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## Research Article

# After the disruptive innovation: How remote and digital services were embedded, blended and abandoned in UK general practice – longitudinal study

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## Abstract

**Background:** United Kingdom general practices transitioned rapidly to remote-by-default services in 2020 and subsequently considered whether and how to continue these practices. Their diverse responses provided a unique opportunity to study the longer-term embedding, adaptation and abandonment of digital innovations.

Research questions:

1. What was the range of responses to the expansion of remote and digital triage and consultations among United Kingdom general practices in the period following the acute phase of the coronavirus disease discovered in 2019 (COVID-19) pandemic?
2. What can we learn from this example about the long-term impacts of crisis-driven sociotechnical change in healthcare settings?

**Methods:** We collected longitudinal data from 12 general practices from 2021 to 2023, comprising 500 hours of ethnographic observation, 163 interviews in participating practices and linked organisations (132 staff, 31 patients), 39 stakeholder interviews and 4 multi-stakeholder workshops (210 participants), with additional patient and public involvement input. Data were de-identified, uploaded to NVivo (QSR International, Warrington, UK) and synthesised into case studies, drawing on theories of organisational innovation.

**Results:** General practices' longitudinal progress varied, from a near-total return to traditional in-person services to extensive continuing use of novel digital technologies and pathways. Their efforts to find the right balance were shaped and constrained by numerous contextual factors. Large size, slack resources, high absorptive capacity, strong leadership and good intrapractice relationships favoured innovation. Readiness for remote and digital modalities varied depending on local tension for change, practice values and patient characteristics. Technologies' uptake and use were influenced by their material properties and functionality. Embedding and sustaining technologies required ongoing work to adapt and refine tasks and processes and adjust (or, where appropriate, selectively abandon)

technologies. Adoption and embedding of technologies were affected by various staff and patient factors. When technologies fitted poorly with tasks and routines or when embedding efforts were unsuccessful, inefficiencies and 'techno-stress' resulted, with compromises to patient access and quality of care.

**Limitations:** Sampling frame was limited to United Kingdom and patient interviews were relatively sparse.

**Conclusion:** There is wide variation in digital maturity among United Kingdom general practices. Low use of remote and digital technologies and processes may be warranted and reflect local strategic choices, but it may also indicate lack of awareness and a reactive rather than strategic approach to digital innovation. We offer an updated typology of digital maturity in general practice with suggestions for tailored support.

**Future work:** The typology of digital maturity could be applied further to identify in more detail the kind of support needed for practices that are at different stages of maturity and are serving different populations. The need for strategically traditional practices in deprived settings should also be explored.

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## Introduction

United Kingdom general practices' response to coronavirus disease discovered in 2019 (COVID-19) in early 2020 included 'total triage', in which all patients applied remotely for all appointments,<sup>1</sup> and expansion of remote consultations.<sup>2-10</sup> While policy support for remote and digital encounters had been strong for several years,<sup>11-14</sup> and while some innovator practices were already using digital triage and telephone or video consultations as part of business as usual,<sup>15</sup> such practices were atypical before 2020. The widespread introduction of these modalities across all practices as a crisis response in early 2020 was one of the fastest and most disruptive changes made in the NHS since its establishment in 1948.<sup>16-19</sup>

Almost overnight, it became impossible for patients to walk into their local surgery and request an appointment. Instead, they had to telephone or enter data on an app or web platform. In response, they were then sent advice (e.g. to self-manage), signposted to other services such as pharmacy or emergency services or allocated a call-back from a clinician.<sup>2,4</sup> These changes were initially assumed to be temporary, but even at the time they were hailed as an opportunity to accelerate the modernisation of general practice – especially in relation to efficiency and 'demand management'.<sup>16,20,21</sup> Similar changes occurred around the world; one Australian study of the expansion of telehealth in 2020 celebrated '[a] decade's worth of work in a matter of days'.<sup>22</sup>

'Remote by default' – all patients to be offered a remote consultation unless there was a specific reason to offer an in-person one – was briefly espoused as government policy in England following a speech by the Secretary of State for Health and Social Care in July 2020.<sup>23</sup> National support was also provided for procuring digital platforms, with numerous new technologies emerging in this climate.<sup>24</sup>

The policy assumption was that services should capitalise on the disruptive crisis of the early pandemic and take steps to routinise and optimise the remote and digital technologies and care pathways that had been hastily implemented a few months earlier. From mid-2020 to mid-2021, many general practices made great efforts to routinise remote and digital services as business as usual. Notably, patients and staff – to a greater or lesser extent – gained skills in communicating remotely and navigating the new systems.<sup>4,6,25,26</sup> There were some real and perceived gains – most obviously, greater convenience for some patients when booking and consulting online,<sup>27-29</sup> and reduced patients' travel burden.<sup>17,24</sup>

However, these new ways of working were soon found to have some significant downsides. The anticipated efficiency gains largely failed to materialise,<sup>29</sup> thus reinforcing earlier findings from before the pandemic.<sup>30-32</sup> The new technologies and pathways increased the complexity of work practices and required more staff–staff and staff–patient interactions;<sup>29,33</sup> this contributed to staff frustration and stress.<sup>34,35</sup> Continuity of care became harder to achieve,<sup>18,36-39</sup> as did long-term condition monitoring.<sup>40,41</sup> Staff reported feeling underconfident to process requests or deliver care remotely,<sup>35,42</sup> and supervisors felt that some of their trainees were not competent to do so.<sup>42</sup> Concerns were raised about over-investigation,<sup>43</sup> over-prescribing,<sup>43-45</sup> compromises to preventive medicine<sup>46</sup> and clinical risks,<sup>32,35,42,43,47-49</sup> although a systematic search for safety incidents related to remote and digital services showed that such incidents were extremely rare.<sup>47</sup> Patient experience and satisfaction varied,<sup>28,50</sup> but there was evidence of widening disparities of access and outcome between the most and the least advantaged patients, especially as the former took advantage of digital routes to make more requests of practices while the latter found it harder – or even impossible – to navigate and negotiate access.<sup>25,51-60</sup>

All these changes occurred against a backdrop of contextual challenges for UK general practice. These included a long period of austerity in public services<sup>61,62</sup> and policy incentives to expand and extend various clinical and clinically related roles.<sup>63-66</sup> Primary care also faced a crisis of recruitment, retention and skill mix made worse by the barriers to immigration introduced by Brexit.<sup>34,49,66-71</sup> There has been a progressive weakening of the material and technical infrastructure that supports primary care services.<sup>16,24,71,72</sup> Rising consultation rates have also strained general practice, reflecting rising patient expectations and the presence of more, and more complex, illnesses in the population.<sup>49,73,74</sup>

In 2021, UK general practices were faced with a strategic dilemma. Should they, in the interests of efficiency, patient equity and staff well-being, attempt to return to more familiar routines of traditional in-person general practice? This would entail withdrawing their 'modernised' (i.e. digitally mediated and remote) services and writing off sunk financial investment and any benefits (perhaps unevenly distributed) accrued to date, and would also be going counter to the policy push to expand remote and digital care that began long before the COVID-19 pandemic.<sup>11-14</sup> Should practices continue to pursue advanced forms of remote and digital care while also investing in ways to mitigate the inequities that were by now well-documented, especially among multiply disadvantaged patients? Or should they try to steer a middle course between digital inequity and backward-looking traditionalism, and if so, how should they go about this?

In September 2021, we began a 28-month, mostly qualitative study [Remote by Default 2 (RBD2)] to explore how a sample of general practices was addressing this strategic and ethical dilemma. The protocol<sup>3</sup> and baseline findings<sup>4</sup> have been published, along with various thematic findings (outlined below). This paper reports the final findings from RBD2, focusing upon how strategic decisions about remote and digital services played out in different general practice settings. Our research questions for this paper were:

1. What was the range of responses to the expansion of remote and digital triage and consultations among UK general practices in the period following the acute phase of the COVID-19 pandemic?
2. What can we learn from this example about the long-term impacts of crisis-driven sociotechnical change in healthcare settings?

In this paper, we define *remote services* as those in which the patient and clinician (or support staff member) are

physically distant from one another, and *digital services* as those in which the episode of care is digitally mediated in some way. A consultation using an old-fashioned telephone is remote but not digital, but a modern telephony system often includes a digital component like asking the patient to select from a list of options by pressing a number. An encounter at the front desk in which the receptionist asks the patient a set of questions to complete an online consultation request form on their behalf is digital but not remote. Many encounters in contemporary general practice are both remote and digitally mediated.

## Methods

### *The Remote by Default 2 study*

Remote by Default 2 was a multisite longitudinal (mostly qualitative and ethnographic) case study of 12 UK general practices across England, Scotland and Wales, nested in a wider qualitative analysis of the context for digitalisation in UK health care. Data collection occurred from September 2021 to December 2023. A social care extension to RBD2 to look at care navigation ran from September 2022 to May 2023. Data sources are summarised in *Table 1*. Practice-based data sources comprised ethnographic observation (500 hours across participating practices over 28 months); semistructured interviews of staff ( $n = 124$ , including 10 on care navigation) and patients ( $n = 31$ ) in participating practices, plus 8 staff from external organisations providing care navigation support for patients at those practices (e.g. refugee and other charities, homeless hostel, care home). Basic descriptive statistics (e.g. demographics, list size) were obtained from practice reports. Practice context data also included documents like websites and leaflets, as well as 209 online patient reviews of the 8 practices in England (comparable data were not available in Scotland and Wales).

We supplemented this main work package with data collection from national stakeholders for context. These included 39 interviews (mostly with policy-makers). Of these, 31 had a health-related role and 8 (3 of whom were interviewed as a group) had a role in social care or care navigation.

We conducted four online multisector workshops involving clinical, policy, industry and lay stakeholders. These workshops included staff and patients from participating practices. Each addressed a key cross-cutting theme which emerged from the literature and our early empirical data: access and triage (April 2022,  $n = 50$ ), quality and safety (September 2022,  $n = 61$ ), workforce and training (January 2023,  $n = 51$ ), and technologies

**TABLE 1** Data sources, contribution to the study and caveats

Source, type of data, dates	Description of data set	Contribution and caveats of this data source
Multisite longitudinal case study of remote care in general practice (September 2021–December 2023) <sup>3</sup>	Twelve general practices (8 in England, 2 in Wales, 2 in Scotland) followed for 28 months. Five hundred hours of ethnography. Interviews with practice staff ( $n = 124$ ) and patients ( $n = 31$ ); practice documents (e.g. annual reports, websites, leaflets). Interviews with eight staff in linked local organisations (e.g. homeless hostels, refugee charities, care home)	In-depth ethnographic and interview material providing rich insights into the functioning and priorities of modern UK general practice, covering a key 28-month period as practices transitioned to the 'new normal' of hybrid provision. While the sample was diverse, it was relatively small and not statistically representative
Online reviews by patients (2021–3)	Two hundred and nine online patient reviews from the eight practices in our sample from England, hosted on NHS practice websites (comparable data were not available in Wales or Scotland)	Unedited data set containing patient opinions and experiences of care. Unverifiable; may be biased towards poor experiences
Stakeholder interviews (2021–3) <sup>3</sup>	Stakeholders ( $n = 39$ ). Thirty-one were in health roles at the national and local level in England, Wales and Scotland sampled from policy (arm's length bodies, government, health boards), industry, training providers and patient advocacy. Eight were in social care roles	'Bird's eye view' provided by senior stakeholders and experts from across the UK, main emphasis on policy-makers but also includes other sectors. Skewed towards views of senior national stakeholders
Four multisector workshops (held online)	Intensive 2-hour workshops with clinicians, national clinical leads, representatives from arm's-length bodies, practice staff and lay people (total 210 participants). Plenaries and breakout groups were recorded on video and transcribed	Diverse and nuanced discussions among a large number of participants from various sectors. Breakout groups facilitated the capture of a wide range of perspectives. While many and diverse views were captured, some groups were not represented

and infrastructure (April 2023,  $n = 48$ ). The workshops were structured, with a formal presentation of emerging research findings, breakout groups to discuss key findings, and a final plenary where those groups fed back and next steps were prioritised.

Each workshop generated a large amount of rich data, including video archives of plenaries and breakout group discussions. Workshops also stimulated follow-on work with practices and national policy-makers on the topic, including further focused data collection (e.g. additional interviews). We partnered with design services to pilot practice-based co-design of pathways for digital access and (separately) design of information resources for patients and staff, and held a co-production workshop for care navigation.

The data sources used to inform this paper are summarised in *Table 1*.

### Management and governance

Details of ethics and governance have been published.<sup>3,4</sup> Briefly, the study was sponsored by the University of Oxford and had approval from East Midlands – Leicester South NHS Research Ethics Committee and UK Health Research Authority (September 2021, 21/EM/0170) and subsequent amendments. All patients and staff interviewed gave written informed consent in accordance

with our ethics protocol. Low-literacy patients were supplied with easy-to-read versions of information sheets and consent forms and translation as needed.

### Patient and public involvement

There were two patient and public involvement groups advising the project. First, we set up an online patient involvement group, with an average of 11 participants attending the 6 meetings. Second, we established an advisory group in one socioeconomically deprived site consisting of eight people attending a social support day centre. Many of the latter had low digital literacy, few or no digital devices and some were homeless. This group was proactively recruited by one of the researchers in residence (SR-B) to ensure that the voices of people likely to be digitally excluded were captured (this work is described in more detail in our papers on the patient experience of access<sup>53,75</sup>). Both the patient involvement and advisory groups gave periodic feedback on our emerging findings and made suggestions from a lived-experience perspective.

### Sampling and data collection for practice-based case studies

Our original planned sample of 11 practices<sup>3</sup> was extended with an additional practice recruited soon after our protocol paper was submitted; this was mainly to avoid research fatigue as several PhD students had joined the team. Practice characteristics are described in

detail in previous papers<sup>3,4</sup> and summarised in *Appendix 1*, *Table 3*. Practices were purposively selected to achieve geographical spread (8 from England, 2 from Wales and 2 from Scotland) and variation in practice size (median 14,250 patients; range 2300–31,000). They were also chosen for diversity of socioeconomic settings but with oversampling from deprived localities: four practices were in the most deprived decile of Index of Multiple Deprivation<sup>76</sup> by postcode, two in the second decile, one each in the third, sixth and eighth deciles, and two each in the seventh and ninth deciles.

Finally, practices were chosen to achieve maximum variety in digital maturity, with an oversample from less digitally mature practices. At the study's outset, we classified digital maturity on a pragmatic 5-point scale based on practices' self-assessment along with our own baseline observations.<sup>3,4</sup> That scale is described in an earlier paper.<sup>77</sup> Briefly, it comprised:

- traditional (few digital services) – three practices self-assessed at this level
- traditional with lone innovator (few digital services but one keen staff member attempting to introduce more) – two practices
- digitally curious (experimenting with remote and digital technologies and reacting to prevailing trends in these, but without a clear strategy) – four practices
- digitally strategic (introducing and evaluating a wide range of remote and digital services as part of a wider practice strategy) – two practices
- system-oriented (providing state-of-the-art digital services and supporting other practices) – one practice.

Importantly, this pragmatic digital maturity scale was not simply a scale of technological advancement. Rather, the scale recognised that *withdrawing* digital services was a strategic option. Hence, moving from 'digitally curious' to 'digitally strategic' did not always involve introducing more technologies. In the *Discussion*, we offer an updated typology of digital maturity based on the findings of the RBD2 study.

To collect practice-based data, we used an adapted researcher-in-residence model,<sup>78</sup> in which one member of the research team built a relationship with practice staff, kept in touch by telephone and e-mail, and made repeated visits. Data on each practice were synthesised iteratively and discussed among the research team to build an ongoing picture of how the introduction of remote and digital services was evolving. After the data collection period ended, we fed back a summary narrative to each

practice as a PowerPoint presentation with a written summary and amended it in response to feedback.

### Theoretical approach

For this paper, we took the organisation (each of our 12 general practices) as our unit of analysis and focused on how remote and digital services evolved in these practices over 28 months. This adds to our previous work addressing other cross-cutting themes including quality,<sup>29</sup> safety,<sup>47</sup> continuity,<sup>37</sup> equity and access (including care navigation),<sup>57,79</sup> workforce,<sup>34,80</sup> training,<sup>42</sup> infrastructure and procurement. These other analyses used different theoretical lenses and units of analysis (e.g. patient, safety incident, clinical relationship, care pathway, workforce).

We framed the analysis reported here in the theoretical literature on organisational innovation. In their classic book *The Innovation Journey*, Van de Ven *et al.* emphasised that any organisational-level innovation is a distinctly nonlinear journey with multiple overlapping stages. Stages include problem identification, idea generation, experimentation, implementation and routinisation, the last being a final stage in which the innovation ceases to be viewed as new and becomes business as usual.<sup>81</sup> These authors highlighted the potentially positive impetus of external shocks such as technological developments or economic downturns on the *introduction* of innovations but warned that the long-term *routinisation* of these innovations required continuing effort and resources.

Drawing on Van de Ven *et al.*'s earlier work, three frameworks formed the main theoretical lens for this paper. First, Greenhalgh *et al.*'s review summarised the evidence base on organisational-level innovations in health care. In this work, innovations were defined as '*a novel set of behaviors, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost-effectiveness, or users' experience and that are implemented by planned and coordinated actions*' (p. 582).<sup>82</sup> Extending Rogers' classic research on the adoption of innovations by individuals,<sup>83</sup> they produced a unifying Diffusion of Innovations framework for considering organisational antecedents for innovation in general, organisational readiness for particular innovations and the strategic decision to adopt (or abandon) an innovation, the role of individual adopters and influencers, the work of implementation, and the challenges of long-term routinisation and sustainability. Second, this framework was later extended into the non-adoption, abandonment and challenges to spread, scale-up and sustainability (NASSS) framework to incorporate the particular challenges of *digital* innovation in healthcare organisations; it included domains relating to the material features,

functionality and supply chain of the technology and the value proposition.<sup>84</sup> Third, to specifically address remote consultations, a more specific framework, planning and evaluating remote consultation services (PERCS),<sup>77</sup> was developed; PERCS included a domain on the clinician-patient interaction.

We used these linked theoretical perspectives to analyse what happened in the period *after* the external shock (the acute crisis of the COVID-19 pandemic), which had left general practices with a range of hastily introduced digital technologies and novel care pathways. Using Gkerekakis *et al.*'s terminology, the external shock had been a disruption that created unique opportunities for innovation, and staff and patients had been exposed to the potential of these innovations.<sup>19</sup> But in this post-crisis period, there was also a pressing need to take stock and re-assess whether the advantages of the new ways of working outweighed their disadvantages.

### Co-design component

Our original study design included a co-design component in 3 of our 12 practices, in which an independent design company planned to work with patients and staff to try to optimise key access pathways using a popular design tool (the 'double diamond' method, which consists of four phases: discover-define-develop-deliver<sup>85</sup>). As described in the *Results*, this element of the study was abandoned in favour of a more emergent and adaptive approach to design.

### Data management and analysis

The study generated a very large data set (*Table 1*) which was uploaded to NVivo (QSR International, Warrington, UK) and first analysed thematically using the approach described by Clarke and Braun.<sup>86</sup> This involved close reading to gain familiarity; identifying themes which captured important issues and perspectives using a combination of deductive application of existing theory and inductive analyses of empirical data; discussion among researchers to share initial interpretations and resolve differences through dialogue; selecting illustrative excerpts; and sharing draft findings with the wider author team. Each of the thematic analyses was led by an experienced postdoctoral researcher or senior academic with support from a small multidisciplinary team including social scientists and clinicians.

Following this largely deconstructive thematic phase (in which the data set was divided into themes and categories), we produced a *constructive* analysis (aiming to bring all the separate themes together) by using longitudinal organisational case narratives as a

synthesising tool.<sup>87,88</sup> To achieve that end, we took each individual general practice in turn and considered how and why the provision of remote and digital care had evolved from 15 months after the introduction of remote by default care as an emergency pandemic response<sup>1</sup> to the end of 2023. To produce these constructive narratives, we drew on our longitudinal ethnographic data, which had begun with the preparation of a familiarisation document on each practice after the first 2 months of data collection.<sup>4</sup> We developed and refined the story of what happened in each practice, sensitised by concepts from organisational science including the innovation journey,<sup>81</sup> crisis-driven innovation,<sup>16,19</sup> and the assimilation, routinisation and sustainability of healthcare innovations.<sup>77,82,84</sup>

## Results

### How did remote and digital care unfold in participating practices?

With the exception of the most digitally advanced practice which was already conducting many administrative and clinical encounters remotely and digitally, all practices in our sample described a dramatic, almost overnight change from in-person to remote by default care in mid-March 2020 as part of the COVID-19 infection control response. Staff pulled together to make the emergency measures work, as one practice manager describes:

[I]t's funny because we'd literally ... moved to 15-minute appointments at the beginning of March 2020 and I'd spent about six months getting it all ready and ... working out all the systems, making sure we had the right resource etc. And we'd cleared the backlog and we were so proud of it and it was going really beautifully and then bam [laughs] but what was amazing ... is the way that everybody responded to constantly changing systems. And we were changing systems overnight that previously would probably have taken six months to do. ... but it brought everybody really together and everybody was really trying to do their bit ... we had shared triage lists, we had shared urgent lists, you know, there was this great feeling of team spirit.

Practice manager, Newbrey, April 2022

This 'crisis spirit' enabled an impressive temporary transformation of general practice services to total triage and mostly remote consultations in early 2020. By the end of our data collection in December 2023, this transformation had given way to a hybrid model combining remote and in-person care in all 12 participating practices. Below, we describe some general findings common to all

practices in our sample before going on to describe some key differences in the next sections.

Firstly, while there was a strong policy push in the early 2020s for innovation in remote and digital services,<sup>11,23,89-91</sup> and while this built on more than a decade of policy supporting and incentivising such changes,<sup>11-14</sup> the prevailing context for continuing and extending these modalities was adverse. Along with the acute crisis of the pandemic, a number of slow crises<sup>92</sup> had reduced the resilience of the UK healthcare system. Pandemic expenditure aside, funding for general practice had fallen substantially since a change of government in 2010.<sup>93</sup> Furthermore, a major restructuring of English health and social care, in the shape of Integrated Care Systems governed by new Integrated Care Boards (ICBs), was announced in 2021 and introduced in 2022. While the idea was to break down intersectoral boundaries and provide locally driven integrated care,<sup>94</sup> many localities faced growing mismatches between need and resources. For example, the number of patients per full-time equivalent general practitioner (GP) increased by 17% between 2015 and 2023.<sup>49</sup> GPs were also expected to do more for an ageing and increasingly multimorbid population and undertake increasing amounts of 'hidden' (unacknowledged and unmeasured) back office work such as processing test results and making judgements about what kind of appointment – if any – to offer patients.<sup>95</sup> Hospital waiting lists had risen to their highest ever,<sup>62</sup> leaving primary care teams to support patients waiting for specialist assessment. Secondary care services had introduced protocols requiring pre-assessment work-ups, or chose to provide 'advice and guidance' rather than seeing the patient.<sup>96</sup> Numerous locality-based health and social care services had been severely curtailed or withdrawn entirely,<sup>97,98</sup> putting pressure on general practice to pick up the workload.<sup>99,100</sup> In response to these inexorable chronic pressures – and in the wake of the acute pressures of the pandemic – GPs were retiring, emigrating or leaving the profession,<sup>71</sup> reflecting a worsening shortage of skilled clinicians globally.<sup>101</sup> Partly in response, funding to recruit additional non-medical clinicians was introduced in England (but not in Wales or Scotland) as part of the NHS Long-Term Workforce Plan.<sup>102,103</sup> This move proved controversial because it included a perverse incentive to assign staff such as physician associates to roles which some critics said were inappropriate or unsafe.<sup>64</sup>

In this challenging context, all 12 of our practices were struggling to cope with a high and rising workload, match capacity to demand, support increasing numbers of vulnerable patients, deliver the standards of excellence to which they aspired, respond to policy must-dos,

supervise an expanding range of non-medical staff, and maintain staff morale. However, by the end of 2023, all 12 practices felt they were in a more stable position than in mid-2021 when our fieldwork began. For example, they had all introduced approaches to managing acute demand, had restored previously suspended services such as long-term condition monitoring and cancer screening, and had gained confidence in making judgements about what kind of modality to offer to patients. As one participant said, '*I feel more confident that we're getting the balance right between face to face and remote*' (GP, Westerly, August 2023).

Secondly, all practices reported that digital technologies, even when introduced with the goal of improving efficiency, initially resulted in unintended inefficiencies. At least in the beginning, they had had a tendency to make care pathways more complicated, more fragmented (more people and contacts involved) and more stressful (because of the associated cognitive load<sup>104</sup>). In many but not all cases, ongoing refinement of pathways and processes led to smoother embedding, reduction in inefficiencies like double handling and easing of staff stress.

Thirdly, all practices found that as services became digitalised, new kinds of inequity emerged. This produced what one author has called the 'digital inverse care law' – that patients most in need of care were even less likely to be able to access it than previously.<sup>105</sup> All practices sought to mitigate these inequities, though their solutions varied and met different levels of success, as we describe below.

Fourthly, abandonment and substitution of technologies was an important part of the picture. By the end of 2023, many practices had rejected technological innovations that they had judged not to add value. In this regard, there was a sense of 'Darwinian' survival and evolution of technologies that were more fit for purpose and extinction of ones that had proved inefficient, inequitable, non-customisable or potentially unsafe in the context of use. We found a few examples of practices persisting with technologies and pathways that seemed a poor fit with their goals and values, usually because they were tied into contracts with suppliers or because the strategic decision to withdraw them had not yet been made. In some cases, persistence with inappropriate technology could be traced to limited confidence in – or appetite for – navigating the rapidly evolving market of digital technologies and the complexities of procurement.

Despite these common experiences, there was wide variation in how practices responded to policy

encouragement to continue with digital innovation. The relatively steady state reached by the end of 2023 ranged from determinedly traditional to boldly futuristic. **Box 1** shows three examples to illustrate this diversity.

**BOX 1** Examples of how remote and digital care unfolded in UK general practice 2020–3

Carleon is a semirural Welsh practice serving a population of 7500 on 3 sites, including a deprived estate of mainly Welsh-speaking patients, a 'stoical' farming community and a seaside site serving English retirees. The practice self-classified as 'traditional' (the lowest level of maturity) on our digital maturity scale in 2021. Premises were cramped (a hoped-for new building had not materialised), digital infrastructure was extremely basic and remote services were limited to the telephone. At the beginning of our fieldwork, various digital innovations were mooted, and one or two were introduced over the next few months, mainly in an attempt to respond to rising demand. For example, video consultations were tried very briefly but hardly used, and an electronic consultation tool was also made available but not actively promoted. By late 2023, Carleon had successfully introduced a handful of digital innovations, including AccuRx™ (London, UK) messaging (used for patients to send in photographs); a 'reception e-mail' (which a few patients used to send in biometric data such as blood pressure readings); and MyHealthOnline™ (Skelmersdale, Lancashire, UK) (an option for ordering repeat prescriptions). Patients who preferred a telephone consultation could request one. Overall, however, Carleon had largely returned to the arrangement offered pre pandemic. Most patients either called reception or turned up in person to book appointments; most consultations (including for long-term conditions) were in-person; repeat prescriptions were ordered mostly by telephone; and a majority of other digital applications and pathways had been abandoned. The practice remains proud of its 'open door' policy (in which anyone can turn up and ask to be seen) and patients speak highly of this. There are no current plans to introduce further digital services. Our final classification of Carleon was 'strategically traditional'.

Camp St, the largest practice in our sample with 32,000 patients, serves a mixed demographic in a commuter town close to a large city. It is a teaching and training practice spread across three sites. At the outset of our study, the practice self-classified as 'digitally curious' (mid-point on our scale). Prior to the pandemic, it had begun to experiment with various innovations, including improving patient access through e-mail pre-assessment and early trials of online consultations. Partners had hoped this would increase efficiency and improve access for some patient groups. Use of digital technology was extended early in the pandemic, including fully implementing online consulting, and conducting long-term condition reviews and text messaging via AccuRx. These innovations were introduced with the aim of maintaining patient access and reducing staff stress. Practice culture encouraged responsiveness to patient needs and promoting patient choice. Staff quickly recognised that some of their new digitally supported processes generated new kinds of inefficiency and that some patient groups such as the elderly and limited English speakers were struggling with digital access. They regularly reviewed and adapted their digital pathways, for example introducing guidance for receptionists on the best appointment types for different clinical problems. They also encouraged people who struggled with digital modes to walk in and book at the desk if preferred. Clinicians varied widely in their tolerance of remote consultations; those uneasy with consulting remotely were allowed to see patients face-to-face if they preferred. By the end of 2023, some digital services that had felt 'clunky' when first introduced were well-embedded in business as usual and experienced as efficient and useful. This included online booking, digital long-term condition reviews and automated text-message follow-up to see if patients' symptoms were resolving. Some digital pathways, including triage of online consultation requests and the high proportion of phone consultations which were converted to in-person, are still considered inefficient and in need of improvement. In sum, Camp St

now illustrates a 'digitally strategic' practice, going forward with a relatively modest range of technologies, and with digitally supported processes continually revisited and adapted in response to the needs and preferences of patients and staff.

Towerhill, a 16,000-patient practice in a large English city, was classified by the research team as 'system-oriented', the most digitally advanced point on our scale, in 2021. At the beginning of the study, the practice's digital infrastructure was already state of the art and various digitally supported processes and services had been running for several years. Before the pandemic, telephone triage, remote consultations and a GP-led walk-in clinic (in which patients could bring a sick child for fast-track triage and treatment by a GP) were available to patients. Thus, the introduction of 'total triage' occurred smoothly. Led by two entrepreneurial GP partners and a proactive manager, the practice systematically sought out, introduced and evaluated numerous digital innovations. They thought these innovations might improve the efficiency of processes generally and the all-important waiting time for patients to be seen. Feedback from patients, a predominantly young adult and socioeconomically affluent demographic, confirmed that the practice was known for quick appointments and fast turnaround of requests. By the end of 2023, Towerhill was providing almost all repeat prescriptions and long-term condition reviews and approximately 60% of all consultations remotely (mostly by telephone, some by video). Many practice processes were strongly digitally oriented and had been progressively refined and honed. A striking feature of this practice was how they continued to introduce and pilot novel digital technologies as these came on stream (e.g. they trialled, and subsequently abandoned, a remote and digital physical examination hub). They also sought to help other practices to do the same, and two of the partners were digital innovators at the ICB level. At the beginning of our fieldwork, support staff had raised concerns that some patients – in this practice, a small minority – were unable to cope with the digital-first policy for booking. By the end of our fieldwork, the needs of these patients appeared to have been partly met by a nurse who did home visits and made bespoke arrangements for known vulnerable patients. In 2019, Towerhill had merged with another (more traditional) practice, St Mary's, but the two practices had agreed to separate after 1–2 years because of differences in their values and priorities. Notably, some partners originally from Towerhill had opted to stay with St Mary's because they were more comfortable with a less digitally advanced ethos. Other partners originally at St Mary's opted to stay with Towerhill because they found they preferred a more high-tech approach.

In the next subsection, we consider the strategic questions which seemed to drive decision-making in participating practices.

### Strategic questions facing general practices 2021–3

Based on the data we collected, and in the context of a strong policy push to use digital technologies as part of a wider strategy of modernising general practice,<sup>11,12,106</sup> the key question on which practices deliberated – 'what remote and digital services should we provide?' – could be refined into more specific questions under the seven subheadings below. These strategic questions, which we identified early in our fieldwork, guided our ongoing data collection and analysis.

#### 1. Access and equity

- How can we ensure that all patients, including those with vulnerabilities and special needs, can access care?

- b. How can we avoid inequities of access for those lacking digital devices or connectivity, confidence, capability or family support?

2. Triage and allocation of modality

- a. How can we efficiently and safely prioritise the most urgent and needy appointment requests?
- b. How can we allocate patients to the most appropriate and acceptable clinician and modality (in-person, telephone, video, asynchronous e-consultation)? When should we signpost to alternatives (self-management, pharmacy, emergency etc.)?

3. Continuity

- a. How can we avoid fragmented care when an episode of illness involves multiple contacts with different staff members and technologies?
- b. How can we provide continuity of the clinical relationship for patients who need or desire it?

4. Non-acute services

- a. How can we ensure that all patients with long-term conditions are identified, monitored and managed to a consistently high standard?
- b. How can we provide comprehensive and efficient preventive services such as vaccination, screening and well-person check-ups?

5. 'Back office' work

- a. How can we efficiently support clinically related administrative work such as repeat prescription requests, work generated from secondary care (e.g. waiting list delays, follow-on tasks) and clinical scheduling (e.g. booking appointments with the correct clinician)?

6. Human resources

- a. What mix of staff do we need to deliver care in the digital age, and, given current incentives and constraints, how can we best deploy the staff we have?
- b. How can we reduce 'techno-stress' and improve staff well-being as they incorporate remote and digital modalities into their work?
- c. How can we ensure that all staff (clinical and non-clinical) are capable and confident to fulfil their roles in a system that includes multiple new technologies, processes and pathways and is continually evolving?

7. Technologies

- a. How can we optimise our use of existing technologies and our investments in new technolo-

gies so as to maximise the quality and efficiency of our current service and prepare for future developments?

- b. How can we disinvest in technologies and systems that have failed to add value?

Practices were more or less aware of, and reflexive about, these questions. Addressing them could involve strategic digitalisation (e.g. introduction, extension or adaptation of a digital service) or strategic 'de-digitalisation' (curtailment or withdrawal of a digital service). All practices also grappled with pragmatic trade-offs between gains in one aspect of provision (e.g. training reception staff to provide digital navigation support for vulnerable people) and negative unintended consequences (e.g. staff burnout from burden of work and role creep).

Because of prevailing pressures, some practices were at times described by their managers or senior clinicians as 'in firefighting mode' or 'at breaking point' (sources intentionally omitted). While the sense of acute crisis waxed and waned over the study period and across different sites, our data showed that some practices, some of the time, were primarily responding *reactively* to questions like 'How can we comply with the latest policy directive without compromising the service we aspire to deliver?' or 'Where will we get support staff now that so many have left?'. We contrast this with asking *proactive* strategic questions such as 'How can we best deploy technologies to deliver on our mission and values?'.

In sum, as Van de Ven *et al.* predicted,<sup>81</sup> few practices followed an uncomplicated linear journey towards greater digital maturity. Rather, their strategic decisions were sometimes reactive rather than proactive, and sometimes oriented to withdrawing rather than extending digital services. Below, we apply elements of the aforementioned Diffusion of Innovations, NASSS and PERCS frameworks to explain variation among our 12 practices in how they embedded, sustained, blended and abandoned remote and digital services between 2021 and 2023.

### ***Organisational antecedents for innovation***

As was predicted from the evidence base on organisational innovation,<sup>82</sup> a number of structural features appeared to be key antecedents of practices' abilities to introduce, assimilate and sustain digitally supported practices and pathways. Notably, these included practice size and the associated phenomenon of 'slack resources' – that is, money and staff that could be channelled into implementing and evaluating the innovation. Absorptive capacity was key; we define this as an organisation's ability to identify, assimilate,

transform and apply valuable external knowledge, based on its existing stock of relevant knowledge, know-how and infrastructure.<sup>107,108</sup> Also important were differentiation of staff roles, such as an advanced division of labour with different specialist functions allocated to different teams, and strong leadership.

Those practices which saw the most digital innovation and made the most progress towards a safe and efficient remote and digital service were among the largest practices in our sample. They included Fernleigh (15,000 patients at the start of our fieldwork), Towerhill (15,800), Newbrey (21,000), Westerly (27,000) and Camp St (31,000). Larger practices were usually better-resourced and more digitally advanced at the beginning of the study. These practices were also characterised by high-quality premises and material infrastructure, a relatively advanced division of labour (e.g. there were roles for technical innovation and support, and various specialised support staff roles) and capacity to co-ordinate this, and relatively high absorptive capacity. For example, these practices had a sound existing technological set-up along with in-house know-how and horizon-scanning mechanisms which facilitated capturing innovations from outside the practice and routinising them within the practice. This know-how included the ability to identify which digital technologies were not suitable for adoption by the practice.

Conversely, the least digitally advanced practices at the start of the RBD2 study were among the smallest and least well-resourced in our sample. They included Range Park (2300), Carleon (7500) and Ogden East (8300). At baseline, these practices had made the least progress towards digitalisation, and they continued to make slower progress than the larger practices. They had fewer available staff and resources and limited absorptive capacity. For example, the existing technological set-up in these smaller practices was often inadequate to accommodate a particular new technology; in some, broadband connection was weak and unreliable. From a human standpoint, there was sometimes nobody on the staff with a key skill set. People in the practice were sometimes not aware of digital innovations that could potentially support their work.

The effect of practice size was moderated by arrangements to achieve economies of scale across localities. In England, for example, procurement tended to occur 'top down' via ICB negotiations. In Scotland, the process was more 'bottom-up', with smaller practices joining with other small practices in an ad hoc way to negotiate with suppliers. One staff member in a Scottish practice explained,

*So eventually Mjog [digital provider] agreed that if we got sort of a particular number of practices grouped together, then maybe we could get it like a cheaper rate. So that's what happened with us.*

*Service manager, Range Park, October 2023*

Our sample included two exceptions to the general rule that practices' digital maturity increases with their size. One of the largest practices in our sample, Queens Rd (30,000 patients), continued to struggle with digital services despite 1 digital enthusiast partner. One important reason for this was the practice's recent history: it had been formed in 2019 by the amalgamation of six small and medium-sized practices, some of which had been described by our interviewees as struggling (financially and organisationally). At the start of our fieldwork in 2021, the practice was spread across multiple geographically distant and heterogeneous sites. Some of these were small, street-corner house conversions which were cramped, unfit for purpose and weighed down with legacy infrastructure and high running costs. Despite a single strategy, then, Queens Rd was still working to fully bring together multiple smaller practices with different histories, cultures and patient demographics (ranging from affluent to Deep End) and achieve the economies of scale and other efficiencies that are potentially available to larger practices.

The other exception in our sample, River Rd (an inner-city Scottish practice with 5500 patients), achieved a relatively advanced level of digital maturity despite its small size. At the start of our fieldwork, this practice was struggling in multiple areas. This included a mismatch between demand and capacity, low staff morale, problems with practice infrastructure (a basic telephony system with limited capacity and no queueing function) and a new electronic triage system (Footfall™, Loughborough, Leicestershire, UK) which was unfamiliar and unpopular. By the end of our fieldwork, there was palpable improvement: a new telephony system had greatly reduced pressure on support staff; the new triage software was well embedded in practice processes; a new staff member (advanced nurse practitioner) had been hired and staff morale overall had improved. A hybrid of in-person and remote consultations was offered, with patients able to choose in-person if they wished. These changes took a great deal of leadership, dedication, effort, financial commitment and strong values orientation. Related factors contributing to improvement were good managerial relations, ongoing adjustment of processes, monitoring of intended and unintended impacts of changes, and measures to shift the stress of electronic triage from support staff to GPs. Emblematic of the dedication involved, the practice partners took a

substantial pay cut to pay for the new staff member and to purchase a new telephony system and triage platform. Despite impressive progress with some digital processes, River Rd also illustrated strategic *de-innovation* in the sense that most consultations had returned to in-person by late 2023.

Most practices in our sample possessed at least some of the key structural preconditions for innovation outlined in the previous section, partly because practices who volunteer for research are self-selecting for such features. However, this did not necessarily mean that remote and digital modalities were routinised and sustained unproblematically. This brings us to the issue of readiness.

### **Organisational readiness: values and tension for change**

As predicted by the Diffusion of Innovations framework,<sup>82</sup> participating practices' readiness for digital innovations varied. Specific aspects of this readiness included tension for change, which is the extent to which staff found traditional ways of working intolerable and wished to sustain the 'disruptive' remote and digital processes introduced in 2020. Innovation-system fit, or the extent to which remote and digital care matched the practice's strategic priorities, existing ways of working and values was also important. Power balances – whether champions pushing for particular innovations outnumbered traditionalists resisting them or were more strategically placed – also affected readiness. Readiness was strongly influenced by strategic implications – that is, whether the practice had assessed these (either in a formal business plan or, more usually, more informally) and found them favourable.

Rhian, a practice in south Wales serving a deprived ex-mining community of 11,500 patients, illustrated – at least to some extent – limited readiness for digitalisation. We initially classified Rhian's digital maturity as 'traditional with lone innovator'. The business manager, who had joined the practice from a more digitally mature organisation, had written a draft digital strategy including a detailed rationale for a novel software product (Doctrin™, Warwick, Warwickshire, UK) which would automate some of the busy front- and back-office tasks. This individual expressed concern about the partners' lack of appetite for the proposed strategy, perhaps partly because of their previous negative experience with an e-consultation tool which had had the unintended consequence of increasing workload. Rhian's lack of readiness coexisted with limited absorptive capacity. There were few existing digital products installed, and practice staff had limited

knowledge and awareness of such products. There was also a strong shared belief among both clinical and non-clinical staff that in-person consultations were 'better' than remote ones.

Since remote and digital modalities had been introduced more or less universally in early 2020 by a national directive,<sup>1</sup> readiness in the RBD2 study (2021–3) related mainly to practices' choices to persist with remote and digital technologies. This can be characterised as a 'tension to revert' back to in-person modalities rather than the more usual 'tension for change' to drive digital innovation further. The re-introduction of in-person services described at the end of the last section in River Rd practice, for example, was precipitated partly by a deterioration in staff–patient relations, creating strong tension to revert. This was so severe that there were concerns about staff safety, as this quote illustrates:

*When it started to affect me was when [some patients] were being really awful. I've worked here so long, we had great rapport with patients. And it just went–bang–hey [patients] just didn't trust us. Didn't think we were doing our job. Didn't think the doctors were doing their job. And that they should be able to see them ... I was threatened once ... that felt a bit hairy – they said they were coming down and I was a f\*\*\*\*\*g bitch. But that was a minority of patients. ... A lot of it was to do to not being able to see doctors face to face.*

*Receptionist, River Rd, August 2022*

Even without the 'burning platform' of threats to staff, Deep End practices in our sample felt pressure to abandon the disruptive innovations introduced during the pandemic. This was largely because these innovations were perceived to be a poor fit with patient needs and practice values.<sup>109,110</sup> An example was Ogden East, which served a deprived part of a small city in southwest England. A substantial proportion of the practice's patients were multiply disadvantaged. This included those who were unemployed or working in precarious occupations, limited English speakers and older adults. Some patients were also homeless or poorly housed, and the practice provided a methadone service to drug users. Many patients lacked digital connectivity and devices and/or social connections with people who could help them with digital access. Even in 2020, there was a prevailing feeling among staff that remote care was discriminating against multiply disadvantaged patients. Tension to revert to in-person services grew steadily. Between 2021 and 2023, Ogden East re-introduced more traditional forms of access on the grounds that this approach better served their patient population.

Similarly, Range Park, a Deep End practice with 2300 patients in a very deprived part of Scotland, showed low readiness for most digital technologies. This practice serves a similar patient demographic to Ogden East. It had been led for 25 years by a singlehanded GP who was deeply committed to her deprived practice population. This individual was prepared to put effort into introducing innovations which she saw as necessary for high-quality patient care (see quote in next section), but she viewed experimenting with digital technologies for their own sake as a distraction from the practice's core business.

Camp St practice (see *Box 1*) is another example of how practice values drove a retreat from digitalisation – in this case, a partial and selective one. While staff from all practices in our sample talked of being 'patient-centred', staff at Camp St described this as an over-riding value. Staff allowed this value to drive the selective withdrawal of remote and digital services and the creation and formalisation of workarounds to ensure that no patient was knowingly disadvantaged by digitalisation.

### **Technologies and the value proposition**

Innovations covered in the RBD2 study included novel systems (technologies and their associated pathways) for online booking, appointment management, and patient-facing text messaging and e-mail. While only some of these technologies were new in the sense of being newly designed and marketed, they were new in the sense that Everett Rogers (author of the classic text *Diffusion of Innovations*<sup>83</sup>) used in his definition of an innovation as something that is *perceived as new* by its intended adopters. Innovations also included adaptations to existing systems such as the electronic patient record, and digital advances in telephony systems.

Across our 12 practices, the most important technology supporting access and clinical interactions was the telephone. While this technology was far from new, nor was it perceived as new, it was a crucial component of two highly disruptive service-level innovations introduced in 2020: total triage and remote clinical encounters. Prior to 2020, the telephone was used in these practices mostly for simple, uncontentious administrative tasks – such as booking an appointment at a time when capacity broadly matched demand – or for clinician-initiated transactional tasks such as a doctor or pharmacist phoning a patient to change the dose of a drug. After 2020, the telephone was used increasingly for patient-initiated, clinically related and sometimes conflict-ridden encounters, most commonly to *negotiate* access in a system in which available appointments failed to match demand.<sup>57</sup> It was also newly used for a direct clinical function: to

mediate the clinician-patient consultation, including history-taking, assessment, diagnosis and agreement of a management plan.

The expansion of scope and vast increase in volume of telephone encounters greatly increased pressure on practice telephony systems. Such systems had never been designed for this level of traffic or these types of interactions. Some practices, especially the smaller ones, had only basic telephony systems with manual switchboards and no queueing function. This led to lengthy waits and sometimes jammed lines, with calls being terminated before patients could get through (and since telephones were also used for other practice business, much other work was also compromised). Digital telephony systems with high capacity queueing functions and automated switchboards, thus emerged as essential for processing the range, volume and length of calls in contemporary general practice. Despite this being acknowledged at the national level,<sup>111</sup> decision-makers and commissioners were sometimes slow to prioritise resources for improving telephone systems, perhaps because their focus was on 'new' technologies, as the following quote illustrates.

*I mean, it was insane. The patients couldn't get through. It [telephone] wasn't working and nobody [in the health board] felt that that was an emergency or something that needed to be addressed as a priority. At the same time, we were getting battered and bashed [by patients] saying we're not doing our work. I brought it up with [the health board's eHealth Programme Manager]. I said we should have this as part of a [Clinical Cluster Leads] meeting. And I think by sheer force of repeated embarrassment to these people [health board], they started to do something.*

*Lead GP, Range Park, September 2022*

As outlined in the NASSS framework,<sup>84</sup> a new digital technology may (or may not) generate various kinds of value – for the patient, for the practice and for the supplier. Some technologies were quickly abandoned because they failed to generate value. Some generated negative value such as increased administrative workload, clinical double-handling (e.g. remote consultation converted to in-person), a perceived risk to patient safety, or a widening of access inequities. A good example of this was video consultations, which were withdrawn in most of our participating practices between 2021 and 2023. This occurred because where patients were judged not to need in-person assessment, video rarely added any value over the quicker and more reliable option of a telephone call.<sup>112</sup> For some clinical conditions, video consultation was also an inferior option. For instance, a GP

at Westerly described how an experiment to offer remote physiotherapy appointments by video was abandoned because in-person, hands-on assessment and treatment were quickly found to be clinically preferable.

Poor value was sometimes related to a technology's material properties, such as low dependability or material features ['clunkiness', lags, bugs, glitches and little or no scope for (re)configuration] that made them awkward, impossible or potentially unsafe to use. Poor value was sometimes the result of pathway complexity or because the technology required advanced technical skills and cognitive ability.

Other technologies, along with the work practices they supported, were steadily assimilated into practices' routines. These were sustained when and to the extent that they were perceived, and shown, to add value, especially when adapted and configured to the local use case. In such cases, the value equation often began negatively but improved iteratively over time, as described in *The work of embedding and sustaining digital processes and pathways*.

An example of how material properties mattered is the cluster of products known (somewhat misleadingly) as 'e-consultation tools'. This term refers to software designed to support various functions including care navigation, collection of patient information via a digital form to inform triage decisions, allocating patients to the most appropriate professional (or signposting them to an alternative care route), and optimisation of workflows. More than a dozen such products came onto the UK market in the months following the government's 'remote by default' policy announcement and joined existing products that had been introduced pre pandemic but which had not been widely used except in a small proportion of digitally innovative practices.<sup>23</sup> The e-consultation tools available in 2021 included AccuRx<sup>TM</sup>, eConsult<sup>TM</sup>(London, UK), AskMyGP<sup>TM</sup> (Manchester, Lancashire, UK), Footfall<sup>TM</sup> and Online Consult<sup>TM</sup> (part of the EMIS<sup>TM</sup> system, Leeds, Yorkshire, UK). These programmes were accessed variously by website, NHS App or third-party app, and varied widely in material properties, functionality and usability.<sup>50</sup> By 2022, 95% of GP practices in England<sup>50</sup> (and all 12 practices in our sample) had one of these tools installed, though in one site it was never used much. Some programmes like eConsult used pre-assessment questions and algorithms to collect a large amount of structured data, while others like AskMyGP and AccuRx allowed a more conversational, free-text exchange between patients and clinicians.

E-consultation tools often generated a mix of positive and negative value. They created value in the form of

accessibility, convenience and ease of communicating about administrative issues for some patients. However, they could also generate negative value for support staff and clinicians to process and prioritise the information collected, especially when patients used them repeatedly for minor or self-limiting problems. The staff member in the quote below describes examples of both types of value – one from a patient and one from her personal experience exchanging information about her own child:

*[W]e were getting eConsult[ations] put in at three o'clock in the morning from, you know, patients who'd had a few too many to drink and thought, 'What's that there? I'll take a picture, send it in'. And then he must've woken up in the morning and thought, 'What the hell have we done with this?'. We replied saying, 'Hello, this looks like you've leant on your arm sort of thing'. [same interview] [My] six-year-old [has] got chronic health problems. She's on regular medication under [specialist]. It's been a case of, 'Hiya, just to let you know, we've got [specialist], they've changed her medication. See attached her new medication sheet'. Reply from the surgery pharmacist: 'Regarding [child], she's now been updated on her medication sheet'. Brilliant. I didn't need to go and see a GP.*

*Practice nurse, Rhian, October 2022*

As we discuss below (see *Equality, diversity and inclusion*), e-consultation forms also had the unintended consequence of increasing digital inequities, thus decreasing value, especially for practices with a large number of socioeconomically disadvantaged patients.

On the positive value side, while clinical and clinically related tasks were rarely, if ever, automatable using digital technologies because of the high degree of judgement involved, our informants described several digitally driven improvements in the efficiency of back-office functions as a result of digitalisation. For example:

*Software to manage vaccination bookings has ... given us so many more hours. [Describes previous laborious system for booking flu jabs]. We now do directly bookable invites, so we send them a link, and then you just look at the screen. They still can ring in [if they prefer]. We have far less people in the admin team, but they do far more now.*

*GP, Queens Rd, September 2023*

A similar product had greatly streamlined the work of booking routine appointments:

*The AccuRx self-booking tool has been a revelation for us. We can send a patient an SMS [text message] to enable them to see all appointments of a particular type, such as 'Dr X, face-to-face, routine' or 'Dr Y, telephone, same day', and they can then book the most convenient one.*

*GP partner, Fernleigh, December 2023*

These step changes in efficiency rarely occurred with the initial version of new software. As in the above example of the self-booking tool, they were generally introduced as a result of dialogue between the software developers (some of whom were GPs themselves) and the users of the technologies. The following extract from field notes illustrates this iteration:

*I'm observing NK [pseudonym of salaried GP], who is duty doctor. He's using AccuRx to text patients using template messaging. Some of the templates come from AccuRx, some he's written himself. NK and other GPs at Easton worked together to write the template for patients to submit photos on this messaging service, which has now been adopted by AccuRx as a template. NK tells me that the company started when DCB0160 (a standard focused on managing risk when manufacturing IT systems) was paused during the pandemic. AccuRx didn't have the right data processing pathways or usage language because of this when it was first deployed in general practice. So, NK had informed them of the issue, which they coded and resolved in one week. Direct engagement from NK led to 1) new template wording in the tool, and 2) new data processing pathways (photos sent by patients being deleted from AccuRx's systems and only stored locally on the GP systems).*

*Field notes from observations at Easton, September 2022*

Relatedly, technical reconfigurability and malleability were important for embedding and extending use of technology. Many systems included specific features for local customisation and adaptation, such as e-consultation user dashboard settings (e.g. to include workflow and alert features), control functions (e.g. to manage the times and flow of online requests) and practice websites. However, some components had been designed without adequate local configurability and required distributed reconfigurations across multiple and interlocking levels of infrastructure, generating work and frustration at the local level, as this quote illustrates:

*It is awful. We have the most non-patient user friendly email address. And so we try to give it to patients over*

*the phone ... It is to do with safety of data, so that is our secure email box. We can't change that. It continually causes problems .... We need a better practice website. I don't know how it works in terms of safety. The health board provided the website.*

*Receptionist, Range Park, March 2023*

Lack of dependability often affected the value proposition of a technology. We identified examples of frustrating breakdowns in both back-office and patient-facing technologies, sometimes rendering certain tasks impossible until the problem was fixed.

*Failures are very frustrating. DSX™ [software to collate the most up-to-date version of all referral forms] is intermittently completely unreliable. It doesn't populate from patients' notes and causes much pain. And when the hospital system went down, stopping all access to test results.*

*Lead GP, Camp St, August 2023*

Core elements of information infrastructure were often inadequate and patchwork. For example, participants talked about frustrations running new applications on legacy networks, the slow loading of electronic patient record systems, unreliable log-on functions, and the challenges of adding e-consultations to the growing number of separate software applications in use. One participant said:

*So you're kind of jumping in and out, logging in and out of these different systems. They all have different requirements for passwords that you have to change regularly, which you can't keep in your head. [...] There is a single log on, but it doesn't always work and they're going to get rid of it, which will be a nightmare for me. [...] But there's an issue with single log on. It often shuts you down. It sometimes glitches and they will shut down in the middle of the consultation, and they can't fix it which is why they're talking about getting rid of it.*

*GP partner, River Road, August 2022*

In sum, the pandemic-induced rapid development and evolution of digital technologies created many opportunities for general practice – but these innovations were not always fit for purpose and their embedding in workflows and technical infrastructure did not always go smoothly. In the next subsection, we consider in more detail how practices' efforts to routinise and embed digital processes played out.

### ***The work of embedding and sustaining digital processes and pathways***

As the previous subsection showed, digital technologies are never 'plug and play'. In particular, solutions designed

in laboratory 'sandbox' settings usually required multiple attempts to get them up and running in the real-world general practice setting, as the following quote illustrates:

*We have a new telephony system, called Surgery Connect. We had some teething issues initially with poor sound quality, but it was all ironed out by the provider who reinstalled all the phones. The problem with our old system before was the number of calls coming in. It got to be so many that GPs couldn't call out because the lines were blocked by all the calls coming in. It took some trial and error with one or two other providers in between before we landed on Surgery Connect. The system does have a callback feature. However, we found patients were getting cut out or lost when the auto redial was turned on, so they had to wait in the queue and be told they are 30th in line.*

*Salaried GP, Westerly, August 2023*

What this informant refers to as 'teething issues' reflects the extensive and ongoing work needed to embed digital technologies into complex work processes. This work included, for example, upgrading, re-fitting or replacing specific digital products, extensively adapting processes, providing training for staff and patients, creating and resourcing new work roles, and rapid-cycle, pragmatic evaluation. This iterative embedding work was particularly important for dealing with the wave of new (or newly introduced) digital technologies that emerged during the pandemic and were introduced abruptly and disruptively in 2020.<sup>19</sup>

*I wouldn't say [there's been] any sort of great changes in the last sort of 18 months in our working practices, but it's been a sort of refining and honing of the total triage model and how we integrate with [describes various practice processes].*

*Practice manager, Newbrey, November 2023*

Embedding work for e-consultation tools, for example, included adapting their functionality or use to try to reduce the unintended consequence of increased workload. While these adaptations were sometimes successful, well-intentioned attempts to refine the work process could sometimes worsen the problem they were seeking to solve. In such cases, inefficiency and technostress could escalate quickly. In the quote below, a GP describes how their practice tried to supplement the AccuRx e-consultation tool with symptom-specific questionnaires in the hope that these would streamline the triage process, but discovered that the add-on generated new problems:

*[W]e've got quite a few questionnaire templates for common same day urgent problems. So we've got templates for urinary symptoms. We've got, you know, a back pain template, I think there's a mental health one. So rather than say, oh, I think I've got a UTI, and then we say, oh, well, book with urgent care, we will send them a questionnaire and check that they haven't got any symptoms of urosepsis or pyelonephritis ... [But] if you overuse the questionnaire, it massively slows down the triage process because you've got to then wait for the data to come back and then you can't, you know, make a triage decision until you've got that information back. [And] one of the risks is that you ask for further information and then the patient doesn't reply and then you haven't done anything with the case. And then it just sits in the triage inbox for hours and hours and hours ... [A]nd there's a certain type of patient that tends not to reply and then you're in a sort of difficult territory of excluding patients from actual access because yeah.*

*GP partner, Newbrey, November 2023*

The comment in the last sentence of this quote ('a certain type of patient ...') alludes to the challenge of digital inequity, which all practices were concerned to avoid. An unanticipated effect of the introduction of e-consultation tools was that digitally skilled patients often found them easy to use and took advantage of them to ask for advice or make requests more often than they had through other channels before. This created, in many practices, a deluge of requests, some of which contained a great deal of text but limited useful information. Staff were diverted into advising and signposting patients who had made contact, especially since there was a government target that all e-consultation requests had to have a response within 72 hours. This limited their ability to identify and address the needs of what one Ogden East GP called 'the invisible cohorts' of people who were unable to connect at all using digital access routes.

In practices where support staff had strong community links (e.g. lived locally in a village setting) or were socioculturally close with the patient population (e.g. able to speak relevant ethnic or regional languages and aware of key cultural norms and social circumstances), they were often able to achieve sophisticated articulation work to smooth the patients' access.

Dealing with the large volume of requests arriving via e-consultation tools was an example of adaptive embedding – and, in some cases, de-innovation – by practices. One practice (Camp St) had piloted, and was planning to develop further, the specialised role

of 'super-receptionist' with advanced training in how to make clinically related decisions on e-consultation requests. Several, including Rhian, Queens Rd and Westerly, had largely abandoned e-consultations by the end of 2023. They did so on the grounds that this innovation could not solve, and tended to exacerbate, the problem of widening inequity. Another practice (Carleon) had retained e-consultation technology but did not advertise this modality and it was, in practice, hardly used. Two practices (River Rd, Towerhill) had transferred the task of processing e-consultations from receptionists or trainees to senior doctors on the grounds that this increased overall efficiency by minimising double-handling. An informant said,

*You could say [triage by a senior doctor] makes it more safe. For example, a 32-year-old person with headache for a week. Receptionist may give this person a face-to-face appointment in a week. But I see that she has been treated for sinusitis with antibiotics, so I may just give her a call about sinusitis and see if she is OK. So I can make a decision based on clinical evidence and experience. The system does require a senior GP, someone who knows the patients.*

*GP partner, Towerhill, September 2023*

As the above examples illustrate, practices were sometimes able to optimise the use of particular technologies and processes by modifying who used them, when and how. But sometimes, ongoing troubleshooting was needed. For this, particular staff members generally acquired responsibility. The assistant practice manager in River Rd, for example, described how they had to check, and, if necessary, manually override, the e-consultation platform on bank holidays. Although it was possible to programme the platform in advance not to open on bank holidays as intended, this instruction was sometimes overridden by glitches in the system which were neither fully understood nor technically fixable.

Embedding work for remote and digital services required careful monitoring of the impact of these changes. Partly because this task involved bringing together data from non-interoperable systems, it was generally done manually. Easton, for example, had a medical student analyse e-consultation use by patient demographics. Fernleigh had a staff member who manually compiled monthly usage reports for modality of appointment requests from multiple systems. As we have discussed in more detail elsewhere, embedding work also involved and attention to training,<sup>42</sup> workforce well-being,<sup>34,80</sup> quality<sup>29</sup> and patient safety.<sup>47</sup>

### ***Staff factors, interpersonal influence and team relations***

Strategic decisions about remote and digital technologies were generally made at practice level, and sometimes at the health board or ICB level. Nevertheless, the attitudes, capabilities and actions of individual staff members could greatly influence the assimilation, embedding, ongoing use and adaptation, and, in some cases, the abandonment, of these technologies.

Staff varied both in their attitudes to different technologies and in their technological capabilities. As they gained knowledge and skills, they often used technologies more, especially if benefits were immediately evident. One GP, for example, explained how they learnt how to code test results differently on patient records, thus allowing the patient to access them directly from their NHS app. Seeing how this change reduced the need for GP callbacks reinforced the GP's new coding behaviour. Another GP described learning how to send an automated text message to a patient a few days after an encounter, prompting them to book a review if they were not improving (and eliminating the need for a clinician to call the patient back). Notwithstanding such incremental learning, overall staff training needs, especially the need to learn to use a technology *on the job and as part of a team* (as opposed to demonstrating competence in a classroom or isolated self-study setting), were numerous and often unmet. High staff turnover also meant that many staff lacked basic training, as we have reported in detail elsewhere.<sup>42</sup>

Perhaps the most prominent influence on a staff member's attitudes to remote and digital care was their confidence in managing the risks associated with remote assessment and triage. Both clinicians and support staff varied hugely in their perception of, and tolerance of, these risks.

*If you think you're batting somebody off and putting them off not to come in and you know, if something happens ... you, you, it's, it's a worry, you do take it home with you sometimes.*

*Receptionist, Newbrey, August 2022*

Interpersonal influence was an important factor affecting the uptake and use of technologies and also their non-use and abandonment. In some practices, one or more staff members became champions for particular products and techniques, encouraging others to try them out. Others became super-users, acquiring advanced digital skills and informally teaching others on the job, for example, being the go-to receptionist for when other support staff encountered problems. In other practices, lack

of champions or super-users contributed to the slow assimilation – and in some cases to the abandonment – of particular technologies. For instance, see the lack of enthusiasm for a well worked-up digital strategy in Rhian under *Organisational readiness: values and tension for change*.

Inexperienced and underconfident staff tended to triage patients to in-person assessment or generate inefficient double-handling of problems. In general, staff became more confident with experience, although negative experiences could erode confidence. Confidence also grew through informal, on-the-job discussions with – and troubleshooting by – their more experienced peers. In one or two practices, clinicians or support staff were deliberately organised in shared open-plan offices to promote this informal interaction, as the following quote illustrates:

*So there is now a duty hub here, I can show you if you like. So clinicians go in. And although they're on their separate calls they are working in a hub together. So there's six seats. [T]hey are a team together, they will have headsets like cancelling noise and stuff. So they kind of work together.*

*Practice manager, Queens Rd, September 2023*

While policy documents often depicted digitalisation as 'freeing up' staff for other work, the reality could be an increase in workload for some staff members. One example was electronic discharge summaries from secondary care. Automation had made these easier to generate and send, which increased the volume of traffic and the work of sorting and processing these artefacts in primary care:

*The hospital fires over the discharge copy. But then they need to tell us something else, [so they later] resend the whole sheet with a small change ... Sometimes I can get six documents down and it's the same thing. It makes me really angry, because I don't have the time to sift through it. The doctors want it all dealt with all the time. I get that, but I'm already running one person short, you know.*

*GP support supervisor, Easton, September 2022*

Many general practice staff found digitally mediated work stressful. Such work was typically complex, relatively inflexible and involved distribution of tasks among multiple staff members.<sup>80</sup> The resulting 'techno-stress' could be mitigated when members of a multidisciplinary team knew each other well and cared about and supported each other. Much informal learning about how to make digital processes more efficient and safer emerged through

these positive interpersonal relationships. In addition, when team relations were supportive, staff felt able to admit ignorance, voice concerns and share uncertainties (a phenomenon known as psychological safety<sup>113</sup>). This was particularly helpful in supporting staff to overcome difficult patient interactions.

*I started three months ago. So it's been full on. But the surgery itself has been really supportive, not just the receptionists, the doctors, the nurses too, and the managers. If you do something wrong, or you make a mistake. You don't get told off, they explain to you, and then they teach you how to do it the right way.*

*Patient services co-ordinator, Easton, September 2022*

In one practice (name intentionally omitted), staff relations were poor and turnover was high. Support staff sometimes stayed only a few weeks after induction, with some leaving abruptly without giving notice. On the clinical side, many sessions were staffed by locums and salaried doctors. This practice had achieved a relatively advanced level of digital maturity, but some of this progress appeared to have been made at the expense of staff well-being and team relations. Organisational memory was limited because a high proportion of staff were newly appointed, had little sense of the practice's history and mission and were unfamiliar with key routines. Techno-stress was very high: one receptionist said that the practice 'feels like a call centre' and described the pace of work as 'relentless'. Given the importance of teamwork for the ongoing embedding and routinisation of digital innovations (see previous section), we predict that this practice may struggle to sustain its current level of digital services in the medium and long term.

### ***The patient and carer perspective***

Patient-facing technologies made various demands on patients and carers, who needed knowledge, skill, confidence and language proficiency to use them. Woolgar coined the expression 'configuring the user' to depict the assumptions built into technologies of who would use them and how.<sup>114</sup> Advanced telephony systems with touch-tone selection (e.g. 'for pharmacy, press 1'), for example, contained the inbuilt assumption that patients would be able to process the instructions in real time and respond accordingly. In reality, some patients could not – perhaps because of lack of privacy at home, language barriers, or limited ability to cope with the cognitive load.<sup>104</sup> Hence, they became unable to access the practice by phone.

All participating practices in the RBD2 study recognised the need for patients to acquire new skills and the tendency of digital pathways and processes to exclude those who

lacked these skills. They met these challenges with a range of responses and, in general, in ways that reflected the different demographics of their practice populations. Practices with few patients from socioeconomically deprived and disadvantaged groups typically took the view that most patients would need to develop the skills needed to engage with digital services. They described putting in work to teach them how to do this:

*Our patients are now quite skilled at AccuRx texting. Once they're used to it, they quite like going back and forth with the doctor.*

*Practice manager, Fernleigh, July 2022*

Deep End practices in very deprived localities serving populations with complex health and social care needs (River Rd, Range Park, Ogden East) often saw advances in digitalisation as strategically inappropriate. Staff in these practices and linked social care providers believed that their most vulnerable patients (e.g. homeless, drug users, socially isolated, those with mental health conditions) would likely be further disadvantaged. They also had little hope that patients would acquire the skills and devices which policy appeared to expect of them. Our empirical observations<sup>57,79</sup> affirmed NHS England's user testing data;<sup>50</sup> both showed that severely disadvantaged patients often had limited ability to understand e-consultation tools and use them to access and navigate care. This was particularly the case when patients had low health literacy, low digital literacy, limited English or Welsh proficiency or multiple health and social problems.

Importantly, however, some patients from deprived postcodes were keen on remote services because they found it difficult to get time off work or domestic duties to attend appointments in person. These patients, who typically did not have advanced smartphones, tended to favour telephone consultations or text message exchanges. Some Deep End practices (e.g. River Rd) had successfully mainstreamed text messaging and telephone callbacks to meet the needs of such patients.

Digitally advanced practices serving mixed populations with pockets of deprivation (Westerly, Queens Rd, Camp St) were committed to delivering digital services for those patients who could avail themselves of them. These practices also proactively sought to identify patients for whom digital access was challenging and to develop workarounds to accommodate their needs. As an informant said:

*We get patients to write down what's wrong, hand it in to reception, and that gets scanned in if they can't use digital access.*

*GP, Westerly, November 2023*

Staff sometimes found it challenging to achieve the right balance between a default expectation that patients should develop and apply digital skills and making exceptions for certain patients. This task often involved a combination of technological solutions and ad hoc decisions, as this participant reflects:

*[T]here needs to be some responsibility to the patient, to be informed ... [but] we also have a recurring message [on the electronic record], like 'is visually impaired' or 'is nervous on the phone'.*

*Practice manager, Queens Rd, September 2023*

Another patient-related factor influencing practices' remote and digital strategy was staff's perception of their patients' needs and preferences for continuity with a particular clinician. In some practices (notably Towerhill – see *Box 1*), the key quality metric was *when* (i.e. how quickly) the patient was dealt with. In other practices, the metric was *who* saw the patient, and whether the appointment was in-person. Smaller and more traditional practices (River Rd, Carleon, Range Park, Ogden East), and those serving a high proportion of older patients (Fernleigh), were notable for their emphasis on continuity of in-person care by a familiar clinician.

While there is a growing literature on the benefits of co-design with patients to ensure patient-centred pathways and processes, most of participating practices had made limited progress in this regard. Forging formal partnerships was uncommon, and many practices lacked the resources to organise such partnerships. Staff at other practices expressed concern that patients' expectations for additional in-person capacity would be misaligned with what they could deliver.

Practices often had some mechanism for collecting patient feedback ('*We have a board in the waiting room where patients to write down what they love and what drives them nuts*' – GP, Towerhill). However, these mechanisms were generally designed to capture suggestions for relatively minor changes rather than wholescale transformations of services. One exception was Ogden East, which had managed to recruit and retain a strong and broadly representative patient group. They consulted this group on major strategic matters, as this quote illustrates:

*We have an active patient participants group which are involved in decision making and we take their feedback on board. When we were moving to [new premises], which was deemed necessary, all the patients were consulted in a lengthy exercise in advance of that and the vast majority were approving of this. It is a 3-monthly, engaged, well-attended group.*

*Salaried GP, Ogden East, April 2022*

One reason why Ogden East remained 'strategically traditional' (Table 2) was that the patient participants group had strongly supported this position.

Smaller practices, including the two Welsh practices (Carleon and Rhian) and the Scottish practices (Range Rd and River Rd), were notable for their 'family doctor' ethos and friendly and informal relations between staff and patients. While there were no formal patient participation groups in these practices, reception staff in particular often felt they knew their patients' needs well and could

advocate for them. Our patient interviews in these practices revealed a high degree of trust in practice staff and in the processes they followed.

*They seem to know when to offer me a face-to-face [appointment]. If I rang and said 'I am not happy with what they have said as a plan, can I have an in-person appointment please', I know that they would give me that even if it takes a few days, and I would be happy to wait.*

*Patient, Carleon, February 2023*

Informal staff-patient interactions based on personal relationships were sometimes highly effective in identifying where small but important ' tweaks' were needed in digital systems, as this quote illustrates:

*There was an access issue [with the e-consultation platform]. Some patients were saying that [because of] the school run or working, they still couldn't access the*

**TABLE 2** Typology of general practices in relation to digital innovation

Type	Support needs and strategic contribution
<b>1. Digital trailblazer (Towerhill)</b> Being innovative and digitally advanced is a core part of the practice's ethos and identity. Characterised by very high absorptive capacity (i.e. in-house human and technical infrastructure strongly geared to capturing innovations, bringing them into the practice and making them work) and close alignment with national digital technology policy. Digital technologies are quickly piloted and (if successful) smoothly routinised through advanced processes for monitoring their impacts, learning and adjusting accordingly. The emphasis is typically on efficiency (e.g. prompt waiting times). Staff may include digital entrepreneurs who work to develop, source and adapt digital technologies and support wider uptake of these locally and nationally. Trailblazer practices tend to be sited in relatively affluent areas and serve a demographic who are able to benefit from remote and digital services. They are often system-oriented, active at local or regional level to support and drive innovation and procurement across a network. The needs of less digitally enabled patients tend to be met by bespoke arrangements and workarounds	Trailblazer practices could serve as 'sentinel' or 'beacon' sites to inform policy-makers and horizon scanners of novel digital technologies and illustrate how to optimise the use of these in innovative processes and pathways. Their entrepreneurial ethos and values may help forge links with commercial suppliers (though there needs to be attention to regulation and governance if there are commercial conflicts of interest). Their system orientation means they are often important strategic partners in locality-wide change efforts. Their enthusiasm for digital solutions means they may need reminding and incentivising to ensure that the needs of non-digitally enabled patients are identified and fully addressed
<b>2. Digitally strategic (Fernleigh, Camp St, River Rd, Easton, Newbrey)</b> Typically large, well-resourced and with strong leadership and high absorptive capacity (i.e. meets key preconditions for organisational innovativeness). Digital technologies are readily identified, introduced and evaluated as part of a wider strategic vision, but the practice does not pursue digital innovation as an end in itself. Rather, this is one of multiple strategic considerations; others may include responding to demographic changes, addressing the needs of particular vulnerable groups, mergers with other practices, ensuring staff comfort and well-being, teaching/training, and research. Ideas and plans for novel technologies and pathways are discussed in the context of wider strategic questions and (if approved) taken forward. Enthusiasm for particular digital innovations will vary depending on alignment with practice values and the needs of the patient population and practice staff. In some practices (e.g. where key subgroups are at risk of being disadvantaged), strategic decisions will tend to favour a relatively technology-light set-up. In others, the needs of digitally less confident patients may be addressed via human intermediaries like digital navigators	Digitally strategic practices should be supported to identify, obtain, trial and routinise the technologies they need to achieve their strategic vision. One key role for policy-makers and commissioners is removing barriers to procurement so practices can source the 'right' technological solutions (and move on from the 'wrong' ones) promptly. Funding may be needed for intermediary roles. Digitally strategic practices can provide insights about the challenges of combining and juggling multiple strategic priorities. Policy-makers should not confuse the 'technology-light' digitally strategic practice (which is cautious about certain technologies and pathways for good reasons) with the digitally hesitant practice, and be careful not to stigmatise the practice which chooses strategic de-digitalisation

continued

**TABLE 2** Typology of general practices in relation to digital innovation (continued)

Type	Support needs and strategic contribution
<b>3. Digitally reactive (Westerly, Queens Rd)</b> The reactive practice is not in principle opposed to digital technologies and has no over-riding reason for not introducing them. Indeed, it may be keen to introduce them. However, for various reasons, the practice is not yet digitally strategic. Rather, digital technologies tend to be introduced <i>reactively</i> and/or in a somewhat piecemeal way – for example as a ‘fix’ for an immediate problem (e.g. overwhelming patient demand), to respond to a policy must-do, or because someone is curious to experiment (we initially called such practices ‘digitally curious’). This practice may be relatively technologically advanced in some areas and perhaps achieve significant efficiency gains, though efficiency losses may occur when practices assume a plug-and-play approach rather than investing in the work of embedding and co-adapting the technology and the work pathway. Because adoption decisions are mostly non-strategic, there is little sense that new technologies and pathways serve a clear practice mission. There may be a prevailing ethos of ‘firefighting’ and staff and patients may be dissatisfied with the overall service	It is important to identify and address the underlying reason(s) why the practice is not taking a more strategic approach. Workload may be excessive and/or staffing and skill mix suboptimal. Leadership and senior-level commitment may be weak or resources inadequate, and there may be low agreement on strategic direction. There may be too little ‘headspace’ for reflection and planning. Policy incentives and must-dos may be [experienced as] perverse. Once the underlying reasons have been identified, solutions follow – for example, practice leaders may benefit from mentoring, attention to team relationships, or specific support (e.g. with business planning). Funding is likely to be needed for intermediary roles
<b>4. Digitally hesitant (Rhian)</b> The hesitant practice generally lacks one or more key preconditions for organisational innovation. It may, for example, be smaller, less well-resourced or lacking strong leadership. It may also have limited absorptive capacity, with few or no staff able to horizon-scan; limited in-house technological knowledge and know-how; and weak processes in place to introduce and evaluate innovations. There may be strong traditional values (e.g. associating ‘proper’ medicine with in-person consultations). Negative experiences with attempting to introduce digital technologies in the past may have shaped current attitudes, making such efforts more likely to fail. This kind of practice tends to have few up-and-running digital services. Those that are in place may have been purchased at locality level and imposed and may be experienced as clunky and stressful by staff who are neither confident nor adequately trained to get the most out of them. When new technologies are considered, these are usually at a relatively late stage of adoption (e.g. neighbouring practices have already introduced them), but the practice may still be uneasy about trying them out and be unsure as to how to go about this	Policy-makers and commissioners should recognise digitally hesitant practices as needing significant organisational support to meet the preconditions for innovation, not merely help in introducing a particular digital technology. These practices may be struggling with technologies that are unfit for purpose because they were unable to identify or negotiate solutions for their particular needs. Resources may be needed to optimise the existing technological set-up, train clinical and support staff, and provide protected time for team reflection and strategic planning. Local networks (e.g. ICBs) may be able to help with raising awareness of technological innovations and other opportunities locally. Networking events with (or visits to) practices at a more advanced stage of digital maturity may help build knowledge and confidence
<b>5. Strategically traditional (Range Park, Carleon, Ogden East)</b> Typically, a small practice serving a less digitally equipped and digitally capable demographic. Key patient groups may have a strong preference for (and/or have needs that require) predominantly in-person services. These practices include (but are not limited to) Deep End practices serving deprived communities with complex health and social care needs, including major social challenges and drug/alcohol use. Other vulnerable groups include those living precariously (perhaps moving home and changing practice frequently), homeless, refugees and other displaced people, people with learning difficulties, and elderly people who lack family or social support for technology use. These practices may make selected use of digital technologies (e.g. for back-office functions or to allow some patients to order prescriptions online) but are careful to prioritise in-person services for those with the greatest need	Policy-makers should acknowledge that in the context of profound socioeconomic hardship, digitalisation may worsen inequities and put vulnerable groups at risk. They should support practices serving such populations to provide a traditional, ‘in person by default’ service, including ensuring that basic technologies such as telephony systems are fit for purpose and have adequate capacity. Policy-makers should encourage and support such practices to maximise the use of digital solutions for back-office (non-patient-facing) functions and maximise the opportunities for low-tech digital tools (e.g. text messaging). They should not assume that strategically traditional practices are digital laggards, nor that human intermediation (‘digital navigators’) can fully overcome the effects of multiple disadvantages on access to services

*online form during the times it was available. So this week we've expanded it. We open it at 7 am, so we have got an hour and a half before surgery opens*

*Assistant manager, River Road, September 2023*

The ‘double diamond’ co-design methodology<sup>85</sup> we had originally planned did not produce workable solutions in any of the three practices where it was tried. On reflection,

this methodology was ill-matched to the challenges faced by participating practices. The double diamond approach assumed that a particular ‘design problem’ was readily surfaced by an external design agency talking to staff and patients; that a solution to this problem could emerge through facilitated, collaborative creative thinking in a workshop format; and that this solution would be implementable, helpful and relatively enduring.

However, in reality, practices faced multiple, multifaceted and sometimes 'wicked' problems unfolding in dynamic and unpredictable ways. Critically, this was also in a context of severe resource constraints. As the RBD2 study unfolded, we moved from the 'double diamond' model to a more flexible and agile approach to design, in which a small design company was commissioned to respond rapidly to practices' design needs as these emerged. We found that the major need in this space was for high-quality, accurate and appealing information and guidance for both practice staff and patients to explain new digital technologies, pathways and ways of working. Examples of resources produced by the design company (Design Science) are shown in [Box 2](#).

## Discussion

### Summary of key findings

This longitudinal ethnographic study in UK general practice has generated a number of key findings. Following a disruptive and near-universal shift to 'total [remote] triage' and remote by default consultations in 2020, practices adjusted in different ways to a 'new normal' of hybrid (a blend of remote/digital and in-person) provision. By the end of 2023, practices had reached a relatively steady state, with solutions ranging from a near-total return to traditional in-person services (with very selective use of digital tools) to a single, digital-by-default access route, extensive use of digital processes and pathways, and more than half of all consultations delivered remotely. Abandonment or substitution of technologies was not uncommon.

In trying to find the appropriate balance with hybrid services, practices were guided by strategic questions around access and equity, triage and linked safety concerns, continuity, non-acute services such as long-term condition monitoring, back-office and other administrative work, human resources (especially skill mix, training and retention), and selection and optimisation of – and sometimes disinvestment in – technologies. Despite a continuing policy push and some positive incentives, the context for innovation was adverse and legacy infrastructure inadequate. Some practices had good preconditions for innovation (notably, spare resources, strong leadership and high absorptive capacity) while others did not. Practices' readiness for advancing digitalisation of access varied and was powerfully influenced by values-driven perceptions about what was best for the patients they served. Much ongoing work was needed to embed and sustain technology-supported tasks and processes. The NHS's workforce crisis had been

worsening for some years and staff shortages were severe in some practices. When technologies fitted poorly with tasks and routines, when staff were reluctant or when the work of embedding was inadequate or unsuccessful, inefficiencies in work processes and 'techno-stress' among staff resulted, sometimes leading to compromises to patient access and quality of care.

### Equality, diversity and inclusion

The study has some important findings in relation to equality, diversity and inclusion. Many patient-facing digital innovations in our participating practices contained inbuilt assumptions about the patient's level of digital literacy (e.g. the ability to follow an algorithm), health literacy (e.g. the ability to identify an 'emergency') and system literacy (e.g. the ability to understand and navigate all potential access routes) – and hence could potentially increase inequities of access. Our two research questions on equity – 'How can we ensure that all patients, including those with vulnerabilities and special needs, can access care?' and 'How can we avoid inequities of access for those lacking digital devices or connectivity, confidence, capability or family support?' – had no easy or universal answers. An important component of provision for disadvantaged or vulnerable patients was staff using initiative and creativity to personalise solutions for particular patients. However, these efforts were sometimes labour-intensive, and in the context of austerity, high workload, high staff turnover and other prevailing stresses to practices, such efforts were sometimes limited. The decision by some practices in deprived settings to curtail digital provision in favour of a largely face-to-face service ('strategically traditional') seemed justified. We have published separately on equity and access from the patient's perspective.<sup>53,75</sup>

### Strengths and limitations

A significant strength of this study was the longitudinal ethnographic design, with an embedded researcher-in-residence for each practice. Using a purposively diverse sample of general practices drawn from across England, Scotland and Wales, we built relationships with clinical and non-clinical contacts and visited regularly to collect data. Through theoretically informed sampling, we interviewed all staff types from receptionists to senior partners, and also interviewed patients. The 28-month data collection period allowed us to observe the longer-term impacts of disruptive innovations introduced in the acute phase of the pandemic. Data analysis included extensive discussion among researchers to examine similarities and contrasts between practices. A 'technology-agnostic' position enabled us to study the benefits and drawbacks of both digitalisation and 'de-digitalisation' in different contexts.

**BOX 2** Examples of design outputs in response to RBD2 practices' challenges


Example 1: Practice website design for improving patient accessibility



Example 2: Flow chart for staff to improve telephone communication with patients

When we originally planned this study, we took note of the fact that previous studies on a similar topic had tended to use a larger unit of analysis and did not have the granularity to fully explain their findings (e.g. why some practices observed increased efficiency while others observed decreased efficiency with a telephone-first model<sup>[115]</sup>). For this reason, we majored on granularity – producing rich narratives of a small

and diverse sample of practices. As social scientist Bent Flyvbjerg stated: 'a scientific discipline without a large number of thoroughly executed case studies is a discipline without systematic production of exemplars, and ... a discipline without exemplars is an ineffective one' (p. 219).<sup>[116]</sup> We believe an important contribution of the RBD2 study is the production of exemplars with the granularity to address why innovations in remote

and digital care have different fortunes in different practice settings.

Limitations of the RBD2 study included that our sampling frame was limited to UK; we did not have a practice in Northern Ireland; and patient interviews were relatively sparse. While the study generated rich qualitative data, a larger study with a quantitative component using validated instruments (e.g. for assessing organisational antecedents such as absorptive capacity<sup>108</sup>) could have supported formal hypothesis-testing around the organisational-level determinants of digital innovation.

### Comparison with previous literature

Empirically, we have broadly confirmed a body of literature which demonstrated that remote and digital modalities in general practice may be acceptable and even preferred by some patients<sup>28,32,33</sup> but that at an organisational level the transformation to such modalities is fraught with challenges.<sup>117</sup> These include potential increases in workload and reductions in efficiency,<sup>30-33,54</sup> especially when capacity is severely constrained.<sup>38,49</sup> There may also be complexification of staff roles and interactions, with increase in role stress.<sup>35,54</sup> distortion of demand for patient-initiated consultations (leading to a mismatch between provision and need),<sup>6,54</sup> widening of inequities,<sup>25,27,33,54,60</sup> a shift towards more transactional care and loss of opportunities for preventive and long-term condition care;<sup>18,40,60</sup> reduced continuity of care;<sup>18,38</sup> and documented<sup>36</sup> or perceived<sup>32,33,54</sup> safety challenges.

Our own empirical work extends this literature by demonstrating that while the negative impacts of digitalisation are common, they are not inevitable; they may not be permanent; and they do not affect all tasks and processes equally. Rather, our findings broadly affirm Amara's law – that people tend to overestimate the impact of a technology in the short term but underestimate its impact in the longer term.<sup>118</sup> Sociotechnical theory has long emphasised the need for mutual adaptation of technologies to improve the fit with work processes and vice versa.<sup>117,119</sup> Our empirical findings illustrate how the value generated by technologies can sometimes change dramatically through embedding and routinisation, turning an 'inefficient' process into a more efficient one. This transition was more likely for administrative functions (which could often be highly protocolised) than clinical ones (which could not).

We have shown that with leadership and adequate resources, practices can work strategically to optimise the potential of remote and digital technologies. They achieve this, for example, by ensuring that the direction of change aligns with practice priorities and values;

giving due attention to the labour-intensive process of embedding and adaptation; training staff and cultivating psychological safety and positive team relations; assessing the consequences (intended and unintended) of innovations; and selectively abandoning, replacing or modifying technologies and processes that prove unfit for purpose. Practices vary considerably in how reflexive they are about their strategic priorities and whether and how they are achieving these. We have also shown that larger practices are generally (but not invariably) better able to drive digitalisation strategically, most usually because they are better resourced and better able to achieve economies of scale, but that smaller practices may benefit from deep knowledge of, and commitment to, their local community and from strong team relations.

At a theoretical level, we have affirmed the appropriateness of the complexity-informed Diffusion of Innovations,<sup>82</sup> NASSS<sup>84</sup> and PERCS<sup>77</sup> frameworks in considering the multiple interacting influences on innovation in healthcare organisations. We have also extended the (relatively sparse) evidence base on the contribution of crises to digital innovation in healthcare organisations. Gkerekakis *et al.* argued that the COVID-19 pandemic illustrated how an external crisis can be a time of 'opportunity, disruption and exposure' in healthcare organisations; that is, the acute crisis pushes the organisation into adopting an innovation and 'exposes' them to its potential.<sup>19</sup> In a previous paper using data from the early months of the pandemic (the Remote by Default 1 study), we used Gkerekakis *et al.*'s framework to show how the pandemic had prompted rapid introduction of digital innovations in primary care, particularly remote triage and video consultations.<sup>16</sup> While the literature on crisis tends to focus on sudden and often unexpected events (whether economic, geological, epidemiological or geopolitical) which pose immediate and tangible threats to our health and well-being (experienced as what Van de Ven *et al.* would call 'shocks'),<sup>120</sup> Boin *et al.* have also warned about 'slow' or 'creeping' crises such as climate change or the global healthcare workforce shortage.<sup>92</sup> Because they emerge slowly, these crises may go unnoticed (i.e. they are not experienced as shocks), yet their impact may be just as serious. The RBD2 study showed how the 'double whammy' of an acute shock in the context of the inexorably escalating slow crises of underfunding and workforce shortages had contributed significantly to the inability of some practices to plan strategically and maximise the potential of digital innovation.

Everett Rogers, who developed the original Diffusion of Innovations theory focusing on individuals, identified 'potential for reinvention' as a key attribute of an innovation that increased its chances of adoption and continued use by individuals.<sup>83</sup> The same point has been made in the

human-computer interaction literature, usually using the term 'appropriation'.<sup>121-123</sup> The RBD2 study has illustrated how successful appropriation and continued use of remote and digital technologies in general practice organisations often involves staff members adapting technologies or creatively drawing on selected functionality to produce novel use cases.<sup>82</sup>

### Implications for decision-makers

Against a background of several decades of policy support for digitalisation of health services,<sup>11-14</sup> and the dramatic shift to remote access and care in 2020,<sup>1,2</sup> by 2022-3 policy documents were emphasising the technologically driven 'recovery' of general practice from pandemic-induced compromises to services.<sup>11,124</sup> These and wider digital policy documents present a vision in which digitalisation (along with staff training) will optimise contact channels for patients seeking care, systematically gather key information to inform the efficient allocation of patients to the appropriate professional and modality, and match capacity to need.<sup>125-128</sup> Nationally led support and guidance are available for procuring digital technologies.<sup>129</sup>

This technologically upbeat policy discourse rarely acknowledges that progress towards greater digitalisation may be more appropriate for some practices and some patient populations than others. In particular, Deep End practices serving disadvantaged populations with complex health and care needs may resist digitalisation for good reasons. These practices tend to be smaller, less well-resourced and focused on ensuring access and in-person care where needed, for the most disadvantaged. However, some disadvantaged groups do welcome technological solutions – for example, socioeconomically disadvantaged people benefit from relatively low-tech digital solutions such as text messaging and telephone consultations; those with hearing impairment may favour online consultations rather than telephone.

The digitalisation of general practice appears to depend on making radical and complex changes to already complex working processes in a high-stakes working environment. UK general practice has been adapting to seismic shifts in its working infrastructure. In such a context, mandates and enforced implementation of specific technologies may be unwise. Rather, we have shown that practices are to a large extent aware of the need to balance a range of competing strategic questions related to care to patients, workforce and financial security, and have acted or reacted to optimise systems, albeit with variable success. Perhaps what is needed is a complexity-informed framework to support decision-making (and operational implementation and internal evaluation) in what is likely to continue to be a stressed uncertain and rapidly changing environment.

Five years on from the crisis-driven integration of remote and digital consulting and access, practices have developed significant local knowledge about what works for their staff and patients. Many, but not all, practices have been able to consolidate this knowledge and use it strategically. Others are struggling reactively to successive policy changes and external shocks. Different practices are serving very different populations, with different resources and at different stages of digital maturity. It follows that they will need different kinds of incentives and support. Based on our empirical findings and theoretical analysis, and extending our earlier digital maturity scale (see *Sampling and data collection for practice-based case studies*), we offer a novel typology of general practices and their support needs in relation to digital innovation (Table 2). We indicate where in this new typology we think each of our participating practices lies.

### Conclusion

Rapid introduction of remote and digital services in UK general practice in 2020 was followed by a period of questioning whether these innovations should continue and (in most cases) a labour-intensive process of embedding and adaptation. We have shown, in line with existing theory, that success of efforts to routinise digital innovations depends on (among other things) resources, leadership, alignment with practice mission and values, positive team relations, ongoing assessment of consequences and selective abandonment, replacement or modification of technologies that prove unfit for purpose. We have also extended the empirical and theoretical literature on the role of crisis in driving major technological change in healthcare organisations, and developing a novel typology of digital maturity in general practice, and recommend that national and local support for general practice should be tailored to their position in this typology. There is scope for further research on how practices can best act strategically and reflexively to optimise care overall, what kind of external support is most helpful, how practices transition from, for example, digitally hesitant or digitally reactive to digitally strategic, and how and why some digitally strategic practices develop a more system-oriented 'digital trailblazer' ethos.

### Additional information

#### Credit contribution statement

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## Patient data statement

No NHS patient data were included in this study.

## Confidentiality and anonymity

All data included in this paper are fully anonymised and consistent with terms of consent signed by participants.

## Reporting guidelines

We have followed published guidance for case study research.<sup>116</sup> Formal, structured protocols akin to Consolidated Standards of Reporting Trials for randomised controlled trials do not exist for this kind of research.

## Consent

All patients and staff interviewed gave written informed consent in accordance with our ethics protocol. No actual patient data are reported in this paper. All references to patients in quotes have been fictionalised to protect anonymity.

## Data availability

Selected data on this mainly qualitative study will be made available to bona fide researchers with appropriate ethical approvals on reasonable request to the lead author.

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## Data-sharing statement

Selected data from this qualitative study may be made available to researchers with appropriate training and ethical approval. Please contact the corresponding author to discuss.

## Ethics statement

Ethical approval was obtained from East Midlands – Leicester South Research Ethics Committee and UK Health Research Authority (16 August 2021, 21/EM/0170 and subsequent amendments). The work was overseen by an independent advisory group with wide cross-sector representation including academics, policymakers, industry, clinicians, lay members and a lay chair.

## Information governance statement

All personal information was handled in line with the Data Protection Act (2018) and General Data Protection Regulation (EU GDPR) 2016/679. Under the Data Protection legislation, University of Oxford is the Data Controller, and you can find out more about how we handle personal data, including how to exercise your individual rights and the contact details for our Data Protection Officer here: [www.phc.ox.ac.uk/intranet/information-governance](http://www.phc.ox.ac.uk/intranet/information-governance).

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### List of abbreviations

COVID-19	coronavirus disease discovered in 2019
GP	general practitioner
ICB	Integrated Care Board
NASSS	non-adoption, abandonment and challenges to spread, scale-up and sustainability
PERCS	planning and evaluating remote consultation services
RBD2	Remote by Default 2

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## Appendix 1 Background information

TABLE 3 Summary of participating practices

Practice (with deprivation decile and list size in 2021)	Status in September 2021 (digital maturity scored in terms of our initial pragmatic scale)	Status in December 2023 (digital maturity scored in terms of our final typology)
<p><b>Range Park</b>  <i>Deep End inner-city practice in Scotland. Two thousand three hundred patients (88% white). High deprivation, low health literacy and many young families. Patients have high levels of illness and comorbidities linked to social determinants, with high rates of drug and alcohol use</i>          Deprivation decile: 1st</p>	<p>Two GP partners, working with mental health counsellor, attached community link worker and district nursing service. Lead GP (25+ years in this practice) had a long-standing presence in the community and knew many patients and families well; she was active on local and national primary care committees. While most consultations were in-person, this GP was confident managing consultations with known patients by telephone. The practice, which was low-tech with poor infrastructure, had no plans to expand its digital services. Rather, its priorities were to improve outreach and support to the local population through non-digital means. Digital maturity: Traditional</p>	<p>The period 2021–3 was characterised by rising patient demand and breakdown of the inadequate technological set-up (an old-fashioned telephony system which jammed under the volume of calls). The lead GP fought to get this replaced with a digital telephony system with higher capacity and a queueing function. One receptionist who has been with the practice many years and knows most of the patients is confident making triage decisions; this is closely overseen by the lead GP who provides on-the-job training. But this arrangement depends on personal (experiential) knowledge and a particular interpersonal relationship; new reception staff and locum GPs struggle with it. There are no plans to extend digital services. Digital maturity: Strategically traditional</p>
<p><b>River Road</b>  <i>Teaching and training Deep End practice serving a young and ethnically diverse population of 5500 in a very deprived borough on the outskirts of a major city in southern Scotland. Many patients have complex needs and low health literacy</i>          Deprivation decile: 1st</p>	<p>There are four part-time GP partners, one nurse, one healthcare assistant, one community link worker, and aligned health visitors and district nurses – but no advanced nurse practitioners, paramedics or pharmacists (reflecting Scotland's lack of an additional roles reimbursement scheme). The practice is co-located in purpose-built premises with a library, leisure centre and various social services, and is committed to addressing the complex health and social care needs of the locality. Telephony system was basic and often malfunctioned under increased demand. An electronic triage tool (Footfall) was introduced in 2021 and initially led to increased workload and reception staff stress. Most patients were not comfortable with remote services. Digitally curious</p>	<p>This practice successfully introduced and routinised a number of digital innovations, notably a new telephony system and GP-led digital triage which allowed patients to be efficiently channelled to the most appropriate staff member. However, partners attributed the significant improvements in efficiency and patient satisfaction observed during our fieldwork period more to improved staffing and restoration of 'in-person by default' services than to the new digital technologies and pathways. This practice was unusual in achieving significant strategic progress despite its small size (for discussion, see <i>Organisational antecedents for innovation</i>), though the current steady state is best described as digitally strategic but 'technology light'. Digitally strategic</p>
<p><b>Carleon</b>  <i>Training practice on 3 sites in north Wales with list size 7500, including seaside retirees, farming communities and some very deprived semirural boroughs</i>          Deprivation decile: 2nd</p>	<p>Popular family doctor service with five part-time GP partners, two registrars and relatively few attached staff (two advanced nurse practitioners and two practice nurses) plus a pharmacist working remotely from England. Limited digital provision, partly because both staff and patients preferred traditional in-person appointments. However, demand was high and rising and while the traditional system was described as 'not really working', the direction of change was not yet clear. Traditional</p>	<p>Practice remains very traditional in ethos and uses few digital innovations; staff and patients like this. AccuRx messaging (to send in photographs); a 'reception e-mail' (e.g. blood pressure readings); and MyHealthOnline (for ordering repeat prescriptions) are options but not used much. Most consultations are in-person. The practice remains proud of its 'open door' policy (in which anyone can turn up and ask to be seen) and patients speak highly of this. There are no current plans to introduce further digital services. Strategically traditional</p>

continued

**TABLE 3** Summary of participating practices (continued)

Practice (with deprivation decile and list size in 2021)	Status in September 2021 (digital maturity scored in terms of our initial pragmatic scale)	Status in December 2023 (digital maturity scored in terms of our final typology)
<b>Ogden East</b> <i>Single-site teaching and training practice serving a population of 8300 in a city in western England (88% white, many in lowest socioeconomic decile and including homeless, travellers and isolated elderly). A high proportion have complex comorbidities and many have low health and digital literacy</i> Deprivation decile: 1st	This Deep End practice had two full-time GP partners and five salaried GPs, plus a wide range of other clinical and administrative staff. The practice ethos was centred on its very deprived and needy population; it offered a drug and alcohol service. It was strongly patient-centred, allowing patients to select their preferred appointment type and supporting a diverse patient involvement group which was consulted on major strategic questions. Prompted by the pandemic, they introduced some digital modalities (e.g. online consultations, which they found generated high workload), but they were keen to avoid digital exclusion of vulnerable patients. Plans included introducing some kind of remote triage. Traditional	There is open access (patients can walk in and ask to be seen) plus doctor-first digital triage (complex case mix makes triage by support staff unsafe). Most patients are given an in-person slot. Vulnerable patients (e.g. homeless, immune-suppressed) are flagged electronically. Health needs (and hence demand) in this very deprived population have increased, with more complex comorbidity, mental health problems (especially anxiety) and delayed cancer diagnosis. The practice has not fully caught up with the pandemic backlog of chronic disease monitoring – partly because few patients can cope with remote monitoring. Some staff meetings (e.g. multidisciplinary team with community team) now occur by videoconference, but there is limited appetite for extending patient-facing digital services because of fears of widening inequities. Strategically traditional
<b>Rhian</b> <i>Teaching and training practice in small south Wales town with branch surgery in nearby village (total 11,500 patients). Includes a deprived former coal mining community, a growing number of young professional families on a large new housing estate, and retired people</i> Deprivation decile: 3rd	Practice had five GP partners, two salaried GPs, four nurses, two healthcare assistants and an on-site pharmacist. Some staff had been there over 20 years, though several partners were on breaks or soon to retire. Patients could ask for their preferred consultation type, which was triaged by receptionists. Rhian had been an early digital adopter 20 years ago led by one an enthusiastic partner, but more recently had fallen behind. The new business manager, recently joined from a more digitally mature practice, was keen to use digital solutions along with a re-worked staffing structure and appointment system, but there was little appetite for this among partners. Traditional with lone innovator	The practice remains traditional in ethos, and most staff and patients are happy with this arrangement. When a new partner was appointed recently, they chose the person who was least keen on remote and digital forms of care. Triage is done (by telephone or walk-up) by receptionists, who feel 'swamped', though many have worked at the practice for years so have high loyalty. The business manager continues to believe that efficiency gains could be made with digitalisation – for example, back-office functions, online prescription requests, combined online and telephone triage system. Digitally hesitant
<b>Easton</b> <i>Teaching and training practice on the outskirts of a small city, serving a mixed population of 13,500 including some very deprived wards</i> Deprivation decile: 7th	The practice had 5 GP partners and 7 salaried GPs (most part-time), 1 advanced nurse practitioner, 5 nurses, paramedic, pharmacist, phlebotomist, healthcare assistant and 17 support staff, across reception, management and administrative roles. Its ethos was strongly oriented to its more deprived patients (e.g. there were 10 patient support staff). Partners described the practice as 'not desperately digital'. They had installed, and were using, all the standard technologies recommended by the primary care network (e.g. video consultations, electronic booking, automated telephony) but there was no strong appetite to extend these, and staff described many glitches and breakdowns (suggesting that in-house technical knowledge is limited). Digitally curious	Some innovations introduced early in the pandemic were withdrawn or adapted after concerns were raised about equity – for example, video consulting is rarely, if ever, used, there is a lower threshold for bringing in telephone consultees, and patients may turn up and wait. Discussions are ongoing about what configuration of digital and in-person access routes are most suitable. More staff have developed flexible working patterns which match their needs and preferences (e.g. staff vulnerable to infections are able to consult remotely). Staff relations are strong; they support one another in daily work, managing clinical, technological and social challenges collaboratively. Easton are not looking to expand their digital portfolio but are open to new technologies that may offer genuine staff and patient benefit. Digitally strategic

**TABLE 3** Summary of participating practices (continued)

Practice (with deprivation decile and list size in 2021)	Status in September 2021 (digital maturity scored in terms of our initial pragmatic scale)	Status in December 2023 (digital maturity scored in terms of our final typology)
<b>Fernleigh Medical Group</b> <i>Dispensing village practice in central southern England serving a mainly affluent and elderly population of 15,000 across two sites</i> Deprivation decile: 9th	<p>The staff of 40 included 7 partners, 7 salaried GPs and many staff in non-medical clinical roles (e.g. paramedic, physician assistants), freeing the GPs for more complex patients and extended roles. The practice, described as 'patient-centred', used a usual doctor system to support continuity. It was involved in a range of non-core activities including training, undergraduate teaching, research and working with the local community. It prided itself for being innovative in terms of both processes and technology (all consulting rooms were well-equipped with high-quality hardware and many software packages were in active use, e.g. Docman™, AccuRx, Medlink™, eConsult). One partner was a digital entrepreneur who co-owned a tech company making digital templates. Despite the range of technologies and one digitally enthusiastic partner, many older patients were not comfortable using online contact methods. Digitally curious (practice self-assessment); digitally strategic (researchers' assessment)</p>	<p>Since 2021 the practice has embedded and extended the functionality of various digital technologies (e.g. extended AccuRx to include e-mail and self-booking of appointments) and abandoned some that were unpopular and not generating value (e.g. eConsult). They have worked hard to optimise the efficiency and reduce the stress of digital pathways – for example, they now run a system whereby all appointment requests are triaged by clinicians (usually, GP partners), passing to the patient's usual doctor as much as possible. Much partner time is also spent on supervision of trainees and non-medical clinicians, leaving less time for seeing patients. Demand is rising (as are costs) and stress levels remain high, though not as high as mid-pandemic. The partners would like to upgrade local hardware (e.g. replace workstations) but procurement is a challenge (needs to go via ICB). Digitally strategic with some features of digital trailblazer</p>
<b>Towerhill</b> <i>Teaching and training practice serving a population of 15,800 in a fairly affluent borough in a major city in south-east England</i> Deprivation decile: 8th	<p>Four-partner practice with three salaried GPs, five physician assistants, one advanced clinical practitioner, one pharmacist, three business managers and various administrative staff. Partners are active in the Clinical Commissioning Group, Primary Care Network and GP Federation; one is a digital entrepreneur with their own tech company. Practice ethos is very pro-digital – a young and digitally savvy group of GPs ('we're interested in the new and shiny') serve a population with a similar demographic. Staff are keen to innovate and embrace change, and they enjoy state-of-the-art premises, IT infrastructure and numerous digital technologies. A high proportion of consultations occurred remotely even before the pandemic. Patients could only contact the practice online; those who telephoned were talked through a digital template. Some support staff expressed concern that the less digitally literate patients were being overlooked. System-oriented</p>	<p>Numerous digital technologies and pathways were systematically identified, introduced, evaluated and (if proven successful) sustained. The practice was proud of its efficiency metrics, for example quick appointments and fast turnaround for requests. High proportion of all consultations (~60%) occur remotely (mostly by telephone). Many practice processes were strongly digitally oriented and had been progressively refined and honed. Two partners continue to be digital innovators at regional network level. The minority of patients unable to use digital access are offered bespoke arrangements (to the extent that these patients are known). See <i>Box 1</i> for further details. Digital trailblazer</p>

continued

**TABLE 3** Summary of participating practices (continued)

Practice (with deprivation decile and list size in 2021)	Status in September 2021 (digital maturity scored in terms of our initial pragmatic scale)	Status in December 2023 (digital maturity scored in terms of our final typology)
<b>Newbrey</b> <i>Suburban practice on the outskirts of a university city in central England. Serves a relatively affluent and educated population of 21,000 (students, young professionals, healthcare workers and their families), but also has some postcode pockets of deprivation</i> Deprivation decile: 9th	<p>This large practice had 5 GP partners (including one 'lone innovator' digital enthusiast) plus around 30 staff including 9 salaried GPs, 1 advanced clinical practitioner, 6 nurses, 2 paramedics, 1 social prescriber, 1 care co-ordinator, several healthcare assistants and a large administrative team. Immediately prior to the start of our fieldwork, the practice struggled with unmanageable demand. Telephone triage had proven highly inefficient (because of double-handling); a recent process innovation was a proactive patient booking team which aimed to give as many patients as possible their preferred appointment type. Traditional with lone innovator (practice self-assessment); digitally curious (researchers' assessment)</p>	<p>More staff have joined (e.g. co-ordinators, non-medical clinicians), and the practice has taken over a small practice on a second site, increasing the list to 25,000. Demand-capacity mismatch has eased with additional staff and proactive attention to processes. Total triage (via AccuRx) has been retained and extensively refined, with all requests now assessed by a GP, and is now working well. Workarounds are used to 'bypass' triage (e.g. clinicians book follow-up appointments directly). Innovations which have generated work and increased inequities (see example in text) are being reconsidered. Plans to purchase additional hardware have come up against inflexible procurement rules. Digitally strategic</p>
<b>Westerly</b> <i>Large teaching and training practice lies on the outskirts of a major city in southern England, serving an ethnically diverse population of 27,000 (traditionally very deprived but increasingly socioeconomically mixed as people move into new-build estates)</i> Deprivation decile: 2nd	<p>There were 6 GP partners, 6 salaried GPs, 2 GP registrars plus 30 staff including 7 nurses, 2 pharmacists, 3 managers, and a large reception and support team. Many patients were limited English speakers; high use of interpreting service. Strong emphasis placed on equity, continuity of care and patient choice. Access was primarily by telephone and the NHS app, through which patients would book slots for telephone or in-person appointments. There was also a daily walk-in clinic. The practice was experiencing high and rising demand; reception staff were stressed and felt that demand was unsustainable. Priorities were rationalising the appointment system, replacing the outdated phone system and addressing staff well-being. Digitally curious</p>	<p>The practice struggled to identify and introduce a telephony system that could cope with the very high demand caused by the increase in remote appointments; by the end of our fieldwork, and despite trialling several systems, the system was still not meeting requirements. The proportion of in-person appointments was increased to respond to patient dissatisfaction with remote. To respond to demand, e-consultations were turned off at night and weekends, and the duty doctor list was capped (additional patients were put through to 111). Despite these moves, staff continued to report high levels of workload and stress; turnover (especially among front-desk support staff) was high and team relations suboptimal. Staff expressed concerns about equity and digital exclusion. Digitally reactive</p>
<b>Queens Road</b> <i>Large practice across seven sites in a small city in Western England (formed from merger of multiple small practices including one former Deep End practice). Serves a mixed sociodemographic of 30,000 patients, with a high number of people with refugee status. Has the highest usage of the telephone interpreting service Language Line in the region</i> Deprivation decile: 7th	<p>The practice had two GP partners, four salaried GPs and a range of allied clinical and administrative staff. It provided a drug and alcohol service and a chronic pain clinic that offer non-medical solutions to patients on prolonged opiate use. The practice offered multiple access routes (online booking, telephone, online consultation platform). It sought to work flexibly around the needs of patients with known vulnerabilities (i.e. homeless and people with learning disabilities) by enabling them to make appointments at the front desk and offering in-person double appointment slots. There was an expectation that patients without additional needs will adapt to the remote triage system. Moves towards further digitalisation were met with some resistance by patients (and staff perceived some hostility), but the practice believed that digitalisation of services for the majority would help meet rising patient demand. Digitally curious</p>	<p>Continues to run a dual model in which patients who are able to use digital services are expected to do so, but those with particular needs and vulnerabilities are accommodated by open-door and in-person by default services. The triage model is referred to as 'doctor last': most patients are signposted to self-management or non-doctor routes using protocols; these have been refined over the last few months, which has reduced double-handling. Duty doctors and pharmacist doing remote consultations are co-located in a 'duty hub'. Some administrative functions (e.g. vaccination invitations) have been automated using digital tools, resulting in major improvements to efficiency. An e-consultation tool (eConsult) generated high workload, so a decision was made to restrict its use to a 2-hour slot in the morning. Remote long-term condition reviews have had high uptake by patients in the more affluent sites but low uptake in the Deep End site. Digitally reactive</p>

**TABLE 3** Summary of participating practices (*continued*)

Practice (with deprivation decile and list size in 2021)	Status in September 2021 (digital maturity scored in terms of our initial pragmatic scale)	Status in December 2023 (digital maturity scored in terms of our final typology)
<b>Camp St Group</b> <i>Large (31,000 patients) teaching and training practice spanning 3 sites in southern English commuter town. Mixed demographic with significant minority populations (limited English, refugee, low income)</i> Deprivation decile: 6th	<p>Innovative practice with 15 partners and 40 additional staff including paramedics, 1 advanced clinical practitioner, 6 nurses, 4 pharmacists, 4 healthcare assistants and many support staff. Various digital innovations had been piloted prior to the pandemic (e.g. pre-assessment by e-mail, online consultations) and some but not all had been retained. In early 2020, various innovations including long-term condition reviews and text messaging using AccuRx, and online consulting, were introduced but there were concerns that the shift to digital did not suit all patients, especially the elderly and those with limited English. Digitally curious</p>	<p>Some digital services that had felt 'clunky' when first introduced (e.g. online booking, digital long-term condition reviews) are now well-embedded in business as usual and experienced as efficient and useful. The practice appears digitally strategic, progressing with a relatively modest range of technologies, assessing their impact systematically and adapting where needed (see <i>Box 1</i> for examples), and accommodating patients and clinicians who favour in-person consultations. Some processes (e.g. triage of online consultation requests) are still considered in need of improvement. Digitally strategic</p>

