BMJ Open

Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-048151
Article Type:	Original research
Date Submitted by the Author:	18-Dec-2020
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Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

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Abstract

Objective: The first wave of the COVID-19 pandemic had a major impact on healthcare utilisation. The aim of this retrospective review was to quantify how utilisation of non-COVID care changed during this time so as to gain insight and inform planning of future services during potential second and subsequent waves.

Methods and analysis: A longitudinal design was used to analyse anonymous private UK health insurer datasets covering the period of January 2018 to August 2020. Taken as a measure of healthcare utilisation in the UK, incidence rates of claims broken down by service area and condition were calculated alongside overall monthly totals and costs. Pre-COVID-19 years were compared to the current year.

Results: Healthcare utilisation during the first wave of COVID-19 decreased by as much as 70% immediately after lockdown measures were implemented. After two months, the trend reversed and claims steadily began to increase, but did not reach rates seen from previous years by the end of August 2020. Assessment by service and diagnostic category showed that most areas, especially those highly reliant on in-person treatment, reflected the same pattern (i.e. rapid drop followed by a steady recovery). The provision of mental health services differed from this observed trend, where utilisation increased by 20% during the first wave of COVID-19, in comparison to pre-COVID-19 years. The utilisation of maternity services and the treatment of existing cancers also stayed stable, or increased slightly, during this time.

Conclusions: Healthcare utilisation in a UK based privately insured population decreased dramatically during the first wave of the COVID-19 pandemic, being over 70% lower at its height. However, mental health services remained resilient during this time, possibly due to greater virtualisation of diagnostics and care.

Keywords: COVID-19, healthcare utilisation, medical claims data, health insurance

Strengths and limitations of this study

- This longitudinal study evaluated healthcare utilisation within a private healthcare sample over three years enabling insight into health seeking behaviours during the first COVID-19 wave.
- Real-world monthly claims data for both service type and diagnostic category was assessed enabling comparative analysis.
- The data was limited to a population that were privately insured within a country where the majority use the government funded National Health Service (NHS).
- Although costs were analysed it was not possible to confirm whether other variables such as medical inflation or contracted rates might have influenced the unit cost of care or frequency of claims.

Introduction

In the aftermath of the first wave of the novel coronavirus disease (COVID-19), it is clear the impact of the global pandemic on healthcare systems has been acute[1]. Most systems, regardless of location, have had to take immediate action ranging from rapid transitions to virtual care[2] to complete shutdowns. Fear of infection and reduced availability of healthcare services has led to reduced non-COVID healthcare utilisation worldwide. In Italy and Germany[3,4], paediatric ER visits dropped by as much as 64- 88% whilst heart attack treatment rates in the US decreased by 38% in some major hospitals[5].

In the UK, the first identified cases of COVID-19 were reported at the end of January 2020, but the first person-to-person transmission was only confirmed in late February[6]. On March 11th the World Health Organisation (WHO) declared the spread of COVID-19 a pandemic and measures were taken nationally to slow the spread and protect healthcare systems. A UK national lockdown started on March 23rd and the public were informed to only to leave their homes for specific reasons such as food shopping, travel to work, once daily exercise and urgent medical needs[6]. Further restrictions were imposed by mid-April[6].

In addition to limiting population movement, physical distancing outside of the home was also advised and this perhaps triggered the beginning of the changes in healthcare utilisation by individuals. When considering visiting a hospital or clinic, members of the public were now tasked with weighing their risk of travelling, as well as visiting a setting which was a potential hotspot for infection. From the provider perspective, there was a scramble to triage the most urgent, but also the least at-risk patients, for in-person consultation. The challenge of providing healthcare during a pandemic for those with compromised immune systems[7,8] has been a global issue. The short-term impact of COVID-19 has directly affected many individuals who have been infected, but also the wider population looking to access healthcare during this time[9].

In the UK, approximately 13% of consumers have private medical insurance[10]. There is little debate in relation to how severely most healthcare systems have been disrupted but the areas and services that have been able to adapt most effectively, often with the use of virtual care, may provide potential solutions for areas still lagging behind. This is especially critical at the moment as the UK is experiencing a second wave of COVID-19 infections and lockdown measures have been re-implemented[11]. In this study we sought to review trends in claims and costs for patient care collected over the past year up to the end of the first wave. The aim was to explore changes in how people were utilising care in comparison to previous years so as to assess overall stability. In the wake of the second wave of COVID-19, understanding where resources might be best directed could lead to an improved "non-COVID" healthcare response.

Methods

Study design and data sources

A longitudinal design was used to analyse frequency of healthcare service claims in the UK. Data was obtained from a global insurance provider operating in the UK. Data was extracted in the form of monthly total number of claims, total enrolled membership, and costs for the period of January 2018 through to the end of August 2020. This data was then disaggregated into monthly totals by service area (e.g. physiotherapy or specialist consultation) and condition (e.g. musculoskeletal or mental disorders). The data from 2018 and 2019 from the same relative time period were averaged and considered to represent a typical "pre-COVID-19" year. The data from 2020 were classified as the "COVID-19" year.

Patient and public involvement

Patients were not actively recruited for this study as it was secondary use of an existing dataset and it contained no identifying or personal information at any point. As it was analysed and processed anonymously, clients and the public were not directly involved in this study.

Statistical analysis

As the ratios for each month varied based on fluctuating membership, the monthly frequency of claims was calculated as the frequency of claims per 1000 enrolled members. This frequency was calculated by 1000 x [monthly number of claims total ÷ monthly membership] for monthly totals. The frequency for claims by service and condition categories was also calculated in the same way. Changes in frequencies between the "pre-COVID-19" year (January through August in 2018 and 2019 averaged) and the "COVID-19" year (January through August 2020) were calculated as a percentage based on the per 1000 incident rates. The calculation was [incident rate difference ÷ first incident rate] x 100. Finally, percentage of claimants and corresponding costs by month of enrolled members from 2018 to 2019 to 2020 were calculated based on monthly totals of enrolled. Inferential statistical tests were not used in our study because it was a descriptive analysis using longitudinal data from the whole population rather than a sample

Results

The mean age of the population was 42.1 ±11.5 years and 52.4% were males. Based on frequency of claims per 1000 enrolled members, monthly totals for the pre-COVID-19 year and the COVID-19 year can be seen in Table 1. Online supplementary material including a breakdown by service (Table S1) and condition (Table S2) at a monthly level is available. The biggest shift in claims frequency was directly after lockdown in the UK which started in late March. By the end of April, the rate of claims had decreased by almost 70% in comparison to the pre-COVID-19 years. To offer context, January and February 2020, reported slight increases and while March had a reported decrease in claims, it was only by 13%. The impact of COVID-19 was most prominent in April and continued through to August where the overall claims rate was 42% less (at a rate of 54.8 claims per 1000 enrolled members) than the previous year (which was 95.0 claims per 1000 enrolled members).

The biggest decreases of the year for claims can be seen in May when the most restrictions had been applied across the general population.

Table 1. Frequency of claims by month per 1000 enrolled members from 2018/2019* to 2020

Month	Pre-COVID-19 Year*	COVID-19 Year	Difference in Claims/1000 enrolled
January	194.0	215.7	11%
February	175.4	199.3	14%
March	189.3	165.1	-13%
April	167.7	51.7	-69%
May	180.3	50.2	-72%
June	165.7	73.5	-56%
July	158.8	100.5	-37%
August	95.0	54.8	-42%

***Average of 2018 and 2019**

In Table 2, monthly calculated percentage of claimants demonstrate the same trend. Claimant numbers as a percentage of the covered population were approximately the same across the pre-COVID-19 years and COVID-19 year, in January and February. This shifted in March 2020 and the percentage of claimants dropped for the first time (by 1%) compared to the pre-COVID-19 years. This decrease continued until May where a maximum decrease of 5% was recorded. Costs (in GB pounds) per claimant varied on a monthly basis across both pre-COVID-19 and COVID-19 years, but were not outside of the normal month-to-month variation seen in the pre-COVID period

Table 2. Percentage of population who were claimants and monthly costs per claimant for 2018/2019* and 2020

	Pre-COVID-19 Year*		COVID-19 Year		
Month	Claimants by %	Average cost per claimant	Claimants by %	Cost in £	Change in Claimants by %
January	6.2	£867	6.4	£851	**0.2**
February	6.1	£793	6.3	£798	**0.3**
March	6.4	£815	5.4	£829	**-1.0**
April	6.1	£753	2.0	£701	**-4.1**
May	6.4	£789	1.9	£818	**-4.5**
June	6.2	£782	2.7	£908	**-3.5**
July	6.2	£815	3.6	£906	**-2.6**
August	5.8	£797	3.4	£798	**-2.4**

***Average of 2018 and 2019**

Frequency of Claims by Condition

The total claims per 1000 enrolled members can be seen below in Table 3 as broken down by 16 condition areas. The largest decrease in claims by condition was seen for respiratory system diseases. This condition area decreased overall by almost 51% compared to previous years. Closely following this rate of decrease were conditions which all had decreases of over 40% (but less than 50%). These five conditions were general injury and/or poisoning (46%) and diseases of the circulatory (45%), nervous (44%), digestive (43%) and musculoskeletal (41%) systems. Other decreases over 20% (but under 40%) included conditions ranging from skin disease (38%) to endocrine, nutritional and metabolic conditions at 30%. After this, moderate to small decreases were found for categories including a vague "symptom, signs, ill-defined condition" group (19%), neoplasm (13%), blood diseases (9%) and unknowns categorised as "others" (3%). In contrast to all other conditions, pregnancy/childbirth and mental disorders increased overall in claims frequency by approximately 4% and 20% respectively.

When assessing rankings in Table 3, it can be seen that overall the top ranked conditions, stayed the same in the COVID-19 year compared to previous years. Both pre-COVID-19 and COVID-19 years had musculoskeletal disease, the general "symptoms, signs, ill-defined" category and neoplasm conditions with the highest incident rates per 1000 enrolled members. The real changes were more subtle with mental disorders moving up a place from 5th to 4th highest number of claims and a moderately larger gap between the top 4 conditions compared to all others. In the COVID-19 year this gap was larger with previous years having a difference of only 7 claims / 1000 enrolled members and the COVID-19 year having a difference of more than 45 claims / 1000 enrolled members.

Table 3. Frequency of claims by condition and change in percentage from 2018/2019* to 2020

Condition	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Respiratory system disease	26.5	13.0	-50.8
Injury & poisoning	89.4	48.1	-46.2
Circulatory system disease	36.3	20.0	-44.9
Nervous system disease	60.2	33.7	-44.1
Digestive system disease	74.2	42.3	-42.9
Musculoskeletal system disease	483.9	283.5	-41.4
Skin & subcutaneous disease	33.6	21.0	-37.6
Genitourinary system disease	96.6	62.4	-35.5
Infectious & parasitic disease	2.9	1.9	-35.1
Endocrine, nutritional, metabolic disease	10.4	7.3	-29.7
Symptoms, signs, ill-defined conditions	182.1	146.7	-19.4
Neoplasms	127.9	111.6	-12.8
Blood diseases	2.3	2.1	-8.7
Others	5.0	4.9	-2.9
Pregnancy, childbirth	4.6	4.8	**4.3**
Mental disorders	90.0	107.6	**19.6**

***Average for 2018 and 2019**

Frequency of Claims by Service

The total claims per 1000 enrolled members can be seen below in Table 4 as broken down by service. The largest decrease in claims was in relation to theatre charges, which corresponds with restrictions to elective surgical procedures during this time. Closely following this was physiotherapy (48%), surgeon/anaesthetist services (47%), package pricing (44%) and accommodation/consumables (43%) categories, all of which are related to surgical intervention or in-person delivery of care.

The next group of decreases were relatively moderate, mostly ranging from 31-41%. The services included in this group were highly varied in type of claims and included chiropractic/osteopathy services (40%), cash benefits (35%) and specialist consultations (30%).. Of the areas that decreased from previous years, only specialist services and diagnostic services were less than 30%, with rates of 28% and 17% respectively. Finally, two service areas contrasted the other trends and increased in comparison to previous years for claims by service. Chemotherapy/radiotherapy increased by 13.6% overall and mental health services increased by 20% compared to previous years.

When assessing rankings in Table 4, the overall top ranked services were physiotherapy, specialist consultations, diagnostic services and surgeon/anaesthetist services. These were all over 100 claims/1000 enrolled members with only one of the group (i.e., surgeon/anaesthetist services) being under the 200 claims. Ranking for highest number of claims in the COVID-19 year were slightly different with four services over 100 claims/1000 enrolled but only one service (i.e., diagnostic services) over 200 claims which closely follows the general trend of decreased claims. The notable group of psychiatric service that contrastingly increased during the COVID-19 year (by 20%) also rose up in the ranks from the 5thth to 4thth highest claim number with 108 claims/1000 enrolled.

Like the condition rates, changes within the group rankings overall were subtle with gaps between rankings being wider in the COVID-19 year versus the pre-COVID-19 year. During the pre-COVID-19 years the difference between rankings after the top 4-5 ranked services, was relatively gradual with no more than 25 claims difference between rankings and most commonly about 10 claims. During the COVID-19 year, this change with a strong divide between the top 4 ranked services, the lowest of which was 108 claims/1000 enrolled (i.e., psychiatric service) and the next rank down which was almost half that amount with 57 claims/1000 enrolled.

Table 4. Frequency of claims by service and change in percentage from 2018/2019 to 2020

Service	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Theatre charges	47.7	21.4	-55.2
Physiotherapy	282.5	147.4	-47.8
Surgeons and anaesthetist fees	107.7	57.3	-46.8
Package pricing	19.5	10.8	-44.3
Accommodation/consumables	61.6	35.1	-42.9
Others	33.3	19.7	-40.8
Chiro/osteopathy	50.6	30.4	-39.9
Cash benefit	23.0	15.0	-34.7
Treatment room charges	43.1	28.6	-33.8
GP consultations	2.2	1.5	-33.7
Specialist consultations	279.5	193.9	-30.6
Specialist fees	15.1	10.9	-28.1
Diagnostic services	250.7	208.9	-16.7
Chemotherapy/radiotherapy	19.0	21.6	13.6
Psychiatric	90.6	108.4	19.6

***Average of 2018 and 2019**

Discussion

The impact of COVID-19 has challenged healthcare systems worldwide. During the first wave of the pandemic the UK experienced the highest mortality rate in Europe, closely followed by Belgium, Italy, and Spain[1]. This study sought to explore the UK's response in healthcare utilisation as measured by frequency of claims submitted to a large private health insurer. Our aim was to tease out potential trends that might shed light on how the first wave impacted healthcare provision so as to potentially support response planning during subsequent waves.

Claims submitted in 2020, from January through August, which captured the build-up and completion of the first COVID-19 wave, were compared with the average of two previous years for the same time period. Our findings show that the trends in healthcare utilisation in the UK private sector reflect that which has been reported globally[12–14]. Our data show a sizeable drop in care utilisation for almost all services and diagnostic categories. The exception to this trend being for those with mental health and maternity needs, as well as those requiring chemotherapy and radiotherapy services.

During the first wave of the pandemic the UK's National Health Service and the private health sector worked in collaboration to ensure individuals received care based on clinical need, rather than funding origin. With many NHS hospitals focused solely on managing patients with COVID-19 private sector providers treated many NHS patients based on the agreed clinical necessity criteria. Our data could therefore be considered to be a reasonable representation of the impact of the pandemic on the different aspects of non-COVID care across the nation.

There has been much written in the scientific literature and popular press about how the pandemic, and the consequent reduction in care provision, has had a profound impact on the timeliness of diagnosing and treating may conditions, including cancer[15]. Our findings suggest that there was an appreciable reduction in new claims for neoplasms (12.8%), which is likely to reflect a delay in diagnosing individuals with cancer. However, we did see a relative increase in the number of claims for cancer treatment in the form of chemotherapy and radiotherapy, suggesting that those patients who already had a diagnosis at the time of lockdown were not impacted to the same degree.

Another area where substantial change in claims activity was seen is that of psychological and emotional health. Considerable concern has been raised in relation to mental health during the course of the pandemic, with the associated physical distancing and quarantining requirements exacerbating existing mental health issues and potentially contributing to new ones[16]. A recently published study comparing mental health trends longitudinally for over 40,000 participants found that by the end of April 2020, the quality of UK mental health had decreased in comparison to pre-COVID-19 years[17]. Our research very much supported this across claims in both the conditions and services categories. Under the condition category of mental disorders and under the service category of psychiatry, rates of claims at the start of the year were found to be slightly higher than previous years, but unlike other years, the trend did not decrease. In contrast to almost all other claim areas by April both categories had increased compared to pre-COVID-19 years. This is perhaps the most poignant take away for future risk management within healthcare. While better treatment strategies for hospitalised COVID-19 patients are being developed and early vaccine results are promising[18,19], the deterioration of mental health appears to be widespread[17] regardless of infection status. It is worth noting that remote

delivery of psychological consultations and therapies was commonplace in the private healthcare sector, even before the pandemic, and it appears that this was rapidly "ramped up" to meet the burgeoning demand during this period.

As many countries have now entered a second wave of COVID-19 infections and have re-implemented societal restrictions, it is clear that care for individuals with non-COVID health issues will continue to be impacted. Virtual care delivery may help plug some of the diagnostic and treatment gaps that will inevitably occur until widespread vaccination can be delivered.

Strengths and limitations

A strength of this study is the longitudinal nature of the data that were collected and which allowed for a stronger comparative analysis. As well, the ability to look at this data as both service type and diagnostic category offered insight into what was driving any changes in trends and which areas were impacted most. In contrast, a weakness of this study is that it was limited to a population with private health insurance, with our ability to generalise findings to the broader population unclear. While it is essential to have quantitative data addressing objective health behaviours (i.e., submitted healthcare claims), ideally qualitative data in relation to what motivated people to change their health seeking behaviours would also have been advantageous.

Conclusions

Overall, our findings reflect the direct impact of COVID-19 on healthcare delivery systems across the UK, with a sudden decrease in utilisation being observed in April and May immediately following the implementation of lockdown measures. The steady recovery after this time up until August indicates a level of resilience for all types of service. As we enter the second wave of COVID-19 infections we have a real opportunity to strengthen the provision of non-COVID care across all service and diagnostic categories. The relative success of the provision of psychological healthcare services is a potential blueprint for others to use so that traditional face-to-face care is augmented, and potentially sometimes replaced, by virtual delivery methods.

References

1. Kontis, V. *et al.* Magnitude, demographics and dynamics of the effect of the first wave of the COVID-19 pandemic on all-cause mortality in 21 industrialized countries. *Nat. Med.* 1–10 (2020) doi:10.1038/s41591-020-1112-0.
2. Mehrotra, A., Ray, K., Brockmeyer, D. M., Barnett, M. L. & Bender, J. A. Rapidly Converting to 'Virtual Practices': Outpatient Care in the Era of Covid-19. (2020) doi:10.1056/CAT.20.0091.
3. Lazzerini, M. *et al.* Delayed access or provision of care in Italy resulting from fear of COVID-19. *The Lancet Child and Adolescent Health* vol. 4 e10–e11 (2020).
4. Happle, C. *et al.* Covid-19 Related Reduction in Paediatric Emergency Healthcare Utilization – A Concerning Trend. 1–14.
5. Garcia, S. *et al.* Reduction in ST-Segment Elevation Cardiac Catheterization Laboratory Activations in the United States During COVID-19 Pandemic. *Journal of the American College of Cardiology* vol. 75 2871–2872 (2020).
6. Flynn, D. *et al.* COVID-19 Pandemic in the United Kingdom. *Heal. Policy Technol.* (2020).
7. Alromaihi, D., Alamuddin, N. & George, S. Sustainable diabetes care services during COVID-19 pandemic. *Diabetes Res. Clin. Pract.* **166**, 108298 (2020).
8. Guzman, R. De & Malik, M. Dual Challenge of Cancer and COVID-19 : Impact on Health Care and Socioeconomic Systems in Asia Paci fi c special articles abstract. *JCO Glob. Oncol.* **6**, 906–912 (2020).
9. Deepthi, R., Mendagudali, R., Kundapur, R. & Modi, B. Primary Health Care and COVID-19 Pandemic. *Int. J. Heal. Syst. Implement. Res.* **4**, 20–29 (2020).
10. Farmer, A. Healthcare : NHS versus private What do you think ? *yougov.co.uk* 1–6 (2020).
11. Karlsson, U. & Fraenkel, C. Covid-19 : risks to healthcare workers and their families Mistakes made in the first wave must not be repeated in the second. *BMJ* **371**, 1–2 (2020).
12. Liang, Y. *et al.* Symptoms, management and healthcare utilization of copd patients during the COVID-19 epidemic in Beijing. *Int. J. COPD* **15**, 2487–2494 (2020).
13. Kumar, R. & Singh Bhadoria, A. Covid-19: Estimation Of The Severity And Healthcare Utilization-A Model Based Analysis. *Int. J. Adv. Sci. Technol.* **29**, 15164–15171 (2020).
14. WHO. COVID-19 significantly impacts health services for noncommunicable diseases. (2020).
15. Maringe, C. *et al.* Articles The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England , UK : a national , population-based , modelling study. *Lancet Oncol.* **21**, 1023–1034 (2020).
16. Giallonardo, V. *et al.* The Impact of Quarantine and Physical Distancing Following COVID-19 on Mental Health : Study Protocol of a Multicentric Italian Population Trial. **11**, 1–10 (2020).
17. Pierce, M. *et al.* Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry* **7**, 883–892 (2020).
18. Callaway, E. What Pfizer ' s landmark COVID vaccine results mean for the pandemic. *Nature* 1–8 (2020).
19. NIH (National Institutes of Health). Promising Interim Results from Clinical Trial of NIH-Moderna COVID-19 Vaccine. 1 (2020).

Footnotes

Contributors: AH and PRM conceived and designed the study. MM extracted and supported data preparation. AH, PRM and AT performed the data analysis and AH and PRM drafted the first version of the manuscript. All authors critically reviewed the manuscript and approved the final version.

Funding: The authors have not declared a specific grant for this research from any funding agency in the public or not-for-profit sectors. This work was funding by Cigna Europe & Global Segments.

Competing interests: All authors are either directly employed or contracted by Cigna Europe & Global Segments.

Patient consent for publication: Not required.

Ethics approval: Ethical approval was not required as no patient-specific information was collected.

Data availability statement: The data generated and analysed during the present study are only for private use and are not publicly available.

Table S1. Frequency of claims by condition data per 1000 enrolled members from 2018 to 2019* to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Musculoskeletal system	Pre	70.8	64.6	68.6	60.9	64.8	60.2	58.3	35.8
	Post	73.4	68.2	51.8	9.4	10.4	19.4	31.9	19.0
Symptoms, signs, & ill-defined conditions	Pre	23.0	21.6	23.4	22.4	23.8	24.4	27.0	16.5
	Post	38.7	34.3	27.1	6.0	6.7	10.3	15.1	8.6
Neoplasms	Pre	19.5	17.2	18.7	16.1	16.5	15.4	15.5	9.0
	Post	20.5	18.2	19.1	10.2	11.0	13.3	13.4	6.0
Mental disorders	Pre	14.6	12.9	14.6	12.6	13.8	10.2	7.9	3.3
	Post	18.8	18.1	19.4	16.1	10.8	10.7	9.7	4.0
Genitourinary	Pre	13.8	13.0	13.9	12.4	13.1	12.2	10.9	7.3
	Post	14.7	13.7	10.8	2.6	2.9	5.3	7.7	4.6
Injury & poisoning	Pre	13.5	12.2	12.9	11.7	12.4	11.1	9.8	5.7
	Post	11.2	10.8	9.7	2.2	2.1	3.8	5.8	2.6
Digestive	Pre	11.7	10.1	11.2	8.8	9.7	8.9	8.5	5.3
	Post	11.1	10.4	7.4	1.1	1.3	2.4	5.2	3.5
Nervous system	Pre	8.9	7.8	8.7	7.7	8.9	7.6	6.4	4.0
	Post	8.8	8.1	6.0	0.8	1.1	2.3	4.3	2.2
Circulatory	Pre	5.4	5.0	5.0	4.5	5.3	4.9	4.0	2.3
	Post	5.2	4.8	3.6	0.6	1.0	1.7	2.0	1.0
Skin & subcutaneous	Pre	5.0	4.1	4.8	4.2	4.9	4.1	4.2	2.4
	Post	4.7	4.9	4.0	1.2	1.1	1.7	2.3	1.2
Respiratory	Pre	4.1	3.7	3.7	3.3	3.8	3.4	3.0	1.5
	Post	4.1	3.5	2.4	0.3	0.5	0.6	1.0	0.7
Endocrine, nutritional	Pre	1.5	1.3	1.4	1.3	1.4	1.3	1.3	0.9

& metabolic	Post	1.7	1.4	1.5	0.3	0.3	0.6	0.9	0.5
Others	Pre	0.8	0.5	0.7	0.5	0.6	0.8	0.7	0.4
	Post	1.0	1.1	0.8	0.2	0.2	0.5	0.6	0.4
Pregnancy & childbirth complications	Pre	0.6	0.6	0.6	0.6	0.7	0.5	0.6	0.2
	Post	1.0	0.9	0.6	0.6	0.6	0.6	0.4	1.0
Infectious & parasitic	Pre	0.5	0.3	0.5	0.4	0.3	0.4	0.4	0.2
	Post	0.4	0.3	0.4	0.0	0.2	0.2	0.2	0.1
Blood	Pre	0.3	0.4	0.4	0.4	0.3	0.2	0.3	0.1
	Post	0.4	0.5	0.5	0.1	0.1	0.1	0.2	0.3

*Average for 2018 and 2019

Table S2. Frequency of claims by service data per 1000 enrolled members from 2018 to 2019 to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Specialist Consultations	Pre	40.4	36.1	39.2	35.8	37.4	36.1	34.2	20.3
	Post	43.0	39.3	33.8	10.9	11.3	17.7	23.7	14.3
Physiotherapy	Pre	39.6	37.0	40.7	36.7	38.2	34.3	34.9	21.3
	Post	38.3	37.9	27.3	6.5	6.1	9.2	13.9	8.2
Diagnostic	Pre	34.3	31.5	33.1	29.9	32.4	31.5	34.2	23.9
	Post	54.1	48.4	39.4	7.5	8.9	14.8	23.1	12.8
Surgeons/Anaesthetist Fees	Pre	16.9	14.7	15.6	13.5	14.6	13.9	12.3	6.2
	Post	16.0	14.1	11.2	1.2	1.3	3.1	6.9	3.5
Psychiatric	Pre	14.6	13.0	14.7	12.6	14.6	10.1	7.9	3.2
	Post	18.8	18.5	19.3	16.4	10.8	10.8	9.6	4.1
Accommodation/Consumables	Pre	10.2	8.6	9.1	7.4	7.9	7.6	6.6	4.1
	Post	8.1	7.6	6.5	1.8	2.9	2.6	3.8	1.8
Treatment Room Charges	Pre	7.5	6.4	6.9	5.7	6.3	6.3	5.3	3.3
	Post	5.9	5.6	4.3	0.3	0.3	0.9	2.7	1.4
Chiro/Osteopathy	Pre	7.2	7.1	7.8	6.9	7.4	6.4	5.2	2.6
	Post	7.5	6.5	4.7	0.4	1.5	3.5	4.5	1.9

Treatment Room Charges	Pre	5.9	5.4	5.8	5.2	6.0	5.4	5.6	3.8
	Post	6.7	6.6	5.1	1.1	1.0	2.2	3.6	2.3
Others	Pre	5.3	4.9	4.8	3.8	5.1	4.2	3.6	1.6
	Post	4.9	4.6	3.8	0.7	0.8	1.5	2.5	1.1
Package Pricing	Pre	2.8	2.6	2.7	2.4	2.6	2.4	2.5	1.5
	Post	3.3	2.7	2.2	0.2	0.1	0.5	1.2	0.7
Chemotherapy/Radiotherapy	Pre	2.8	2.5	2.9	2.3	2.5	2.2	2.3	1.4
	Post	2.3	2.8	3.0	2.6	2.9	3.8	2.4	1.7
Specialist Fees	Pre	2.2	1.9	2.2	2.0	2.1	1.8	1.8	1.0
	Post	2.3	1.9	1.8	0.9	0.8	1.2	1.3	0.6
GP Consultations	Pre	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.1
	Post	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.0

*Average for 2018 and 2019

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2, 3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4-5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	NA
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, explain how loss to follow-up was addressed	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	5-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-8
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-048151.R1
Article Type:	Original research
Date Submitted by the Author:	19-May-2021
Complete List of Authors:	Howarth, Ana; Cigna Europe, Global Wellbeing Solutions; St George's University of London, Population Health Research Institute Munro, Morag; Cigna Europe Theodorou, Alf; Cigna Europe; NewCourse Mills, Peter R.; Cigna, Global Wellbeing Solutions; Whittington Hospital, Department of Respiratory Medicine
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health services research
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

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Abstract

Objective: The first wave of the COVID-19 pandemic had a major impact on healthcare utilisation. The aim of this retrospective review was to quantify how utilisation of non-COVID care changed during this time so as to gain insight and inform planning of future services during potential second and subsequent waves.

Methods and analysis: A longitudinal design was used to analyse anonymous private UK health insurer datasets covering the period of January 2018 to August 2020. Taken as a measure of healthcare utilisation in the UK, incidence rates of claims broken down by service area and condition were calculated alongside overall monthly totals and costs. Pre-COVID-19 years were compared to the current year.

Results: Healthcare utilisation during the first wave of COVID-19 decreased by as much as 70% immediately after lockdown measures were implemented. After two months, the trend reversed and claims steadily began to increase, but did not reach rates seen from previous years by the end of August 2020. Assessment by service and diagnostic category showed that most areas, especially those highly reliant on in-person treatment, reflected the same pattern (i.e. rapid drop followed by a steady recovery). The provision of mental health services differed from this observed trend, where utilisation increased by 20% during the first wave of COVID-19, in comparison to pre-COVID-19 years. The utilisation of maternity services and the treatment of existing cancers also stayed stable, or increased slightly, during this time.

Conclusions: Healthcare utilisation in a UK based privately insured population decreased dramatically during the first wave of the COVID-19 pandemic, being over 70% lower at its height. However, mental health services remained resilient during this time, possibly due to greater virtualisation of diagnostics and care.

Keywords: COVID-19, healthcare utilisation, medical claims data, health insurance

Strengths and limitations of this study

- This longitudinal study evaluated healthcare utilisation within a private healthcare sample over three years enabling insight into health seeking behaviours during the first COVID-19 wave.
- Real-world monthly claims data for both service type and diagnostic category was assessed enabling comparative analysis.
- The data was limited to a population that were privately insured within a country where the majority use the government funded National Health Service (NHS).
- Although costs were analysed it was not possible to confirm whether other variables such as medical inflation or contracted rates might have influenced the unit cost of care or frequency of claims.

Introduction

In the aftermath of the first wave of the novel coronavirus disease (COVID-19), it is clear the impact of the global pandemic on healthcare systems has been acute[1]. Most systems, regardless of location, have had to take immediate action ranging from rapid transitions to virtual care[2] to complete shutdowns. Fear of infection and reduced availability of healthcare services has led to reduced non-COVID healthcare utilisation worldwide. In Italy and Germany[3,4], paediatric ER visits dropped by as much as 64- 88% whilst heart attack treatment rates in the US decreased by 38% in some major hospitals[5].

In the UK, the first identified cases of COVID-19 were reported at the end of January 2020, but the first person-to-person transmission was only confirmed in late February[6]. On March 11th the World Health Organisation (WHO) declared the spread of COVID-19 a pandemic and measures were taken nationally to slow the spread and protect healthcare systems. A UK national lockdown started on March 23rd and the public were informed to only to leave their homes for specific reasons such as food shopping, travel to work, once daily exercise and urgent medical needs[6]. Further restrictions were imposed by mid-April[6].

In addition to limiting population movement, physical distancing outside of the home was also advised and this perhaps triggered the beginning of the changes in healthcare utilisation by individuals. When considering visiting a hospital or clinic, members of the public were now tasked with weighing their risk of travelling, as well as visiting a setting which was a potential hotspot for infection. From the provider perspective, there was a scramble to triage the most urgent, but also the least at-risk patients, for in-person consultation. The challenge of providing healthcare during a pandemic for those with compromised immune systems[7,8] has been a global issue. The short-term impact of COVID-19 has directly affected many individuals who have been infected, but also the wider population looking to access healthcare during this time[9].

In the UK, approximately 13% of consumers have private medical insurance[10]. There is little debate in relation to how severely most healthcare systems have been disrupted but the areas and services that have been able to adapt most effectively, often with the use of virtual care, may provide potential solutions for areas still lagging behind. This is especially critical at the moment as the UK is experiencing a second wave of COVID-19 infections and lockdown measures have been re-implemented[11]. In this study we sought to review trends in claims and costs for patient care collected over the past year up to the end of the first wave. The aim was to explore changes in how people were utilising care in comparison to previous years so as to assess overall stability. In the wake of the second wave of COVID-19, understanding where resources might be best directed could lead to an improved "non-COVID" healthcare response.

Methods

Study design and data sources

A longitudinal design was used to analyse frequency of healthcare service claims in the UK. A prepared dataset was obtained from a global insurance provider operating in the UK. As it was not raw data and had been prepared in advance, we did not have to contend with missing data. Data was extracted in the form of monthly total number of claims, monthly total claimants, monthly total enrolled membership, and provider billed costs for the period of January 2018 through to the end of August 2020. This data was then disaggregated into monthly totals by service area (e.g. physiotherapy or specialist consultation) and condition (e.g. musculoskeletal or mental disorders). For the frequency counts of monthly claims, it must be clarified that these do not represent medical encounters but instead a claim in a relevant pre-determined category according to the billing system of the insurance provider. As an example, someone requiring surgery may have claims in at least two categories according to service (e.g., theatre charges and surgeon fees) for only one medical encounter.

The data from 2018 and 2019 from the same relative time period were averaged and considered to represent a typical “pre-COVID-19” year. The data from 2020 were classified as the “COVID-19” year.

Patient and public involvement

Patients were not actively recruited for this study as it was secondary use of an existing dataset and it contained no identifying or personal information at any point. As it was analysed and processed anonymously, clients and the public were not directly involved in this study.

Statistical analysis

As the ratios for each month varied based on fluctuating membership, the monthly frequency of claims was calculated as the frequency of claims per 1000 enrolled members. This frequency was calculated by 1000 x [monthly number of claims total ÷ monthly membership] for monthly totals. The frequency for claims by service and condition categories was also calculated in the same way. Changes in frequencies between the “pre-COVID-19” year (January through August in 2018 and 2019 averaged) and the “COVID-19” year (January through August 2020) were calculated as a percentage based on the per 1000 incident rates. The calculation was [incident rate difference ÷ first incident rate] x 100. Finally, percentage of claimants and corresponding costs by month of enrolled members from 2018 to 2019 to 2020 were calculated based on monthly totals of enrolled. Inferential statistical tests were not used in our study because it was a descriptive analysis using longitudinal data from the whole population rather than a sample

Results

The mean age of the population was 42.1 ±11.5 years and 52.4% were males. Based on frequency of claims per 1000 enrolled members, monthly totals for the pre-COVID-19 year and the COVID-19 year can be seen in Table 1. Online supplementary material including a breakdown by service (Table S1) and condition (Table S2) at a monthly level is available. The biggest shift in claims frequency was directly after lockdown in the UK which started in late March. By the end of April, the rate of claims had decreased by almost 70% in comparison to the pre-COVID-19 years. To offer context, January and February 2020, reported slight increases and while March had a reported decrease in claims, it was only by 13%. The impact of COVID-19 was most prominent in April and continued through to August where the overall claims rate was 42% less (at a rate of 54.8 claims per 1000 enrolled members) than the previous year (which was 95.0 claims per 1000 enrolled members).

The biggest decreases of the year for claims can be seen in May when the most restrictions had been applied across the general population.

Table 1. Frequency of claims by month per 1000 enrolled members from 2018/2019* to 2020

Month	Pre-COVID-19 Year*	COVID-19 Year	Difference in Claims/1000 enrolled
January	194.0	215.7	11%
February	175.4	199.3	14%
March	189.3	165.1	-13%
April	167.7	51.7	-69%
May	180.3	50.2	-72%
June	165.7	73.5	-56%
July	158.8	100.5	-37%
August	95.0	54.8	-42%

***Average of 2018 and 2019**

In Table 2, monthly calculated percentage of claimants demonstrate the same trend. Claimant numbers as a percentage of the covered population were approximately the same across the pre-COVID-19 years and COVID-19 year, in January and February. This shifted in March 2020 and the percentage of claimants dropped for the first time (by 1%) compared to the pre-COVID-19 years. This decrease continued until May where a maximum decrease of 5% was recorded. Costs (in GB pounds) per claimant varied on a monthly basis across both pre-COVID-19 and COVID-19 years, but were not outside of the normal month-to-month variation seen in the pre-COVID period

Table 2. Percentage of population who were claimants and monthly costs per claimant for 2018/2019* and 2020

	Pre-COVID-19 Year*		COVID-19 Year		
Month	Claimants by %	Average cost per claimant	Claimants by %	Cost in £	Change in Claimants by %
January	6.2	£867	6.4	£851	**0.2**
February	6.1	£793	6.3	£798	**0.3**
March	6.4	£815	5.4	£829	**-1.0**
April	6.1	£753	2.0	£701	**-4.1**
May	6.4	£789	1.9	£818	**-4.5**
June	6.2	£782	2.7	£908	**-3.5**
July	6.2	£815	3.6	£906	**-2.6**
August	5.8	£797	3.4	£798	**-2.4**

***Average of 2018 and 2019**

Frequency of Claims by Condition

The total claims per 1000 enrolled members can be seen below in Table 3 as broken down by 16 condition areas. The largest decrease in claims by condition was seen for respiratory system diseases. This condition area decreased overall by almost 51% compared to previous years. Closely following this rate of decrease were conditions which all had decreases of over 40% (but less than 50%). These five conditions were general injury and/or poisoning (46%) and diseases of the circulatory (45%), nervous (44%), digestive (43%) and musculoskeletal (41%) systems. Other decreases over 20% (but under 40%) included conditions ranging from skin disease (38%) to endocrine, nutritional and metabolic conditions at 30%. After this, moderate to small decreases were found for categories including a vague "symptom, signs, ill-defined condition" group (19%), neoplasm (13%), blood diseases (9%) and unknowns categorised as "others" (3%). In contrast to all other conditions, pregnancy/childbirth and mental disorders increased overall in claims frequency by approximately 4% and 20% respectively.

When assessing rankings in Table 3, it can be seen that overall the top ranked conditions, stayed the same in the COVID-19 year compared to previous years. Both pre-COVID-19 and COVID-19 years had musculoskeletal disease, the general "symptoms, signs, ill-defined" category and neoplasm conditions with the highest incident rates per 1000 enrolled members. The real changes were more subtle with mental disorders moving up a place from 5th to 4th highest number of claims and a moderately larger gap between the top 4 conditions compared to all others. In the COVID-19 year this gap was larger with previous years having a difference of only 7 claims / 1000 enrolled members and the COVID-19 year having a difference of more than 45 claims / 1000 enrolled members.

Table 3. Frequency of claims by condition and change in percentage from 2018/2019* to 2020

Condition	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Respiratory system disease	26.5	13.0	-50.8
Injury & poisoning	89.4	48.1	-46.2
Circulatory system disease	36.3	20.0	-44.9
Nervous system disease	60.2	33.7	-44.1
Digestive system disease	74.2	42.3	-42.9
Musculoskeletal system disease	483.9	283.5	-41.4
Skin & subcutaneous disease	33.6	21.0	-37.6
Genitourinary system disease	96.6	62.4	-35.5
Infectious & parasitic disease	2.9	1.9	-35.1
Endocrine, nutritional, metabolic disease	10.4	7.3	-29.7
Symptoms, signs, ill-defined conditions	182.1	146.7	-19.4
Neoplasms	127.9	111.6	-12.8
Blood diseases	2.3	2.1	-8.7
Others	5.0	4.9	-2.9
Pregnancy, childbirth	4.6	4.8	**4.3**
Mental disorders	90.0	107.6	**19.6**

***Average for 2018 and 2019**

Frequency of Claims by Service

The total claims per 1000 enrolled members can be seen below in Table 4 as broken down by service (see supplementary file 2 for a brief description of service categories). The largest decrease in claims was in relation to theatre charges, which corresponds with restrictions to elective surgical procedures during this time. Closely following this was physiotherapy (48%), surgeon/anaesthetist services (47%), package pricing (44%) and accommodation/consumables (43%) categories, all of which are related to surgical intervention or in-person delivery of care.

The next group of decreases were relatively moderate, mostly ranging from 31-41%. The services included in this group were highly varied in type of claims and included chiropractic/osteopathy services (40%), cash benefits (35%) and specialist consultations (30%).. Of the areas that decreased from previous years, only specialist services and diagnostic services were less than 30%, with rates of 28% and 17% respectively. Finally, two service areas contrasted the other trends and increased in comparison to previous years for claims by service. Chemotherapy/radiotherapy increased by 13.6% overall and mental health services increased by 20% compared to previous years.

When assessing rankings in Table 4, the overall top ranked services were physiotherapy, specialist consultations, diagnostic services and surgeon/anaesthetist services. These were all over 100 claims/1000 enrolled members with only one of the group (i.e., surgeon/anaesthetist services) being under the 200 claims. Ranking for highest number of claims in the COVID-19 year were slightly different with four services over 100 claims/1000 enrolled but only one service (i.e., diagnostic services) over 200 claims which closely follows the general trend of decreased claims. The notable

group of psychiatric service that contrastingly increased during the COVID-19 year (by 20%) also rose up in the ranks from the 5thth to 4thth highest claim number with 108 claims/1000 enrolled.

Like the condition rates, changes within the group rankings overall were subtle with gaps between rankings being wider in the COVID-19 year versus the pre-COVID-19 year. During the pre-COVID-19 years the difference between rankings after the top 4-5 ranked services, was relatively gradual with no more than 25 claims difference between rankings and most commonly about 10 claims. During the COVID-19 year, this change with a strong divide between the top 4 ranked services, the lowest of which was 108 claims/1000 enrolled (i.e., psychiatric service) and the next rank down which was almost half that amount with 57 claims/1000 enrolled.

Table 4. Frequency of claims by service and change in percentage from 2018/2019 to 2020

Service	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Theatre charges	47.7	21.4	-55.2
Physiotherapy	282.5	147.4	-47.8
Surgeons and anaesthetist fees	107.7	57.3	-46.8
Package pricing	19.5	10.8	-44.3
Accommodation/consumables	61.6	35.1	-42.9
Others	33.3	19.7	-40.8
Chiro/osteopathy	50.6	30.4	-39.9
Cash benefit	23.0	15.0	-34.7
Treatment room charges	43.1	28.6	-33.8
GP consultations	2.2	1.5	-33.7
Specialist consultations	279.5	193.9	-30.6
Specialist fees	15.1	10.9	-28.1
Diagnostic services	250.7	208.9	-16.7
Chemotherapy/radiotherapy	19.0	21.6	13.6
Psychiatric	90.6	108.4	19.6

***Average of 2018 and 2019**

Discussion

The impact of COVID-19 has challenged healthcare systems worldwide. During the first wave of the pandemic the UK experienced the highest mortality rate in Europe, closely followed by Belgium, Italy, and Spain[1]. This study sought to explore the UK's response in healthcare utilisation as measured by frequency of claims submitted to a large private health insurer. Our aim was to tease out potential trends that might shed light on how the first wave impacted healthcare provision so as to potentially support response planning during subsequent waves.

Claims submitted in 2020, from January through August, which captured the build-up and completion of the first COVID-19 wave, were compared with the average of two previous years for the same time period. Our findings show that the trends in healthcare utilisation in the UK private sector reflect that which has been reported globally[12–14]. Our data show a sizeable drop in care utilisation for almost all services and diagnostic categories. The exception to this trend being for those with mental health and maternity needs, as well as those requiring chemotherapy and radiotherapy services.

During the first wave of the pandemic the UK's National Health Service and the private health sector worked in collaboration to ensure individuals received care based on clinical need, rather than funding origin. With many NHS hospitals focused solely on managing patients with COVID-19 private sector providers treated many NHS patients based on the agreed clinical necessity criteria. This meant that regardless of whether a patient had private insurance or not, all patients were triaged to access care in the same way. Our data could therefore be considered to be a reasonable representation of the impact of the pandemic on the different aspects of non-COVID care across the nation. Combined with public health measures (e.g., lockdown and masking) that potentially reduced the influenza season, this may in some part explain why the respiratory conditions showed the largest drop in utilization in this private healthcare analysis. Along the same lines, the category of injury (and poisoning) saw the second largest reduction, which may also have been influenced by lockdown measures severely limiting physical activities.

There has been much written in the scientific literature and popular press about how the pandemic, and the consequent reduction in care provision, has had a profound impact on the timeliness of diagnosing and treating may conditions, including cancer[15]. Our findings suggest that there was an appreciable reduction in new claims for neoplasms (12.8%), which is likely to reflect a delay in diagnosing individuals with cancer. However, we did see a relative increase in the number of claims for cancer treatment in the form of chemotherapy and radiotherapy, suggesting that those patients who already had a diagnosis at the time of lockdown were not impacted to the same degree.

Another area where substantial change in claims activity was seen is that of psychological and emotional health. Considerable concern has been raised in relation to mental health during the course of the pandemic, with the associated physical distancing and quarantining requirements exacerbating existing mental health issues and potentially contributing to new ones[16]. A recently published study comparing mental health trends longitudinally for over 40,000 participants found that by the end of April 2020, the quality of the mental health of adults in the UK had decreased in comparison to pre-

COVID-19 years[17]. Our research very much supported this across claims in both the conditions and services categories. Under the condition category of mental disorders and under the service category of psychiatry, rates of claims at the start of the year were found to be slightly higher than previous years, but unlike other years, the trend did not decrease. In contrast to almost all other claim areas by April both categories had increased compared to pre-COVID-19 years. This is perhaps the most poignant take away for future risk management within healthcare. While better treatment strategies for hospitalised COVID-19 patients are being developed and early vaccine results are promising[18,19], the deterioration of mental health appears to be widespread[17] regardless of infection status. It is worth noting that remote delivery of psychological consultations and therapies was commonplace in the private healthcare sector, even before the pandemic, and it appears that this was rapidly "ramped up" to meet the burgeoning demand during this period.

As many countries have now entered a second wave of COVID-19 infections and have re-implemented societal restrictions, it is clear that care for individuals with non-COVID health issues will continue to be impacted. Virtual care delivery may help plug some of the diagnostic and treatment gaps that will inevitably occur until widespread vaccination can be delivered.

Strengths and limitations

A strength of this study is the longitudinal nature of the data that were collected and which allowed for a stronger comparative analysis. As well, the ability to look at this data as both service type and diagnostic category offered insight into what was driving any changes in trends and which areas were impacted most. In contrast, a weakness of this study is that it was limited to a population with private health insurance within the UK specifically, with our ability to generalise findings to the broader population unclear. While it is essential to have quantitative data addressing objective health behaviours (i.e., submitted healthcare claims), ideally qualitative data in relation to what motivated people to change their health seeking behaviours would also have been advantageous. As it stands, the data was only able to offer a descriptive snapshot of this unique time period and without more granular information in relation to potential confounding variables, a more complex analysis was not possible.

Conclusions

Overall, our findings reflect the direct impact of COVID-19 on healthcare delivery systems across the UK, with a sudden decrease in utilisation being observed in April and May immediately following the implementation of lockdown measures. The steady recovery after this time up until August indicates a level of resilience for all types of service. As we enter the second wave of COVID-19 infections we have a real opportunity to strengthen the provision of non-COVID care across all service and diagnostic categories. The relative success of the provision of psychological healthcare services is a potential blueprint for others to use so that traditional face-to-face care is augmented, and potentially sometimes replaced, by virtual delivery methods.

References

1. Kontis, V. *et al.* Magnitude, demographics and dynamics of the effect of the first wave of the COVID-19 pandemic on all-cause mortality in 21 industrialized countries. *Nat. Med.* 1–10 (2020) doi:10.1038/s41591-020-1112-0.
2. Mehrotra, A., Ray, K., Brockmeyer, D. M., Barnett, M. L. & Bender, J. A. Rapidly Converting to 'Virtual Practices': Outpatient Care in the Era of Covid-19. (2020) doi:10.1056/CAT.20.0091.
3. Lazzerini, M. *et al.* Delayed access or provision of care in Italy resulting from fear of COVID-19. *The Lancet Child and Adolescent Health* vol. 4 e10–e11 (2020).
4. Happle, C. *et al.* Covid-19 Related Reduction in Paediatric Emergency Healthcare Utilization – A Concerning Trend. 1–14.
5. Garcia, S. *et al.* Reduction in ST-Segment Elevation Cardiac Catheterization Laboratory Activations in the United States During COVID-19 Pandemic. *Journal of the American College of Cardiology* vol. 75 2871–2872 (2020).
6. Flynn, D. *et al.* COVID-19 Pandemic in the United Kingdom. *Heal. Policy Technol.* (2020).
7. Alromaihi, D., Alamuddin, N. & George, S. Sustainable diabetes care services during COVID-19 pandemic. *Diabetes Res. Clin. Pract.* **166**, 108298 (2020).
8. Guzman, R. De & Malik, M. Dual Challenge of Cancer and COVID-19 : Impact on Health Care and Socioeconomic Systems in Asia Paci fi c special articles abstract. *JCO Glob. Oncol.* **6**, 906–912 (2020).
9. Deepthi, R., Mendagudali, R., Kundapur, R. & Modi, B. Primary Health Care and COVID-19 Pandemic. *Int. J. Heal. Syst. Implement. Res.* **4**, 20–29 (2020).
10. Farmer, A. Healthcare : NHS versus private What do you think ? *yougov.co.uk* 1–6 (2020).
11. Karlsson, U. & Fraenkel, C. Covid-19 : risks to healthcare workers and their families Mistakes made in the first wave must not be repeated in the second. *BMJ* **371**, 1–2 (2020).
12. Liang, Y. *et al.* Symptoms, management and healthcare utilization of copd patients during the COVID-19 epidemic in Beijing. *Int. J. COPD* **15**, 2487–2494 (2020).
13. Kumar, R. & Singh Bhadoria, A. Covid-19: Estimation Of The Severity And Healthcare Utilization-A Model Based Analysis. *Int. J. Adv. Sci. Technol.* **29**, 15164–15171 (2020).
14. WHO. COVID-19 significantly impacts health services for noncommunicable diseases. (2020).
15. Maringe, C. *et al.* Articles The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England , UK : a national , population-based , modelling study. *Lancet Oncol.* **21**, 1023–1034 (2020).
16. Giallonardo, V. *et al.* The Impact of Quarantine and Physical Distancing Following COVID-19 on Mental Health : Study Protocol of a Multicentric Italian Population Trial. **11**, 1–10 (2020).
17. Pierce, M. *et al.* Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry* **7**, 883–892 (2020).
18. Callaway, E. What Pfizer ' s landmark COVID vaccine results mean for the pandemic. *Nature* 1–8 (2020).
19. NIH (National Institutes of Health). Promising Interim Results from Clinical Trial of NIH-Moderna COVID-19 Vaccine. 1 (2020).

Footnotes

Contributors: AH and PRM conceived and designed the study. MM extracted and supported data preparation. AH, PRM and AT performed the data analysis and AH and PRM drafted the first version of the manuscript. All authors critically reviewed the manuscript and approved the final version.

Funding: The authors have not declared a specific grant for this research from any funding agency in the public or not-for-profit sectors. This work was funding by Cigna Europe & Global Segments.

Competing interests: All authors are either directly employed or contracted by Cigna Europe & Global Segments.

Patient consent for publication: Not required.

Ethics approval: Ethical approval was not required as no patient-specific information was collected.

Data availability statement: The data generated and analysed during the present study are only for private use and are not publicly available.

Table S1. Frequency of claims by condition data per 1000 enrolled members from 2018 to 2019* to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Musculoskeletal system	Pre	70.8	64.6	68.6	60.9	64.8	60.2	58.3	35.8
	Post	73.4	68.2	51.8	9.4	10.4	19.4	31.9	19.0
Symptoms, signs, & ill-defined conditions	Pre	23.0	21.6	23.4	22.4	23.8	24.4	27.0	16.5
	Post	38.7	34.3	27.1	6.0	6.7	10.3	15.1	8.6
Neoplasms	Pre	19.5	17.2	18.7	16.1	16.5	15.4	15.5	9.0
	Post	20.5	18.2	19.1	10.2	11.0	13.3	13.4	6.0
Mental disorders	Pre	14.6	12.9	14.6	12.6	13.8	10.2	7.9	3.3
	Post	18.8	18.1	19.4	16.1	10.8	10.7	9.7	4.0
Genitourinary	Pre	13.8	13.0	13.9	12.4	13.1	12.2	10.9	7.3
	Post	14.7	13.7	10.8	2.6	2.9	5.3	7.7	4.6
Injury & poisoning	Pre	13.5	12.2	12.9	11.7	12.4	11.1	9.8	5.7
	Post	11.2	10.8	9.7	2.2	2.1	3.8	5.8	2.6
Digestive	Pre	11.7	10.1	11.2	8.8	9.7	8.9	8.5	5.3
	Post	11.1	10.4	7.4	1.1	1.3	2.4	5.2	3.5
Nervous system	Pre	8.9	7.8	8.7	7.7	8.9	7.6	6.4	4.0
	Post	8.8	8.1	6.0	0.8	1.1	2.3	4.3	2.2
Circulatory	Pre	5.4	5.0	5.0	4.5	5.3	4.9	4.0	2.3
	Post	5.2	4.8	3.6	0.6	1.0	1.7	2.0	1.0
Skin & subcutaneous	Pre	5.0	4.1	4.8	4.2	4.9	4.1	4.2	2.4
	Post	4.7	4.9	4.0	1.2	1.1	1.7	2.3	1.2
Respiratory	Pre	4.1	3.7	3.7	3.3	3.8	3.4	3.0	1.5
	Post	4.1	3.5	2.4	0.3	0.5	0.6	1.0	0.7
Endocrine, nutritional & metabolic	Pre	1.5	1.3	1.4	1.3	1.4	1.3	1.3	0.9
	Post	1.7	1.4	1.5	0.3	0.3	0.6	0.9	0.5
Others	Pre	0.8	0.5	0.7	0.5	0.6	0.8	0.7	0.4
	Post	1.0	1.1	0.8	0.2	0.2	0.5	0.6	0.4
Pregnancy & childbirth complications	Pre	0.6	0.6	0.6	0.6	0.7	0.5	0.6	0.2
	Post	1.0	0.9	0.6	0.6	0.6	0.6	0.4	1.0
Infectious & parasitic	Pre	0.5	0.3	0.5	0.4	0.3	0.4	0.4	0.2
	Post	0.4	0.3	0.4	0.0	0.2	0.2	0.2	0.1
Blood	Pre	0.3	0.4	0.4	0.4	0.3	0.2	0.3	0.1
	Post	0.4	0.5	0.5	0.1	0.1	0.1	0.2	0.3

*Average for 2018 and 2019

Table S2. Frequency of claims by service data per 1000 enrolled members from 2018 to 2019 to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Specialist Consultations	Pre	40.4	36.1	39.2	35.8	37.4	36.1	34.2	20.3
	Post	43.0	39.3	33.8	10.9	11.3	17.7	23.7	14.3
Physiotherapy	Pre	39.6	37.0	40.7	36.7	38.2	34.3	34.9	21.3
	Post	38.3	37.9	27.3	6.5	6.1	9.2	13.9	8.2
Diagnostic	Pre	34.3	31.5	33.1	29.9	32.4	31.5	34.2	23.9
	Post	54.1	48.4	39.4	7.5	8.9	14.8	23.1	12.8
Surgeons/Anaesthetist Fees	Pre	16.9	14.7	15.6	13.5	14.6	13.9	12.3	6.2
	Post	16.0	14.1	11.2	1.2	1.3	3.1	6.9	3.5
Psychiatric	Pre	14.6	13.0	14.7	12.6	14.6	10.1	7.9	3.2
	Post	18.8	18.5	19.3	16.4	10.8	10.8	9.6	4.1
Accommodation/Consumables	Pre	10.2	8.6	9.1	7.4	7.9	7.6	6.6	4.1
	Post	8.1	7.6	6.5	1.8	2.9	2.6	3.8	1.8
Treatment Room Charges	Pre	7.5	6.4	6.9	5.7	6.3	6.3	5.3	3.3
	Post	5.9	5.6	4.3	0.3	0.3	0.9	2.7	1.4
Chiro/Osteopathy	Pre	7.2	7.1	7.8	6.9	7.4	6.4	5.2	2.6
	Post	7.5	6.5	4.7	0.4	1.5	3.5	4.5	1.9
Treatment Room Charges	Pre	5.9	5.4	5.8	5.2	6.0	5.4	5.6	3.8
	Post	6.7	6.6	5.1	1.1	1.0	2.2	3.6	2.3
Others	Pre	5.3	4.9	4.8	3.8	5.1	4.2	3.6	1.6
	Post	4.9	4.6	3.8	0.7	0.8	1.5	2.5	1.1
Package Pricing	Pre	2.8	2.6	2.7	2.4	2.6	2.4	2.5	1.5
	Post	3.3	2.7	2.2	0.2	0.1	0.5	1.2	0.7
Chemotherapy/Radiotherapy	Pre	2.8	2.5	2.9	2.3	2.5	2.2	2.3	1.4
	Post	2.3	2.8	3.0	2.6	2.9	3.8	2.4	1.7
Specialist Fees	Pre	2.2	1.9	2.2	2.0	2.1	1.8	1.8	1.0
	Post	2.3	1.9	1.8	0.9	0.8	1.2	1.3	0.6
GP Consultations	Pre	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.1
	Post	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.0

*Average for 2018 and 2019

Supplementary File 2. Brief Service Categories Description

Diagnostic Services

- Diagnostic services including pathology, x-rays, scans and any other appropriate tests.

Specialist Consultations

- Appointment with a consultant which took place either face-to-face or remotely.

Physiotherapy

- Physiotherapy treatment.

Psychiatric

- Mainly cognitive behavioural therapy but could include other psychiatric interviews, consultations and therapies.

Surgeons and Anaesthetist Fees

- Fees charged by a surgeon or anaesthetist as a result of a surgical procedure carried out.

Accommodation/Consumables

- The use of an inpatient or day case facility plus any drugs/dressings used during the stay.

Chiro/Osteo

- Treatment carried out by a chiropractor or osteopath.

Treatment Room Charges

- Charge for services carried out in a treatment room within a facility.

Theatre Charges

- Charge for use of an operating theatre including any theatre drugs.

Chemotherapy/Radiotherapy

- Treatment using cancer drugs.

Others

- Examples include surgical appliances, oncology and Discretionary Benefit Option (DBO). DBO is a reimbursement which Cigna has made, at the specific request of the client, for a claim which would normally fall outside the terms and conditions of the plan. The most common example of this is a surgeon/anaesthetist fee which is above the limit on the Cigna Fee Schedule and DBO is applied to cover part or all of the shortfall.

Cash Benefit

- A fixed amount that the insurer will pay to a member who elects to receive treatment in an NHS facility and, therefore, does not incur medical cost which would otherwise have been covered under the plan.

Package Pricing

- A combined charge for all elements of a hospital stay including accommodation, theatre charges, drugs/dressings and other associated costs. Surgeon/anaesthetist fees for the surgical procedure performed is not included in the package price.

Specialist Fees

- Fees charged by a specialist for services carried out.

GP Consultations

- A private consultation with a general practitioner.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2, 3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4-5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	NA
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, explain how loss to follow-up was addressed	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	5-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-8
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-048151.R2
Article Type:	Original research
Date Submitted by the Author:	20-Jun-2021
Complete List of Authors:	Howarth, Ana; Cigna Europe, Global Wellbeing Solutions; St George's University of London, Population Health Research Institute Munro, Morag; Cigna Europe Theodorou, Alf; Cigna Europe; NewCourse Mills, Peter R.; Cigna, Global Wellbeing Solutions; Whittington Hospital, Department of Respiratory Medicine
Primary Subject Heading:	Public health
Secondary Subject Heading:	Health services research
Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Trends in Healthcare Utilisation during COVID-19: A Longitudinal Study from the UK

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Abstract

Objective: The first wave of the COVID-19 pandemic had a major impact on healthcare utilisation. The aim of this retrospective review was to quantify how utilisation of non-COVID care changed during this time so as to gain insight and inform planning of future services during potential second and subsequent waves.

Methods and analysis: A longitudinal design was used to analyse anonymous private UK health insurer datasets covering the period of January 2018 to August 2020. Taken as a measure of healthcare utilisation in the UK, incidence rates of claims broken down by service area and condition were calculated alongside overall monthly totals and costs. Pre-COVID-19 years were compared to the current year.

Results: Healthcare utilisation during the first wave of COVID-19 decreased by as much as 70% immediately after lockdown measures were implemented. After two months, the trend reversed and claims steadily began to increase, but did not reach rates seen from previous years by the end of August 2020. Assessment by service and diagnostic category showed that most areas, especially those highly reliant on in-person treatment, reflected the same pattern (i.e., rapid drop followed by a steady recovery). The provision of mental health services differed from this observed trend, where utilisation increased by 20% during the first wave of COVID-19, in comparison to pre-COVID-19 years. The utilisation of maternity services and the treatment of existing cancers also stayed stable, or increased slightly, during this time.

Conclusions: Healthcare utilisation in a UK based privately insured population decreased dramatically during the first wave of the COVID-19 pandemic, being over 70% lower at its height. However, mental health services remained resilient during this time, possibly due to greater virtualisation of diagnostics and care.

Keywords: COVID-19, healthcare utilisation, medical claims data, health insurance

Strengths and limitations of this study

- This longitudinal study evaluated healthcare utilisation within a private healthcare sample over three years enabling insight into health seeking behaviours during the first COVID-19 wave.
- Real-world monthly claims data for both service type and diagnostic category was assessed enabling comparative analysis.
- The data was limited to a population that were privately insured within a country where the majority use the government funded National Health Service (NHS).
- Although costs were analysed it was not possible to confirm whether other variables such as medical inflation or contracted rates might have influenced the unit cost of care or frequency of claims.

Introduction

In the aftermath of the first wave of the novel coronavirus disease (COVID-19), it is clear the impact of the global pandemic on healthcare systems has been acute[1]. Most systems, regardless of location, have had to take immediate action ranging from rapid transitions to virtual care[2] to complete shutdowns. Fear of infection and reduced availability of healthcare services has led to reduced non-COVID healthcare utilisation worldwide. In Italy and Germany[3,4], paediatric ER visits dropped by as much as 64- 88% whilst heart attack treatment rates in the US decreased by 38% in some major hospitals[5].

In the UK, the first identified cases of COVID-19 were reported at the end of January 2020, but the first person-to-person transmission was only confirmed in late February[6]. On March 11th the World Health Organisation (WHO) declared the spread of COVID-19 a pandemic and measures were taken nationally to slow the spread and protect healthcare systems. A UK national lockdown started on March 23rd and the public were informed to only to leave their homes for specific reasons such as food shopping, travel to work, once daily exercise and urgent medical needs[6]. Further restrictions were imposed by mid-April[6].

In addition to limiting population movement, physical distancing outside of the home was also advised and this perhaps triggered the beginning of the changes in healthcare utilisation by individuals. When considering visiting a hospital or clinic, members of the public were now tasked with weighing their risk of travelling, as well as visiting a setting which was a potential hotspot for infection. From the provider perspective, there was a scramble to triage the most urgent, but also the least at-risk patients, for in-person consultation. The challenge of providing healthcare during a pandemic for those with compromised immune systems[7,8] has been a global issue. The short-term impact of COVID-19 has directly affected many individuals who have been infected, but also the wider population looking to access healthcare during this time[9].

In the UK, approximately 10.5% of consumers have private medical insurance[10]. There is little debate in relation to how severely most healthcare systems have been disrupted but the areas and services that have been able to adapt most effectively, often with the use of virtual care, may provide potential solutions for areas still lagging behind. This is especially critical at the moment as the UK has already experienced a second wave of COVID-19 infections where lockdown measures have been re-implemented[11] and there are concerns about preparing for a third wave. In this study we sought to review trends in claims and costs for patient care collected over the past year up to the end of the first wave. The aim was to explore changes in how people were utilising care in comparison to previous years so as to assess overall stability. In the wake of the second wave of COVID-19, understanding where resources might be best directed could lead to an improved “non-COVID” healthcare response.

Methods

Study design and data sources

A longitudinal design was used to analyse frequency of healthcare service claims in the UK. This was not longitudinal in the sense that the same individuals were followed over time, rather it was the fully insured served population from one UK private health insurer. A prepared dataset was obtained from this insurance provider operating in the UK. The health insurance provider is only one of two providers that offer only employer sponsored cover with no direct to consumer products. The businesses that make up the clientele predominately consist of corporate or white-collar employee organisations across the UK. As it was not raw data and had been prepared in advance, we did not have to contend with missing data. Data was extracted in the form of monthly total number of claims, monthly total claimants, monthly total enrolled membership, and provider billed costs for the period of January 2018 through to the end of August 2020. This data was then disaggregated into monthly totals by service area (e.g., physiotherapy or specialist consultation) and condition (e.g., musculoskeletal or mental disorders). For the frequency counts of monthly claims, it must be clarified that these do not represent medical encounters but instead a claim in a relevant pre-determined category according to the billing system of the insurance provider. As an example, someone requiring surgery may have claims in at least two categories according to service (e.g., theatre charges and surgeon fees) for only one medical encounter.

The data from 2018 and 2019 from the same relative time period were averaged and considered to represent a typical “pre-COVID-19” year. The data from 2020 were classified as the “COVID-19” year.

Patient and public involvement

Patients were not actively recruited for this study as it was secondary use of an existing dataset and it contained no identifying or personal information at any point. As it was analysed and processed anonymously, clients and the public were not directly involved in this study.

Statistical analysis

As the ratios for each month varied based on fluctuating membership, the monthly frequency of claims was calculated as the frequency of claims per 1000 enrolled members. This frequency was calculated by 1000 x [monthly number of claims total ÷ monthly membership] for monthly totals. The frequency for claims by service and condition categories was also calculated in the same way. Changes in frequencies between the “pre-COVID-19” year (January through August in 2018 and 2019 averaged) and the “COVID-19” year (January through August 2020) were calculated as a percentage based on the per 1000 incident rates. The calculation was [incident rate difference ÷ first incident rate] x 100. Finally, percentage of claimants and corresponding costs by month of enrolled members from 2018 to 2019 to 2020 were calculated based on monthly totals of enrolled. Inferential statistical tests were not used in our study because it was a descriptive analysis using longitudinal data from the whole population rather than a sample

Results

The mean age of the population was 42.1 (±11.5 years) ranging from 20 to 65 years with an average of 52.4% being males. While not being able to confirm exact membership enrolment or divulge employer details, as this is industry sensitive information, it is possible to report that the minimum average monthly membership was >260,000 with a maximum of just under 300,000. Based on frequency of claims per 1000 enrolled members, monthly totals for the pre-COVID-19 year and the COVID-19 year can be seen in Table 1. Online supplementary material including a breakdown by service (Table S1) and condition (Table S2) at a monthly level is available. The biggest shift in claims frequency was directly after lockdown in the UK which started in late March. By the end of April, the rate of claims had decreased by almost 70% in comparison to the pre-COVID-19 years. To offer context, January and February 2020, reported slight increases and while March had a reported decrease in claims, it was only by 13%. The impact of COVID-19 was most prominent in April and continued through to August where the overall claims rate was 42% less (at a rate of 54.8 claims per 1000 enrolled members) than the previous year (which was 95.0 claims per 1000 enrolled members).

The biggest decreases of the year for claims can be seen in May when the most restrictions had been applied across the general population.

Table 1. Frequency of claims by month per 1000 enrolled members from 2018/2019* to 2020

Month	Pre-COVID-19 Year*	COVID-19 Year	Difference in Claims/1000 enrolled
January	194.0	215.7	11%
February	175.4	199.3	14%
March	189.3	165.1	-13%
April	167.7	51.7	-69%
May	180.3	50.2	-72%
June	165.7	73.5	-56%
July	158.8	100.5	-37%
August	95.0	54.8	-42%

***Average of 2018 and 2019**

In Table 2, monthly calculated percentage of claimants demonstrate the same trend. Claimant numbers as a percentage of the covered population were approximately the same across the pre-COVID-19 years and COVID-19 year, in January and February. This shifted in March 2020 and the percentage of claimants dropped for the first time (by 1%) compared to the pre-COVID-19 years. This decrease continued until May where a maximum decrease of 5% was recorded. Costs (in GB pounds) per claimant varied on a monthly basis across both pre-COVID-19 and COVID-19 years, but were not outside of the normal month-to-month variation seen in the pre-COVID period

Table 2. Percentage of population who were claimants and monthly costs per claimant for 2018/2019* and 2020

	Pre-COVID-19 Year*		COVID-19 Year		
Month	Claimants by %	Average cost per claimant	Claimants by %	Cost in £	Change in Claimants by %
January	6.2	£867	6.4	£851	**0.2**
February	6.1	£793	6.3	£798	**0.3**
March	6.4	£815	5.4	£829	**-1.0**
April	6.1	£753	2.0	£701	**-4.1**
May	6.4	£789	1.9	£818	**-4.5**
June	6.2	£782	2.7	£908	**-3.5**
July	6.2	£815	3.6	£906	**-2.6**
August	5.8	£797	3.4	£798	**-2.4**

***Average of 2018 and 2019**

Frequency of Claims by Condition

The total claims per 1000 enrolled members can be seen below in Table 3 as broken down by 16 condition areas. The largest decrease in claims by condition was seen for respiratory system diseases. This condition area decreased overall by almost 51% compared to previous years. Closely following this rate of decrease were conditions which all had decreases of over 40% (but less than 50%). These five conditions were general injury and/or poisoning (46%) and diseases of the circulatory (45%), nervous (44%), digestive (43%) and musculoskeletal (41%) systems. Other decreases over 20% (but under 40%) included conditions ranging from skin disease (38%) to endocrine, nutritional and metabolic conditions at 30%. After this, moderate to small decreases were found for categories including a vague "symptom, signs, ill-defined condition" group (19%), neoplasm (13%), blood diseases (9%) and unknowns categorised as "others" (3%). In contrast to all other conditions, pregnancy/childbirth and mental disorders increased overall in claims frequency by approximately 4% and 20% respectively.

When assessing rankings in Table 3, it can be seen that overall, the top ranked conditions, stayed the same in the COVID-19 year compared to previous years. Both pre-COVID-19 and COVID-19 years had musculoskeletal disease, the general "symptoms, signs, ill-defined" category and neoplasm conditions with the highest incident rates per 1000 enrolled members. The real changes were more subtle with mental disorders moving up a place from 5th to 4th highest number of claims and a moderately larger gap between the top 4 conditions compared to all others. In the COVID-19 year this gap was larger with previous years having a difference of only 7 claims / 1000 enrolled members and the COVID-19 year having a difference of more than 45 claims / 1000 enrolled members.

Table 3. Frequency of claims by condition and change in percentage from 2018/2019* to 2020

Condition	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Respiratory system disease	26.5	13.0	-50.8
Injury & poisoning	89.4	48.1	-46.2
Circulatory system disease	36.3	20.0	-44.9
Nervous system disease	60.2	33.7	-44.1
Digestive system disease	74.2	42.3	-42.9
Musculoskeletal system disease	483.9	283.5	-41.4
Skin & subcutaneous disease	33.6	21.0	-37.6
Genitourinary system disease	96.6	62.4	-35.5
Infectious & parasitic disease	2.9	1.9	-35.1
Endocrine, nutritional, metabolic disease	10.4	7.3	-29.7
Symptoms, signs, ill-defined conditions	182.1	146.7	-19.4
Neoplasms	127.9	111.6	-12.8
Blood diseases	2.3	2.1	-8.7
Others	5.0	4.9	-2.9
Pregnancy, childbirth	4.6	4.8	**4.3**
Mental disorders	90.0	107.6	**19.6**

***Average for 2018 and 2019**

Frequency of Claims by Service

The total claims per 1000 enrolled members can be seen below in Table 4 as broken down by service (see supplementary file 2 for a brief description of service categories). The largest decrease in claims was in relation to theatre charges, which corresponds with restrictions to elective surgical procedures during this time. Closely following this was physiotherapy (48%), surgeon/anaesthetist services (47%), package pricing (44%) and accommodation/consumables (43%) categories, all of which are related to surgical intervention or in-person delivery of care.

The next group of decreases were relatively moderate, mostly ranging from 31-41%. The services included in this group were highly varied in type of claims and included chiropractic/osteopathy services (40%), cash benefits (35%) and specialist consultations (30%). Of the areas that decreased from previous years, only specialist services and diagnostic services were less than 30%, with rates of 28% and 17% respectively. Finally, two service areas contrasted the other trends and increased in comparison to previous years for claims by service. Chemotherapy/radiotherapy increased by 13.6% overall and mental health services increased by 20% compared to previous years.

When assessing rankings in Table 4, the overall top ranked services were physiotherapy, specialist consultations, diagnostic services and surgeon/anaesthetist services. These were all over 100 claims/1000 enrolled members with only one group (i.e., surgeon/anaesthetist services) being under the 200 claims. Ranking for highest number of claims in the COVID-19 year were slightly different with four services over 100 claims/1000 enrolled but only one service (i.e., diagnostic services) over 200 claims which closely follows the general trend of decreased claims. The notable group of psychiatric

service that contrastingly increased during the COVID-19 year (by 20%) also rose up in the ranks from the 5thth to 4thth highest claim number with 108 claims/1000 enrolled.

Like the condition rates, changes within the group rankings overall were subtle with gaps between rankings being wider in the COVID-19 year versus the pre-COVID-19 year. During the pre-COVID-19 years the difference between rankings after the top 4 to 5 ranked services, was relatively gradual with no more than 25 claims difference between rankings and most commonly about 10 claims. During the COVID-19 year, this change with a strong divide between the top 4 ranked services, the lowest of which was 108 claims/1000 enrolled (i.e., psychiatric service) and the next rank down which was almost half that amount with 57 claims/1000 enrolled.

Table 4. Frequency of claims by service and change in percentage from 2018/2019 to 2020

Service	Pre-COVID-19 Year*	COVID-19 Year	Change in %
Theatre charges	47.7	21.4	-55.2
Physiotherapy	282.5	147.4	-47.8
Surgeons and anaesthetist fees	107.7	57.3	-46.8
Package pricing	19.5	10.8	-44.3
Accommodation/consumables	61.6	35.1	-42.9
Others	33.3	19.7	-40.8
Chiro/osteopathy	50.6	30.4	-39.9
Cash benefit	23.0	15.0	-34.7
Treatment room charges	43.1	28.6	-33.8
GP consultations	2.2	1.5	-33.7
Specialist consultations	279.5	193.9	-30.6
Specialist fees	15.1	10.9	-28.1
Diagnostic services	250.7	208.9	-16.7
Chemotherapy/radiotherapy	19.0	21.6	13.6
Psychiatric	90.6	108.4	19.6

***Average of 2018 and 2019**

Discussion

The impact of COVID-19 has challenged healthcare systems worldwide. During the first wave of the pandemic the UK experienced the highest mortality rate in Europe, closely followed by Belgium, Italy, and Spain[1]. This study sought to explore the UK's response in healthcare utilisation as measured by frequency of claims submitted to a private health insurer. Our aim was to tease out potential trends that might shed light on how the first wave impacted healthcare provision so as to potentially support response planning during subsequent waves.

Claims submitted in 2020, from January through August, which captured the build-up and completion of the first COVID-19 wave, were compared with the average of two previous years for the same time period. Our findings show that the trends in healthcare utilisation in the UK private sector reflect that which has been reported globally[12–14]. Our data show a sizeable drop in care utilisation for almost all services and diagnostic categories. The exception to this trend being for those with mental health and maternity needs, as well as those requiring chemotherapy and radiotherapy services.

During the first wave of the pandemic the UK's National Health Service and the private health sector worked in collaboration to ensure individuals received care based on clinical need, rather than funding origin. With many NHS hospitals focused solely on managing patients with COVID-19 private sector providers treated many NHS patients based on the agreed clinical necessity criteria. This meant that regardless of whether a patient had private insurance or not, all patients were triaged to access care in the same way. Our data could therefore be considered to be a reasonable representation of the impact of the pandemic on the different aspects of non-COVID care across the nation. This means the data for this study did not include any COVID-19 related care utilization. Combined with public health measures (e.g., lockdown and masking) that potentially reduced the influenza season, this may in some part explain why the respiratory conditions showed the largest drop in utilization in this private healthcare analysis. Along the same lines, the category of injury (and poisoning) saw the second largest reduction, which may also have been influenced by lockdown measures severely limiting physical activities.

There has been much written in the scientific literature and popular press about how the pandemic, and the consequent reduction in care provision, has had a profound impact on the timeliness of diagnosing and treating may conditions, including cancer[15]. Our findings suggest that there was an appreciable reduction in new claims for neoplasms (12.8%), which is likely to reflect a delay in diagnosing individuals with cancer. However, we did see a relative increase in the number of claims for cancer treatment in the form of chemotherapy and radiotherapy, suggesting that those patients who already had a diagnosis at the time of lockdown were not impacted to the same degree.

Another area where substantial change in claims activity was seen is that of psychological and emotional health. Considerable concern has been raised in relation to mental health during the course of the pandemic, with the associated physical distancing and quarantining requirements exacerbating existing mental health issues and potentially contributing to new ones[16]. A recently published study comparing mental health trends longitudinally for over 40,000 participants found that by the end of

April 2020, the quality of the mental health of adults in the UK had decreased in comparison to pre-COVID-19 years[17]. Our research very much supported this across claims in both the conditions and services categories. Under the condition category of mental disorders and under the service category of psychiatry, rates of claims at the start of the year were found to be slightly higher than previous years, but unlike other years, the trend did not decrease. In contrast to almost all other claim areas by April both categories had increased compared to pre-COVID-19 years. This is perhaps the most poignant take away for future risk management within healthcare. While better treatment strategies for hospitalised COVID-19 patients are being developed and early vaccine results are promising[18,19], the deterioration of mental health appears to be widespread[17] regardless of infection status. It is worth noting that remote delivery of psychological consultations and therapies was commonplace in the private healthcare sector, even before the pandemic, and it appears that this was rapidly "ramped up" to meet the burgeoning demand during this period.

As many countries have now entered a second wave of COVID-19 infections and have re-implemented societal restrictions, it is clear that care for individuals with non-COVID health issues will continue to be impacted. Virtual care delivery may help plug some of the diagnostic and treatment gaps that will inevitably occur until widespread vaccination can be delivered.

Strengths and limitations

A strength of this study is the longitudinal nature of the data that was collected, which allowed for a stronger comparative analysis. As well, the ability to look at this data as both service type and diagnostic category offered insight into what was driving any changes in trends and which areas were impacted most. In contrast, a weakness of this study is that it was limited to a population with private health insurance within the UK specifically, with our ability to generalise findings to the broader population unclear. While it is essential to have quantitative data addressing objective health behaviours (i.e., submitted healthcare claims), ideally qualitative data in relation to what motivated people to change their health seeking behaviours would also have been advantageous. As it stands, the data was only able to offer a descriptive snapshot of this unique time period and without more granular information in relation to potential confounding variables, a more complex analysis was not possible.

Conclusions

Overall, our findings reflect the direct impact of COVID-19 on healthcare delivery systems across the UK, with a sudden decrease in utilisation being observed in April and May immediately following the implementation of lockdown measures. The steady recovery after this time up until August indicates a level of resilience for all types of service. As we enter the second wave of COVID-19 infections we have a real opportunity to strengthen the provision of non-COVID care across all service and diagnostic categories. The relative success of the provision of psychological healthcare services is a potential blueprint for others to use so that traditional face-to-face care is augmented, and potentially sometimes replaced, by virtual delivery methods.

References

1. Kontis, V. *et al.* Magnitude, demographics and dynamics of the effect of the first wave of the COVID-19 pandemic on all-cause mortality in 21 industrialized countries. *Nat. Med.* 1–10 (2020). doi:10.1038/s41591-020-1112-0
2. Mehrotra, A., Ray, K., Brockmeyer, D. M., Barnett, M. L. & Bender, J. A. Rapidly Converting to 'Virtual Practices': Outpatient Care in the Era of Covid-19. (2020). doi:10.1056/CAT.20.0091
3. Lazzerini, M. *et al.* Delayed access or provision of care in Italy resulting from fear of COVID-19. *The Lancet Child and Adolescent Health* **4**, e10–e11 (2020).
4. Happle, C. *et al.* Covid-19 Related Reduction in Paediatric Emergency Healthcare Utilization – A Concerning Trend. 1–14
5. Garcia, S. *et al.* Reduction in ST-Segment Elevation Cardiac Catheterization Laboratory Activations in the United States During COVID-19 Pandemic. *Journal of the American College of Cardiology* **75**, 2871–2872 (2020).
6. Flynn, D. *et al.* COVID-19 Pandemic in the United Kingdom. *Heal. Policy Technol.* (2020).
7. Alromaihi, D., Alamuddin, N. & George, S. Sustainable diabetes care services during COVID-19 pandemic. *Diabetes Res. Clin. Pract.* **166**, 108298 (2020).
8. Guzman, R. De & Malik, M. Dual Challenge of Cancer and COVID-19 : Impact on Health Care and Socioeconomic Systems in Asia Paci fi c special articles abstract. *JCO Glob. Oncol.* **6**, 906–912 (2020).
9. Deepthi, R., Mendagudali, R., Kundapur, R. & Modi, B. Primary Health Care and COVID-19 Pandemic. *Int. J. Heal. Syst. Implement. Res.* **4**, 20–29 (2020).
10. Thorlby, R. *Health System Overview: England*. (2020).
11. Karlsson, U. & Fraenkel, C. Covid-19 : risks to healthcare workers and their families Mistakes made in the first wave must not be repeated in the second. *BMJ* **371**, 1–2 (2020).
12. Liang, Y. *et al.* Symptoms, management and healthcare utilization of copd patients during the COVID-19 epidemic in Beijing. *Int. J. COPD* **15**, 2487–2494 (2020).
13. Kumar, R. & Singh Bhadoria, A. Covid-19: Estimation Of The Severity And Healthcare Utilization-A Model Based Analysis. *Int. J. Adv. Sci. Technol.* **29**, 15164–15171 (2020).
14. WHO. COVID-19 significantly impacts health services for noncommunicable diseases. (2020).
15. Maringe, C. *et al.* Articles The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England , UK : a national , population-based , modelling study. *Lancet Oncol.* **21**, 1023–1034 (2020).
16. Giallonardo, V. *et al.* The Impact of Quarantine and Physical Distancing Following COVID-19 on Mental Health : Study Protocol of a Multicentric Italian Population Trial. **11**, 1–10 (2020).
17. Pierce, M. *et al.* Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. *The Lancet Psychiatry* **7**, 883–892 (2020).
18. Callaway, E. What Pfizer ' s landmark COVID vaccine results mean for the pandemic. *Nature* 1–8 (2020).
19. NIH (National Institutes of Health). Promising Interim Results from Clinical Trial of NIH-Moderna COVID-19 Vaccine. 1 (2020).

Footnotes

Contributors: AH and PRM conceived and designed the study. MM extracted and supported data preparation. AH, PRM and AT performed the data analysis and AH and PRM drafted the first version of the manuscript. All authors critically reviewed the manuscript and approved the final version.

Funding: The authors have not declared a specific grant for this research from any funding agency in the public or not-for-profit sectors. This work was funding by Cigna Europe & Global Segments.

Competing interests: All authors are either directly employed or contracted by Cigna Europe & Global Segments.

Patient consent for publication: Not required.

Ethics approval: Ethical approval was not required as no patient-specific information was collected.

Data availability statement: The data generated and analysed during the present study are only for private use and are not publicly available.

Table S1. Frequency of claims by condition data per 1000 enrolled members from 2018 to 2019* to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Musculoskeletal system	Pre	70.8	64.6	68.6	60.9	64.8	60.2	58.3	35.8
	Post	73.4	68.2	51.8	9.4	10.4	19.4	31.9	19.0
Symptoms, signs, & ill-defined conditions	Pre	23.0	21.6	23.4	22.4	23.8	24.4	27.0	16.5
	Post	38.7	34.3	27.1	6.0	6.7	10.3	15.1	8.6
Neoplasms	Pre	19.5	17.2	18.7	16.1	16.5	15.4	15.5	9.0
	Post	20.5	18.2	19.1	10.2	11.0	13.3	13.4	6.0
Mental disorders	Pre	14.6	12.9	14.6	12.6	13.8	10.2	7.9	3.3
	Post	18.8	18.1	19.4	16.1	10.8	10.7	9.7	4.0
Genitourinary	Pre	13.8	13.0	13.9	12.4	13.1	12.2	10.9	7.3
	Post	14.7	13.7	10.8	2.6	2.9	5.3	7.7	4.6
Injury & poisoning	Pre	13.5	12.2	12.9	11.7	12.4	11.1	9.8	5.7
	Post	11.2	10.8	9.7	2.2	2.1	3.8	5.8	2.6
Digestive	Pre	11.7	10.1	11.2	8.8	9.7	8.9	8.5	5.3
	Post	11.1	10.4	7.4	1.1	1.3	2.4	5.2	3.5
Nervous system	Pre	8.9	7.8	8.7	7.7	8.9	7.6	6.4	4.0
	Post	8.8	8.1	6.0	0.8	1.1	2.3	4.3	2.2
Circulatory	Pre	5.4	5.0	5.0	4.5	5.3	4.9	4.0	2.3
	Post	5.2	4.8	3.6	0.6	1.0	1.7	2.0	1.0
Skin & subcutaneous	Pre	5.0	4.1	4.8	4.2	4.9	4.1	4.2	2.4
	Post	4.7	4.9	4.0	1.2	1.1	1.7	2.3	1.2
Respiratory	Pre	4.1	3.7	3.7	3.3	3.8	3.4	3.0	1.5
	Post	4.1	3.5	2.4	0.3	0.5	0.6	1.0	0.7
Endocrine, nutritional & metabolic	Pre	1.5	1.3	1.4	1.3	1.4	1.3	1.3	0.9
	Post	1.7	1.4	1.5	0.3	0.3	0.6	0.9	0.5
Others	Pre	0.8	0.5	0.7	0.5	0.6	0.8	0.7	0.4
	Post	1.0	1.1	0.8	0.2	0.2	0.5	0.6	0.4
Pregnancy & childbirth complications	Pre	0.6	0.6	0.6	0.6	0.7	0.5	0.6	0.2
	Post	1.0	0.9	0.6	0.6	0.6	0.6	0.4	1.0
Infectious & parasitic	Pre	0.5	0.3	0.5	0.4	0.3	0.4	0.4	0.2
	Post	0.4	0.3	0.4	0.0	0.2	0.2	0.2	0.1
Blood	Pre	0.3	0.4	0.4	0.4	0.3	0.2	0.3	0.1
	Post	0.4	0.5	0.5	0.1	0.1	0.1	0.2	0.3

*Average for 2018 and 2019

Table S2. Frequency of claims by service data per 1000 enrolled members from 2018 to 2019 to 2020

Service	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Specialist Consultations	Pre	40.4	36.1	39.2	35.8	37.4	36.1	34.2	20.3
	Post	43.0	39.3	33.8	10.9	11.3	17.7	23.7	14.3
Physiotherapy	Pre	39.6	37.0	40.7	36.7	38.2	34.3	34.9	21.3
	Post	38.3	37.9	27.3	6.5	6.1	9.2	13.9	8.2
Diagnostic	Pre	34.3	31.5	33.1	29.9	32.4	31.5	34.2	23.9
	Post	54.1	48.4	39.4	7.5	8.9	14.8	23.1	12.8
Surgeons/Anaesthetist Fees	Pre	16.9	14.7	15.6	13.5	14.6	13.9	12.3	6.2
	Post	16.0	14.1	11.2	1.2	1.3	3.1	6.9	3.5
Psychiatric	Pre	14.6	13.0	14.7	12.6	14.6	10.1	7.9	3.2
	Post	18.8	18.5	19.3	16.4	10.8	10.8	9.6	4.1
Accommodation/Consumables	Pre	10.2	8.6	9.1	7.4	7.9	7.6	6.6	4.1
	Post	8.1	7.6	6.5	1.8	2.9	2.6	3.8	1.8
Treatment Room Charges	Pre	7.5	6.4	6.9	5.7	6.3	6.3	5.3	3.3
	Post	5.9	5.6	4.3	0.3	0.3	0.9	2.7	1.4
Chiro/Osteopathy	Pre	7.2	7.1	7.8	6.9	7.4	6.4	5.2	2.6
	Post	7.5	6.5	4.7	0.4	1.5	3.5	4.5	1.9
Treatment Room Charges	Pre	5.9	5.4	5.8	5.2	6.0	5.4	5.6	3.8
	Post	6.7	6.6	5.1	1.1	1.0	2.2	3.6	2.3
Others	Pre	5.3	4.9	4.8	3.8	5.1	4.2	3.6	1.6
	Post	4.9	4.6	3.8	0.7	0.8	1.5	2.5	1.1
Package Pricing	Pre	2.8	2.6	2.7	2.4	2.6	2.4	2.5	1.5
	Post	3.3	2.7	2.2	0.2	0.1	0.5	1.2	0.7
Chemotherapy/Radiotherapy	Pre	2.8	2.5	2.9	2.3	2.5	2.2	2.3	1.4
	Post	2.3	2.8	3.0	2.6	2.9	3.8	2.4	1.7
Specialist Fees	Pre	2.2	1.9	2.2	2.0	2.1	1.8	1.8	1.0
	Post	2.3	1.9	1.8	0.9	0.8	1.2	1.3	0.6
GP Consultations	Pre	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.1
	Post	0.4	0.4	0.3	0.1	0.1	0.1	0.1	0.0

*Average for 2018 and 2019

Supplementary File 2. Brief Service Categories Description

Diagnostic Services

- Diagnostic services including pathology, x-rays, scans and any other appropriate tests.

Specialist Consultations

- Appointment with a consultant which took place either face-to-face or remotely.

Physiotherapy

- Physiotherapy treatment.

Psychiatric

- Mainly cognitive behavioural therapy but could include other psychiatric interviews, consultations and therapies.

Surgeons and Anaesthetist Fees

- Fees charged by a surgeon or anaesthetist as a result of a surgical procedure carried out.

Accommodation/Consumables

- The use of an inpatient or day case facility plus any drugs/dressings used during the stay.

Chiro/Osteo

- Treatment carried out by a chiropractor or osteopath.

Treatment Room Charges

- Charge for services carried out in a treatment room within a facility.

Theatre Charges

- Charge for use of an operating theatre including any theatre drugs.

Chemotherapy/Radiotherapy

- Treatment using cancer drugs.

Others

- Examples include surgical appliances, oncology and Discretionary Benefit Option (DBO). DBO is a reimbursement which Cigna has made, at the specific request of the client, for a claim which would normally fall outside the terms and conditions of the plan. The most common example of this is a surgeon/anaesthetist fee which is above the limit on the Cigna Fee Schedule and DBO is applied to cover part or all of the shortfall.

Cash Benefit

- A fixed amount that the insurer will pay to a member who elects to receive treatment in an NHS facility and, therefore, does not incur medical cost which would otherwise have been covered under the plan.

Package Pricing

- A combined charge for all elements of a hospital stay including accommodation, theatre charges, drugs/dressings and other associated costs. Surgeon/anaesthetist fees for the surgical procedure performed is not included in the package price.

Specialist Fees

- Fees charged by a specialist for services carried out.

GP Consultations

- A private consultation with a general practitioner.

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2
Objectives	3	State specific objectives, including any prespecified hypotheses	2, 3
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4-5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	NA
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	NA
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	NA
		(*b*) Describe any methods used to examine subgroups and interactions	NA
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, explain how loss to follow-up was addressed	NA
		(*e*) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	5-8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	5-8
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	10
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.