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Older Adults Undergoing Total Hip or Knee Arthroplasty: Chronicling Changes in Their Multimorbidity Profile in the Last Two Decades

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ABSTRACT

Background: Despite the ubiquitous use of total hip arthroplasty (THA) and total knee arthroplasty (TKA) in older adults, little is known about the multimorbidity (MM) profile of this patient population. This study evaluates the temporal trends of MM, hypothesizing that patients with MM have had an increasingly greater representation in THA and TKA patients over time.
Methods: Data on a US representative sample of older adults from the linked Health and Retirement Study and Medicare data from 1993 to 2012 were used. The Health and Retirement Study is a biennial survey that collects data on a broad array of measures, including self-reported chronic conditions and geriatric syndromes, which were used to account for MM. Medicare data were used to identify fee-for-service Medicare beneficiaries who underwent THA (n = 479) or TKA (n = 998) during the study years, which were grouped into 3 periods: 1993-1999, 2000-2006, and 2007-2012. Multivariable logistic regression analysis was conducted to obtain age-, gender-, and race-adjusted time trends for MM.
Results: Compared to the earliest study period, and for both THA and TKA patients, there were significantly fewer patients with stroke and/or poor cognitive performance in the most recent study period. In addition, more TKA than THA patients presented with 2+ chronic conditions. Nearly 70% presented with co-occurring chronic conditions and geriatric syndromes, and this percentage did not change significantly over time.
Conclusion: The high representation of THA and TKA patients presenting with co-occurring chronic conditions and geriatric syndromes in this patient population warrants detailed exploration of the effects of geriatric syndromes on postoperative outcomes.

In 2013, total hip arthroplasty (THA) and total knee arthroplasty (TKA) were among the 5 most common procedures performed in individuals 65-84 years of age [1]. Despite the high frequency of these procedures and the disproportionate representation of older adults in this patient population, very few studies have described in detail the clinical presentation of these patients, and the changes thereof over time. To be clear, there is a distinction here between what we refer to as multimorbidity (MM) and multiple chronic conditions by accounting for the co-occurrence of not just chronic conditions (which have been well-described in the literature), but also that of relatively unstudied characteristics including geriatric syndromes (eg, poor cognitive functioning, visual impairment, hearing impairment, urinary incontinence, persistent dizziness and falls, and severe pain) and functional limitations (eg, strength limitations, difficulty with activities of daily living [ADL], and instrumental activities of daily living [IADL]). Especially in the presence of functional limitations, the co-occurrence of chronic conditions and geriatric syndromes has been shown to be strongly associated with adverse health outcomes, including self-reported

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health status, 2-year health decline, and 2-year mortality [2]. With the aging of the US population, as well as the improved longevity of individuals with chronic illnesses, it is expected that older adults undergoing these procedures may be presenting with an increasingly complex MM profile, which is key to understanding the risk stratification of these patients.

In this study, changes in the MM profile of patients undergoing THA or TKA during the past 2 decades (1992-2012) were evaluated. However, since by definition, almost all individuals in this patient population present with functional limitations, MM was defined as the co-occurrence of chronic conditions and geriatric syndromes, including (but not limited to) such conditions as poor cognitive performance and sensory impairment. In addition, time trends for each of the chronic conditions and geriatric conditions were examined and described.

We hypothesize that, compared to their counterparts undergoing these procedures in earlier years, a greater percentage of more recent patients have been presenting with chronic conditions and geriatric syndromes, therefore an increasingly complex MM profile.

Methods

This is a temporal study analyzing changes in the demographics and MM profile of older adults undergoing THA and TKA during a nearly 2 decade period spanning from 1993 to 2012. To this end, a unique data resource was used, consisting of linked data from the Health and Retirement Study (HRS) and Medicare data, as detailed below.

This study was approved by the university Institutional Review Board, the HRS, and the privacy board of the Centers for Medicare & Medicaid Services.

Data Sources

The Health and Retirement Study

Sponsored by the National Institute on Aging, and initiated in 1992, the HRS is the largest longitudinal survey of a US representative sample of older adults, 50 years of age or older ($n \approx 30{,}000$). Participants are surveyed approximately every 2 years on a wide array of items, including (but not limited to) chronic conditions, functional limitations, geriatric syndromes, as well as behavioral factors. In addition, the HRS includes rich sociodemographic variables, including on income and education.

For respondents who are enrolled in Medicare and agree to have their Medicare records made available for research, Medicare enrollment and claims data can also be accessed.

Medicare Enrollment and Claims Files

Medicare enrollment files include one record per beneficiary, and each record carries demographic variables as well as monthly indicators detailing individuals' enrollment for various Medicare programs (eg, Part A, Part B, or Part C for Medicare managed care programs), which made it possible for us to identify Medicare fee-for-service (FFS) beneficiaries.

Medicare claims files include (but are not limited to) claims data for services received in inpatient hospital settings, as well as outpatient institutional and noninstitutional settings. In this study, we limited our use of claims data to inpatient claims data to identify Medicare beneficiaries with THA or TKA procedures.

Study Population

The study population consisted of HRS respondents 65 years of age or older who are also Medicare FFS beneficiaries, and underwent THA or TKA procedures during the years 1993-2012. As noted above, these procedures were identified from the Medicare Provider Analysis and Review or MEDPAR file, which includes claims for inpatient stays. The following International Classification of Diseases, 9th Revision, Clinical Modification procedure codes were used: 81.51 for THA and 81.54 for TKA.

The study population was limited to those undergoing primary THA or TKA. While respondents with ipsilateral procedure or repeat procedures were included in the study population, their HRS data reflect their demographic and MM profile at baseline, corresponding to the very first THA or TKA procedure for that respondent. Thus, respondents have only one record in the analytical data set ($n = 479$ for THA and $n = 998$ for TKA).

Variables of Interest

Our study variables originated from the HRS, and specifically from the interview immediately preceding the primary THA or TKA. The median time elapsed between the collection of these data and the procedure was 1.9 years (range 34 days to 3.1 years). The percentage of HRS participants who had proxy respondents was 3.1%.

Outcome Variable

MM profile: A variation of composite MM variable was used, as described previously [2]. In the aforementioned study, older individuals were characterized by grouping them based on the occurrence or co-occurrence of chronic conditions, functional limitations, and geriatric syndromes. Thus, MM0 reflected the absence of any chronic conditions, functional limitations, or geriatric syndromes; MM1 as the occurrence (but not co-occurrence) of these conditions; MM2 as the occurrence of any 2 of these conditions; and MM3 as the co-occurrence of chronic conditions, functional limitations, and geriatric syndromes.

Because the study population consisted of orthopedic patients, most of whom present with functional limitations, this study uses an adaptation of the definition described above, as follows: MM0 as the absence of chronic conditions or geriatric syndromes; MM1 as the presence of chronic conditions or geriatric syndromes; and MM2 as the co-occurrence of chronic conditions and geriatric syndromes. Because the number in the MM0 category was too small, we combined the MM0 and MM1 categories into MM0/1.

Following is the list of self-reported conditions in the HRS that were used to identify the presence of chronic conditions, geriatric syndromes, and functional limitations. We note here that while we did not account for functional limitations to define the MM variable, we used them to better characterize our study population in greater detail.

- Self-reported chronic conditions (each defined as absent/present): hypertension, arthritis, heart disease, lung disease, stroke, diabetes, (nonskin) cancer, and psychiatric conditions.
- Geriatric syndromes (each defined as absent/present): poor cognitive functioning, indicated by a score in the bottom third of the 35-point Telephone Interview Cognitive Survey, or a proxy respondent reporting the respondent's cognitive status was fair or poor [3]; depressive symptoms, indicated by the presence of 4 or more symptoms on the Center for Epidemiology Studies Depression Scale; urinary incontinence; “often troubled” by severe pain; visual impairment, indicated by poor vision even when using corrective lenses as usual—or being legally blind; hearing impairment, indicated by poor hearing even when using hearing aid as usual; persistent dizziness; and falls.
- Functional limitations (each defined as absent/present): difficulty sitting for 2 hours; rising from a chair; lifting 10 pounds; moving an object; picking up a dime; reaching over head; climbing one stair; climbing several stairs; walking one block; walking several blocks; stooping; ADLs; and IADLs.