THE IMPACT OF COVID-19 ON UROLOGICAL CANCER: AN INTERNET SEARCH VOLUME ANALYSIS

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Abstract

Objectives: Health services have been disrupted due to Coronavirus disease 2019 (COVID-19). With patients, unable to access face to face healthcare, many turn to sources such as the Internet for health-related information. Other patients ignore all other health related issues and focus on the threat posed by a pandemic. This study sought to analyse the Internet health-seeking behaviour related to urological cancer of patients in the United Kingdom (UK) during the COVID-19 Pandemic. **Methods:** Internet search volumes over a 3-month period, during the UK pandemic, were analysed using Google Trends™ to obtain a search volume index (SVI) and compared to an equivalent pre COVID-19 period. The SVI measures relative search volume and was obtained for "Prostate Cancer", "Kidney Cancer", "Bladder Cancer" and Testicular Cancer" searches. **Results:** The average SVI for Prostate Cancer before the COVID-19 pandemic was 49.3, compared to 42.6 during the pandemic (p=0.001). Kidney cancer had an average SVI of 45.5 before the pandemic compared to 35.4 during the pandemic (p <0.001). Similar results were obtained for Bladder and Testicular Cancer. There was a 23% decrease in SVI for urological cancer searches during the pandemic compared to before the pandemic (p <0.001). **Conclusions:** The decline in searches for urological cancer during the pandemic may have implications. Patients maybe ignoring new cancer related symptoms which could result in late diagnoses, public health campaigns are required. Patients with cancer may not be utilising online resources available to them and healthcare professionals should reach out to patients at a time when face-face interaction is limited.

Keywords: urology; prostate cancer; cancer; telemedicine; ehealth; bladder cancer; kidney cancer; testicular cancer; public health

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic which originated in Wuhan (Hubei, China) in December 2019 has had a massive impact on global health. Severe Acute Respiratory Syndrome-Coronavirus-2 is responsible for causing COVID-19 with an illness ranging from mild to critical.[1] Common symptoms of the disease include, fever, cough, muscle aches and shortness of breath.[1] With many health systems around the world struggling to cope, there has been a change in the way in which other health conditions including cancers are dealt with.

The first coronavirus case was recorded in the UK on the 30th of January 2020, with 236,711 cases confirmed as of 16 May 2020.[2] Sir Simon Stevens, the chief executive of the National Health Service (NHS), wrote a letter on the 17th of March, outlining the NHS' response to the COVID-19 pandemic. In this letter, NHS providers were encouraged to start rolling out remote consultations, including the use of telephone and video services.[3] On the 23rd of March 2020, the UK Prime Minister Boris Johnson urged for people to stay at home and non-essential services were to be shut down, the so called "UK Lockdown".[4] The British Association of Urological Surgeons (BAUS) mentioned that outpatient pathways will need modification, with most follow ups being performed remotely.[5] They recommended only the most urgent cases to be managed on a face-to-face basis.[5]

A survey of 122 Italian oncologists during the COVID-19 pandemic revealed major changes in practice including patient triage and the use of telephone consultations, with 80% of oncologists resorting to telephone consultations to communicate with their patients.[6] In the United Kingdom (UK), there are an estimated 2.5 million people currently living with or having a history of cancer, with another 1,000 new diagnoses daily.[7] Prostate cancer is the most common urological cancer in the UK and accounts for 26% of all new male cancer diagnoses.[8] The incidence of prostate cancer is

anticipated to increase by 12% to around 233 cases per 100,000 males by 2035. Renal cancer is the second most common urological malignancy, with 36 new diagnoses a day and four in ten cases in England presenting at a late stage raising a public health concern as 34% of cases are preventable.[7]

Since the dawn of the century, the Internet has become increasingly used as a resource for patients, including those with new symptoms and those with a pre-diagnosed condition such as a cancer.[9] This resource can provide a wealth of information to a patient to help them better understand their illness. With various community support groups available on the Internet, many cancer patients have benefited from peer support by being able to talk with people in a similar position.[10] Public health informatics methods such as 'infodemiology' and 'infoveillance' can be used to analyse search behaviour on the Internet. Eysenbach devised the term infodemiology, which refers to *the science of distribution and determinants of information in an electronic medium, specifically the Internet, or in a population, with the ultimate aim to inform public health and public policy*.[11] With limited access to face to face health provision because of the COVID-19 pandemic, many patients will and have been resorting to the Internet as their port of call for medical information.

The aim of this study was to analyse the health information seeking behaviour of the UK population in pursuing cancer related information on urological cancers by analysing Internet search data using Google Trends[TM].

Methods

Google, is currently the prominent Internet search engine worldwide.[12] All searches using Google are indexed and can be analysed using Google Trends[TM]. Google Trends[TM] is a tool which gives researchers the ability to study the patterns and trends of Google search queries.[13] Data from search engines can be useful in analysing Internet behaviour, with Google Trends[TM] having been shown to be a reliable tool to assess variations in human behaviour and gauge the public's interests.[14] When searching for a particular keyword on Google Trends[TM], the result indicating the popularity of that key word is returned as the "search volume index". This displays the number of searches during a particular period, for a specific word in comparison to the total number of searches performed on google during that time frame. This is ranked from 0 to 100, with 100 signifying the peak of that search term during that period. Therefore, a GoogleTrends™ search volume index of 25 signifies that search activity for a specific term was 25% of that seen at the time of peak search activity.[13]

The four most commonly occurring urological cancers were chosen to assess the Internet searching behaviour of the UK population during the Coronavirus Pandemic. These were; prostate cancer, kidney cancer, bladder cancer and testicular cancer. Cancer search terms (e.g. Prostate Cancer) were input into Google Trends[TM] for each urological cancer to bring up the search volume index for each search term. Search filters, were used to limit the data to searches carried out within the United Kingdom over a three month period from 30th of January 2020 to 30th of April 2020. As a comparator, the same time frame from 30th January 2019 to 1st of May 2019 (to account for the leap year in 2020) was used to compare the impact of COVID-19 on the health information seeking behaviour of the UK population. Statistical analysis was performed using an independent samples t-test to establish any significant differences between the two study periods, with alpha set at 5%. Descriptive statistics are presented as the mean and one standard deviation.

Results

The average search volume index for prostate cancer between the 30th of January to the 1st of May 2019 was 49.3 ± 9.6, with the highest peak of search interest (SVI=68) being seen in April. During the Coronavirus pandemic, the average SVI was 42.6 ± 17.2. Regional variation was evident in search terms for Prostate Cancer between the 30th of January to the 30th of April 2019 with Wales having an SVI of 100, with both Northern Ireland and Scotland at the bottom end of the scale with an SVI of 80. Figure 1 illustrates the trend in the SVI for the query, "Prostate cancer" over the last 12 months with a notable dip from February 2020 until the end of April 2020.
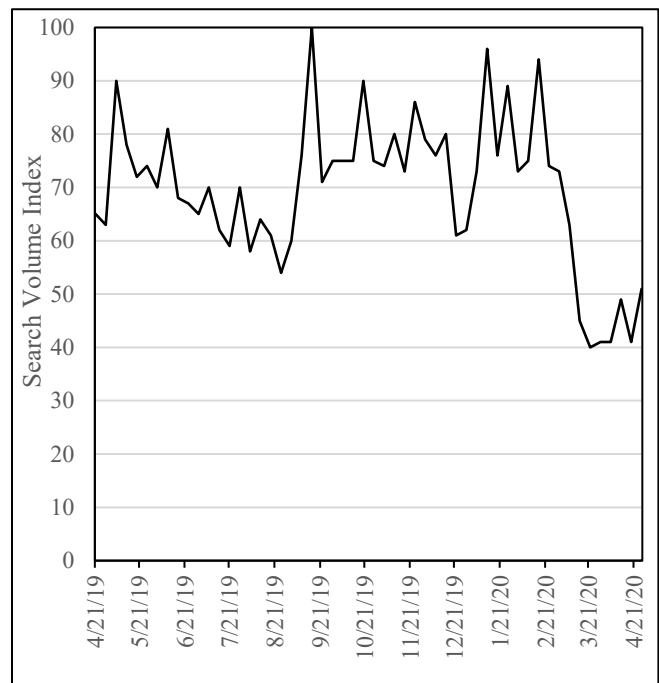

Figure 1. United Kingdom: Prostate Cancer search volume index over 12 months.

For Kidney cancer for the time frame 30th January 2019 to 1st May 2019 (prior to the Coronavirus pandemic), the average SVI was 45.5+19.4 and during the COVID-19 pandemic, the average SVI was 35.4+16.9. There was a statistically significant difference in SVI for kidney cancer searches, between these two dates of interest (p <0.001). A similar trend was seen with searches for bladder and testicular cancer. Table 1 illustrates the average search volume indexes obtained during the study period, whilst Table 2 illustrates the national variation in search volume indexes over the study period.

Table 1. Average SVI and standard deviation for the four cancers over the study period.

Cancer	Search Volume Index		P value
	Average SVI Pre-Coronavirus	Average SVI During Coronavirus	
Prostate	49.3+9.6	42.6+17.2	0.001
Kidney	45.5+19.4	35.4+16.9	<0.001
Bladder	55.2+16.6	40.4+18.0	<0.001
Testicular	43.5+16.3	30.6+11.2	<0.001

Discussion

The Internet is a useful tool for providing patients with information about medical conditions, with 93% of households in the UK having access to the Internet in 2019.[15] In 2013, the Pew Research Centre's Internet and American Life Project survey highlighted that 72% of Internet users had gone online to look up medical information.[16] This figure is likely to be higher at present given the increased availability of the Internet and the ongoing digital revolution. The nature of the Internet, allows for the easy availability of health-related information, however this information does need to be quality assured. Misinformation, on health-related topics is prevalent on the Internet and this can put patients at harm, with one survey of medical professionals estimating that 44% of patients had experienced problems related to information available on the Internet and 8% of patients coming to harm.[17] Despite these pitfalls, the Internet does remain a very valuable source of information for patients and especially so, for cancer patients who would like the most information, regarding their diagnosis.[18] A large population based study by Murray et al showed that 96% of patients using the Internet for information felt that the Internet had helped them better understand their condition.[19] The Internet is not only used for research at the time of diagnosis but at every stage of a patient's illness including treatment and follow up, with online communities also playing a vital role.[10]

Even with ever increasing availability of patient health resources on the Internet, there are still some patients who will seek health related information from their healthcare provider. A study analysing the health seeking behaviours of American citizens revealed that those patients with chronic conditions including cancer, were more likely to consult their healthcare provider rather than the Internet for information on their health.[20] This is also the case for the elderly, those with a lower socio-economic status and those with poor Internet skills.[20] With the advent of a health pandemic, the natural expectation would be that such patients would turn to the Internet for health information as it is more difficult to access face-to-face healthcare services, with the United Kingdom being in lockdown.

However, this study has shown a significant decrease in search activity on urological cancers during the COVID-19 pandemic when compared to a similar time frame in 2019 before the pandemic, (p <0.001). The average SVI for the four urological cancers in this study, pre-pandemic 30th of January to 1st of May 2019 was 48.4±16.4 compared to 37.2±16.6 during the pandemic. This could therefore suggest that patients already diagnosed with cancer, may not be looking for help regarding their disease as they could be focusing more on the coronavirus. High risk groups, more susceptible to COVID-19, have been identified and those with certain cancers are amongst this group of patients. These individuals have a higher chance of contracting COVID 19 and with a poorer prognosis.[21] This can therefore put a significant amount of stress on cancer patients, which can impact on their mental and physical wellbeing. It is thus of upmost importance that measures are in place to provide support to this group of patients during the time of a pandemic. Again, the significant drop in SVI for urological cancers during the COVID-19 pandemic, could also mean that patients with symptoms of new urological cancer are not looking online for symptoms which may be related to cancer. This raises concerns, as there is a fear that as people focus their health attention towards COVID-19, once the outbreak is over there will be an increase in the number of new cancer diagnoses and more worryingly, those presenting with late disease.[22] The National Health Service will therefore need to be prepared for such a scenario to ensure prompt diagnosis and treatment of such patients.

From a public health perspective, cancer patients may come to harm as they struggle to gain access to their healthcare providers during the COVID-19 pandemic, especially with many primary care services having been re-configured.[23] It is therefore important not to lose track of

Table 2. Variation in search volume by Nation.

Region	Prostate cancer		Kidney cancer		Bladder cancer		Testicular cancer	
	(2019)	(2020)	(2019)	(2020)	(2019)	(2020)	(2019)	(2020)
Wales	100	98	100	100	93	100	88	90
England	83	95	60	55	81	87	90	85
Northern Ireland	80	100	67	58	100	92	95	100
Scotland	80	100	80	72	87	98	100	84

patients in this group and one way of overcoming this, is through telemedicine. Telemedicine has been shown to be acceptable to cancer patients; has the potential of cost benefits for the healthcare provider and allows patients to stay in their homes avoiding the risks associated with a hospital visit, especially during a pandemic.[24] A Google Trends[TM] search for "Telemedicine" over the last 12 months, shows an increased search volume index, with a peak SVI of 100 seen in April 2020 during the COVID-19 pandemic and this was not seen in the prior 12 months (Figure 2).
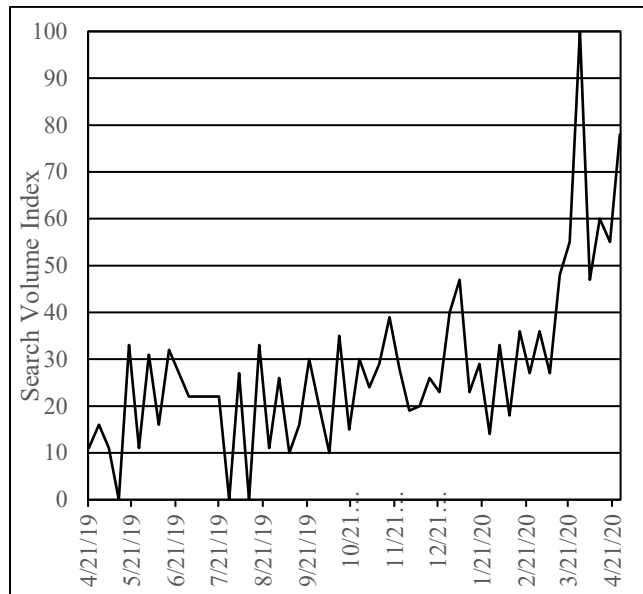

Figure 2. United Kingdom: Telemedicine search volume index over 12 months.

This may indicate the adaptability of healthcare providers, as they look at ways of maintaining patient contact. Telemedicine can be employed in a range of settings and has even been shown to be effective in an emergency setting during the COVID-19 pandemic.[25] Healthcare providers can therefore look at Telemedicine as one way of continuing healthcare delivery when face to face interactions are limited.

As the United Kingdom emerges from the COVID-19 pandemic, new ways of accessing and delivering healthcare will be required. The United States National Cancer Institute in 2006 stated "*behavioural measures are needed in the health care environment and in public health planning, to guide policy and communication planning*".[11] Thus, this study has used Google Trends[TM] to measure the public's behaviour during the COVID-19 pandemic, and has shown that there was a 23% decrease in searches for urological cancers over a three month period in 2020 at the height of the COVID-19 pandemic, compared to a similar pre-pandemic period in 2019. It is of upmost importance, that despite the presence of a pandemic, the public should not neglect the presence of other conditions which remain prevalent within the community and should continue to seek medical advice

from their healthcare professionals. Current evidence during the COVID-19 pandemic in the UK has shown a 25% drop in the number of urgent cancer referrals in England.[26] Presentations to the emergency department in England have dropped by one third during the COVID-19 pandemic and 18.7% of patients presenting with their first symptoms of cancer in England, present as an emergency.[27,28] Despite the Government's strong public health policy on the Coronavirus, campaigns should also be instigated, informing the public not to neglect symptoms of other diseases especially the re flag symptoms seen with malignancy.

This study has shown that Internet data can be used to predict trends in health behaviour. The lull in searches for urological cancer during this pandemic may be accompanied by a subsequent increase in the numbers of patients seeking help for cancer related queries after the pandemic, which could put a strain on health resources. For example, as the COVID-19 pandemic slows down, it is likely there will be a backlog of patients with new cancer symptoms requiring commencement of treatment, which can put a strain on resources.[22] Public Health policy makers can therefore use Internet data, to predict future health care needs and come up with solutions at an early stage, to keep the public engaged in their health and to avoid overstretching healthcare systems.[29,30]

Study limitations exist. The dataset has only been obtained from the United Kingdom, making generalisability of the study to other countries difficult. Also, although Google is the predominant search engine worldwide, there are other platforms which can be used to search for information and these have been excluded from the study.[12] Another limitation, is the lack of demographic data such as age and sex which cannot be obtained through Google Trends[TM]. Having such data would allow for a more streamlined focus to be given to certain healthcare users by being able to see which groups in society may need the most support during an unprecedented time such as the COVID-19 Pandemic.

Conclusion

This study has revealed a significant decrease in searches for Urological Cancer during the COVID-19 pandemic. With limited face to face healthcare provision during a pandemic, it is important that healthcare providers are still able to reach out to patients to maintain their physical and mental well-being. Telemedicine is being used to achieve this goal. In addition, the public should not ignore their broader health during a pandemic and public health campaigns must not only focus on the pandemic but must also address other health matters including cancer related symptoms and inform the public on seeking help from their healthcare providers.

This study has shown that Google Trends[TM] data can be used to assess the health seeking behaviour of the UK population. This approach could provide useful insights for

policy makers in public health promotion and determining the future needs of a healthcare system. With large volumes of data available on a real-time basis, Google Trends™ has the potential to be used for future health related research.

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