

THE PATH TOWARDS INTEGRATING DIGITAL TECHNOLOGIES

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In addition to the challenges posed by privacy, data biases, data sharing infrastructure and the digital skills gap, there is one key component for the successful clinical translation of AI-based technologies: **practical integration into the healthcare system**. The wrong approach would risk introducing unwanted biases or inequalities, and challenge the **long-term sustainability** of the system, both socially and financially. The rapid pace at which healthcare AI is developing means that decisions are being taken quickly and sometimes without direct precedents.

We have investigated the main challenges involved in the integration process by studying a recent, very **closely related example** of a disruptive digital healthcare technology: **virtual primary care services** (VPCs). We have found that VPCs tend to **service specific populations**, particularly those who are younger and healthier. This, especially if combined with policies that require that patients de-register from their in-person GP to access virtual services, could lead to in-person GPs being left with **increasingly complex patient cohorts**, therefore threatening their operability.

The precedent of VPCs suggests that the establishment of an effective parallel virtual /physical system may introduce risk segmentation, risk selection and cost-shifting. In order to improve the health of those who need it most, policies directed towards AI technologies may need to **move towards unified systems** to achieve balance and equity in terms of access, services and financial sustainability.

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1. INTRODUCTION

An ageing population in the United Kingdom is placing an increasing strain on primary care service provision [1]. According to the Office for National Statistics, “around 18.2% of the UK population were aged 65 years or over mid-2017, compared with 15.9% in 2007; this is projected to grow to 20.7% by 2027” [1]. The rates of chronic disease will also increase as the population ages with a majority of patients over 65 having two or more chronic diseases [1]. The burden of this ageing population will fall on GP practices as patients require more primary care services and chronic disease management. According to the General Practice report (2016), an average member of the public sees a GP six times a year; this is twice the number of visits in 2006, and is expected to rise [2]. The impact of increased GP visits and increasing complexity could mean longer appointments, increasing waits for appointments and GP burnout. AI-driven symptom checkers and virtual primary care services (VPCs) are posited as a way to address these issues. It is presumed that these services will alleviate the pressures of an ageing population by making medical services more accessible and easier to navigate, and preventing unnecessary visits to GP offices.

VPCs allow patients to consult with a doctor or nurse via email, text message, telephone or video. A majority of these services can be accessed through mobile or desktop technology. VPCs are a rapidly growing healthcare delivery model and are servicing an increasing number of patients. In Sweden, KRY has treated over 6,000 patients and Min Doktor has over 20,000 registered users [3], while in the United Kingdom, Babylon has 70,000 members enrolled in its service, and is continuing to grow [4]. While this is a new field of research, evidence has shown that VPCs can be used to effectively manage chronic conditions such as diabetes [5] and COPD [6], and mental health issues like anxiety and depression [7], and post-surgical care [8].

Confronted with heavily-utilized and under-resourced health systems, some governments in Europe are trying to accelerate the integration of new health technologies. In England, the digital first policy aims to offer all patients the option of digital primary care by 2023/24 [9]. Germany has a comprehensive Digital Health Germany plan with the aim to integrate digital health into the healthcare ecosystem. While there is no doubt that these new technologies offer a number of benefits and have the potential to alleviate stressors on an overburdened health system, they also pose the risk of disrupting primary care services in negative ways. Indeed, these initial attempts at the integration of VPCs have highlighted the limitations of current provider payment and funding calculations, cost shifting and the fragmentation of the primary care market. The lessons learned from VPC integration can provide insight into the potential risks of other new health technologies, such as the increasing use of AI-driven symptom checkers. In this paper, we will first explore VPCs and how the integration of these services in the United Kingdom has led to a fragmented primary care system. We will detail the issues of cost shifting, cherry picking and risk selection. We will then briefly elucidate on how the lessons learned from VPC integration can be applied to AI more broadly.

2. VIRTUAL PRIMARY CARE

VPCs can offer a number of advantages over in-person GP services. For patients, these include decreased travel time and convenience, which in theory, can improve access to health services. This can be particularly important for rural patients or those with disabilities. For health systems, VPCs may prove to be a cost-effective means of delivering services, with less overhead than traditional primary care practices. However, limited to no research has been done on the clinical outcomes, quality of care and cost efficacy of VPCs. Even more concerning is that limited research exists on how the integration of these services can have an impact on wider primary care systems [10]. Indeed, it has become clear that the integration of these services without alterations to provider payment regimes and care pathways is likely to lead to fragmentation of health services and potentially increasing health inequities by creating parallel primary care systems.

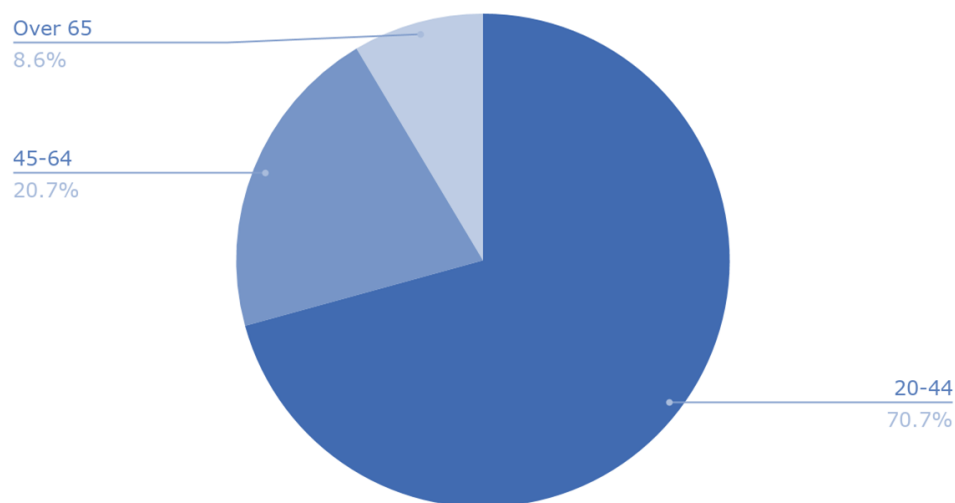


Figure 1. January 2020 patient demographics of GP at Hand [9]

At the heart of the issue is that, despite adoption of smartphone technology across demographics, VPCs tend to service specific populations. Recent data from England highlights that 53% of VPC users are male and 71% are between the ages of 20 and 44 years, and just 9% of users are 65 years or older [4]. Similar user demographics are seen in VPCs in Sweden and France, with the majority of VPC users being urban and young, and therefore, statistically, more likely to be healthy. A recent report by Ipsos Mori supported this, showing that users of the biggest VPC in England tended to be healthier than brick and mortar GP populations [10]. Importantly, these demographics tend to have different healthcare needs and utilization patterns: research shows that men and younger populations are less frequent users of primary care services [11], [12]. There is the potential that VPC services may be seeking out these populations due to their low utilization rates or cream skimming, but this has not been supported thus far. Moreover, it should be acknowledged that the risk does exist

that VPCs may increase access to care and thus increase usage, but this has yet to be borne out in any research.

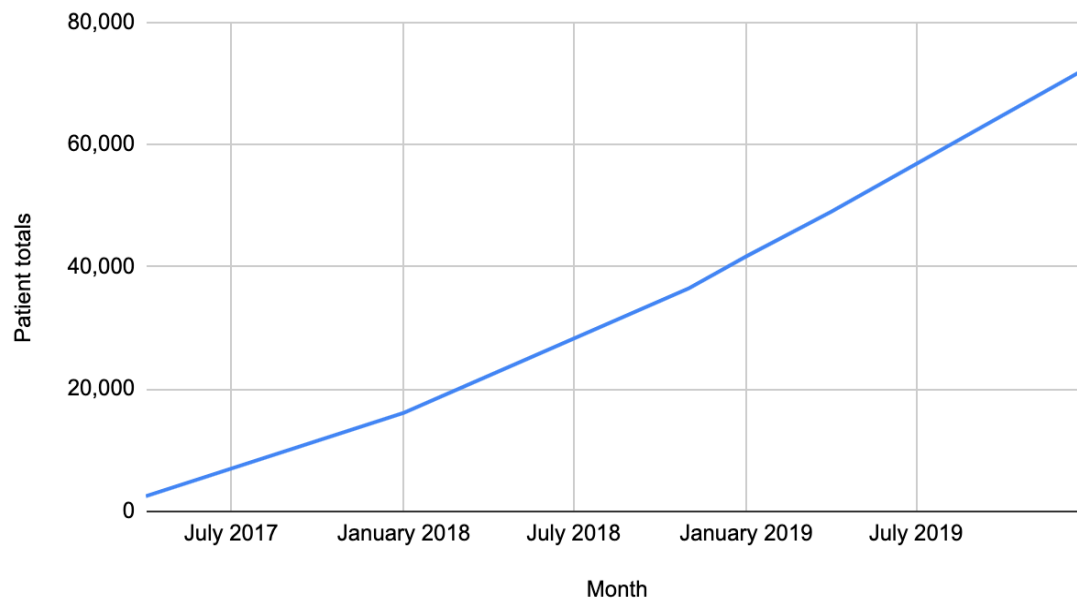


Figure 2. Total patients at VPC GP at Hand (Babylon) [9]

However, when combined with policy dictating that patients must de-register from their in-person GP to access virtual services, as seen in England, the unintended consequence of risk selection is that brick-and-mortar GPs are left with increasingly complex patient lists. The consequences of this can be manifold, including inadequate compensation, burnout and GPs leaving the workforce [10]. In a period where many countries are facing a shortage of primary care providers, this could have lasting effects for years to come [13].

VPCs often cite the limitations of the technology as one reason for the primarily young and healthy cohort on their patient lists. Indeed, in England, certain populations were barred from registering with VPCs as they were deemed too complex to manage virtually. This ban included pregnant women, frail older people and people with complex mental health conditions, learning difficulties or drug dependence. NHS England has now relaxed those restrictions, but many VPC practitioners are unwilling to treat more complex patients, and patients with chronic conditions may be reticent about using VPCs. Furthermore, limited research has been conducted on whether or not VPCs are appropriate for more complex patients.

To understand the impact of segmentation further, it is best to look to the insurance market. For an insurance market to function effectively, risk must be shared between low- and high-risk enrollees, with the former effectively subsidizing the latter. However, in competitive insurance markets, people who know themselves to be at greater risk of ill health are more likely to seek out health insurance because they are more likely to financially benefit from it

[14]. To address these concerns, insurance companies with a large portion of high-risk users increase premiums to cover their costs. This, in turn, leads low-risk enrollees to exit the pool and thus further increases premiums, as low utilizers are no longer subsidizing high risk enrollees. The resulting “death spiral” leads to the eventual collapse of the insurance market, whereby premiums increase so high that there are no low-risk enrollees in the market.

Similarly, the tendency for younger, healthier patients to opt for VPCs might threaten the financial sustainability of traditional GP practices in a capitated payment scheme. For example, the majority of GPs in England are contracted to provide services via the General Medical Services (GMS) contract. Under GMS, GPs receive a capitated fee – a base payment of £87.92 for each patient registered to them – with additions calculated according to the Global Sum Formula, which takes into account sex, age, rurality, deprivation and turnover of patients [15]. Turnover of patients is included because patients who have recently registered tend to use services more frequently [16]. However, these formulas are far from perfect and do not capture the many variables of primary care. In England, GPs must cross-subsidize care to ensure adequate remuneration for caring for higher-needs patients with surpluses from those with lesser needs, and thus rely on diverse patient lists with a balance of both.

For example, the average income for a patient in London is £146 [17], while Babylon receives just over £90 per patient [18]. The difference in income may be a reflection of the differing patient lists between brick-and-mortar GPs and VPCs. However, what these payments do not capture is that more complex patients tend to have much higher healthcare utilization with 10% of the most complex patients accounting for 66% of healthcare costs [19]. With a patient list of only complex patients, GPs would be at risk of providing care that goes uncompensated and might therefore be incentivized to risk-select healthier patients or reduce the quality of care for very expensive patients.

As well as risk segmentation and risk selection, VPCs may also introduce cost-shifting. This is partly due to their very high registration and turnover rates. In England, nearly a quarter of those initially enrolled in a VPC left after a few months [4]. Presently, the GSM formula is calculated quarterly; this can mean that VPCs receive payment for patients who are no longer rostered and, potentially, the system will pay twice for the same patient if they re-register with a brick-and-mortar GP before recalculation.

In addition, it remains to be seen if VPCs lead to cost-shifting of other health services. For instance, patients who are unable to access the services they need from their VPC provider, or are simply dissatisfied with the service, may opt to go to elsewhere rather than switch VPC providers or register with a traditional GP service and wait for an appointment. For more acute needs, or due to the perceived convenience, patients may go to Accident and Emergency (A&E). The impact of these behaviours would shift the costs of care for that patient from the primary care coffers to acute care funding. Importantly for VPC providers, this patient behaviour would not have an impact on their financial compensation. Indeed, Ipsos Mori [10] found that, despite being healthier than the general population, VPC “patients are

historically higher users of NHS 111 and A&E than might be expected, given their age”, and that these “patients also want to see or speak to a GP quickly, and are proactive about seeking information and advice”. This could mean that even when accessing VPC services they may continue to use NHS 111 and A&E services when they cannot access in-person appointments at a VPC.

3. SOLUTIONS

In light of these issues, there are two possible solutions:

Firstly, payment models would have to be adjusted prior to the integration of VPCs. The current system, whereby patients must de-register from in-person GPs to access virtual care, divides the population and unfairly compensates VPCs.

In response, governments could adjust their provider payment schemes prior to the integration of VPCs or any new health technology. In England, the Global Sum Formula could increase payments associated with complex patients to ensure that either VPCs take on these patients or in-person GPs are fairly compensated for their workload. In addition, governments may adjust the timeframe in which payments are calculated. As is seen in England, many patients leave VPCs in the first few months; by calculating the GSM payments more frequently, it may ensure proper payments are received for care given. However, the costs associated with this administrative task could outweigh the benefits. While these steps may ensure adequate remuneration for GPs and VPCs, they do not fully address the issue of segmentation of patients into either physical or virtual primary care services and the unintended results of a parallel primary care system for the young and healthy, and the old and the sick.

Indeed, these solutions beg the question why there is a separation between VPC and in-person services; and why policies are in place that create and sustain this parallel system, for instance, insisting patients can register at only a VPC or in-person GP. Therefore, the second and potentially best solution to ensure the benefits of VPCs are garnered for both patients and the health system might be to create a unified system of physical and virtual primary care services, in which patients can access VPC services through their GP clinic, and the allocation of funds reflects the actual contribution of providers towards improved health outcomes and population health. Indeed, it does appear that governments and the private sector are working towards a unified partnership. Companies such as e-consult and push doctor are now partnering with CCGs in the United Kingdom to integrate VPC technology into already existing GP practices. This will ensure that a patient has access to both types of services, and that funding follows the patient. Success of this unified model has been seen in Canada, which has a similar health system to the United Kingdom, where virtual visits are integrated into rural GP clinics and physicians are remunerated the same for a virtual visit or an in-person visit [20].

Looking forward to AI

While VPCs are not AI driven, lessons can be learned from their integration and applied to new health technologies entering into the primary healthcare market.

Rushing the roll out of new health technology and the unintended consequences.

While it can be easy to be swayed by new health technologies and the ways it can potentially reform health systems, it is imperative that analysis is done prior to roll-out to ensure that large-scale health technologies improve the health of those who need it the most. From VPC integration, we can see that patients within a specific demographic are receiving virtual care services but those who have the highest need (complex and older patients) are not accessing these services.

Government and private enterprise should aim to integrate new technologies in a slower and more controlled way with continuous monitoring and adjustment. This will prevent larger scale integration issues and allow for continued improvement. The necessity of a more flexible and adaptable model is outline in the World Health Organization (WHO) guidelines on harnessing digital technology to strengthen health systems [21].

Part of that monitoring process should include ongoing investigation into how the product will have an impact on the wider healthcare system including auxiliary health services. As AI-based technologies such as symptom checkers are becoming more commonplace, it is important that companies and the public sector think carefully about how these new technologies impact all facets of the system prior to embracing them.

Payment and funding. In a resource-limited environment, careful consideration must be given to how technologies will be funded, and whether this funding will affect other areas of service. For VPCs, it has become clear that the current funding formulas were not made with digital health services in mind and have required re-evaluation. This same consideration must be applied to all new health technologies and ensure payment models are adapted prior to integration. As a growing number of technologies are being integrated, provider payment models may have to become more adaptable and funding calculations may have to be revised completely.

4. CONCLUSION

AI and virtual medical services hold vast potential to address inefficiencies in the health system and improve accessibility for patients. However, they may have a number of unintended consequences once integrated, such as cost-shifting or fragmentation. Moving forward, governments must implement policy around how new technology should be integrated and carefully consider its impact. As the demand for new health technology increases, it may be necessary for governments to explore new models of governance around health technology, including creating more easily adaptable payment models, ensuring continuous monitoring and evaluation of technologies, or allowing for easier integration of health technology in already existing services.

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