

## Second Hip Fracture Occurrences among Older Adults: 1970-2022

Ray Marks

*Department of Health and Behavior Studies, Columbia University, Teachers College, New York, NY, USA*

**\*Correspondence to:** Dr. Ray Marks, Department of Health and Behavior Studies, Columbia University, Teachers College, New York, NY, USA.

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Received: 01 September 2022

Published: 10 September 2022

**Keywords:** *Aging; COVID-19; Frailty; Hip Fractures; Morbidity; Mortality; Older Adults; Second Hip Fractures; Prevention; Surgery*

### Abstract

Hip fractures, which remain an immense public health concern, have been subject to study and prevention efforts for many years, but with limited success in averting either incident, second or subsequent hip fractures. This review examines second hip fracture incidence rates and determinants of this injury both before the onset of the COVID-19 pandemic and after COVID-19 emerged in 2019. It specifically explores if more preventive efforts are currently warranted in this regard, and in what respect, if indeed, more frail older adults are living longer, but may be in excessively poor health due to COVID-19 health impacts, plus ensuing legal restrictions and closures. Based on what is published, it is concluded 1) second hip fracture incidence rates remain considerable, especially among those who are frail with osteoporotic bone disease, poor vision, heart/or cognitive conditions, plus those who have muscle deficits of the lower limb, live alone and have a falls history; 2) studies to identify the impact of COVID-19 on hip fracture re-injury incidence and mechanisms, plus recovery trends, and any desired novel mitigation approaches that appear promising in this regard, along with more routine efforts to minimize bone attrition are strongly recommended to avert a possible excess wave of recurrent hip fractures that could overwhelm the individual as well as declining human and healthcare resources.

## Introduction

In recent years, and despite some evidence of declining hip fracture rates in some spheres, hip fractures continue to pose one of the most serious health care problems facing policy makers, health care organizations, and older adults desiring to live independently in the community, rather than in the nursing home. Indeed, although some evidence of a decline in hip fracture prevalence has recently been reported [e.g., 1-4], the injury remains an ever present and potentially unwarranted albeit cause of severe disability, excess morbidity, reduced life quality and premature mortality among many older adults [4-8], especially men [3], and those of higher ages [9]. Moreover, according to some, it is just as likely that the annual incidence of hip fractures could increase, rather than decrease, over the next several decades [10], even though certain pharmacologic drugs may limit hip fracture risk, due to an increase in the numbers of adults living to higher ages [9], a group that is poorly studied, and where frailty and bone fragility prevalence rates continue to rise [11,12]. In addition, data do not commonly account for the fact that a 'first' hip fracture incident may be overlooked if the older adult does not have access to a hospital environment where data are collected and housed, or where only surgical cases are reported, rather than non surgically treated cases. In addition, falls that lead to death as a result of a hip fracture may be overlooked, and since, December 2019, possible COVID-19 infection risks and restricted access to health services may have underestimated actual hip fracture incidents occurring in the community, where some adults may well have fallen and been unable to go for help, or too fearful to be admitted to a hospital, even in areas where hip fracture rates have reportedly remained stable over 10 years. As well, prior to COVID-19 rates of hip fracture over time did not appear to be falling in Germany [13], and recently appeared to be increasing among older women in Taiwan [14], Saudi Arabia [15], American elders [16] and among men [17], where loss of independence, mortality, and morbidity is substantively greater than for women [3,18]. Rates may also depend on multiple intrinsic as well as extrinsic factors including the region studied, the availability of services, and whether data are systematically collected, are accurate and up to date [19,20].

At the same time, clearly compounding the need to continue to examine hip fracture trends, are increasing numbers of older adults at risk for either a hip fracture recurrence or a new fracture, which may be in the same location with a tendency to greater displacement or instability [21]. Further, Dolk in 1989 [22] predicted the frequency of sustaining two hip fractures over the course of an individual's lifetime could reach 20 percent. In addition, because new hip fractures may occur on the same side as well on the opposite side to an initial fracture, it may be possible to sustain three hip fractures over time. According to Shroder *et al.* [23] the risk of incurring a third hip fracture per 1000 men was 8.6 and was 9.8 per 1000 for women, per year, and has been shown to be a growing problem [24].

Additional research reveals, ipsilateral second hip fractures may include those that involve the trochanteric region that may not have been operated on, or in the case of internally fixated hips, may be attributable to the suboptimal placing of the screw(s). Rarely, they may also occur after removal of internal fixation. In their study, Shroder *et al.* [3] found 8 percent of second hip fractures occurred on the same side as the original fracture, while 92 percent occurred on the opposite side. Other data showed that 62 percent of those cases presenting with a femoral neck fracture and 72 percent of those with a trochanteric fracture, the two predominant hip fracture sites, had a preceding contralateral fracture of the same type. The mean time

interval between the two fractures at the time of study was 3.3 years (range 5 days-14 years); although 20 percent incurred a second fracture within one year following the initial fracture, regardless of gender or fracture type. In calculating the risk of incurring a second hip fracture, the investigators found this rose about nine times over the risk of the first hip fracture for men, and six times for women with a first hip fracture. This increased risk of a second hip fracture which was highly significant for both genders, was significantly higher for men than for women.

In attempting to identify a cohort with high risk of suffering a fracture of the contralateral hip, Yamanashi *et al.* [25] who followed 714 patients with a hip fracture prospectively observed a second fracture, which tended to occur within eight months of the initial fracture, and which was generally of the same type, found this pattern to prevail regardless of age and gender. The increased risk of a second hip fracture was however found to be strongly associated with the presence of a senile dementia and/or a Parkinson's disease diagnosis.

Nymark *et al.* [26] who examined the average time period from a first to a second hip fracture and found this was highest within the first 12 months following a first hip fracture suggested preventive strategies at the time of first fracture were hence strongly indicated as did Lönnroos *et al.* [27] who found the incidence rate for these second fractures were indeed quite high at one year post surgery for an index hip fracture, and higher at the second year thereafter. There may yet be a substantial risk of a second hip fracture among older adults within 5 years due to the persistence of a state of poor functional status, along with an associated increase in mortality compared to that observed in the presence of a single fracture [28], and that occurs more readily than not unless concerted efforts are made to mitigate this risk [29].

In light of the severe individual and economic consequences of hip fractures in their own right, and an apparently unchanged prevalence to a large degree on recurrent or second hip fractures, we sought to specifically investigate whether more efforts than ever are needed to foster or restore functional recovery post-hip fracture surgery in the post pandemic period where hip fracture patients receiving surgery may well be in poorer health than in pre pandemic times.

In the following discourse, the focus was on examining trends over time on the topic of second hip fractures, and their known determinants. Specifically highlighted, are key reports reflecting the 1970-2020 time period, and those thereafter in an effort to capture any novel trends and any current intervention and prevention insights.

Since second hip fractures account for up to 15% of all hip fractures, Guy *et al.* [30] propose that efforts be made to determine if the proportion of second hip fracture has changed over time in terms of patient and fracture characteristics. The frail elderly, as well as hip fracture survivors and those with one or more common comorbid conditions are potentially an important older group to target to examine and intervene accordingly [31], as they may recover more slowly than healthy older adults or those with a first hip fracture, thus increasing the overall costs of this health condition, which are already immense. In addition, poorly or sub-optimally treated hip fractures that result in a second hip fracture may not only exacerbate the ensuing level of functional disability that arises, but may foster an even more debilitating state. Hospitalizations also expose elderly patients to COVID-19 even if timely surgery and rehabilitation strategies for restoring

functional recovery post-hip fracture surgery are available, thus more preventive efforts to secure the health and safety of the older community dwelling adult at the present time may be strongly indicated.

## Method and Procedures

To fulfil the aims of this report, all pertinent full length published studies in the English language detailing the impact of COVID-19 on hip fractures in the **PUBMED**, **GOOGLE SCHOLAR**, plus **PubMed Central** data bases over the time periods January 1 1970-August 29 2022, employing the key words ‘*Second hip fractures*, and COVID-19. Divided into pre pandemic and post pandemic periods are some key findings described in narrative form regarding second hip fractures as published in peer reviewed research articles over this lengthy period that may have a bearing on the understanding of the trends in this regard, plus the most common risk factors in this respect. Finally, in addition to background information, some recommendations are offered in the context of the increasing importance of efforts to initiate multiple preventive directives against second hip fractures, based on the available evidence, and extent and nature of the prevailing data. The focus was on second hip fracture incidence rates, an underreported topic in general, and what changes or innovations could help reduce its immense burden in the future. Those listed but failing to discuss second hip fractures or second hip fractures in the elderly, as well as those discussing fractures in the context of specific diseases or periprosthetic fractures were excluded.

## Results

Among the relevant studies published to date, while not all countries have reported on this topic, those that have including China, Denmark, Finland, Ireland, Japan, the Netherlands, Norway, Spain, Turkey, the United States, the United Kingdom, and Taiwan appear to present findings that are quite comparable as a whole as regards incidence rates and possible risk factors for second hip fractures, regardless of the highly heterogeneous reports, non-uniform analytic approaches, study periods, and follow-up durations [32].

### *Findings Prior to 2020*

As per Atik *et al.* [32] who conducted a detailed review in 2014, this current topic of study that has prevailed since at least 1974, and while slowly emerging to currently number a total of 1747 listings on **PUBMED** as of July 6 2022, still remains problematic and under studied or stressed as clinically important when compared to other health topics impacting the geriatric population. Among these data, one publication that appeared in 1992 and that covered the 1982-1990 time period, identified 28/1644 cases of second hip fractures in a Chinese context. The authors also noted that the time interval between the first and the second hip fracture was shorter for males than for females (1.7 years vs. 2.7 years) and the interval was also shorter in those with a previous trochanteric fracture as compared to those with a previous cervical [femoral neck] fracture (1.5 years vs. 2.6 years). It appeared that a hip fracture on one side actually reduced the risk of a subsequent hip fracture on the same side, as almost all second hip fractures were located on the side opposite to the original fracture (93 per cent). A possible reason given for this was the onset of a “protective mechanism” and possible increased bone strength at the fracture site due to callus formation. Interestingly, a significant symmetry (trochanteric-trochanteric or cervical-cervical) was found between the first and the second hip fractures

(69 per cent) that was possibly attributed to the presence of senile osteoporosis, and related ongoing systemic weakening of the skeletal system as observed among the older adult [33,34].

Another related prospective study conducted in Finland to examine the outcomes of a hip fracture group between 2002-2003 and 2006 of 50 persons aged  $\geq 60$  years showed 34 second hip fractures to have occurred. The cumulative incidence rate of second hip fractures was 5.08% (95% CI: 3.30 to 7.78) at one year, and 8.11% (95% CI: 5.73 to 11.43) at two years after the first fracture. In the second part of this study, 75 cases with two non-contemporaneous hip fractures were studied, and among possible mediating factors observed were the increased number of psychotropic drug use, with few cases exhibiting osteoporosis (23%). Twelve (16%) patients used bisphosphonates or calcitonin, 15 (20%) used calcium and 9 (12%) vitamin D supplements. It was concluded that there is a high incidence of second hip fractures following a first, and that adequate treatments for osteoporosis, as well as more attention should be directed toward appropriate usage of psychotropic drugs [27].

In addition-Yamanashi *et al.* [25] found that among 714 patients observed for 1,579.5 person-years (mean: 2.4 $\pm$ 1.4 years per patient), 45 second hip fractures were identified (bilateral group), giving an overall incidence of 0.029 per person-year. The annual incidence rate declined linearly from the occasion of the initial fracture. Furthermore, the second hip fracture, which tended to occur increasingly within 8 months after the initial hip fracture, was of the same type (trochanteric or cervical) in 79% of the trochanteric and 71% of the cervical fracture cases. There was no significant difference in the incidence of second hip fracture by gender or age, rather, the increased risk of a second hip fracture was associated with senile dementia and Parkinson's disease.

As affirmed by Chen *et al.* [5], almost 10 percent of hip fracture cases may develop subsequent hip fractures, as well as related increases in age specific mortality rates. Those at most risk were women, and those who were obese, or had a cardiovascular condition. In addition, prolonged medication usage, and poor vision were common. In support of these observations, a systematic review of 13 case control studies conducted by Liu *et al.* [35] concerning risk factors for a second contralateral hip fracture also concluded that among the risk factors in this respect were age, being female, having poor vision, a cardiac disease history, dizziness, and respiratory problems. Additional work by Egan [36] and Matani *et al.* [37] similarly identified older age, cognitive impairment, low bone mass, impaired mobility, plus vision, having a falls history and poor self-perceived health, dementia, and respiratory disease tended to heighten the risk for a second hip fracture.

According to Lee *et al.* [38], hip fracture cases appear to have a 2-7 fold risk of a second hip fracture within 6 years, plus a higher mortality rate at one year compared to those with single hip fractures, especially if they sustain a primary fracture of the hip between the ages of 55 and 64 years [39] or are women [40] who have not received pharmaceutical treatment for osteoporosis, an intervention recommended by Kok *et al.* [41] to help reduce the incidence of second hip fractures [42]. Vitamin D and calcium supplements were correlated with a reduction in the incidence of second hip fractures.

The aforementioned data, while not all encompassing remain of concern, because as indicated by Olmsland *et al.* [43] who found total hip fracture rates declined in both genders between 1999-2008, the rates of second hip fractures did not change. Bynum *et al.* [44] concluded secondary fracture prevention strategies



that take a population perspective are hence indicated. Guy *et al.* [30] concluded that since second hip fracture surgeries account for an increasing proportion of hip fracture surgeries, these may indeed require more health care resources to minimize poorer reported outcomes and excess mortality rates [38].

In this regard, findings by Sheik *et al.* [45] indicate efforts to improve screening for hip fracture patients at risk for subsequent fractures are likely to help provide for more focused medical rehabilitation than is currently being offered and enacted. The most prominent risk factors to identify would be dementia, chest or urine infections and the presence of multiple chronic illnesses. To minimize risk, a falls risk assessment on leaving the hospital after an initial fracture was recommended as well.

#### *Findings Published After 2020*

Since the onset of the COVID-19 pandemic emerging research continues to point to the disabling nature of the second hip fracture in all venues studied. In Ireland for example, recent evidence points to high rates of second fracture occurrences at the hip within 1-3 years following the index hip fracture. Moreover, although 48% of patients studied were placed on bone protection medication regimens following their second hip fracture, it appears many had not been in receipt of this form of protection previously [46,47].

Another recent report by Helynen *et al.* [48] who examined retrieved clinical data on 1130 patients with fragile hip fractures, mean age: 79.3 years, who had undergone surgery in 2013-2016 showed of those who survived surgery 12.4% sustained a second hip fracture. The predisposing factors in this regard were identified as: being female, having a high bone fragility score, and a low physical capacity level. Vitamin D recommended for treating osteoporosis at safe levels were observed in only 24% of patients, and 42% of patients had ionized calcium levels below the reference range. The risk of death was higher after the second hip fracture, regardless of age. It was concluded that after a hip fracture, there is often a high risk for acquiring a second hip fracture, and one reason for this may be the lack of adequate post-surgical anti-osteoporosis medication recommendations or these at any time prior to the index incident.

Zidrou *et al.* [49] confirm a second hip fracture can indeed occur quite commonly among older adults who have already suffered an initial hip fracture. In examining a total of 2013 hip fracture cases between 2009 and 2019, where the cohort had a mean age of  $76.5 \pm 5.4$  years and had been admitted to a tertiary care hospital for a first hip fracture, the researchers found 321 of these cases (15.9%, mean age:  $85.3 \pm 4.9$  SD) sustained a second contralateral hip fracture in the first two years after the initial hip fracture, whereas 136 patients (6.8%) sustained a contralateral hip fracture within 12 months. In total 274 (13.6%) died in the first two years after the initial hip fracture; among these, 139 patients (43.3%) had a contralateral second hip fracture. The mean time from the first hip fracture to second hip fracture was  $13.2 \pm 7.6$  months. The key determinants of the adverse outcomes were advanced age, being female, living alone, being demented, having a chest and/or urinary tract infection, chronic heart failure, and peripheral vascular disease.

Solou *et al.* [50] found the cumulative incidence of a second hip fracture, estimated to reach 8.4% was also related to a mortality rate of 37.03%, when assessed approximately 14 months after the second hip fracture operation. These researchers also found a significant relationship between the mortality time and the

interval between the first and second fracture. In accord with these findings, Fujita *et al.* [51] noted an incidence rate for a second hip fracture within approximately two years after the initial injury and surgical repair was at least 8% when considering the time span of their research on 119 cases. Most at risk in their 2007-2017 retrospective analysis were those with cardiovascular conditions and signs of dementia. As such, there can be little argument that the prevention of a second hip fracture is potentially an essential one for the orthopedic surgeon, and in light of the observation that the average interval from initial fracture to a second hip fracture in their study was 22.8 months. At the same time, this group noted that more patients with second hip fractures exhibited a decreased postoperative walking ability than controls. Unsurprisingly, older adults who incur a second hip fracture are found to have an increased mortality rate when compared to those with a single fracture [34,52]. As well, they are more than likely to have exhibited a history of fragility fractures, the need for assistance when walking outdoors and a history of falls, implying some, if not all secondary hip fractures may have been prevented by intervening accordingly. However, as stated by Wang *et al.* [53], while patients with a first hip fracture are at high risk of fracturing their other hip, preventive therapy is often not forthcoming, and the additional impact of efforts to shorten hospital stays post surgery in this regard remains unknown [4]. While these possible secondary hip fracture determinants may not be clearly understood in the context of factors that can raise or mitigate against the risk for sustaining a second or recurrent hip fracture, past research points to a key role for declines in bone mineral density, muscle size and density and a possible lack of strategies other than anti osteoporosis interventions to meet these health challenges [54].

In sum, despite almost 55 years of research, including multiple efforts to identify risk factors for second hip fracture injuries, these remain sufficiently common and continue to cause a sizeable percentage of older hip fracture patients' severe excess disability if they survive surgery [6,55]. Indeed, this finding is not spurious, but remarkably consistent across multiple venues housing the most advanced orthopedic facilities in multiple regions of the globe renowned for their advanced health care and surgical practices. What is apparent is that among the reasons examined to explain this possible second hip fracture risk, is not the surgical processes per se, but the possible failure to provide comprehensive multi dimensional preventive care approaches post-hip fracture surgery, along with the patients' functional status, and ability to understand their important role in the recovery process [6,55,56].

As such, and among possible solutions, Nymark *et al.* [26] suggest preventive strategies at the time of the first hip fracture that aim at both averting any untoward immediate effects, as well as fostering those with impacts that may be desirable appear warranted for periods of 12 months in the case of men and 19 months in the case of women. Post operative rehabilitation and efforts to heighten activities of daily living [6] are especially indicated among other approaches outlined in Table 1.

**Table 1:** Possible approaches that might be harnessed to foster the secondary prevention of subsequent hip fractures among older adults living in the context of a community setting

<i>Determinants of Concern</i>	<i>Preventive Recommendations</i>
Bone attrition/fragility	Optimize bone health, prevent trauma
Medication usage	Careful medication usage
Overall weakness/mobility	Muscle strengthening/weight bearing exercises
Lifestyle	Avoid alcohol, unsafe outdoor/indoor activities
Nutritional intake	Assess, provide access to desirable nutritional foods
Balance capacity	Foster balance/ambulation training
Vision status	Eyewear reviews/referrals/lighting attributes
Health status	Foster stress control, mobilize social support
Cognitive status	Foster self-efficacy, agency
Falls history	Vigilance, education, control comorbid illnesses
Fear, depression	Counseling
Sleep health	Avoid sleep/hypnotic medications, naps
Understanding	Health education
Weight status	Avoid excess/suboptimal weight

Adapted from: [6, 12, 27, 53, 57-60]

In addition, adequate dietary or supplemental vitamin D and calcium intake should be assured, individuals being treated for osteoporosis should be reevaluated for fracture risk routinely, and monitored periodically for any adverse treatment effects. Patients themselves should be strongly encouraged to avoid tobacco, to consume alcohol in moderation at most, and to engage in regular exercise and fall prevention strategies. Finally, referral to endocrinologists or other osteoporosis specialists may be warranted for individuals who experience repeated fracture or bone loss and those with complicating comorbidities (eg, hyperparathyroidism, chronic kidney disease).

In essence and in recognition of the growing public health problem of osteoporosis and fragility fractures that prevail among the older population, including hip fractures where protection efforts may have been hampered by lockdowns and other infection prevention transmission strategies used to contain the COVID-19 pandemic [61], as outlined some time ago by Wilson and Wallace [62], it appears persistent efforts are required to minimize the overall burden of hip fractures among older members of society, and especially the oftentimes devastating impact of recurrent or subsequent hip fractures among this population [63-65]. To this end, early post operative care and assessment, plus continued vigilance in designing primary and secondary prevention approaches that can be conducted readily in the home environment is needed now more than ever.



## Discussion

Although the topic of hip fracture injuries among the older adult population has been studied for several decades in an effort to prevent these oftentimes devastating injuries, a fair percentage of current reports indicate this condition remains a highly prevalent, as well as a severely debilitating one, if indeed the older adult survives surgery. Especially problematic are multiple negative post operative health outcomes including the risk of second hip fractures. To examine this issue in more detail, and what may yet be needed and why, in this regard, pertinent literature published in those peer reviewed journals housed on **PUBMED, GOOGLE SCHOLAR, and PubMed Central** electronic data bases concerning second hip fractures regardless of fracture mechanism, fracture site, and report type were reviewed. The aim was to identify the key findings observed in past decades, and if any progress in preventing this injury has been made to date in this regard, and if not, whether more carefully construed targeted tertiary as well as secondary preventive efforts are needed to offset the risk of incurring this unwanted debilitating injury and its attendant immense social and personal costs.

The data sources, chosen to provide a broad array of peer reviewed publications on this topic, were categorized according to those time periods preceding the COVID-19 pandemic and the period thereafter, given that those older adults with multiple comorbid health conditions, and who were artificially isolated socially for several months may have become more vulnerable than ever to frailty, bone fragility, falls injuries and cognitive challenges that underpin second hip fractures. Indeed, as discussed by Jain *et al.* [50], several current studies have shown older adults with fractures associated with medical comorbidities such as diabetes, stroke, and hypertension were not only more severely affected by COVID-19 infections, due to their reduced functional reserves and weakened immune systems, but to hip fracture injuries with higher mortality rates than those older adults with no apparent coronavirus infection.

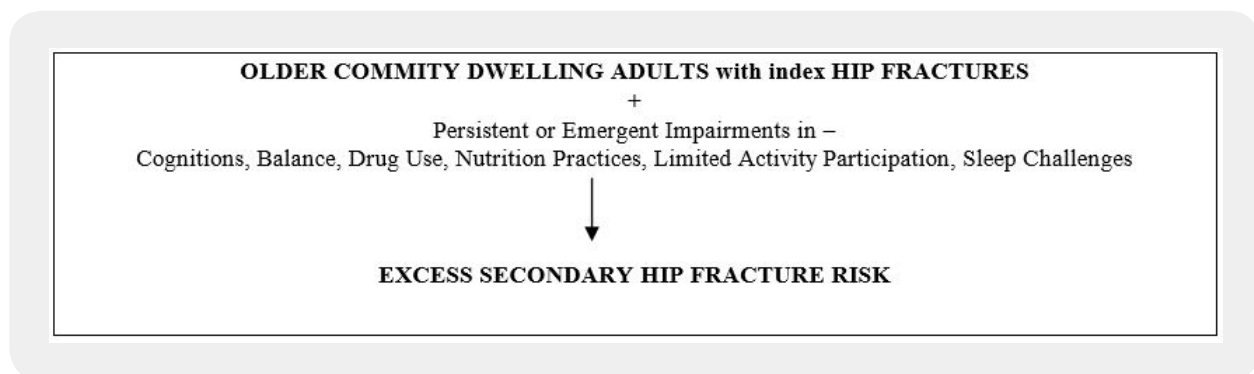
In this regard, since many at risk older adults residing in the community may yet have sustained a hip fracture, but were sent home sooner than they would otherwise have been, with possibly fewer dedicated home care resources, a sizeable number of cases could severely challenged in terms of being able to enact favourable health behaviours, and especially safe exercises needed to prevent muscle dysfunction and mass losses, which in turn, may a profound negative influence on bone quality and integrity, plus the risk of frailty, plus one or more hip fractures [66,67,68]. Physical activity, also key to preventing of chronic diseases, increasingly related to hip fracture injuries as well as COVID-19 such as diabetes, may have been challenging to undertake, for example due to fears of falling, or excess pain or both. In addition, sleep hygiene may have become impaired, depressed feelings may have emerged or been increased, and environmental safety hazards may not have been removed. As well, encouraging safe outdoor activities such as walking may have failed for similar reasons, while increasing the risk for secondary fractures.

While this data may be embedded in other reports, this current overview, which tried to cover as many resources as possible, did not include all available data, and did not assess the quality of the reports reviewed, since it was assumed these data were clearly representative of time as well as global trends and future preventive and intervention needs. Indeed, regardless of country of origin or type of orthopaedic facility, or study methods, they indicate little change between 1970 and 2022 in terms of documented second hip fracture occurrences, although these vary from eight to fifteen percentage points over time. They largely all

concur, mortality rates are increased in the presence of a second hip fracture, and this occurs regardless of the distribution of these, which is largely bilateral, and at the same fracture site as the initial lesion, but not necessarily.

Unfortunately, most often, the type of fracture being discussed is not clearly indicated, or analyzed separately, although this might well prove highly relevant and insightful. At the same time, almost no mention is made of the subtrochanteric fracture and its significantly worse comparative outcomes compared to other hip fracture sites [69]. A role for malnutrition, social isolation factors, pain, and possible multiple muscle and bone mass factors are similarly very poorly articulated, if at all in most studies, regardless of fracture type, and that again could prove of high clinical relevance.

Alternately, the most frequent key determinants observed and reported in the literature and highlighted in Figure 1, including poor health status, vision, muscle weakness, and falls injuries, some attributes, at the very least are possibly somewhat modifiable risk factors that could be targeted to more specific advantage in the future [70]. Focusing on the role of comorbid conditions, cognitive disorders, as well as the use of psychotropic drugs, which again is reported very sporadically may prove of further benefit in multiple dimensions. In this respect, recent data have indicated those older adults who sustain subtrochanteric hip fractures and have a high risk for fragility fractures, should probably be selectively targeted after any hip fracture surgery [64, 69,71], and possibly followed for at least five years thereafter, during which time they are most likely to incur a second fracture [72]. As well, ensuring their homes are safe is imperative for those with a falls history, in particular, along with the delivery of bone building resources as indicated. Another new idea is for routine muscle assessments to be forthcoming in the operative room [72], plus prolonged follow-up strategies thereafter to ensure the attainment of maximal functional independence, while reducing the onset or magnitude of depression, falls fears, excessive drug use, and thereby the dual risk of incurring a second or third hip fracture, plus inordinate personal, social and health care costs.



**Figure 1:** Schematic representation of possible adverse effects of depression and other factors post hip fracture surgery among older community dwelling older adults on the risk and acquisition of a secondary hip fracture.

In the interim, regardless of the absence of any clear contemporary evidence based research in this realm, the available practice based evidence base depicted here, clearly shows that securing the optimal health of the community dwelling older adult, as well as secondary prevention and ongoing rehabilitation is of

paramount importance in the context of averting excess mortality and morbidity and immense social costs attributable to second hip fractures among the older population [73-75]. Alternately, delayed, improper or no intervention, challenges of remote interventions, and others, are likely to result in immense unanticipated hip fracture surgical complications, especially in light of evidence that several specific high risk pre-existing co-morbidities such as having a falls and fragility fracture history, plus one or more comorbid health conditions are clearly associated with the risk of incurring a second or subsequent hip fracture in community based settings, regardless of gender.

As well, it appears especially important to presently assist all vulnerable older isolated adults at risk for bone fractures and falls, to maintain an optimal physical as well as cognitive health status, because even if available surgical treatments for repairing hip fractures can enhance fracture recovery, the added risk of a parallel COVID-19 infection, plus weakness, and fever, among other factors, such as osteoporosis [76] may greatly interfere with incision healing, as well as postoperative recovery and rehabilitation processes. Furthermore, a recent study indicated that surgical stress may actually activate or aggravate the progression and mortality of COVID-19 [35] that may yet be found to induce lengthy periods of associated disease that impact muscle and inflammatory processes adversely. In addition to efforts to avert muscle atrophy due to sedentary behaviors, efforts to continue to prevent the risk of falls injuries and others that often lead to hip fractures, appears of high relevance to address at both the primary prevention level, as well as the tertiary prevention level at the present time. Indeed, all care providers are urged to help their vulnerable clients by comprehensively analyzing each older adult's specific need and situation in order to create the most favorable preventive plan for the individual, in general, as well as when being discharged to the home post-surgery, if this is needed. Alternately, if no progress is made in this regard, more aging adults may be expected to sustain a recurrent, second or third hip fracture over time [65,73], with a greater demand on limited health care resources and severe impact on life quality and dignity.

In sum, to minimize the multiple possible human costs and others as the post pandemic state of persistent cutbacks in resources and personnel prevails, public health interventions focusing on encouraging moderate safe forms of physical activity participation and exercises that promote muscle strength among all community dwelling younger and older adults, regardless of health status, are strongly recommended for mitigating at least some primary hip fracture incidents, while allowing for better possible health outcomes if surgery is indicated.

## **Conclusion**

This narrative overview spanning a 50 year time period supports the view that surgery alone for repairing an index hip fracture among older adults, is necessary, but not sufficient to offset future excess debility and mortality rates attributable to subsequent fractures.

It is further concluded that this situation may yet be compounded once the long term ramifications of the COVID-19 pandemic emerge.

In addition, until more research prevails, concerted multi pronged carefully construed personalized preventive efforts post index hip fracture surgery appear strongly warranted, especially among those hip fracture index cases who are already frail.

Moreover, to avert excess mortality among the second hip fracture population, more concentrated post index fracture targeted rehabilitation and follow up assessments are strongly recommended.

In this regard, it appears high risk older adults living alone in the community, especially those with comorbid diseases and/or a low body mass, and those with cognitive challenges should be specifically targeted.

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