

DECLINE IN PUBLIC INTEREST FOR MOST BUT NOT ALL OF THE SPINAL DISEASES IN THE ERA OF COVID-19 PANDEMIC

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ABSTRACT

Introduction: The COVID-19 pandemic significantly changed public behaviors. Spinal disorders can affect the health care system through patients of all ages and social statuses. Most people are asked to stay at home. However, it is unknown how the public will respond. The purpose of this study was to evaluate the COVID-19 pandemic's impact on the Turkish population on spinal conditions by using Google Trends.

Materials and methods: Common spine-related conditions were categorized into 4 subgroups including pain (neck, back, and low back pain), deformity (scoliosis, kyphosis), degenerative conditions (spinal stenosis, disc herniation, spondylolisthesis), and trauma (vertebra fractures, spinal cord injury). These terms were translated into the Turkish local language. The Google Trends analysis was used to collect the data of all subgroups that were searched within "Turkey" from January 1, 2019, to December 31, 2020, at the "all categories" filter in "google web research".

Results: For 2019, "disc herniation" and for 2020, "low back pain" had the highest mean value of search volume. The most decline of the mean of search interest volume (SIV) was seen in "scoliosis" by %58,3 followed by 35,5% decline in back pain, 11,7% decline in "disc herniation". There was an increase in the mean rank of SIV for "vertebrae fracture" by 42,6% and "kyphosis" by 6,3%.

Conclusion: Public interest in most spine disorders decreased during the COVID-19 pandemic. However there were increases for trauma and kyphosis in the era of pandemic.

Keywords: COVID-19, coronavirus, spine, google trends, public interest.

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Introduction

COVID-19, which first appeared Wuhan, China in December 2019 spread worldwide in a short time, and on 11 March 2020, WHO declared the pandemic status of COVID-19^(1,2). In addition, Turkey announced its first case on the same day⁽³⁾. Since then, all countries have started to make some changes in economic, social life, health systems to decline the devastating effects of Coronavirus^(4,6). National health systems canceled or delayed the

elective procedures, closed the out-patients clinics to shift sources to Coronavirus and urgent/emergency conditions⁽⁷⁻⁹⁾. Patients who had no urgent conditions but reduced life quality tried to solve their problems by their means using the internet, telemedicine⁽¹⁰⁾.

Spinal disorders are musculoskeletal problems that affect the vertebral structure. Spinal pathologies are one of the substantial health care problems worldwide with 13-40% prevalence^(11,12). These are common reasons for the recourse to the health system in patients of all ages and social status. Also,

they are the main cause of morbidity, disability, psychological suffer⁽¹³⁾.

In Turkey, there are 59.6 million in 2019 (72%) and 67.07 million (74%) in 2020 internet users. People spent 7 hours 15 minutes per day in 2019 and 7 hours 29 minutes in 2020 on the internet. Google website was the most visited website with 1.177 billion and 2.226 billion entrance per month during 2019 and 2020 respectively^(14,15). Google trends was designed to analyze how often the search queries were researched. It provides information about in which areas of life, what kind of problems, the interest of the public on diseases^(17,18). It also has been used for several areas including, epidemics, orthopedic, urology, rheumatology, plastic, and facial surgeries⁽¹⁹⁻²²⁾. Therefore, in this study, we attempt to evaluate if there is any effect on the COVID-19 pandemic on the interest of people for spine-related disorders in Turkey by using Google Trends.

Methods

This study did not involve any human or animal participants, therefore ethics committee approval was not needed. This study included the COVID-19 topic, therefore mandatory application for permission of the Ministry of Health of Turkey was held and approved on 23 January 2021. Common spine-related conditions were categorized into 4 subgroups including pain (neck, back, and low back pain), deformity (scoliosis, kyphosis), degenerative conditions (spinal stenosis, disc herniation, spondylolisthesis), and trauma (vertebra fractures, spinal cord injury). These terms were translated to the Turkish local language and searched (Table 1).

Key - word	Translated in Turkish
Back pain	Sirt ağrısı
Low back pain	Bel ağrısı
Neck pain	Boyun ağrısı
Scoliosis	Skolyoz
Kyphosis	Kifoz
Spinal stenosis	Kanal daralması
Disc herniation	Bel fıtığı
Spondylolisthesis	Bel kayması
Vertebrae fracture	Omurga kırığı
Spinal cord injury	Omurilik yaralanması

Table 1: Translation of searching terms in local language.

We also searched the COVID-19 term to show the course of population interest. Data of all subgroups were searched within "Turkey" from 1 January 2019 to 31 December 2020, at the "all categories" filter in "google web research." Results

were given as a graph on a scale from 0 to 100. A value of 100 means the highest search interest volume (SIV) for the terms that were queried within the filters, including the country, time-line, category. The data were reported weekly, and we converted them to monthly results by averaging. Finally, results were compared between 2019 and 2020 to rule out the seasonal factors and to detect the effect of the COVID-19 pandemic.

Statistical Analysis

The data distributions were checked with the Kolmogorov-Smirnov normality test in SPSS 22.0 (SPSS Inc., Chicago, IL). Continuous variables were reported by the mean and standard deviation (SD). The differences were compared using the independent-samples t-test for normally distributed data and the Mann-Whitney U test for the non-normally distributed data. Categorical data were represented as numbers and percentages (%). $p < 0,05$ considered to be statistically significant results.

Results

Mean values of all queries for 2019 and 2020 were listed in Table 2. Among all groups, "disc herniation" had the highest mean value of search volume in 2019, while in 2020 "low back pain". In this study, we observed the general decrease in the public interest to all categories at the beginning of the pandemic but then came back to approximate similar levels of last year.

Category	Mean Value ± Standard Deviation		95% Confidence Interval of the Difference	p
	2019	2020		
Pain				
Low Back Pain	77.3 ± 6	71.3 ± 7.8	0.1 - 11.9	0.04
Back Pain	75.6 ± 9	48.8 ± 15.5	16.1 - 37.6	<0.05
Neck Pain	67.6 ± 9.7	67.5 ± 7.9	6.3 - 12.2	>0.05
Deformity				
Scoliosis	66.8 ± 9.9	27.8 ± 7.2	31.6 - 46.3	<0.05
Kyphosis	45 ± 10.9	47.8 ± 8.5	5.4 - 11.2	0.48
Degenerative				
Disc Herniation	80.4 ± 5.9	71 ± 7	4 - 14.9	0.02
Spinal Stenosis	24.2 ± 10.8	21.6 ± 8.9	5.8 - 10.9	0.54
Spondylolisthesis	47.4 ± 8.6	45.4 ± 12.9	7.3 - 11.2	0.66
Trauma				
Vertebrae Fracture	22.2 ± 12.1	31.6 ± 16.5	2.8 - 21.7	0.12
Spinal Cord Injury	26.3 ± 14.4	24.2 ± 11.3	8.8 - 13.2	0.69

Table 2: Mean values and statistical differences of Search Interest Volumes presented to all queries comparing 2019 - 2020.

The most decline in the mean of SIV was seen in "scoliosis" by %58.3 followed by 35.5% in "back pain", 11.7% in "disc herniation". There was an increase in the mean of SIV for "vertebrae fracture" by 42.6% and "kyphosis" by 6.3%. "Back pain" was the only query that had reached the deepest value before 11 March 2020, the date of the first case in Turkey.

The search volume results of the pain subgroups were shown in Figure 1. There was a statistical difference in SIV of “low back pain” between 2019 and 2020 ($p=0.04$). SIV of “back pain” was declined by 35.5% during the pandemic period and then reached the approximate values of the same period of last year by 68.8% increase during the last two months of 2020. There was a statistical difference between both years ($p<0.05$).

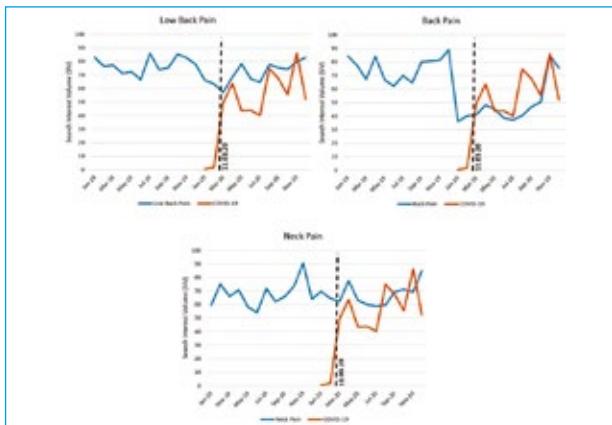


Fig. 1: The relative changes of “low back pain”, “back pain” and “neck pain” queries with bi-monthly data from Google Trends in Turkey for 2019 and 2020 years.

Interest in “neck pain” did not change for both years. Its volume has been parallel to the COVID-19 search volume.

The search volume results of the deformity subgroups were shown in Figure 2. Interest in “kyphosis” was more stable in the pandemic period than last year and the mean values were increased by 6.3% but not statistical difference was observed ($p=0.48$). After the declaration of the first case, the search of “scoliosis” has started to decline until the summer. In June 2020, it reached the highest value in the pandemic period but still 30% less comparing to the same period of 2019. The total mean value of “scoliosis” has been decreased by 58.3%.

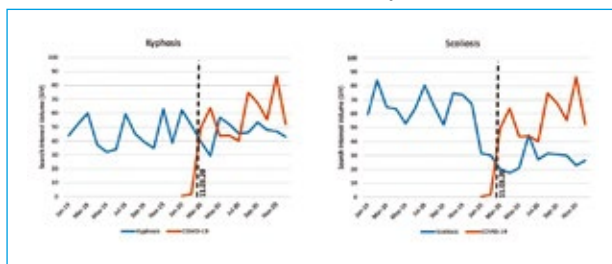


Fig. 2: The relative changes of “kyphosis” and “scoliosis” queries with bi-monthly data from Google Trends in Turkey for 2019 and 2020 years.

Search volume results of the degenerative subgroups were shown in Figure 3. SIV of “disc

herniation” was higher than SIV of “COVID-19” until the last two months of 2020. Search volume of “disc herniation” was declined by 27.3% between the dates of the first cases in China and Turkey. The difference between 2019 and 2020 for “disc herniation” was statistically meaningful ($p=0.02$). Google searches on “spinal stenosis” was always less than “COVID-19” but there was no statistical difference ($p=0.54$). The search for “spondylolisthesis” was declined by 65.1% from January to March, 2020. During the last quarter of 2020 it has continued steadily with no statistical difference ($p=0.66$).

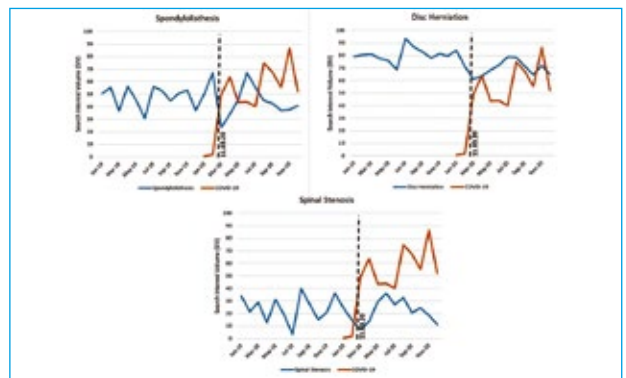


Fig. 3: The relative changes of “spondylolisthesis”, “disc herniation” and “spinal stenosis” queries with bi-monthly data from Google Trends in Turkey for 2019 and 2020 years.

Search volume results of the trauma subgroups were shown in Figure 4. The mean of SIV was increased in “vertebrae fracture” but decreased in “spinal cord injury”. These did not reveal any statistical difference ($p=0.12$ for fracture and $p=0.69$ for injury). Search volumes in “vertebra fracture” was decreased by 40% at the beginning of 2019 but increased 2.5 times in the 2020 same period. Then it increased at the beginning of summer for both years.

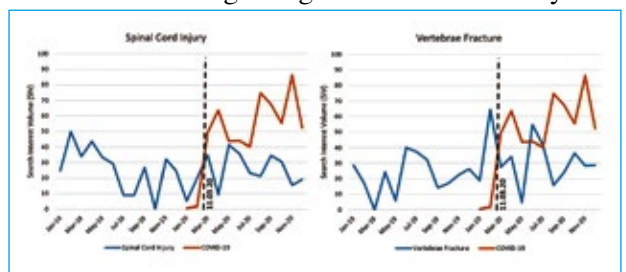


Fig. 4: The relative changes of “spinal cord injury” and “vertebrae fracture” queries with bi-monthly data from Google Trends in Turkey for 2019 and 2020 years.

Discussion

COVID-19 pandemic negatively affected the public interest of spine-related disorders except

“vertebrae fracture” and “kyphosis” in Turkish population.

People in Turkey have shown different reactions to “neck pain”, “low back pain” and “back pain”. Low back pain is one of the most common reasons for disability in life⁽²²⁾. This spine problem has a major concern for the health systems the whole population⁽²³⁾.

Şagát et al.⁽²⁴⁾ reported that the COVID-19 quarantine resulted in a significant increase in LBP intensity. On the other hand, “Low back pain” was always more popular than “COVID-19” during 2020 except in November. Because in November, the Ministry of Health decided to declare the total number of COVID-19 positive cases with or without symptoms. Furthermore, the number of cases had increased which resulted in new lockdowns and curfews. Then people’s attention shifted back to the pandemic topics again. During both two curfew periods in Turkey (April - June and November -continuing), the interest in “low back pain” increased. Therefore, it would be considered that the incidence of low back pain was increased during the quarantine period because of some reasons such as sedentary daily life, abnormal posture. Murat et al.⁽²⁵⁾ found that the back pain was the main spine related pain complaint of patients diagnosed with COVID-19. Interestingly search of “back pain” had dropped suddenly at the time interval between dates of the first cases in China and Turkey. Then it has increased suddenly at the second curfew period. Because, Center for Disease Control and Prevention (CDC) declared new symptoms including body or muscle aches of COVID-19 at the same period⁽²⁶⁾. Therefore, a sudden increase in “back pain” was no surprise. Neck pain is a widespread reason for disability⁽²⁷⁾. Interest in “neck pain” did not change while comparing the 2019 and 2020 years.

During the first curfew period, its trend had decreased but with the start of the summer season, it has increased again with the start of the summer season. We thought that during the quarantine, people wasted more time by using mobile phones that could affect the cervical posture. However, they did not seem aware of neck pain until passing to the mobilization because of immobilization.

Seasonal variations for the interest in spine deformities like scoliosis, kyphosis have been reported anecdotally on the internet, social media, or clinical experiences. Especially in summers parents generally detects children’s deformities during pool and sea activities. Marrache et al.⁽²⁸⁾ reported the

increased number of deformity surgeries in the USA during summer. In our study we detected that there was an increase in both “scoliosis” and “kyphosis” during summer and also reached the peak point for 2020 at the same period. Nevertheless t in “kyphosis” we did not see any dramatic dropped down comparing with “scoliosis”. We could explain this difference as kyphosis had been realized easier than scoliosis at home. Because scoliosis is suitable for overlooked until severe degrees have been reached.

We chose the most common ones for the degenerative spine conditions: disc herniation, spinal stenosis and spondylolisthesis⁽²⁹⁻³¹⁾. The popularity of “disc herniation” query results were expected. Because in the Turkish population, if you complain about the spine, the first thing that comes to mind is the disc herniation. Only last two months in 2020, “COVID-19” was higher but we know that the back pain had become popular at that time because of the declaration of possible symptom of COVID-19 by the CDC. Degenerative conditions of the spine could be affected by environmental conditions such as mechanical, structural, biological^(32,33). Stokes et al.⁽³⁴⁾ reported that abnormal loading conditions like immobilization could lead to degeneration of spine components. An increase in search volumes of degenerative spine conditions during curfew periods has shown that the people at home have researched the reasons for the spine complaints that had activated with immobilization.

All traumatic conditions about the spine are termed as spinal cord or vertebral fractures in the Turkish population. Therefore, we had to search for them separately. Similar up and downs periods for spinal cord injury and vertebrae fracture were expected results. Vertebrae fractures are related to impaired quality of life, negative effects on respiratory functions⁽³⁵⁾. It is common knowledge that fracture frequency increases in summer. Therefore, SIV of queries related to vertebral trauma was also increased during the summer periods and decreased during the quarantines. This situation was reflected in queries on Google search and our study confirmed that. Search volume of “vertebrae fracture” was increased in 2020 comparing to 2019. This condition may be due to the devastating effect of COVID-19 on the respiratory system. Besides, vertebral fractures are the one of the most common conditions affecting the respiratory system badly. Therefore, people naturally have showed more interest during the COVID-19 pandemic. This study had some limitations. First, we only used one source to provide the data. Google

trends give information only the population-level data not included demographic data like age, sex, etc. Moreover, these data are time interval analysis and other events that not considered in this study might be happened simultaneously.

Conclusion

Based on Google trends results, our study suggested that public interest in spine disorders except kyphosis and vertebrae fracture had been declined with the COVID-19 pandemic and changed according to the precautions to decrease the spread of Coronavirus. Scoliosis had the highest decrease rate by 58.3%, while disc herniation, neck pain, and low back pain did not lose any popularity against the COVID-19 pandemic. Curfews, new findings of COVID-19, and changing lifestyles have affected the public interest in spine disorders. Further studies are needed to evaluate the effects of spine disorders on public perception during the pandemic guide the physicians dealing with the spine to help to make ready for preparations.

References

- 1) Zhu N, Zhang D, Wang W, Li X, Yang B, et al. A Novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*.2020; 382(8): 727-733.
- 2) Timeline of WHO's response to COVID-19. (online). Website: <https://www.who.int/news-room/detail/29-06-2020-covidtimeline> Accessed January 19, 2021.
- 3) Çakmak G, Ceyhan E, Demirtaş Y, Berk H. The management of orthopedics and traumatology patients during SARS-CoV-2 pandemic. *Acta Orthop. Traumatol Turc*. 2020; 54(3): 223-227
- 4) Satiani B, Zigrang TA, Bailey-Wheaton JL. COVID-19 financial resources for physicians. *J Vasc Surg* 2020; 72: 1161-1165
- 5) Açıkgöz Ö, Günay A. The early impact of the Covid-19 pandemic on the global and Turkish economy Global threat of COVID 19 and evacuation of the citizens of different countries.*Turk J Med Sci*. 2020; 50(SI-1): 520-526
- 6) Tufan Koçak Z, Kayaaslan B. Crushing the curve, the role of national and international institutions and policy makers in COVID-19 pandemic. *Turk J Med Sci*. 2020; 50(SI-1): 495-508
- 7) Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Bio-Medica* 2020; 91: 157-160.
- 8) Paraiso MFR, Brown J, Abrão MS, et al. Surgical and clinical reactivation for elective procedures during the COVID-19 era: A global perspective. *J Minim Invasive Gynecol* 2020;27:1188-1195.
- 9) Jella TK, Samuel LT, Acuna AJ, Emará AK, Kamath AF. Rapid Decline in Online Search Queries for Hip and Knee Arthroplasties Concurrent With the COVID-19 Pandemic. *J Arthroplasty*. 2020; 35(10): 2813-2819
- 10) Dhanda AK, Leverant e, Leshchuk K, Paskhover B. A Google Trends Analysis of Facial Plastic Surgery Interest During the COVID-19 Pandemic. *Aesth Plast Surg* 2020;44:1378-1380
- 11) Dean LE, Jones GT, MacDonald AG, Downham C, Sturrock RD, et al. Global prevalence of ankylosing spondylitis. *Rheumatology (Oxford)* 2014; 53: 650-657
- 12) Hoy D, Bain C, Williams G, March L, Brooks P, et al. A systematic review of the global prevalence of low back pain. *Arthritis Rheum*. 2012; 64: 2028-2037
- 13) Green BN, Johnson CD, Haldeman S, Griffith E, Clay MB, et al. A scoping review of biopsychosocial risk factors and co-morbidities for common spinal Disorders. *PLoS ONE* 2018; 13(6): e0197987
- 14) Datareportal - Global Digital Insights (online). Website: <https://datareportal.com/reports/digital-2019-Turkey>. Accessed January 19, 2020.
- 15) Datareportal - Global Digital Insights (online). Website: <https://datareportal.com/reports/digital-2020-Turkey>. Accessed January 19, 2020.
- 16) Husain I, Briggs B, Lefebvre C, Cline DM, Stopytra JP, et al. Fluctuation of public interest in COVID-19 in the United States: Retrospective analysis of Google trends search data. *JMIR Public Health Surveill* 2020; 6: e19969.
- 17) Panuganti BA, Jafari A, MacDonald B, DeConde AS. Predicting COVID-19 incidence using anosmia and other COVID-19 symptomatology: Preliminary analysis using Google and Twitter. *Otolaryngology* 2020; 163: 491-497.
- 18) Kardeş S. Public interest in spa therapy during the COVID-19 pandemic: analysis of Google Trends data among Turkey. *Int J Biometeorol*. 2021; 13: 1-6.
- 19) Ginsberg J, Mohebbi MH, Patel RS, Brammer L, Smolinski MS, et al. Detecting influenza epidemics using search engine query data. *Nature* 2009; 457: 1012e24.
- 20) Pelat C, Turbelin C, Bar-Hen A, Flahault A, Valleron A. More diseases tracked by using Google Trends. *Emerg Infect Dis* 2009; 15: 1327e8
- 21) Seifter A, Schwarzwald A, Geis K, Aucott J. The utility of 'Google Trends' for epidemiological research: lyme disease as an example. *Geospat Health* 2010; 4: 135e7
- 22) Wu A, March L, Zheng X, et al. Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. *Ann Transl Med*. 2020; 8(6): 299. doi:10.21037/atm.2020.02.175
- 23) James SL, Abate D, Abate KH, Abay SM, Abbafati C, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018; 392: 1789-1858.)
- 24) Şagát P, Bartík P, Prieto González P, Tohánean DI, Knjaz D. Impact of COVID-19 quarantine on low back pain intensity, prevalence, and associated risk factors among adult citizens residing in riyadh (Saudi Arabia): A cross-sectional study. *Int J Environ Res Public Health*. 2020; 17(19): 7302.

- 25) Murat S, Kaaratekin Dogruoz B, Icagasioglu A, Ulasoglu C, İċten S, et al. Clinical presentations of pain in patients with COVID-19 infection. *Ir J Med Sci.* 2020; 14: 1-5
- 26) Symptoms of Coronavirus (CDC)(online). Website: <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>. Accessed January 19, 2021.
- 27) Murray CJ, Atkinson C, Bhalla K, Birbeck G, Burstein R, et al. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *JAMA* 2013; 310: 591-608
- 28) Marrache M, Harris AB, Puvanesarajah V, Sponseller PD. Seasonal Variation in the Volume of Posterior Spinal Arthrodesis Procedures for Pediatric Scoliosis. *Spine (Phila Pa 1976)*. 2020; 45(18): 1293-1298.
- 29) Carlson BB, Albert TD. Lumbar disc herniation: what has the Spine Patient Outcomes Research Trial taught us? *Int Orthop.* 2019; 43(4): 853-859
- 30) Koreckij TD, Fischgrund JS. Degenerative Spondylolisthesis. *J Spinal Disord Tech* 2015; 28: 236-241
- 31) Deyo RA. Treatment of lumbar spinal stenosis: a balancing act. *Spine J.* 2010; 10(7): 625-627
- 32) Choi YS. Pathophysiology of Degenerative Disc Disease. *Asian Spine J.* 2009; 3(1): 39-44
- 33) Marras WS, Davis KG, Ferguson SA, Lucas BR, Gupta P. Spine loading characteristics of patients with low back pain compared with asymptomatic individuals. *Spine* 2001; 26: 2566-2574
- 34) Stokes IAF, Iatridis JC. Mechanical Conditions That Accelerate Intervertebral Disc Degeneration: Overload Versus Immobilization. *Spine (Phila Pa 1976)*. 2004; 29(23): 2724-2732
- 35) Filippo LD, Formenti AM, Doga M, Pedone E, Rovere-Querini P, et al. Radiological Thoracic Vertebral Fractures are Highly Prevalent in COVID-19 and Predict Disease Outcomes. *J Clin Endocrinol Metab.* 2021; 106(2): e602-e614

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