

## COVID-19 and Knee Osteoarthritis Disability: 2022 Research Update and Commentary

Research Article

Ray Marks\*

Department of Health and Behavior Studies, Program in Health Education, Columbia University, Teachers College, New York, NY 100d27, USA.

### Abstract

Osteoarthritis, often an indirect aging indicator, produces considerable disability among older adults, especially when present at the knee joint. This mini review examines some emerging perspectives on how the various COVID-19 restrictions in response to the SARS-CoV-2 pandemic that emerged in late 2019, along with a persistent infection risk, plus ensuing long-COVID infection repercussions have potentially impacted the older community dwelling adult in the context of prevailing knee osteoarthritis disability.

Using multiple data bases, articles published largely in the time periods between 2020-2022 and carefully reviewed, revealed: 1) many older adults may be either at heightened risk or suffering more intently from knee osteoarthritis pain than in pre-pandemic times, 2) knee joint surgery may now be more challenging to access than in pre pandemic times, 3) high rates of opioid related deaths appear to have emerged, 4) some knee osteoarthritis cases appear to have improved in the face of COVID-19 social restrictions.

As such, it is concluded that whether in the community or being treated in hospital, not only does exposure to COVID-19 remain risky, especially in cases who may now weaker and more frail, but many current surgical cases as well as those previously managing their condition successfully may be more disabled than desired, especially if insightful ongoing preventive efforts to avert multiple interacting COVID-19 effects in the realm of osteoarthritis suffering are not duly forthcoming and carefully prioritized.

**Keywords:** Chronic Disease; COVID-19; Disability; Management; Knee Joint Osteoarthritis.

### Introduction

Osteoarthritis, the most common rheumatic disease [1], and one that is presently incurable, is largely a chronic albeit disabling non-fatal health joint condition with significant individual, social and economic ramifications, especially among older adults no matter where they reside [2]. Principally due to localized disruptions in the cartilage tissue lining located on the moving surfaces of the bones adjacent to or more freely moving joints, osteoarthritis often causes varying degrees of painful mechanical dysfunction [2] that can induce anxiety and depression [3], plus severely impair an individual's ability to function physically without compromise [3], especially at the knee joint, the most commonly affected joint [2]. Unfortunately, even though this topic has been studied profusely, in an effort to uncover its root causes [4], it appears that the global prevalence of osteoarthritis continues to increase as

shown by data indicating a rise of 113.25%, from 247.51 million cases in 1990 to 527.81 million cases in 2019, and among these increases were increases in disease prevalence as it occurs at knee joint [5], which has been shown to produce the highest disease burden among all affected joints [6].

At the same time, while strongly relied upon and useful in restoring function and ameliorating pain in severe cases of the disease, not all cases of knee osteoarthritis may be able to safely undergo artificial joint-replacement surgery, even if this is indicated, due to factors related to the overall health status of the individual, and more recently the added limitations imposed by the persistent COVID-19 pandemic and its ramifications for well established clinical and surgical practices. As well, efforts towards reducing the pain accompanying the disease by means of analgesic medication and/or non-steroidal anti-inflammatory drugs, often prove

#### \*Corresponding Author:

Ray Marks,

Department of Health and Behavior Studies, Program in Health Education, Columbia University, Teachers College, New York, NY 100d27, USA.

E-mail: [rm226@tc.columbia.edu](mailto:rm226@tc.columbia.edu)

**Received:** August 22, 2022

**Accepted:** August 26, 2022

**Published:** August 27, 2022

**Citation:** Ray Marks. COVID-19 and Knee Osteoarthritis Disability: 2022 Research Update and Commentary. *Int J Chronic Dis Ther.* 2022;8(1):123-130.

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ineffective or even harmful, and may thereby heighten the need by some for addictive pain relieving medications [7], which may be especially compounded in COVID-19 survivors [8]. Complication rates post-surgery that occur even in unrestricted times, may also be expected to be more prevalent in the future, including the risk for possible surgical prosthetic dislocations, joint as well as COVID-19 infections, and underlying bone fractures, among other challenges, and may not help most people with knee osteoarthritis who do not need surgery [9].

In seeking to assist people with osteoarthritis, who are frequently 60 years of age or older, and who must continue to meet the challenges of daily life as optimally as possible in the current post pandemic realm, and in light of the impacts of social restrictions on sedentary behaviours and others [10], this review sought to establish if more non operative upstream interventions including a wide array of adjunctive methods other than medications, or surgery might be helpful for reducing the current and projected knee osteoarthritis burden or in allaying the need for immediate surgery, mindful that many adults with this disease live alone, are in the higher age ranges, and are less likely to respond favourably to remote or technologically oriented social media therapy substitute approaches, or situations where social and tangible sources of support are persistently restricted. As outlined by Cisternas et al. [11], both in recent months, and as a result of the emergence of the COVID-19 pandemic in 2019, the American College of Surgeons and the U.S. Centers for Disease Control and Prevention officially recommended the delay of nonemergency procedures until the public health crisis is resolved. Since knee osteoarthritis is a progressive disease, this may require intense therapy without delay to avert excess joint damage as well as overall health declines [10], and increased risk for COVID-19 illness.

To this end, a comprehensive current approach may not only prove quite helpful for averting muscle wasting due to immobility, but also the extent of any prevailing comorbidities including depression, thereby rendering rehabilitation more effective at the time surgery, if this is forthcoming. A healthy older adult may also prove more resistant to the ongoing risk of infection from COVID-19 virus variants, and their implications for mediating chronic disabling pain, while increasing the need for addictive albeit palliative pain treatments as well as further modifications of any surgical procedures [11, 12], and possible services and processes [13]. Other benefits may lie in the lessening of any overt anxiety or frustration, sleep challenges and a lower than desirable motivation for exercise and self-care, plus a decline in self confidence, and weight management strategies.

In this regard, this paper sought to investigate the current status of the above-mentioned topics, and on the basis of available data, render any recommendations that might serve to optimize knee osteoarthritis adults' wellbeing and ability to recover optimally if surgery is needed, in the face of any ensuing COVID-19 service implications and personnel and resource restrictions.

### Specific Aim

This review aimed to examine what has been published to date relative to the 2019 COVID-19 pandemic in so far as the outcomes and overall impacts of the novel corona virus have strongly influenced hospital closures and others. A key question was

whether the extent of suffering incurred by those older adults with pre existing knee osteoarthritis living in the community as of August 15, 2022 was potentially impacted by COVID-19 and continues to be impacted. As such, the review sought to establish whether recommendations to either continue as in the past, or enact more mindful and broad based approaches for the older home bound adult with knee osteoarthritis of one or both joints who remain unable to receive face to face support community based and services.

### Methods

To address the study aims, all relevant publications listed on PUBMED, GOOGLE SCHOLAR, PubMed Central, plus PRE-PRINTS data bases that were relevant were deemed eligible. Key word included: Knee Osteoarthritis, COVID-19, Arthroplasty Surgery, Outcomes. All English based full length reports were duly scanned and selected if they focused on fulfilling the review aims. Excluded were studies pertaining to physical therapy, past systematic reviews that failed to discuss COVID-19, knee surgery outcome studies, and studies of young adults. A narrative of the salient points was then developed.

### Results

In all data bases, one overriding feature was the lack of attention to the impact of COVID-19 on the older adult with knee osteoarthritis, a disease associated with focal articular cartilage lesions, bone remodelling, and joint space narrowing. Most current studies in turn, focused predominantly on elective surgery impacts, or technological communication approaches for offering patient education and support over the 2020-2022 period. Others highlighted a need for more study in this regard, as well as caution, although not all.

As per Puntillo et al. [14] who aimed to analyze the impact of COVID-19 pandemic on chronic pain treatment and to address what types of strategies can be implemented or supported in order to overcome any imposed or persistent limitations in the availability of chronic pain patient care, although pain treatment has been described as a fundamental human right, the corona virus disease 2019 (COVID-19) and ensuing legal pandemic restrictions largely forced healthcare systems worldwide to redistribute healthcare resources toward intensive care units and other COVID-19 dedicated sites. As most chronic pain services were subsequently deemed non-urgent, all outpatient and elective interventional procedures were also largely reduced or interrupted in order to reduce the risk of viral spread at all costs. This widespread shutdown of pain services along with the home lockdowns imposed by governments must surely have affected many with chronic knee osteoarthritis pain negatively, among others, and probably had an additional impact on the patients' psychological health, as well as their overall health.

Unsurprisingly, a report by Cegla et al. [15] revealed changes in the biopsychosocial area were indeed experienced by those patients with a history of chronic pain consequent to the implementation of COVID restrictions, and this was duly observed to adversely affect their overall well-being. In this respect, chronically ill pain patients were said to be particularly affected by the lockdown, wherein a large number of these debilitated patients exhibited

an associated deterioration in mood and an aggravation of their chronic pain that was partially predicted by the associated deterioration in their pain management opportunities.

Morita et al. [16] who collected data from 6409 participants showed statistically significant differences in knee scores between the pre and post COVID-19 pandemic periods, wherein a low activity score was found independently associated with an increase in knee pain. It was concluded that the harmful effects of the COVID-19 pandemic on knee pain alone were significant and suggested affected or at risk adults be encouraged to engage in physical activities, such as walking, despite any prevailing state of emergency. Furthermore, social support for those economically disadvantaged groups with limited healthcare access was advocated in an effort to avert any possible acute exacerbations of knee pain, and what has been reported to have emerged post COVID-19, the possible impact of excess depression due to an increase in social disadvantage [17].

Barahona et al. [18] who conducted a cross-sectional simulation study designed to estimate the time it would take to recover the surgeries scheduled, but not performed in 2020 in Chile, found that the incidence rate of knee arthroplasty in 2020 decreased by 64% compared with 2019. The impact was higher in the public system (68%) and the National Health Fund (63%). The authors indicated a simulated increase in knee arthroplasty productivity by 30% would allow for the recovery of the postponed knee arthroplasty surgeries in 27 months, at a monthly cost to the public system of 318 million Chilean pesos (378 thousand US dollars). This indicates that there is a likely to be an extensive waiting period for people with knee osteoarthritis to be treated and offers a chance to intervene to ensure projected costs of surgery are not exceeded due to any worsening of the disease, possible acquisition of COVID-19 illness, a declining health status, and an excess degree of pain, and weight gain.

There may also be a need to help awaiting knee osteoarthritis surgical candidates to understand that careful selection of these body of patients must yet remain a priority for some time, and that simply exhibiting no personal COVID-19 fears is not a sufficient criterion for scheduling surgery [19], especially when confronted with a high risk of possible COVID infections, among those in the older age groups. Moreover, even though one group reported that elective joint replacement surgery was quite safe to resume with few constraints despite the COVID-19 pandemic, the fact that some cases awaiting surgery were already infected [20, 21], still indicates inpatient hospital unit costs, as well as less than optimal surgical outcomes cannot be overlooked [22], and may yet require very careful monitoring and additional precautions and patient education [21].

On the other hand, according to Ong et al. [23] disruptions to elective orthopedic care in March 2020 seemed to have had no major consequences on clinical outcomes for total knee joint arthroplasty patients, provided the usefulness of pre-pandemic post-discharge protocols is stressed, and there is an over-emphasis on in-person visits and physical therapy. However, this group mentioned that this modified post operative approach can still be expected to produce negative overall satisfaction among those patients with self-perceived complications [24], as well as those who fail to pursue adequate levels of physical activity, which may increase their risk for premature mortality in those with cardiovas-

cular disease [25]. The impact of surgery on older adults suffering from long COVID, and excess distress in response to COVID-19 is also not well studied at this point.

In addition, most current reports fail to highlight the possible persistence of pain among those who suffer neuropathic pain and that enter surgery [26], nor have any well developed prospective studies been conducted to identify the nature of any postoperative complications of knee osteoarthritis surgery due to depression consequent to prolonged suffering post COVID-19 [27], as well as possible reduced feelings of autonomy and unanticipated physical illness, anxiety and day to day challenges in the post pandemic period [27, 28]. There is recent evidence however, that even though there may yet be significant improvements in patient-reported outcomes and gait patterns post-surgery, those parameters still differ significantly from those of healthy volunteers. As well, it has been argued that the problem with dissatisfaction after operative treatment in the post pandemic period may not lie in the procedure itself, but many different factors may contribute to this, but these have not been studied to any degree to date, for example, the role of economics [29], and the overall burden of painful joints [30]. At the same time, many barriers to optimal non operative approaches remain, as well as their possible impact on surgical status and surgical rehabilitation processes, especially in light of COVID-19, including the lack of desired opportunities for group exercise approaches, hydrotherapy, outpatient therapy, and others [31].

As discussed by Green et al. [32], the time to surgery and length of hospital stay were significantly higher than in pre pandemic times following recommencement of elective orthopaedic services in the latter part of 2020 in comparison to a similar patient cohort from the year before. Importantly, the longer waiting times may have contributed to the clinical and radiological deterioration of the patient's arthritis and general musculoskeletal conditioning, which may in turn have affected their immediate postoperative rehabilitation and mobilization needs, as well as increasing their hospital stays. Harris et al. [33] too found their pre-operative patients worried about experiencing an altered treatment outcome due to postponed surgery and felt that their condition had deteriorated during the waiting period. Although this was not reflected in patient-reported outcomes in the face of COVID-19 according to Ong et al. [23], Kniebel et al. [34] found knee osteoarthritis candidates who experienced surgical delays that were COVID-19 related had more pain than those entering surgery in former times, while some exhibited signs of psychosocial distress.

Yet, according to Battista et al. [35], their knee osteoarthritis cases were found to be less than motivated to access first-line interventions for their conditions, such as therapeutic exercise, regardless of the restrictions dictated by the pandemic. However, a surprising finding by Larghi et al. [36] was that COVID-19, which profoundly changed lifestyles, and normal daily activities as well as regular surgical activity in patients affected by osteoarthritis, was that where adopted, the lifestyle changes imposed by the COVID-19 situation led to an improvement of the subject's clinical score. Alhassan et al. [37] however, conclude that those cases scheduled and desirous of surgery would still select to undergo surgery even if there was a danger of infection and possible worse than desired outcomes.

In another study, Rose et al. [38] noted that although some knee



osteoarthritis cases were able to maintain or recover their pre pandemic physical activity levels, many continued to show reduced activity levels many months into the pandemic. Similar variability was seen for sleep, pain, and mood outcomes that should not be ignored. This is because in light of the growing prevalence of knee joint osteoarthritis, a worsening of this condition, even in a small proportion of the population, could undoubtedly have a significant public as well as widespread social health impact according to these authors. It was hence suggested, strategies to identify individuals with knee osteoarthritis who exhibit or at risk for pursuing suboptimal physical activity levels and/or probable worse knee osteoarthritis symptoms than desired, should yet be targeted preferentially so that appropriate healthcare services can be directed towards these individuals. As well, those who were refused surgical treatment in 2019 [39], especially those with a current history of failed knee arthroplasty must surely be selectively targeted.

Moreover, since motivation for self care is not a given and is possibly diminished if one strongly believes in a future 'magic bullet' that affords wellbeing, more emphasis on efforts to maximize the sufferer's beliefs and misconceptions, especially where self-management approaches appear strongly indicated to avert probable increases in pain, distress, and dysfunction [34], along with any lowered physical activity participation levels, whether acquired during the recent lockdowns or not are strongly recommended [40]. Unsurprisingly, in absence of such efforts, this group showed adults already suffering knee osteoarthritis did tend to show a rapid progress of pain compared to those with hip osteoarthritis, and 79% of those surveyed stated they wished to have surgery as soon as possible.

In addition, prevailing data show a clinically relevant association between being isolated from multiple possible diverse intervention opportunities during the period of widespread COVID-19 movement restrictions and an increased risk of cardiovascular, autoimmune, and mental health problems, especially among older adults, even if they were not affected by knee osteoarthritis specifically, that must be acknowledged [41, 42]. Thus, in hindsight, even though it was clearly essential to reduce the spread of the virus in the community early on in the pandemic, it appears plausible to suggest that parallel health risk preventive strategies should have been urgently considered as well, in any effort to minimize the multiple unwanted health concerns that have since unfolded or may unfold in the face of any persistent social or self-isolation legal restrictions and their unintended ramifications, as well as long COVID-19 pain symptoms and others [8]. Finally, older adults may yet feel very apprehensive even if offered a well-structured physical therapy program, if their condition is not evaluated carefully, including the state of any affected joint [s], their overall health and emotional status, their tangible and available resources, and health literacy levels, among other knee osteoarthritis determinants [43]. The degree of their prevailing need, level of dysfunction, and presence of inflammation and joint instability that may render certain exercise efforts unsafe, or suboptimal, at best, should be especially sought and identified, and dealt with accordingly, regardless of waiting list status. To this end, engaging the patient in a personalized partnership where empathy, mutuality, and personal attributes of the patient are respected, and where valid information and misconceptions are openly discussed, and support is offered over time accordingly, may yet enable providers to secure the well being of many their older knee osteoarthritis

community dwelling patients in spite of the unintended COVID-19 consequences that have slowly unfolded without extinction.

## Discussion

This mini review that focuses on osteoarthritis of the knee joint, a common source of immense functional disability among a high proportion of older adults, clearly affirms that this disease remains largely incurable, albeit representing a growing societal burden among all aging populations, and despite decades of research. Moreover, the unanticipated 2019 COVID-19 pandemic, which affected many older adults, including those with knee osteoarthritis, may have done so, even if these sufferers have incurred no active COVID-19 disease. These negative impacts, which may have manifested in multiple ways in the face of COVID-19 social and physical distancing rules introduced quite stringently in many places during the height of the COVID-19 pandemic, may yet persist and may have since become more chronic than ever among those who developed excess pain, cardiovascular disease complications, negative cognitions, fear of movement and activity avoidance strategies, along with a higher than desirable body mass and muscle weakness consequent to the targeted and widespread public health focus on viral risk protection to the exclusion of other health issues deemed non urgent. This strategy to limit the viral spread was indeed implemented largely in isolation despite a call not to neglect the continuum of care of those patients suffering from one or more chronic diseases, including pain, and as such the many older adults with knee osteoarthritis who were either placed on surgical waiting lists or had their regular therapy services eliminated and could be expected to have incurred much excess suffering that may not yet have been addressed or examined thoroughly.

Indeed, the consequent impact on pain in its own right, plus COVID-19 infection risk and its impact on pain and mobility were not strictly focused on even though prior research strongly pointed to the adverse impact of social restrictions on older adult wellbeing, and especially on pathology at the knee joint [44], and the persistent musculoskeletal symptoms of pain in a fair proportion of those who succumbed to COVID-19 but survived [45].

Thus, even though knee osteoarthritis was subsequently found to be a strong predictor of COVID-19 in older adults in its own right, and the social and economic costs of delaying surgery for those already scheduled projected costs of hospital surgical closures alone were deemed to be immense [46], very few community wide efforts to advance the overall wellbeing of the home bound older adult were forthcoming, and where services prevailed, many were technologically oriented or conducted remotely, regardless of the older patient's level of health literacy, social support, and ability to access, trust, and utilize social media.

One reason for this delay in the context of elective surgery may have been the notion that this has no likely impact on a chronically disabled individual. Yet, this review and others, clearly shows widespread adverse impacts on knee osteoarthritis patients, and possibly families, as well as society in the long-run that can predictably prove highly damaging to health, irreversible, and costly. Most affected in the context of knee osteoarthritis was the generally observed decline in the subject's physical activity, as well

as their mental health status [47], that could increase the risk of knee muscle weakness, a known precursor of knee osteoarthritis [48], and along with associated increases in intramuscular fat could possibly foster downstream symptom worsening and knee replacement [49]. Moreover, since almost no follow up studies with sound designs have examined knee osteoarthritis post pandemic impacts and outcomes from a pathological point of view and others, and the importance of the fear of movement osteoarthritis severity predictor], which may have been increased in the isolation of the home is not well articulated [50], the actual costs of failing to consider knee osteoarthritis as a serious disease warranting attention, in spite of the pandemic isolation imperatives, will undoubtedly emerge over time.

Since older adults as with younger adults may have become dependent on having access to healthcare services in pre pandemic times, and do not understand their own poor lifestyle habits and negative health practices can markedly influence their overall health, well-being and mental health status, education in this regard is definitely indicated. Furthermore, information on COVID-19 may not have reached all patients appropriately [51, 52], thus without an effort in this regard, this vulnerable group may fail to understand the importance of preventing infection from this virus at all costs and especially in light of its possible multiple health implications, including long-term adverse impacts on pain production [53], plus physical inactivity that can jeopardize their musculoskeletal health, regardless of any limitations placed on surgical and day to day medical visits and their health affirming offerings and opportunities [54]. In particular, those patients with unremitting pain of any source may well have become increasingly susceptible to addictive substances including opioids, alcohol, as well as prescription and illegal drugs over the COVID-19 social restrictions period, as well as being unaware, misconceiving, or not appreciating this set of cascading downstream multiple health impacts, and the pressing need for timely continuous and optimal self management of their personal health.

As such, until 'normality' in the health service realm is restored, and to offer aging adults more profound life affirming health opportunities, it appears essential to begin to carefully address what older adults living in the community might need or do to effectively manage their knee osteoarthritis, and to especially help them to avoid recourse to opioids or an attitude that is one passively involving 'waiting' for some vicarious means of health restoration. [9, 55]. This idea is not just theoretical, but since it is unknown as to how long or in what way COVID-19 will persist, and the wait lists for knee replacement surgery even if resumed will probably remain excessive and delayed due to resource and manpower factors and possible prioritization of younger patients who need to return to the workforce for years to come [55], evidence that physical activity is protective against excess joint damage surely needs to be better exploited in this regard in the interim, even if certain patients are said to have adequately adjusted to their home bound restrictions and others [56]. As per Mobasher et al. [4] sufficient evidence points to the possible favourable impact of conservative knee osteoarthritis approaches in averting the need for at least some knee osteoarthritis surgical interventions, including patient education [57], especially if these are clear, well developed, and comprehensive [58] and personalized. There may also be more optimistic perspectives that will emerge over time through careful molecular, and genetic studies and others than can help restore joint health, and that can fill the osteoarthritis

treatment gaps more successfully, safely, permanently, and optimally than is possible at present in 2022 [59].

Approaches might include the use of:

- Adaptive equipment
- Environmental adaptations
- Controlled moderate exercise approaches
- Heat/cold applications
- Joint protection strategies
- Relaxation
- Walking
- Weight control [60]

Barriers to the practice of consistent self-management approaches that may need to be further addressed include, but are not limited to, possible: low motivation of those older adults with either minor or severe knee joint lesions, negative outcome expectations, recommendations that are too challenging, low self-efficacy beliefs, written instructions that are hard to follow, and subjective norms that favor injection or surgery and drugs and co-existing perceptions that education is not effective [61].

In sum, until the immense gaps in our understanding of the pathophysiology of osteoarthritis can be better understood, it appears reasonable to propose that efforts to offer aging adults more profound life affirming health opportunities to minimize the multi dimensional impact of the presence of knee osteoarthritis in the face of the post COVID-19 persistent pandemic is strongly indicated. Indeed, even if this is only to bridge the time lag to rescheduled surgery, as well as in the case where surgery is not feasible or indicated, it appears more essential than ever to carefully address what older adults living in the community might specifically need or do to effectively avoid excess injury as well as manage any ensuing or prevailing signs of knee joint osteoarthritis, and to help vulnerable sufferers to avoid recourse to opioids or an attitude that is one passively involving 'waiting' alone in the hope of receiving some vicarious extrinsic means of attaining or restoring their optimal health in the future.

Moreover, and from a possible preventive perspective, some attention to the misconceptions of adults suffering from knee osteoarthritis as to the effectiveness of joint replacement surgery, the fact rehabilitation following surgery is strongly indicated, and the idea the disease is one of inevitable degeneration, along with insightful evidence based efforts to revisit the validity of the belief that knee joint arthroplasty surgery is a non essential form of intervention that can well be delayed without any significant health associated repercussions warrants attention. Another realm warranting more insightful study is the finding that at least some older adults were actually willing to face death from COVID-19, and were desirous to undergo knee joint surgery regardless of any infection threat, rather than suffer from the immense pain generated by their knee osteoarthritis.

On the other hand, research to explore patient as well as provider attitudes that may be mediating or precluding a desire to carry out non pharmacologic and non surgical preventive approaches, regardless of available extrinsic health opportunities and indications also appears strongly warranted, especially if a lack of any focused counter effort in this regard is contributing to the increased prevalence of this disease and its immense burden [9]. Associated

studies to identify the utility of patient education plus the efficacy of systematic and comprehensive team based carefully planned allied health professional guidance rather than surgical or medical guidance alone on the need for surgery, surgical outcomes, as well as their cumulative social implications are also sorely needed.

Whether more personalized solutions, rather than generic solutions generated by various health organizations may be more successful in effectively targeting the outcomes of individual knee osteoarthritis sufferers should also be specifically explored.

In the meantime, even if surgical services and others are restored in their entirety, increasing evidence reveals that patient-reported outcomes following surgery to replace the knee joint through arthroplasty surgery are likely to remain dependent on both basic health as well as prevailing neuromuscular and nutritional status, an array of psychosocial factors, including pain, and sleep challenges, plus the presence of osteoporosis, which, if unrecognized, can all impact the risk of acquiring surgical site infections, plus patient-reported dissatisfaction following surgery as well as persistent pain and disability [62, 63]. Consequently, averting any of these issues has been advanced as an important treatment goal for all those who desire more than the successful completion of a surgical replacement alone [64].

In short, even if the COVID-19 infection rate ceases to be a concern for older adults, and others, and does not impact post surgical outcomes [65], it appears those interested in the wellbeing of this increasingly prevalent group of adults should probably not lose sight of the global impact and fallout of COVID-19 that may well persist for years to come, and in the absence of dedicated conservative management, may yet impact surgery outcomes adversely even if surgery is forthcoming. In this regard, Ragni et al. [66] stress that it is important to recall that adults with osteoarthritis often also suffer from an array of concomitant pathologies, such as diabetes, inflammation, and cardiovascular diseases, plus obesity that are again shared with COVID-19 risk and may therefore increase surgically oriented complications. Moreover, as well as efforts to combat sedentary behaviors [67], the use of addictive drugs [68], or other osteoarthritis treatments, that can have a wide array of iatrogenic effects, and that can potentially increase COVID-19 secondary infection incidence or complications should be addressed

As such, those who seek to maximize older adults' wellbeing in the near future, wherever they reside, are urged to harness their best efforts to foster a quest to carefully evaluate, review and document what is needed and why as a result of the COVID-19 pandemic and parallel aging state of millions of global citizens. What the unmet challenges of those who are at risk have various degrees of the condition are plus the unstudied outcomes of COVID-19 as far as the older adult with knee osteoarthritis of one or both joints is concerned should also be examined meticulously and comprehensively among multiple sub groups without delay in our view, especially those that mimic muscle and nerve pain, fatigue, breathlessness, and anxiety. The costly neglect of failing to do this should also be highlighted by all those who value the concept of optimal health for all.

## Concluding Remarks

A cursory review of what has been published in the realm of knee

osteoarthritis and COVID-19 between the time periods of 2020-2022, while not without limitations, has revealed several thought provoking observations.

1. While the prevalence and burden of degenerative joint disease at the knee is quite well established, and continues to rise, the long term impact of COVID-19 on the course of the disease is uncertain at best.
2. During the pandemic, those older adults who required knee joint replacement surgery, but were placed on waiting lists, may have become reliant on addictive substances to quell pain, as well as unduly distressed.
3. Many older adults living alone and others may have been fearful of moving or unmotivated towards physical activity participation for multiple reasons associated with the widespread COVID-19 legal restrictions, whether they were scheduled to undergo surgery, or not.
4. Those cases living in the community and who continue to face delays in surgery, as well as service limitations, and especially those who fail to pursue recommended life affirming health behaviors, are more likely to incur a resultant lower degree of immunity in the face of persistent or future COVID-19 infectious variants, plus more profound chronic disease manifestations.
5. To counter any undesirable future outcomes, and especially to alleviate excess suffering, more personalized and targeted timely multi pronged programs that emphasize sound application of conservative evidence based approaches to alleviating any prevailing knee osteoarthritis symptoms is increasingly indicated.
6. To foster surgical outcomes, where indicated, careful pre operative examination of clients previously on waiting lists, eliminating those who are currently at too high a risk for surgery, those who have improved and do not require surgery, and those previously unscheduled who may now need urgent surgery appears warranted.
7. Highly important in all respects is a need to eliminate misconceptions, and other harmful mediating influences of excess disablement where possible, and ensure desired directives can be safely implemented independently in the context of an aging community.

At the same time, research is needed to ascertain if pre pandemic rehabilitation processes and procedures can be obviated by technological mechanisms, thus possibly saving precious resources. Moreover, the possible use of technology to perform knee joint replacement surgery, which may assist in reducing surgical waiting lists and securing speedy and desirable post operative results, also deserves further examination.

In the interim, all evidence points to the probable value of concerted insightful efforts to educate and advise those 'at risk' as well as those older adults affected by knee osteoarthritis and their families, accordingly, along with the provision of needed resources, directives, and encouragement and that can help build personal efficacy for managing their own health situation, rather than despair, and anxiety. Grounded in effective policy and in the presence of sufficient resources and the will to foster the wellbeing of



the socially disadvantaged is especially encouraged.

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