embodied sense-making in writing, formalised it and created an illusory sense of control and certainty which was unhelpful for women at this early stage in their pregnancies.

'Having her worrying that her baby's not moving at 16 weeks, what are we going to do? We're not going to deliver it, because it's not going to survive. So it's like creating this ... concerned ... mentality, at a stage where you're out of control, there's nothing that you can do.' (Site 1, midwife, S3).

Similarly, others shared discomfort about recommending certain resources, on account of the potential for misplaced trust in underpinning scientific claims. Even when sites were acknowledged to provide useful peer support and practical tips, staff reported feeling reticent to signpost women to them.

'I think if it's not kind of totally NHS endorsed or regulated, I feel slightly inhibited about advertising it. I just sort of acknowledge that it's a source of useful information. And I might say something like, you know, it's not an official NHS website, so I can't be certain that everything on there is absolutely evidence-based. But I can see that there are a lot of people sharing really good practical information. So I think it is really good, but there is something that slightly holds me back from saying everything on it is totally correct.' (Site 2, obstetrician, S12)

Several staff acknowledged that women were reluctant to bring up their online practices spontaneously. Women's digital work largely tended to stay under the radar, *outside* the clinic. This put the onus on staff to ask directly about women's online practices.

'Women wouldn't necessarily say where they'd read something, or they'd heard something, it's usually, if you'd asked (...). Maybe they don't want to be seen to be looking up things and self-diagnosing things. [laughs], maybe it's just keeping things brief' (Site 2, midwife, S14)

Some obstetric and midwifery staff resisted taking on this investigative role. Previous research (Mackintosh et al., 2017) has highlighted how midwives can practice 'verbal asepsis' (Kirkham, 1989) by limiting conversations about potential complications in an effort to avoid medicalisation of normal pregnancy and birth. Our data supports a linked form of practice which we refer to as 'digital asepsis' which served to prevent staff having to take on the increasingly distributed responsibility for women's online information retrieval, particularly given the enormity of this task in terms of keeping their knowledge updated (Malcolm, 2013).

'I sometimes say to women I assume you've looked it up and you've looked at stuff. And they'll say yes, but they wouldn't talk about what resources they've used. I'm not interested. I don't dig into what resources they're looking at, no, because it actually is really unhelpful. Because either I'm confirming in my own mind that it's a valuable resource, or I'm challenging them that they've looked at something that is unhelpful. It doesn't actually get me any further with their consultation.' (Site 1, consultant obstetrician, S5).

Segregation of knowledge enabled staff to avoid confronting whether women's online practices deviated from normative standards and expectations about health practices. Where both women and staff avoided explicit reference to women's online practices, this represented a form of structural secrecy and cultural censorship (Vaughan, 1999).

3.4. Diagnostic jurisdiction

Whilst patient education using online information was acknowledged to support the work of the clinic, staff were clear to distinguish practices that firmly sat under the auspices of professional work, such as assessment and 'doing diagnosis' (Büscher et al., 2010). Assessment and diagnosis were understood as complex clinical practices requiring face-to-face embodied work, enabled by physical proximity and personal connection. Staff drew on relational and material aspects of *being* with women to highlight the benefits of face-to-face consultations for these professionally legitimised practices. They described using multisensory forms of knowledge and being guided by interactions and hands-on bodywork to assess women's health. They highlighted '*the importance of the personal touch; just by looking at someone and getting a feel for how they are, just by being with them*' (Site 3, midwife, S15). Some staff referred to digital forms of care as untethered and free-floating, as distinct from discussions with women in the clinic, which they considered professionally-mediated and anchored within dialogic care processes.

In addition, staff raised concerns about the shift from diagnosis as a professionally-bounded activity to forms of digitally mediated self-diagnosis. Algorithms within some apps and webpages enabled women to match potential diagnoses to their symptoms, presenting a potential threat to professionalism, authority and power as the symptom checkers shifted diagnosis *outside* the traditional jurisdiction of medicine. Staff concerns focused on the complex practice of diagnosis and the potential for online resources to present information simplistically, potentially contributing to anxieties linked to self-diagnosis. While science-based resources offered information and guidance on help-seeking linked to symptoms, they stopped short of enabling self-diagnosis.

'If I recommended NHS and [X site] ... To patients, I would say that it very clearly states the condition, what some of the symptoms might be, but it also has a safety net where it's like this is obviously a website, you can't call yourself that you have cholestasis because you've read this and you're ticking boxes. Whatever they say, there's some sort of disclaimer' (Site 1, obstetrician, S4)

In contrast, staff noted how other websites and apps drew women into diagnostic work, but that the algorithmic assumptions underpinning associated sense-making and assessment were overly simplistic. For example, an obstetrician discussed how one website '*does not talk about the things that the leg swelling most likely is, but talk about the rare complication (deep vein thrombosis). There's no context to this*' (Site 2, obstetrician, S12). Another midwife similarly reflected:

'These resources lack nuance, it's kind of the lowest common denominator, they say, "OK you've got bleeding. This could be abortion" and I think it lacks the subtlety of, like, "It's probably not" ... but ...' (Site 1, midwife, S7).

Staff highlighted the need for professional mediation and assessment of women's material risk and interpretation of symptoms to accompany the symptom checking process. Distinction practices were evident in relation to jurisdictions around the diagnostic process.

'These [online resources] are quite black and white. So you have a headache and swelling, you have preeclampsia. It doesn't ask things that a healthcare professional would probably ask, in terms of "have you taken paracetamol? What have you been doing? Does the swelling improve when you've rested overnight, or is it constantly there? Let me see the swelling". It's not the same as a consultation' (Site 3, midwife, S8).

Online symptom checkers also provided a triage function, engaging women in the action element of diagnostic work. This included informing women whether they should seek care, and how urgently. Staff expressed concerns that decontextualized symptom checkers encouraged help-seeking, in order to manage uncertainties, potentially increasing

demand on professionals and adding to already overstretched services. An obstetrician compared two resources, asking 'I wonder how midwives feel about these? Because this website is basically suggesting call your midwife at all times about everything'. She contrasted this with another 'x site encourages quite a bit of self-help first, take a paracetamol, make sure you've drunk enough' (Site 2, obstetrician, S12).

Professionally-mediated diagnosis was reported as a complex practice involving sense-making, assessment and action. The dynamic and ongoing nature of diagnosis, mediated by in-person contact, enabled professionals to make sense of bodies, symptoms and care processes in a way that digital resources could not hope to replicate.

3.5. Managing women's anxieties and guilt

In line with the 'vulnerable patient' rhetoric, was the sense of adverse imaginaries and risks associated with online practices. The boundary work that staff engaged in was also linked to the implications of women's information seeking or self-monitoring for their role, in terms of supporting care, managing uncertainties and generating anxieties. Some staff worried that digital resources allowed some women to engage with 'anxiety about the unknown', inviting speculation over every potential pregnancy complication (Furedi, 2014). Rather than enabling uncertainty absorption, women's independent research was often implicated in raising risk consciousness. 'Circulating unknowns' threatened to unsettle professional authority and staff's ability to provide reassurance, as this midwife explains:

'That's what troubles me about it, that women read that ... and become really anxious about things, unnecessarily so, and ... then it's very difficult to make them feel less anxious. Even when you're explaining something in clinic, because they've read this, they're going to constantly maybe think, at the back of their mind even, is that true?' (Site 1, midwife, S1).

Digital mediation of anxiety was reported to be inextricably linked within care practices, as additional professional reassurance work was required to supplement the online information vacuum.

'It's very difficult, because you can't dismiss [women's concerns, triggered by online activities] ... You just have to give them more information. You have to explain around it, so then women feel reassured. I guess the hope is always whatever resource they've used, when they come to you, you give them more information on whatever it is, than the resource they've been reading. And then hopefully that is enough to reassure them' (Site 1, midwife, S3).

Staff also discussed how digital caregiving extended to supporting women who had made a decision informed by online information, which had contributed to delayed help-seeking for potential complications. Rather than draw attention to the agency of the user and their (in)ability to critically situate and make sense of the resources they accessed, staff shared how they tried to steer discussions away from their actions and the specific online practices.

'When people think that [online it's] the correct information, don't access services, and then come to me maybe two weeks down the line and say well baby's not really moved, but that's normal...actually that's not normal, we have to do something about this. That can be a shock for the women, because they think that they've been accessing the correct information. Then I normally would go into discussion about what we would recommend. Kind of depersonalise it from the woman, because ... there is a massive scope to feel guilty there. (Site 3, midwife, S8).

Staff reported how women used online resources to make sense of their pregnancies; sometimes they suffered the consequences of the practical choices they made based on where the epistemic authority was located. Staff shared accounts of how they tried to manage the situation

sensitively, conscious that women had invested time and energy.

'You don't want to kind of devalue the fact that they've tried to [seek information] ... and bring them down. You want to let them leave not feeling [bad] (Site 1, midwife, S2).

Staff attempted to blur boundaries around those truths that underpinned these decisions, in an effort to provide forms of digital caregiving.

4. Discussion

Our main findings highlight how digital resources and online spaces supplement the clinic in maternity care. Staff engage in distinction practices between in-person and digitally mediated care and negotiate credibility claims linked to different digital tools and communities. Staff are also drawn into forms of digital caregiving, managing women's diagnostic uncertainties and anxieties around 'unknowns'.

Using Gieryn's work, this paper has drawn attention to the notion of boundary work in relation to online spaces in maternity care. Boundary work has different consequences for different actors, both for those who *draw* them and those who *rely* on them. Petersen's paper applied Gieryn's ideas to analyse the negotiations lay citizens undertook as they encountered different sources of information during their research on conditions and treatments (Petersen et al., 2019). Our paper extends this analysis to explore how staff are drawn into the provision of digitally-mediated care. Epistemic authority within digital spaces is negotiated and claimed by both lay citizens and staff. Staff become implicated in claims around 'whose science is it?' as they enact digitally-mediated care and engage with science as socially and culturally constituted and constructed (Gieryn, 1999).

As staff become drawn into online information circuits (Knorr Cetina, 2007), they make distinctions linked to knowledge claims, linked to the basis on which claims are made and how they are judged as having epistemic authority (e.g. peer networks as distinct from NHS websites or charities linked with biomedical research). Our findings demonstrate little recognition from our sample of maternity staff of the potential value provided to women from hearing others' experiences and evaluation of services and care, particularly from those attempting to negotiate with medical authority (Holland, 2019; Lingetun et al., 2017). The staff in our study appeared to police boundaries around their professional roles, separating the expertise and competence of those scientists who are trusted with the truth from non-scientists who co-exist within digital spaces (Gieryn, 1999). This form of boundary work may be particular to care provided during pregnancy as this extends over a relatively long period, compared to short episodes of care provided in other areas of healthcare. It also involves diagnostic work within the grey space between physiology and pathology, which women are drawn into (Mackintosh et al., 2021).

Also implicit within staff narratives was a culture of medical paternalism that situated users as vulnerable (Koteyko et al., 2015). Their concerns over the circulation of 'low quality' information online served to expand the need for them to protect and act as guides, reinforcing the authority of biomedicine (Seale, 2005). Yet our findings also highlight the moral and contractual elements of digitally mediated care. Digitally mediated care involves staff drawing boundaries between their actions and consequences downstream as they 'put up interpretive walls to protect their professional autonomy' and to escape responsibility and blame (Gieryn, 1999, p. 17). Whilst certain online portals and resources were explicitly included within the umbrella of service provision, other websites and apps appeared to be located in more of a liminal digital space, and staff were left to navigate the legitimacy of their scientific claims on an individual basis.

Our survey findings demonstrated how women's digital engagement appears to remain largely separate and private, rather than being routinely incorporated into antenatal care (Mackintosh et al., 2020). Other studies show that women wait for providers to initiate discussion

about online information, and many professionals do not incorporate discussion of these resources into clinical encounters (Sayakhot & Carolan-Olah, 2016; Slomian et al., 2017). The staff accounts we have presented create an additional understanding of 'digital asepsis' as staff and women are drawn into a socially shared silence in clinic regarding women's online use. This form of cultural censorship plays a critical yet often invisible role in shaping private experiences and dialogic relationships. What is commonly known (the specificities of women's online practices) is simultaneously hidden from view in a form of cultural censorship (Sheriff, 2000). The result is an informal network that excludes certain knowledge claims, perpetuating partial understandings of women's health practices (Vaughan, 1999).

The legitimacy of professional practice is shaped by, and to some extent co-dependent on, industry, public and policy support. Staff assessed the scientific accuracy and objectivity of apps and online resources in terms of their alignment with medicine and professional authority. Having the authority to diagnose is associated with power. Algorithmic authority provided alternative forms of expertise (Cheney-Lippold, 2011), often encouraging professional help seeking rather than self-help (Semigran et al., 2015). Staff became drawn into providing digitally mediated reassurance and mitigation strategies (Semigran et al., 2015), to allay fears generated by symptom checkers and uncertainties (McMullan et al., 2019). More of the 'right sort of information' was typically seen as the solution (Vaughan, 1999). Reassurance practices and uncertainty absorption was linked to the relevance of information, i.e. its scientific appropriateness as well as its technical accuracy (March & Simon, 1958).

The internet can be seen as 'embedded, embodied and everyday' (Hine, 2015) and as a technology, may acquire multiple meanings in different settings of use (Mol, 2002). Digital media and technologies are implicated within maternal health policies, which focus attention on self-diagnostic processes such as red flag awareness and fetal movement tracking. Affective entanglements occur in the clinic (Swallow & Hillman, 2019), and anxiety and fear circulate and 'stick' in this setting (Ahmed, 2004). Staff are drawn into these affective economies; enacting boundary work at local level enables a certain degree of power, control, prestige and influence within the wider politics of saving babies lives (Buchbinder & Timmermans, 2014; Spendlove, 2018).

4.1. Strengths and limitations

Our team included researchers with different disciplinary backgrounds (health services research, sociology, media and communication, and midwifery) which brought a beneficial interdisciplinary interpretive lens to our analysis. Regular team discussion of findings helped enable reflexivity and surface individual team members' expectations and understandings around digital technologies. We recruited staff from three sites which acted as 'telling cases' on account of their different maternity service configurations, local cultures and technologies-in-use, enabling application to other sites.

This was an exploratory constructivist study, where descriptions were considered 'partial, intermediate, and dependent on the situated view of the researcher' rather than a complete description of all aspects of the phenomenon under study (Malterud et al., 2016, p. 1759). Despite small numbers, we have been able to offer new insights that contribute to the field.

The interviews were conducted pre-Covid. We recognise that management of the pandemic has led to innovative shifts to online practices, and likely to also have led to greater reliance on self-monitoring and use of digital information sources. Further research is needed to explore shifting practices and relationships in maternity care. The lack of traditional interactional data regarding digitally mediated care in this setting has been noted (Mackintosh et al., 2021) and may be linked to bounded aspects of maternity care (e.g. privacy around birth), as well as difficulties identifying where digital work is visible. Future studies could usefully focus on ethnographic understandings of how digital resources shape clinic visits and patient/provider experiences.

4.2. Conclusion

Our paper explicates how new epistemic, social and material reconfigurations are emerging as digitization increasingly (re)shapes service provision. NHS England have a workstream on digital technologies as part of their maternity transformation programme (NHS Digital, 2017). The Royal College of Midwives (RCM) is currently calling on all maternity services to have a 'digital midwife' to lead the digital transformation of maternity services. The focus is on enabling women's access to their electronic health records and 'personalised information in a digital format', as well as to ensure staff are 'familiar with relevant digital services and have the confidence to signpost women wishing to use digital resources for their own needs' (RCM, 2021). Our study raises questions about how best to support obstetric and midwifery staff in terms of training for new capacities and knowledges, engagement practices around women's online use, as well as managing boundaries of professional practice (Lupton, 2017a, 2017b, p. 121).

Ethical statement

The study was approved by the West Midlands-Coventry & Warwickshire NHS Research Ethics Committee on March 18, 2019 (IRAS 253639). Prior to each interview, participants received a detailed explanation of the study, provided their informed consent in writing, and agreed to the audio-recording of their interviews. Names and other potentially identifying details were removed during transcription to protect confidentiality and anonymity.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We acknowledge our funder Sands for supporting the study (Stillbirth and Neonatal death charity) (ref RF516/18). We wish to acknowledge the support of the participating sites and our advisory group members for their valuable contributions. Jane Sandall, King's College, London is supported by the National Institute for Health and Care Research (NIHR) Applied Research Collaboration South London (NIHR ARC South London) at King's College Hospital NHS Foundation Trust. Natalie Armstrong is supported by a Health Foundation Improvement Science Fellowship and also by the National Institute for Health and Care Research (NIHR) Applied Research Collaboration East Midlands (ARC EM). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

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