Using Twitter comments to understand people's experiences of UK healthcare during the Covid-19 pandemic.

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Abstract

Background: The Covid-19 pandemic has led to changes in health service utilization patterns and a rapid rise in care being delivered remotely. There has been little published research examining patients' experiences of accessing remote consultations since Covid-19. Such research is important as remote methods for delivering some care may be maintained in the future.

Objective: To use content from Twitter to understand public discourse around health and care delivery in the UK as a result of Covid-19, in particular views on and attitudes to care being delivered remotely.

Methods: Tweets posted from the UK between January 2018 and October 2020 were extracted using the Twitter API. 1,408 tweets across three search terms were extracted into Excel. 161 tweets were removed following de-duplication, and 610 were identified as irrelevant to the research question. Relevant tweets (n=637) were coded into categories using NVivo software, and assigned a positive, neutral, or negative sentiment. To examine views of remote care over time, the coded data was imported back into Excel so that each tweet was associated with both a theme(s) and sentiment.

Results: The volume of tweets on remote care delivery increased markedly following the Covid-19 outbreak. Five main themes were identified in the tweets: access to remote care (n=267), quality of remote care (n=130), anticipation of remote care (n=39), online booking and asynchronous communication (n=85) and publicising changes to services or care delivery (n=160). Mixed public attitudes and experiences to the changes in service delivery were found. The proportion of positive tweets regarding access to, and quality of, remote care was higher in the immediate period following the Covid-19 outbreak (March-May 2020) when compared to the time before the Covid-19 onset, and the time when restrictions from the first lockdown eased (June-October 2020).

Conclusions: Using Twitter data to address our research questions proved beneficial for providing rapid access to a breadth of attitudes to remote care delivery at a time when it would have been difficult to conduct primary research due to Covid-19. It allowed us to examine public discourse on remote care over a relatively long period and explore shifting public attitudes at a time of rapid changes in care delivery. The mixed attitudes towards remote care highlights the importance that patients have a choice over the type of consultation that best suits their needs, and that the increased use of technology for delivering care does not become a barrier for some. The finding that overall sentiment about remote care was more positive in the early stages of the pandemic but since declined emphasises the need for a continued examination of people's preference, particularly if remote appointments are likely to remain central to healthcare delivery.

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Keywords:
Patient experience; COVID-19; remote healthcare; phone consultation; video consultation; Twitter; sentiment analysis

Introduction

The Covid-19 pandemic has presented many challenges to health and care services. New methods of care delivery have been rapidly introduced to create capacity in hospitals, enable healthcare professionals to work remotely, and to reduce the risk of transmitting the virus in care settings [1]. Care was adapted at speed and people had to rapidly learn new ways of navigating the health and social care system such as accessing care remotely. Since the onset of Covid-19 in spring 2020, GP practices have provided a much higher proportion of consultations by phone, although not by video consultation. In 2020 the proportion of phone consultations increased from 14% in February to 28% in March and then stabilised at 48% between April and June [2]. In contrast, the proportion of online/ video appointments (this includes non-video based online consultations such as live chat or internet telephony – VoIP) remained at less than 1% over the same period [2]. However, the quality of this data is likely to be impacted by variations in approach to appointment management between practices and it is suggested that many video consultations start as a telephone appointment then switch to video and therefore may be undercounted [2].

Whilst research prior to the Covid-19 outbreak has examined patients' experiences of receiving care remotely, it is argued that the findings may not be applicable to the current climate where services are being impacted by Covid-19 [3]. Several studies have examined the impact of Covid-19 on service delivery changes, but there has been little published research examining patients' experiences of accessing remote consultations since the Covid-19 pandemic, although a patient survey conducted by Oxleas NHS Foundation Trust showed that the 'convenience' of video consultations was the main theme that arose [4]. It is vital that such research is undertaken to understand and learn directly from people's experiences, particularly as remote methods for delivering care are likely to be maintained [1].

Social media sites such as Twitter provide opportunities for research to understand how people are experiencing care. Twitter data can be useful for exploring people's opinions on health issues or treatment [5-8], insights into previous pandemics [9-10] and public reactions to the Covid-19 outbreak [11-13]. The advantages of using Twitter for research is that it allows quick and relatively easy access to a breadth of views on particular topics, and the data can be used without obtaining explicit informed consent since it is part of the public domain [14-15]. It is useful to be able to explore people's views when it may be inappropriate and difficult to conduct primary research.

Objective

The aim of the research was to use content from Twitter to understand public discourse around health and care delivery in the UK as a result of Covid-19, in particular views on and attitudes to care being delivered remotely (including through video consultations and telephone calls as well as other innovative methods).

Methods

Identification and collection of tweets

Three search terms were used to collect relevant tweets to address the research objective (Table 1). For each search term, the following criteria was specified: *Date range:* 1st January 2018 to 10th October 2020 (date of extraction), *Location:* Restrict to UK and *Language*: English

Table 1: The number of tweets extracted from Twitter for each search term

Search term	Number of tweets

	extracted
[Video|Virtual|Remote|*phone|Telehealth|Telecare|Online AND Consultation|Appointment AND GP|Doctor|Dr]	764
["Video|Virtual|Remote|*phone|Telehealth|Telecare|Online Consultation|Appointment" AND Care|NHS|Nurse| Physiotherapist|"Occupational therapist"|Chiropodist| Podiatrist|"Health visitor"|Dietician]	494
[Video|Virtual|Remote|*phone|Telehealth|Telecare|Online AND Consultation|Appointment AND "chronic|ongoing condition"| Hypertension|"High Blood Pressure"|Depression|Diabetes| Asthma| "Kidney disease"|Heart|Cardiovascular|Cancer| COPD|"Chronic obstructive pulmonary disease"| Stroke|"mental health"]	150
Total	**1408**

The third search term sought to extract tweets posted by or referring to people with long term conditions to understand their experiences of remote care. The name of specific long-term conditions were included in the search term rather than more general terms such as 'long term condition' or 'chronic condition' that are less likely to be used in tweets. These were based on the most prevalent conditions in England reported in the Quality and Outcome Framework [16].

Twitter data acquisition was achieved using a scraper written in Python 3 which interfaced with the official Twitter search API. Search terms and specifications were converted into Twitter API query language. The scraper made requests to the API for data fitting a particular set of criteria as outlined in the research brief and then would scroll through that data writing it to files for delivery and processing. To restrict the search to the UK, 'place' information (a form of geographic tagging) was used to restrict to UK countries. This was a more favorable approach than using longitude and latitude data as that can include tweets posted outside the UK (such as parts of France or the Republic of Ireland) or exclude areas that should be included (such as the Isle of Wight).

A total of 1,408 comments across the three search terms (detailed in Table 1) were extracted. In addition to the tweet text, the following metadata were acquired: date tweet posted, user name and ID, tweet ID, numbers of Likes, retweets, replies,
user bio information (e.g. user description, user follower count, geographical location – 'place ID' and 'place name')

Data Cleaning and Analysis

Tweets and the associated metadata extracted from the scrape were imported into Excel. Of the 1,408 tweets extracted, 161 duplicate tweets across the search terms were identified via the unique tweet identification number. These were removed leaving 1,247 comments remaining. The tweets and dates posted were imported into NVivo software for manual coding. To develop the coding frame, two researchers analysed a sample of 300 comments each and coded them thematically, using an inductive and deductive approach to coding. An initial codebook was discussed and agreed. This was revised following further coding and additional nodes were added to the codebook when new topics were identified. After final development of the codebook, Cohen's Kappa scores both for the primary theme coding and sub-level coding were calculated between the two researchers for 200 jointly coded tweets. This showed a very high level of agreement for the primary theme coding (0.93) and a good level of agreement for the sub-level coding (0.76).

Seven percent of the tweets were coded to more than one theme. Many of the codes had a positive, neutral and negative subcategory to aid comparison across different types of remote care delivery, and to understand sentiment. Those tweets assigned a neutral sentiment referred to remote care without any opinions expressed (such as people stating that they had accessed/attended a telephone appointment).

Following the coding process, both researchers examined the tweets assigned to each of the codes and grouped comments into key themes. These themes were then analysed to identify topics and patterns in the data.

Identifying irrelevant comments

During the manual coding, 610 tweets (49%) were identified as irrelevant to the research question and were coded as 'unusable'. These comments were varied in nature and covered a range of topics [Textbox 1]:

Textbox 1. Types of tweets identified as irrelevant to the research objective

1. Tweets about accessing GP appointments which did not refer to remote care (most of these were posted before the pandemic and appeared to refer to face-to-face consultations)
2. Tweets about Covid-19 that were not directly related to the research question, such as people tweeting about their symptoms, the NHS test and trace service or the virus in general.
3. Health related tweets but not about people's views or experiences of care and/or how these have been impacted as result of Covid-19.
4. Non-health related tweets, such as tweets referring to virtual appointments for British Gas, hair salons etc.
5. Tweets which included words such as 'online' or 'video' but were not relevant to the research question, such as those referring to people watching health-related videos or healthcare providers reminding patients to book flu jabs online.
6. Tweets that could not be understood out of context, such as replies to tweets which made little sense on their own.

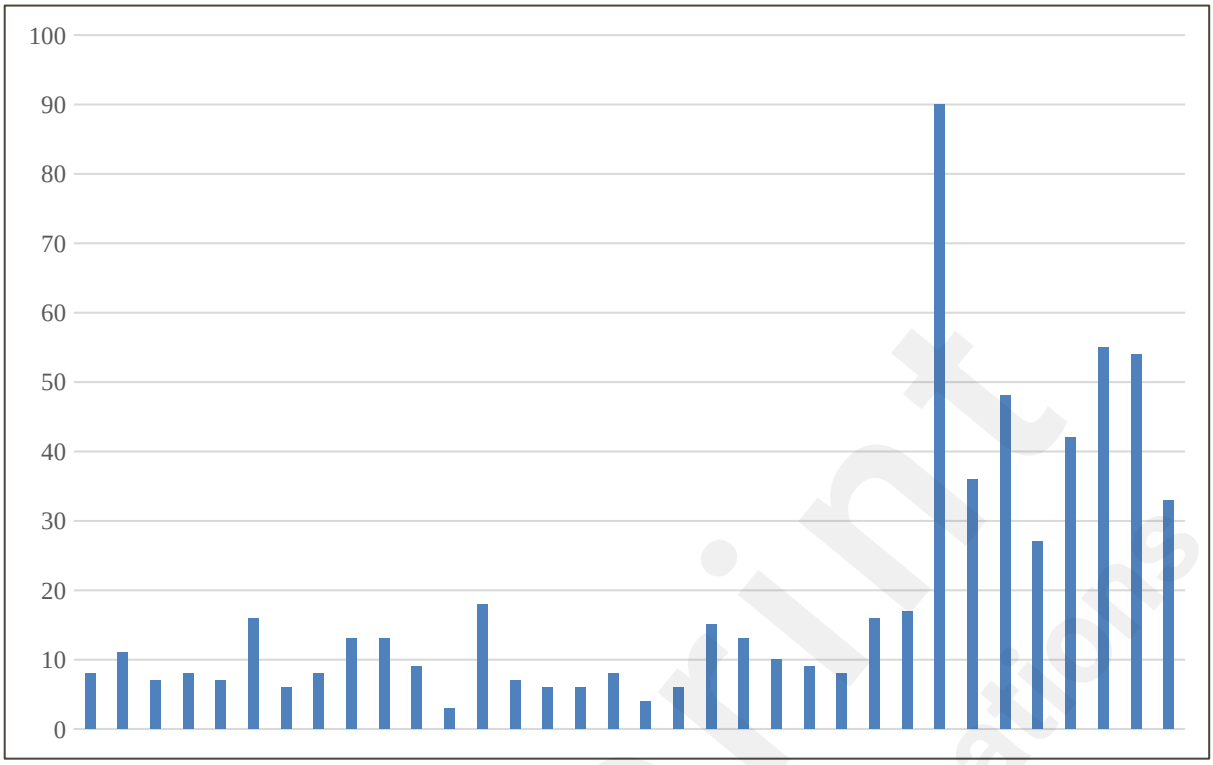
A total of 637 tweets were included in the analysis following the removal of duplicate and irrelevant tweets.

Results

Overall frequency and sentiment of tweets

Figure 1 displays the frequency of tweets by month that referred to remote care and shows that the Covid-19 outbreak increased the discourse on remote care delivery. Based on the three search terms, there was an average of 10 monthly tweets between January 2018 and February 2020 compared with a monthly average of 50 tweets between March and September 2020 [October was not included in this calculation as the Twitter data was only extracted up until 10th October]. There was a sharp rise in the number of tweets in March 2020 when the UK first went into a country-wide lockdown at the onset of the pandemic.

Figure 1: Frequency of monthly tweets referencing remote care (n=637)



Thematic Analysis

There were five main themes identified in the tweets extracted [Textbox 2].

Textbox 2. Main themes identified.

1. **Access to remote care appointments**

   Views on accessing phone or video appointments, including the ease/difficulty of getting an appointment

2. **Quality of remote care delivery**

   Views/experiences on the standard of care provided and the nature of the interaction with healthcare professionals.

3. **Anticipation of remote care**

   Views and attitudes towards remote care appointments ahead of receiving such care

4. **Online booking and asynchronous communication**

   Attitudes/experiences of using online appointment booking systems or asynchronous approaches to communicating with healthcare professionals (e.g. messaging systems)

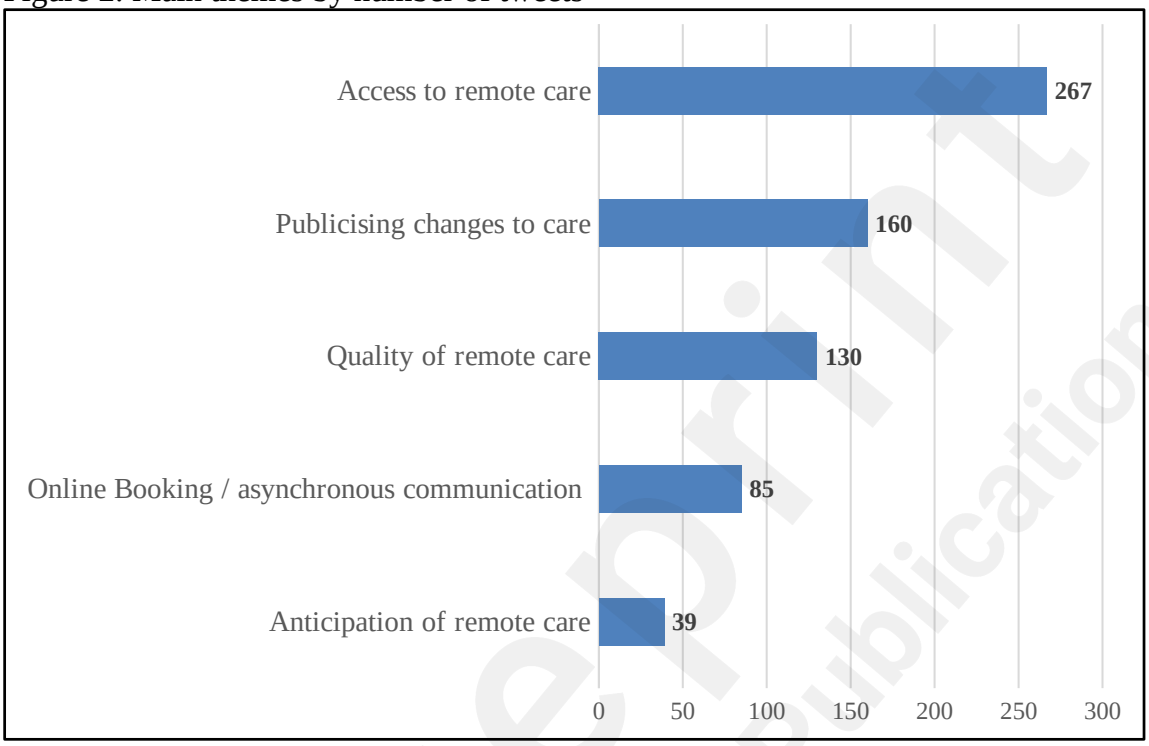
5. **Publicising changes to services or care delivery**

   Tweets publicising remote ways of delivering care or informing people of

changes to care as a result of Covid-19

Figure 2 indicates the number of tweets identified for each theme, with the largest number of tweets relating to accessing remote care. As some tweets were coded under more than one theme, the total number of tweets shown in Figure 2 (n=681) is greater than the overall number of tweets in the dataset (n=637).

Figure 2: Main themes by number of tweets



The ‘online booking/asynchronous communication’ and ‘publicising changes to care’ themes are not discussed in this paper as they are less relevant to this research which is focused on the views to care being delivered remotely. Each of the other themes are discussed in more detail below

Access to remote care

Of the 267 tweets which related to accessing care remotely, those referring to phone consultations accounted for 82%, with video/online consultations accounting for the remaining 18% of tweets. Comments were posted about accessing phone or video appointments both before and since Covid-19, although the number of tweets increased markedly since March 2020 in a similar pattern to what we see with all coded comments (Figure 1). Based on our search terms, there was an average of 3 monthly tweets on accessing remote care appointments between January 2018 and February 2020, compared with an average of 24 tweets a month between March and September 2020.

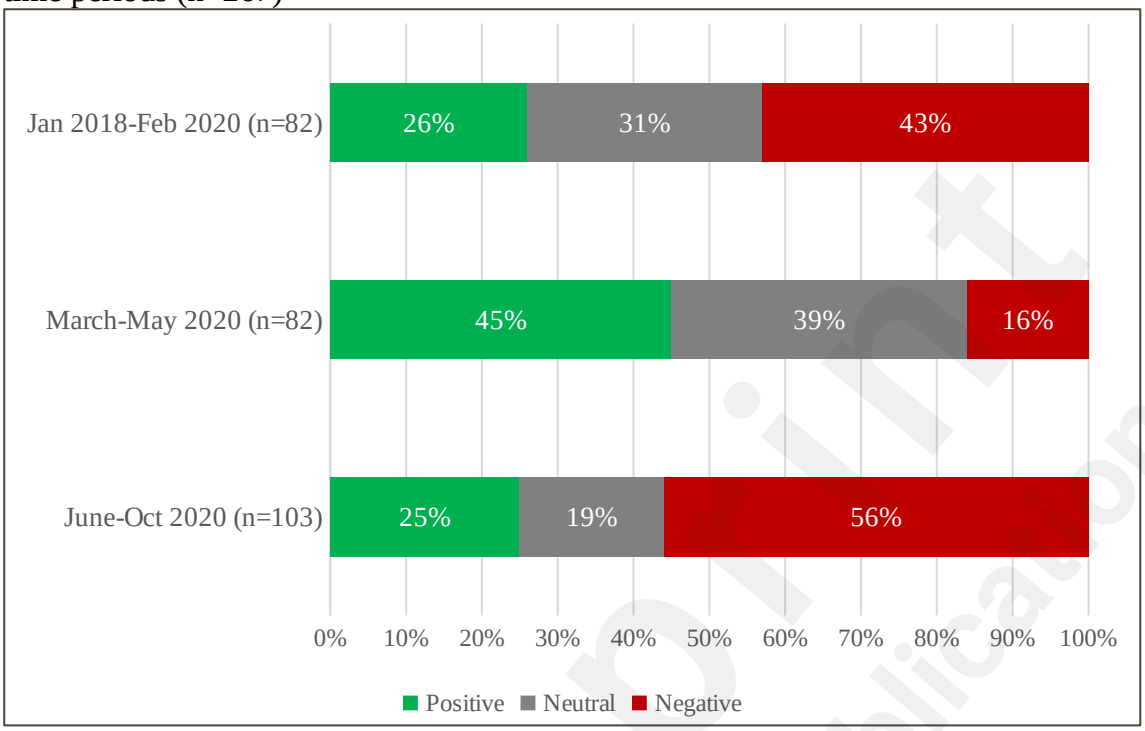
Sentiment

The sentiment of tweets coded in this theme were mixed, with a similar proportion of positive (31%), neutral (29%) and negative comments (40%). To identify any changes over time, the sentiment of tweets was compared across three time periods: before Covid-19 (January 2018-February 2020), early stages of the pandemic (March-May 2020) and the following stages of the pandemic when some UK restrictions had been eased (June-October 2020).

The overall sentiment of these tweets changed at different time periods (Figure 3). During the initial

stages of the pandemic there was almost double the proportion of comments with a positive tone (45%) when compared with the time periods both before Covid-19 (26%) and in the later time period when some of the restrictions had been lifted (25%).

Figure 3: The proportion of positive, neutral and negative tweets on access to remote care at different time periods (n=267)



Some tweets posted in the later period (June-October 2020) highlighted people's frustrations that only remote care appointments were still being offered, despite restrictions having eased across the UK. For example:

> *Can still only get a phone appointment with the dr yet people in service industries been back on the front line since July [September 2020]*

In terms of the positive tweets posted in the initial period following Covid-19 (March-May 2020), there were some tweets which showed people's gratitude to receiving an appointment which were not as evident in the later time period:

> *Very grateful to have just had my respiratory consultant appointment by telephone this afternoon [April 2020]*

Possible explanations for the overall change in sentiment shown in Figure 3 are considered in the discussion._Within the overarching theme on 'access to remote care', two key subthemes were identified: ease/difficulty of getting a telephone/video appointment (including the use of remote appointments as a preliminary to a face-to-face consultation) and the lack of specific phone appointment timings.

Ease/difficulty of accessing a remote consultation

Tweets that were *positive* about accessing phone or video appointments centred on the efficiency of the remote care service, such as the speed of booking and 'attending' an appointment, and the convenience of not needing to travel to a GP practice or wait for the appointment in the surgery.

> *Had to speak to my GP about a minor thing this morning and v impressed - called to arrange a phone appointment which was set up within about an hour - then could do a video call from a browser on my phone to do an examination. Hope this is something they'll continue to offer [May 2020]*

Some tweets also reflected positively on the safety of accessing care remotely during the pandemic:

> *I've just had a very interesting video consultation with Dr [name]. (My GP) We were using AccRX. This is a brilliant use of technology which means I don't have to go down to the practice. Especially useful during the current Coronovirus situation. Brilliant! [March 2020]*

In contrast, tweets that were *negative* in tone within this subtheme highlighted people's frustrations with needing to wait a long time for a phone appointment, both pre and since Covid-19.

> *Once answered our surgery then tells us a Dr will phone us back within 5 days, and then if you're lucky the appointment may be a month away. Shocking! [January 2019]*

> *Phoned GP for appointment. Not doing appointments at this time. I can have a phone consult on 13th July!!! [2 weeks later] .I'm in pain now or I wouldn't have called #NHS [July 2020]*

The difficulty in actually being able to book a phone consultation was also mentioned in a number of tweets due to lengthy waiting times to get through to the GP practice initially (i.e. phone queues), the practice of GP receptionists triaging patients first and/or phone consultations being carried out as a preliminary to a face-to-face appointment.

> *Patients, who telephone a GP Surgery, may have to submit to a "telephone interrogation" by...a receptionist...before any appointment is arranged [July 2020]*

Lack of specific appointment times

Some of the negative tweets about accessing remote appointments (particularly phone) were around the lack of specific appointment times or appointments running late. Such tweets were posted both pre and since the Covid-19 pandemic.

> *I dunno why GP surgeries are using COVID as an excuse to be even more useless. I've just spent 18 minutes of my 30 minute lunch break making 44 phone calls to get an appointment. Have to ring at this exact time. In return they've given me a 2.5 hour slot they might call back in. [September 2020]*

Some people expressed their frustration that not having a specific time for a phone consultation impacted on their ability to carry out daily activities, with a particular reference to confidentiality of discussions:

> *Waited weeks for a phone appointment with the doctor to discuss PCOS diagnosis. Of course I just got the Spanish inquisition about my ovaries in the queue for Morrisons. Soz queue. [June 2020]*

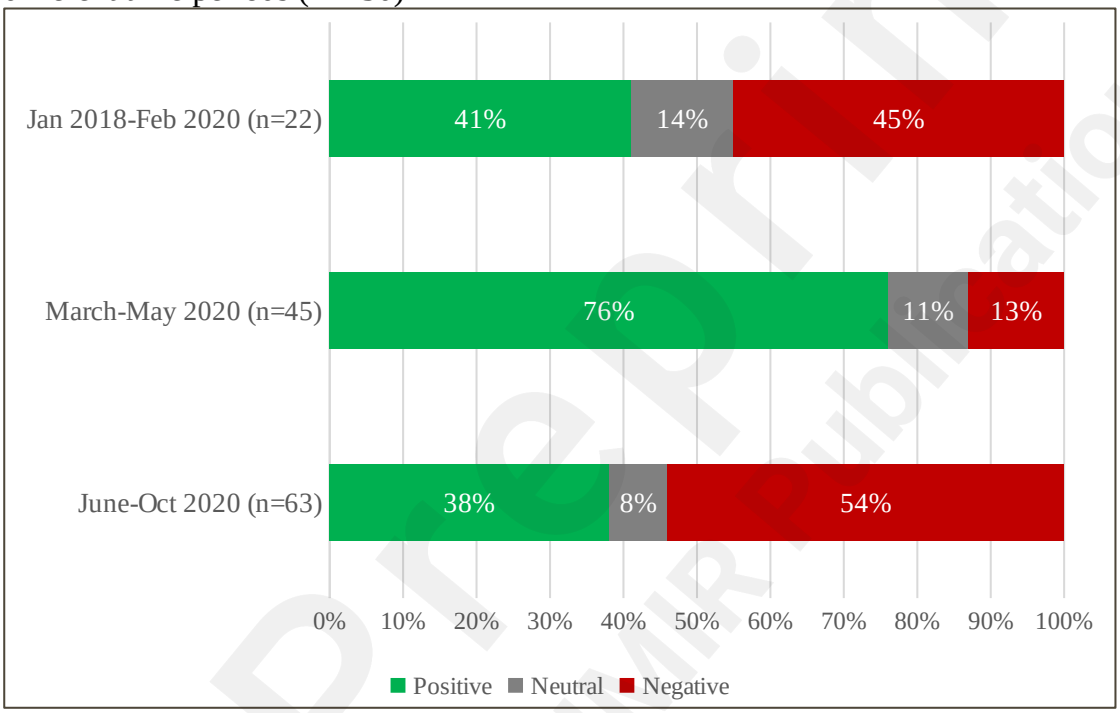
Quality of remote care

Tweets were coded in this theme if the quality of care/service received via phone or video consultations was mentioned, including the patients' interaction with healthcare professionals. Just over half of the tweets coded in this theme were positive in sentiment (52%). Whilst remote consultations were being carried out before Covid-19, only 17% (n=22) of the tweets extracted from our search terms discussed the quality of the care delivered via phone/video before March 2020.

Sentiment

The sentiment of tweets relating to care quality changed at different time periods in a similar pattern to that noted previously for tweets about accessing remote care. During the initial stages of the pandemic (March-May 2020) there was double the proportion of comments with a positive tone when compared with the time period when some restrictions had been lifted (June-Oct 2020), and almost double the proportion of positive tweets in March-May 2020 (76%) when compared with the pre-pandemic time period (Figure 4). Possible reasons for the change in sentiment noted at these two themes are considered in the discussion.

Figure 4: The proportion of positive, neutral and negative tweets on the quality of remote care at different time periods (n=130)



The key subcategories identified in this theme were: efficacy of prescribing (positive comments only), standard of the care provided and the nature of the interaction with healthcare professionals.

Efficient prescribing

The most common positive subcategory, accounting for over one third of the positive tweets in the quality of remote care theme, was on prescribing. Tweets referred to the ease and efficiency at which prescriptions had been issued and/or received following their remote appointment. Almost all these tweets were posted in the early stages of the Covid-19 pandemic (March-May 2020). Some tweets specifically noted that prescribing medications via remote consultations was an improvement to traditional face-to-face consultations and that this way of delivering care should be retained following the pandemic.

> *I had a speedy consultation. Sent photos in advance. A quick phone call & prescription sent to my local pharmacy. Saved me and the GP loads of time. This so should be the new normal [April 2020]*

Standard of care

There were a number of *positive tweets* about the quality of the care received via remote consultations. Some tweets were quite general and simply referred to a good service or a positive experience. Other tweets specified how the quality of care was good, such as obtaining a quick referral to secondary care and receiving follow-up information.

> *Big shout out to the Trauma Physios at the [hospital] today. I had my physio appointment on the phone and an email sent with a list of exercises. I was also given another appointment in 6 weeks which could be audio visual. Fantastic service. The whole NHS are amazing. [March 2020]*

The advantage of remote consultations for people with long term conditions was also noted in a small number of tweets:

> *Had my first hospital consultation online with a Dr at [name] ♡ such an incredible experience during these difficult times, think it is going to be a way forward for people with #chronicillness Ok, now I need to attend hospital for tests, scans etc but it was less stressful [May 2020]*

Being able to link to other patient data through technology during a remote consultation was also noted as an advantage in a few tweets:

> *It does depend on the type. My video appt with my diabetes consultant was great as I can download my insulin pump info plus daily blood tests so we could look at it together and do what was necessary. Fab appointment & no hanging about! [August 2020]*

Tweets with a *negative sentiment* in this theme were mainly in relation to phone rather than video appointments. Some people felt that not seeing a healthcare professional face-to-face provided a less thorough consultation; a lack of visuals and/or not being physically examined were noted as issues by some:

> *... All I could get was a telephone consultation which was alright to a point, but he can't see the area where the trouble is. When I asked would he make physical appointment he said they were emergency only, but I could send pictures by email ☹ [July 2020]*

It was implied in some tweets that the level of care or treatment received via a phone consultation was inadequate and/or had not fully resolved their health problem. Other tweets expressed concern and frustration that phone consultations had resulted in their condition being incorrectly treated or diagnosed by GPs:

> *My 94yo mum finally got an appointment with consultant after being in agony for 13 weeks. GP would only do phone consult and wouldn't refer her, just gave out morphine. Turns out her leg is broken and displaced and her hip is fractured. Her operation is on Wednesday [June 2020]*

Some tweets were more general in nature with people expressing their reservations about the care provided via phone appointments when compared with face-to-face interactions with healthcare professionals. For instance, one person considered the change from a face-to-face appointment to phone appointment with a hospital consultant a 'downgrade'.

> *four weeks to give me the anti clot injection. I have been troubled with high potassium levels but this was dealt with arms length by my GP. I was supposed to see my surgeon next week but this has been downgraded to a telephone consultation. I am beginning feel so alone [June 2020]*

A small number of tweets (both before and since Covid-19) also questioned the quality of care that could be provided via video consultation, with concerns that it could not offer the same

standard of care as a face-to-face consultation. Interestingly, a mixed experience of remote care delivery was noted by one person who reflected that it may not be appropriate for all health issues:

> *When I scratched my arm in the garden, I had video consultation. GP sent prescription for antibacterial cream to pharmacy near me. That worked well. Practice nurse did asthma review over phone which seemed odd -not sure if that's really the best way. Smear test next week...[August 2020]*

Interaction with healthcare professionals

Tweets from people that were *positive* about the interaction with healthcare professionals during remote consultations noted good interpersonal skills of the health professional (listening, helpful, and reassuring) in addition to their professionalism.

> *My virtual appointment today was actually the best appointment I've had in years. The dietician is going to contact me as well as the nurse to help me combat the hypos and my gastroparesis. It was great having a Dr listen to me #type1diabetes #gbdoc [May 2020]*

Negative tweets about the interaction with healthcare professionals referred to phone appointments being rushed and/or a lack of interest shown by the healthcare professional.

> *Seeing a doctor? Fat chance. A brief rushed phone consultation. No examination. And for the flu jab, guess what? It's being done as a drive-through in the car park. I might just say thanks, but no thanks. But I'm nearly 76. [August 2020]*

There were also a small number of tweets which noted some functional issues associated with video consultations that impacted on the quality of care provided:

> *My son had a follow up appointment via a video chat from the hospital where the doctor said she couldn't see as the picture was out of focus [August 2020]*

Whilst some of the tweets in this theme implied poor experiences were due to the care being delivered remotely, others appear to be more related to the doctor's knowledge and/or interpersonal skills which could be the same when delivering care face-to-face.

Anticipation of remote care

This theme captured people's views of remote care appointments before they had actually received them. It was not one of the main themes to emerge from the data, with only 39 comments coded under it and 79% of the tweets posted since March 2020. Many tweets under this theme were written in either a curious or sarcastic manner, possibly due to a lack of explanation or understanding of how a telephone/video appointment could work.

> *"Receptionist at the GP surgery booked me in for a phone appointment. For my blood test." [June 2020]*

Reservation was expressed by some people of how a remote care appointment could work effectively when they felt a physical examination was needed for their particular condition/health problem:

> *tried making an appointment at the dr for [name's] rash and it's a telephone appointment 🙄 now I'm no expert but surely the dr needs to actually see the rash ☹☹ [June 2020]*

> *6 month cancer check soon, letter from hospital today saying it will be a telephone appointment! How's that going to work? Also referred to hospital by my GP for a throat problem, they're giving*

me a telephone appointment for that! Went to the dentist last week and had a filling [July 2020]

Some people suggested in their tweets that remote appointments were potentially a waste of time, when they knew they would need a physical examination or procedure anyway, such as vaccinations and blood tests. There was a view expressed in a small number of tweets that moving to remote care appointments would put people's health at risk:

Sorry but how can you do a examination / consultation over the phone, appointment cancelled in August due to COVID, you are putting cancer patients at risk, and leaving them to fend for themselves #FeelingLetDown #COVID19 #AtRisk #CancerPatients2nd #melanoma [July 2020]

Concern was also expressed in some tweets about anticipating bad news about their, or their family member's, health or condition over the phone rather than in a face-to-face appointment:

I had a few blood tests taken 2 days ago and now the doctor surgery have phoned to say I have to arrange a telephone consultation about the results. I'm left here thinking like 'what if there's something bad wrong with me?!' 😭🤔😭🤔 *[May 2018]*

Whilst most tweets in this theme were negative in tone, there were tweets where people were supportive of the need to carry out their appointment remotely due to Covid-19:

So my cancer follow up appointment on Monday to check bloods and neck is to be done over the phone. must be some new technology I'm not aware of but to be fair good decision as it's non urgent so 👏 *good on you [name] hospital. #NHSheroes [March 2020]*

My Acute asthma appointment is now a telephone appointment rather than F2F #CommonSense wins #cornoravirusuk [March 2020]

There were also some tweets where people were positively anticipating their remote appointment and were appreciative that this form of care delivery was now a possibility. One person mentioned how they had been apprehensive about remote appointments, but after having had their first, was really reassured.

Super excited to be waiting for my video appointment with the [hospital name]! I remember back in the day when this was all a future reality 🙌 *[July 2020]*

Discussion

This research showed that UK public discourse about remote healthcare delivery increased markedly on Twitter since the onset of the Covid-19 pandemic in March 2020. This finding is perhaps unsurprising given the changes to how services have been delivered. The pandemic has resulted in the rapid adoption of digital technology and has revolutionised the use of remote care [1, 17,18]. Our research has allowed us to use online data to explore how people have communicated about changes in care delivery during a time when it would have been very difficult to conduct primary data collection with patients.

Although the search terms were not restricted to primary care and included the search terms 'doctor' and 'dr' in addition to 'GP', the majority of the tweets extracted were about GP consultations. There was also a much higher proportion of tweets about phone consultations rather than other types of remote care delivery, such as video consultations or online messaging systems. This reflects remote primary care delivery patterns since the onset of Covid-19 in March 2020, with GP practices providing a much higher proportion of phone rather than video consultations [2]. Tweets about accessing remote consultations were more common than those referring to care quality. This could suggest access is more pertinent to people or there are more issues with accessing remote care

compared to the quality of such care. It could, however, simply reflect the limited number of characters for tweets making it difficult to express views about care quality. Previous research that examined the content of tweets about hospitals showed that comments which described care were in the minority with various other topics being discussed [19].

Examining the sentiment of tweets about remote consultations over time revealed an interesting pattern in the data. The proportion of positive tweets regarding access to, and quality of, remote care was higher in the immediate period following the Covid-19 outbreak (March-May 2020) when compared to the time before the Covid-19 onset, and the time when restrictions from the first lockdown eased (June-October 2020). This is perhaps surprising as it might be expected people would be less positive immediately following the lockdown when some services were in a state of flux and people would be unfamiliar with navigating new approaches to care delivery. Analysis of the tweets at the different time periods provides insufficient detail to draw strong conclusions on the reason for this finding. One explanation might be that people were more understanding of the changes to care delivery initially when services were perceived to be under pressure and/or when changes were regarded to be temporary. There appeared to be several tweets posted in the later period since the pandemic (June-October 2020) which highlighted people's frustrations that face-to-face consultations were still not being widely conducted despite the easing of restrictions.

Another explanation could relate to the fall in the number of people that sought healthcare during the initial period following lockdown (March-May 2020). With less people seeking healthcare during this period, there may have been greater availability of remote primary care appointments resulting in a more positive experience for those people that did seek healthcare. This suggestion appears to be supported, in part, by experimental statistics on the length of time between booking and appointment dates. Whilst over 60% of consultations took place on the same day as requested in April and May 2020, there was a monthly downward trend after this, falling to 41% in October 2020 [2]. Furthermore, some patients may have decided to wait until they could have a face-to-face consultation, but then resorted to having a remote appointment in the later period (June-October) when it became clear that the virus was still having an impact on care delivery. These patients may have been less positive about the care being delivered remotely if their preference had been for face-to-face interaction.

Those tweets that were negative about accessing care remotely centred on the difficulties of booking an appointment, lengthy waiting times for an appointment and a lack of specific appointment times for phone consultations. These were noted in tweets posted both before and since Covid-19, although the volume of such tweets increased after March 2020. Results from the GP Patient Survey (prior to Covid-19) have shown a downward trend since 2012 in the proportion of patients reporting it was 'easy' to get through to their GP practice on the phone [20]. During March 2020, GP practices were advised by NHS England to triage patients before an appointment was made and to provide care remotely as much as possible [18]. Whilst practices moved towards more appointments being delivered remotely, our research shows the issues surrounding the booking of appointments remained unchanged from a face-to-face appointment. Difficulties in getting through to the GP practice on the phone and issues with online appointment booking systems were frequently cited. The approach of triaging patients was tweeted about with mixed views; while some supported the need to triage patients others were frustrated that decisions about clinical need appeared to be taken by GP practice receptionists.

The benefits of accessing care remotely were highlighted in the data. The efficiency of getting a remote appointment. and the convenience and safety of not needing to go to the GP practice were noted in tweets, with some people calling for remote consultations to be maintained in the long-term.

Other studies have shown similar findings with patients' valuing the convenience and time saved by video consultations when compared to face-to-face consultations [4, 21, 22]. Reduced travel time/expenses and convenience were also highlighted as benefits of telephone consultations by patients experiencing hospital-based telemedicine [23].

The contrast in views and experiences of accessing remote consultations may in part reflect differences between practices in the approach to appointment management and how well set up they were to deliver remote care prior to the pandemic. The Care Quality Commission found that some providers, especially larger ones, were able to move to remote consultations more easily due to already having the right technology in place [24].

There was a mix of views on the quality of care provided in remote consultations, although a higher proportion of tweets had a positive sentiment. A common positive theme, particularly immediately after the onset of Covid-19 (March-May 2020), was the ease and efficiency in which prescriptions had been issued. There is some evidence of a rapid increase in the prescribing of new medication for remote GP appointments and it has been suggested that this may be the result of GPs being more cautious and prescribing medication 'just in case', or due to a shift in the case mix where more patients with new symptoms accessed remote appointments compared to face-to-face consultations [17]. Other positive aspects about the quality of care delivered remotely were quick referrals to secondary care, receiving follow-up information and the interpersonal skills of healthcare professionals. A study conducted by Oxleas NHS Foundation Trust between March-July 2020 showed that patients reported receiving the same level of care and treatment during their remote appointment as they had received previously in face-to-face appointments, although it was noted that there was a preference for being seen face-to-face [4]. Further research is required to determine people's willingness to receive remote care instead of face-to-face appointments in the longer-term.

Tweets that were less positive about the quality of remote care implied the standard of care was not as high as in face-to-face consultations, with a lack of visuals and physical examination being highlighted. Concerns were expressed by a small number of Twitter users that their condition had not be diagnosed or treated correctly via a telephone appointment. These findings support research carried out before Covid-19 which showed that, compared to face-to-face appointments, patients were less positive about the care received via remote consultations [20, 25,26]. For instance, the 2020 GP Patient Survey (fieldwork January-March 2020, before the pandemic) showed that compared to face-to-face appointments, patients who had received a telephone appointment were 2% less likely to have their needs met, 4% less likely to say they were given enough time and 4% less likely to feel any mental health needs were recognised or understood [17].

The mixed attitudes towards remote care evident from in our Twitter data supports the view that whilst care delivered remotely can offer efficiency and convenience for patients and allows easier access for some groups of people, face-to-face consultations are more appropriate for others and/or for certain conditions or situations [1, 4, 27-29]. It is important that patients can choose the type of consultation that best suits their needs and that the increased use of technology for delivering care does not become a barrier for some.

Policy implications

There has been a rapid shift to delivering health care remotely since the Covid-19 pandemic, and it is important to learn from those who have been at the forefront of experiencing such changes. Being able to deliver care remotely has huge potential for cost savings and for improving efficiencies in health and social care systems. Our analysis of Twitter comments has shown mixed public attitudes and experiences to these changes. The finding that overall sentiment about remote care was more

positive in the early stages of the pandemic but has since declined is important. Although the reasons for this can only be speculated, it does emphasise the need for a continued examination and understanding of people's experiences as remote services continue to evolve.

There have been calls by policy makers for the increased use of remote care delivery to continue after the pandemic [30], although some GPs have found the high levels of remote care delivery a strain, have missed face-to-face contact with patients and have been concerned about clinical risk associated with delivering care in this way [31]. Whilst our research has highlighted positive public discourse around remote care and the benefits that it can offer, it has also shown where improvements are needed. Further research is needed to explore the challenges and barriers associated with remote care delivery, to inform the future planning and delivery of remote care. Despite the shift to more consultations now being delivered remotely, the difficulties surrounding booking and getting an appointment remain an issue for some. Healthcare providers should offer specific appointment times for telephone consultations, not only to improve patient's experiences, but to minimise appointments being missed and to protect patient confidentiality.

Our research also found that some people were negatively anticipating care being delivered remotely, for example confusion as to why appointments requiring tests or physical procedures had been booked as a telephone consultation. Some of this confusion likely reflects initial difficulties experienced by providers due to the speed at which remote care was implemented. However, it does suggest that providing people with more information about how remote consultation works may improve public attitudes and acceptance, in addition to giving patients a better experience and avoiding the anxieties leading up to a remote care appointment.

Limitations

There were some limitations of using Twitter comments to understand views on care being delivered remotely. The data is limited to internet users who tweeted between January 2018 and October 2020, and therefore does not represent the views of all healthcare users. Furthermore, tweets are unprompted and therefore, despite carefully planned search terms, the extracted data is not always relevant. Over one thousand tweets were extracted using three search terms, but more than one third of these comments were irrelevant to the research question. Several tweets were also coded into themes that did not directly relate to understanding people's views and attitudes of remote care delivery.

The relatively low number of relevant comments is important to consider when comparing the proportion of tweets with a negative/neutral/positive sentiment within themes. Whilst there was a sufficient volume for identifying overall themes and trends, there was not the level of detail to unpick the reasons for some findings, highlighting the need for further research.

There are concerns that remote care may negatively impact some groups of people more than others, such as those with limited digital literacy and/or lack of access to technology [32,33]. This is difficult to examine in an analysis of Twitter comments, as such groups will be less likely to use social media platforms such as Twitter to share their views. Another limitation of the research was the inability to examine any variations in views of remote care delivery by geographical region or by demographic factors, such as age or gender. This was either due to the relatively low volume of relevant tweets extracted from our search terms (for geographic comparisons) or because such information was not available in the metadata (gender or age). Similarly, whilst one of the search terms sought to explore any changes in care delivery for people living with long term conditions, there was an insufficient number of tweets which referred to particular long-term conditions to allow for analysis by health condition.

As previously mentioned, most of the tweets extracted were about GP consultations, so our research does not provide as much insight into public views of remote secondary care. There were also very few tweets that referenced alternative methods of remote care delivery other than telephone or video consultations. This may reflect that other approaches, such as online messaging systems or live chat, are not yet being widely used to deliver remote care. It may, however, point toward a limitation of the search terms used which did not include words such as 'live chat' or 'message/messaging', although the word 'online' was used.

Conclusion

Using Twitter data to address our research questions was beneficial for providing rapid access to a breadth of attitudes about remote care delivery at a time when it was difficult to conduct primary research. It allowed us to examine public discourse on remote care and explore shifting public attitudes at a time of rapid changes in care delivery. However, we recognise that further research using alternative methodologies such as in-depth interviews with patients could complement our findings to provide further insight into people's experiences of receiving remote care.

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Author contributions
Study design: CG and AT. Analysis and interpretation of data: EA, CW, AT and CG. Drafting of manuscript: EA, CW, and AT.

Conflicts of Interest

None declared.

Abbreviations

API: Application programming interface

References

1. Hutchings R (2020, August) The impact of Covid-19 on the use of digital technology in the NHS. Briefing. London: Nuffield Trust.
2. NHS Digital (2020) Appointments in General Practice - Experimental statistics October, 2020. https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice/october-2020. Archived at:
3. Greenhalgh T (2020) Using virtual consultations in the fight against COVID-19: Interview with Professor Trish Greenhalgh. Retrieved from: https://www.health.org.uk/news-and-comment/newsletter-features/using-virtual-consultations-in-the-fight-against-covid-19. Archived at:

4. Oxleas NHS (2020) Patient Experience of Remote Consultations during the COVID-19 Pandemic. Retrieved from: https://healthinnovationnetwork.com/wp-content/uploads/2020/12/MH-Remote-Consultations-Patient-Experiences.pdf.
   Archived at:
5. Beguerisse-Dı´az M, McLennan AK, Gardun˜o-Herna´ndez G et al (2017) The 'who' and 'what' of #diabetes on Twitter. Digital Health; (3):1-29 doi:10.1177/2055207616688841.
6. Cheng T, Liu L and Woo BK (2018) Analyzing Twitter as a Platform for Alzheimer-Related Dementia Awareness: Thematic Analyses of Tweets. JMIR Aging; 1(2):e11542. doi: 10.2196/11542.
7. Gohill S, Vuik S and Darzi A (2018) Sentiment Analysis of Health Care Tweets: Review of the Methods Used. JMIR Public Health and Surveillance; 4(2):e43 doi:10.2196/publichealth.5789.
8. Conway M, Hu M, and Chapman, WW (2019) Recent Advances in Using Natural Language Processing to Address Public Health Research Questions Using Social Media and Consumer-Generated Data, IMIA Yearbook of Medical Informatics; 28(01):208-217. DOI:10.1055/s-0039-1677918.
9. Chew C and Eysenbach G (2010) Pandemics in the Age of Twitter: Content Analysis of Tweets during the 2009 H1N1 Outbreak. PLoS ONE 5(11): e14118. doi:10.1371/journal.pone.0014118.
10. Mamidi R, Miller M, Banerjee T, Romine W, Sheth A (2019) Identifying Key Topics Bearing Negative Sentiment on Twitter: Insights Concerning the 2015-2016 Zika Epidemic. JMIR Public Health Surveill;5(2):e11036. doi: 10.2196/11036 PMID: 31165711.
11. Saleh SN, Lehmann CU, McDonald SA, Basit MA, Medford RJ (2021) Understanding public perception of coronavirus disease 2019 (COVID-19) social distancing on Twitter. Infection Control & Hospital Epidemiology 42(2):131-138. doi:10.1017/ice.2020.406.
12. Mustafa A, Ansari I, Mohanta SK et al. (2020) Public Reaction To Covid-19 On Twitter: A Thematic Analysis. EPRA International Journal of Multidisciplinary Research, 6(5):349-358. doi: 10.36713/epra4518.
13. Xue J, Chen J, Chen C, Zheng C, Li S, Zhu T (2020) Public discourse and sentiment during the COVID 19 pandemic: Using Latent Dirichlet Allocation for topic modeling on Twitter. PLoS ONE; 15(9): e0239441. doi:10.1371/journal.pone.0239441
14. Van Hoof W, Provoost V & Pennings G (2013) Reflections of Dutch patients on IVF treatment in Belgium: A qualitative analysis of internet forums. Human Reproduction; 28(4):1013–1022. doi:10.1093/humrep/des461
15. Taylor, J & Pagliari C (2018) #Deathbedlive: The end-of-life trajectory, reflected in a cancer patient's tweets. BMC Palliative Care, 17(1), 17. doi: 10.1186/s12904-018-0273-9.
16. NHS Digital (2020) Quality and Outcomes Framework, 2019-20**.** Official statistics. Retrieved from: https://digital.nhs.uk/data-and-information/publications/statistical/quality-and-outcomes-framework-achievement-prevalence-and-exceptions-data/2019-20/main-findings. Archived at:
17. Morris J (2020, 16 December) The remote care revolution in the NHS: understanding impacts and attitudes. Retrieved from: https://www.nuffieldtrust.org.uk/resource/the-remote-care-revolution-in-the-nhs-understanding-impacts-and-attitudes.
   Archived at:
18. Clarke G, Pariza P, Wolters A et al. (2020, 16 July) How has COVID-19 affected service delivery in GP practices that offered remote consultations before the pandemic? Retrieved from: https://www.health.org.uk/news-and-comment/charts-and-infographics/how-has-covid-19-affected-service-delivery-in-gp-practices.
   Archived at:

19. Greaves F, Laverty AA, Cano DR, et al. (2014) Tweets about hospital quality: A mixed methods study. BMJ Quality & Safety; (23):838-846. doi:10.1136/bmjqs-2014-002875.

20. Ipsos MORI (2020) GP Patient Survey National Report. 2020 Publication. London: Ipsos MORI.

21. Donaghy E, Atherton H, Hammersley V, et al. (2019) Acceptability, benefits, and challenges of video consulting: a qualitative study in primary care. British Journal of General Practice; 69(686): e586–e594. doi:10.3399/bjgp19X704141.

22. Wherton J and Greenhalgh T (2020) Evaluation of the Attend Anywhere / Near Me video consulting service in Scotland, 2019-20. Edinburgh: The Scottish Government. ISBN: 978-1-83960-898-8.

23. Smrke A, Younger E, Wilson R. et al. (2020) Telemedicine During the COVID-19 Pandemic: Impact on Care for Rare Cancers. JCO Global Oncol; (6):1046-1051. doi:10.1200/GO.20.00220.

24. Care Quality Commission (2020) The state of health care and adult social care in England 2019/20. London: Care Quality Commission. ISBN: 978-1-5286-2148-9.

25. Hammersley V, Donaghy E, Parker R et al. (2019) Comparing the content and quality of video, telephone, and face-to-face consultations: a non-randomised, quasi-experimental, exploratory study in UK primary care. British Journal of General Practice; 69(686):e595-e604. doi: 10.3399/bjgp19X704573.

26. McKinstry B, Hammersley V, Burton C, et al. (2010) The quality, safety and content of telephone and face-to-face consultations: a comparative study. BMJ Quality & Safety;(19)4: 298-303.

27. Healthwatch (2020) The Doctor Will Zoom You Now: getting the most out of the virtual health and care experience. Retrieved from: https://www.healthwatch.co.uk/report/2020-08-18/doctor-will-zoom-you-now-getting-most-out-virtual-health-and-care-experience
Archived at:

28. RCGP (2020) RCGP survey provides snapshot of how GP care is accessed in latest stages of pandemic. RCGP blog, 30th July. https://www.rcgp.org.uk/about-us/news/2020/july/rcgp-survey-provides-snapshot-of-how-gp-care-is-accessed-in-latest-stages-of-pandemic.aspx
Archived at:

29. Rapson J (2020) 'Digital appointments could be storing up problems for the future', HSJ, 16 April. https://www.hsj.co.uk/technology-and-innovation/digital-appointments-could-be-storing-up-problems-for-the-future/7027421.article.
Archived at:

30. Bridge-Wilkinson A. (2020) Health secretary calls for non-urgent GP consultations to be conducted remotely. The Parliamentary Review News, July 31 2020. Retrieved from: https://www.theparliamentaryreview.co.uk/news/health-secretary-calls-for-non-urgent-gp-consultations-to-be-conducted-remotelys for non-urgent GP consultations to be conducted remotely - The Parliamentary Review. Archived at:

31. Murphy M, Scott LJ, Salisbury C et al. (2021) Implementation of remote consulting in UK primary care following the COVID-19 pandemic: a mixed-methods longitudinal study. British Journal of General Practice 2021; 71 (704): e166-e177. doi:10.3399/BJGP.2020.0948.

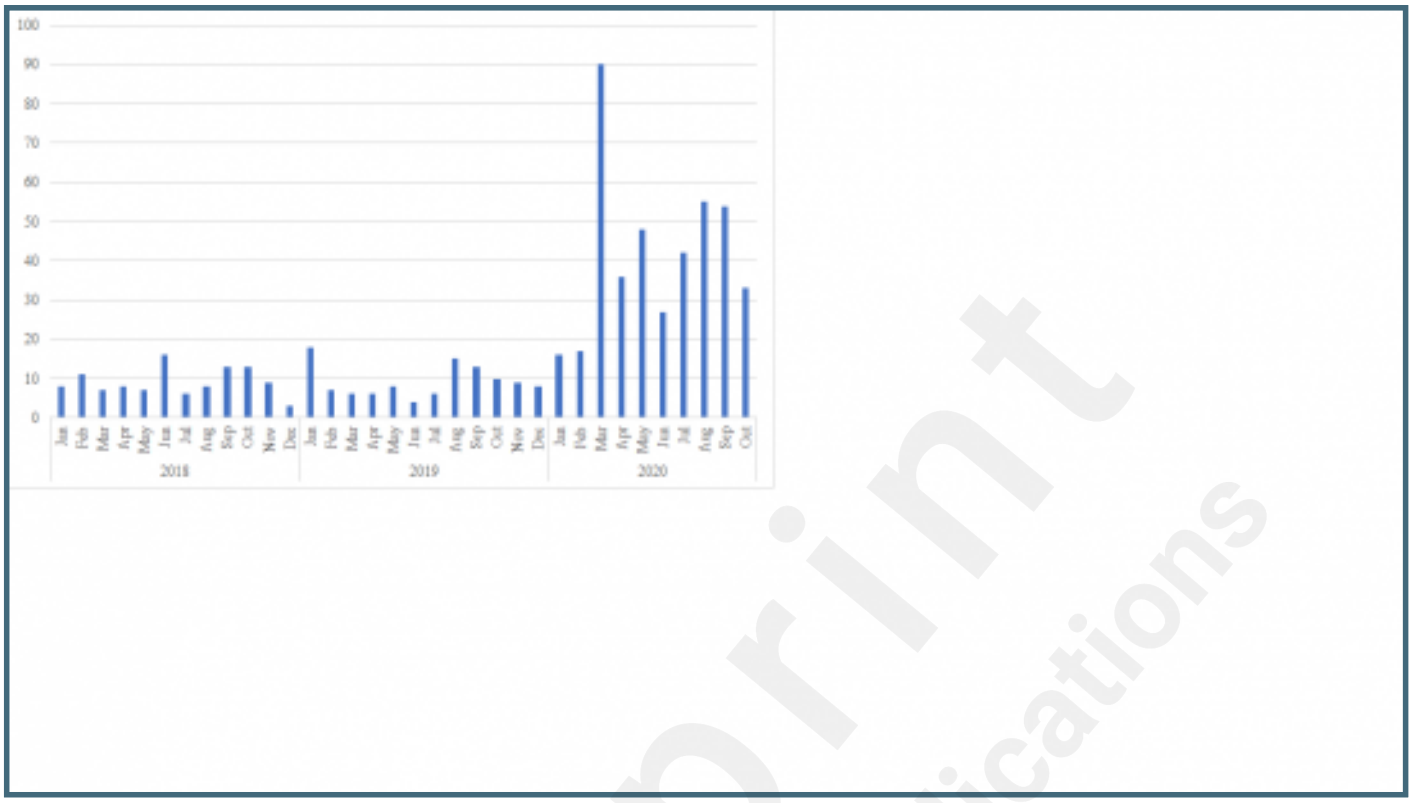
32. Scobie S (2019) Will a digital NHS reap the rewards policy-makers are aiming for? Nuffield Trust blog, 20 August. https://www.nuffieldtrust.org.uk/news-item/will-a-digital-nhs-reap-the-rewards-policy-makers-are-aiming-for . Archived at:

33. Majeed A, Maile EJ, Coronini-Cronberg S et al. (2020) Covid-19 is magnifying the digital divide. The BMJ Opinion blog, 1 September. https://blogs.bmj.com/bmj/2020/09/01/covid-19-is-magnifying-the-digital-divide/
Archived at:

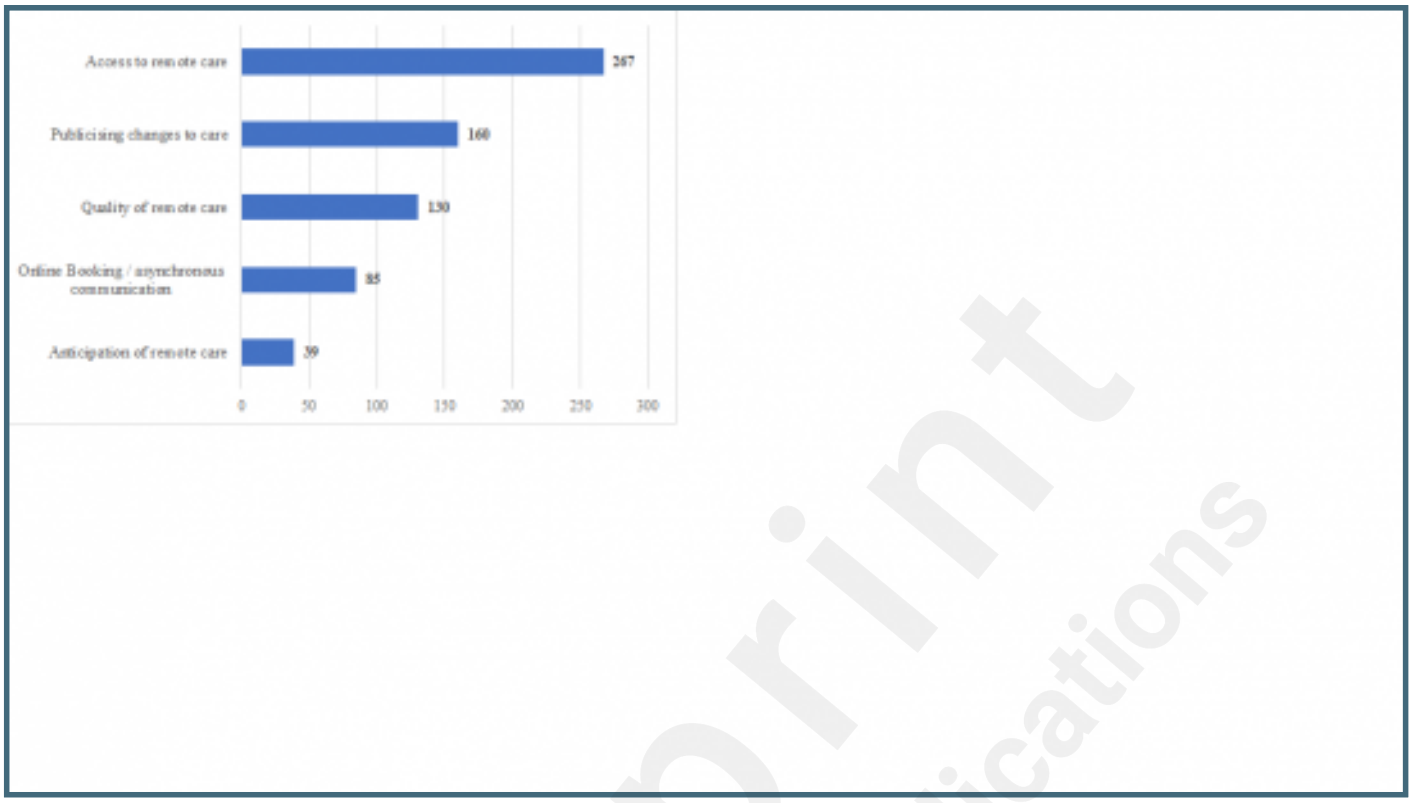
Supplementary Files

Figures

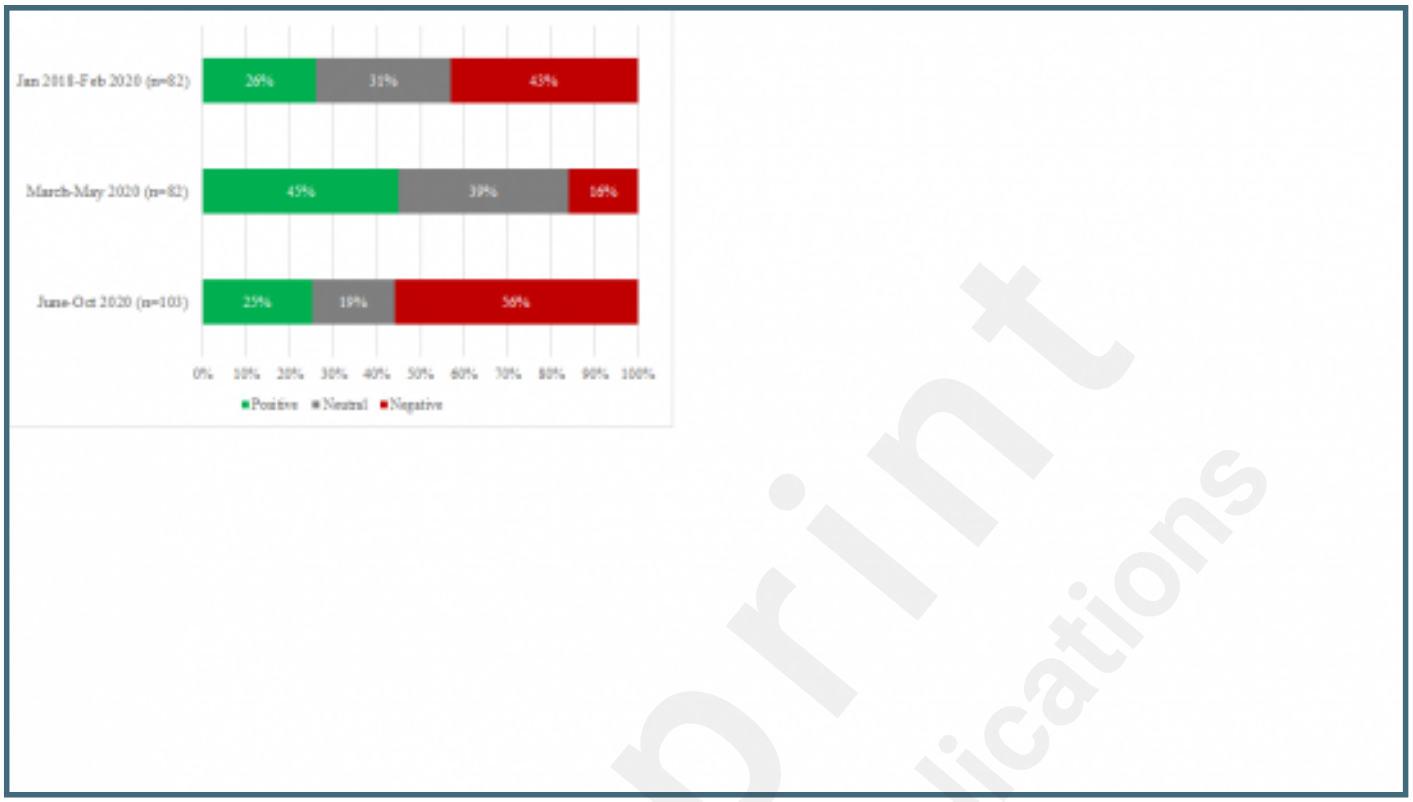
Frequency of monthly tweets referencing remote care (n=637).



Main themes by number of tweets.



The proportion of positive, neutral and negative tweets on access to remote care at different time periods (n=267).



The proportion of positive, neutral and negative tweets on the quality of remote care at different time periods (n=130).