The role of comprehensive geriatric assessment in older patients affected by knee osteoarthritis: a systematic review

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Abstract

Osteoarthritis (OA) is one of the most common musculoskeletal diseases and highly prevalent in older people. Whilst the management of knee OA is usually multidisciplinary, the use of comprehensive geriatric assessment (CGA) for this condition is still limited. Given this background, with this systematic review, we summarized the current literature regarding the importance of CGA in people affected by knee OA. A systematic search across several databases was run until 10th April 2022 and updated on 21st November 2022 for any study investigating the use of CGA in patients with knee OA. The data were summarized descriptively. Among 295 articles initially included, three studies made in the context of the osteoarthritis initiative (OAI) were included. All the three studies used the OAI multidimensional prognostic index (MPI), a composite score derived from the CGA. Higher MPI values were associated with a higher risk of falls, cardiovascular conditions, and fractures across a follow-up period of 8 years and after adjusting for potential confounders. In conclusion, in this systematic review we summarized the current evidence of CGA in knee OA, finding that the MPI, a CGA derived tool, could be useful to early find people at higher risk of conditions that are associated with knee OA and therefore that can be the target of personalized interventions for preventing these conditions.

Introduction

Osteoarthritis (OA) is one of the most common musculoskeletal diseases, being characterized by joint pain and stiffness finally leading to functional decline and relevant loss in quality of life.[1,2] The incidence of OA is rising due to the aging population and an increase in some risk factors, such as obesity.[3] Knee OA is the most common OA localization, and symptomatic knee OA is highly prevalent among people aged over 50 years, affecting more than 250 million people worldwide.[4]

Knee OA is a leading cause of pain in older people that results in an increased risk of all-cause mortality.[2-5] Knee OA is a progressive and chronic disorder, with different degrees of severity, that requires long-term management with various treatment options over the course of the disease. The goals of treatment for OA are to reduce symptoms and ultimately slow disease progression, which may in turn reduce the impact of OA on the patient's mobility and quality of life, with consequent reduction in healthcare resource needs.[6]

In 2019, the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO) published recommendations for the management of knee OA in the form of a treatment algorithm that provides practical guidance for the prioritization of interventions and guides physicians through logical steps based on the severity of the knee OA signs/symptoms.[6]

The management of knee OA is usually multidisciplinary involving non-medical health care professional, physiotherapists, general practitioners, rheumatologists, orthopedic surgeons and finally geriatricians. However, the exact role of geriatricians in the management of knee OA was poorly studied, whilst the comprehensive geriatric assessment (CGA) is widely used for preventing negative consequences in older people, such as hospitalization[7] or mortality.[8] Moreover, CGA can be used across different settings, from primary care to hospital, with similar beneficial effects in older people.[9] Finally, older people affected by knee OA suffer frequently from other medical (*e.g.*, dementia,[10] cardiovascular diseases,[11] depression[12]) and non-medical (*e.g.*, loneliness[13]) conditions that may limit the efficacy of the interventions in knee OA recommended by ESCEO.

Given this background, with this systematic review, we summarized the current literature regarding the importance of CGA in people affected by knee OA.

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See online Appendix for Supplementary Table 1.

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Methods of research

This systematic review adhered to the PRISMA statement[14] and followed a pre-planned, but unpublished protocol available upon request to the corresponding author.

Data sources and searches

Two investigators (NV and AF) independently conducted a literature search using PubMed/Medline and Scopus from database inception until 10th April 2022. The search was updated on 21st November 2022. In PubMed, the following search strategy was used: ("comprehensive geriatric assessment"[Title/Abstract] OR "geriatric assessment"[Title/Abstract] OR ("geriatric assessment"[MeSH Terms] OR ("geriatric"[All Fields] AND "assessment"[All Fields]) OR "geriatric assessment"[All Fields] OR ("assessment"[All Fields] AND "geriatric"[All Fields]) OR "assessment geriatric"[All Fields])) AND (Knee Osteoarthritides OR Knee Osteoarthritis OR Osteoarthritis of Knee OR Osteoarthritis of the Knee OR Osteoarthritis, Knee [mh]). A third senior author (AP) was available in case of conflict.

Study selection

Inclusion criteria for this systematic review were: i) use of CGA derived tool or CGA as intervention; ii) inclusion of people having knee OA; iii) written in English. Studies were excluded they did not include humans.

Data extraction

One investigator (AF) extracted key data from the included articles in a standardized Excel spread sheet and a second independent investigator (NV) checked the data. For each article, we extracted data on author names, year of publication, country, condition, study design, mean age, percentage of females, definition of CGA, data regarding main outcomes of interest.

Data synthesis

Due to the limited number of studies available and to the difference in outcomes, we decided to report the data only as narrative findings.

Results

As reported in Figure 1, among 295 articles initially included, ten full texts were retrieved and three were included.[15-17] All the three studies were performed in the context of the osteoarthritis initiative (OAI) (https://www.niams.nih.gov/grants-funding/funded-research/osteoarthritis-initiative), a large epidemiological study including 4796 people with knee OA or at high risk for this condition, with a follow-up up to eight years.

All the three studies used the OAI multidimensional prognostic index (MPI), a composite score derived from the CGA summarized in Supplementary Table 1. The MPI was calculated as established in previous studies, with some modification based on availability of data, *i.e.*: i) physical functioning was assessed through the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) index;[18] ii) physical activity was measured through the physical activity scale for the elderly scale (PASE);[19] iii) nutritional aspects were evaluated using Body Mass Index; iv) comorbidity was assessed by the Charlson Comorbidity Index score; v) the number of medications used were reported; and vi) cohabitation status was reported, *i.e.* living alone (yes *vs* no); vii) the assessment of depressive symptoms by using the Center for Epidemiologic Studies Depression scale (CES-D);[20] and viii) quality of life assessed through a specific subscale of the knee injury osteoarthritis outcome score (KOOS).[21]

Table 1 shows the main findings of the study included. In the first study, including 885 older participants without falls before the baseline evaluation, we found that higher MPI values can predict the onset of recurrent falls during 8 years of follow-up; the results remained substantially unchanged, investigating the outcome of interest at one year.[16] In the second study including 4211 older people without cardiovascular disease at the baseline, higher MPI values were associated with an increased risk of cardiovascular conditions, suggesting that multidimensional frailty could be associated with an unfavorable cardiovascular profile.[15] Finally, a last study in 4024 older subjects, showed that the MPI was able to predict the onset of osteoporotic fractures, particularly of non-vertebral fractures.[17]

Discussion and Conclusions

In this systematic review including three studies made in the context of the OAI study, we found that the CGA-derived MPI was able to predict the onset of several other conditions typically associated with knee OA, such as cardiovascular diseases, fractures and falls that can be considered typical geriatric syndromes.

Previous literature has already shown the importance of CGA in chronic conditions. For example, we have important literature reporting the use of CGA in dementia and cognitive impairment.[22] In this kind of patients, CGA could better identify the presence of other geriatric syndromes (*e.g.*,

Table 1. Main characteristics and findings of the studies included.

Author, year	Sample size	Mean age	Percentage of females	Main findings
Veronese, 2020	885	71.3	54.6	Compared to those in MPI-1 category, participants in MPI-2 (OR=2.13; 95%CI: 1.53-2.94; P<0.001) and in MPI-3 (OR=5.98; 95%CI: 3.29-10.86; P<0.001) reported a significant higher risk of recurrent falls over the 8-years of follow-up. Similar results were evident when using an increase in 0.1 points in the MPI or risk of falls after one year
Veronese, 2021	4211	60.8	58.6	Higher MPI values at baseline were associated with an increased risk of CVD. Multidimensional frailty increased the risk of new CVD of 91%, pre-frailty 31%, after the adjustment for eight potential confounders
Veronese, 2022	4024	61	59	After adjusting for several potential confounders, people with an MPI over 0.66 (HR=1.49; 95%CI: 1.11-2.00) experienced a higher risk of fractures An increase in 0.10 point in MPI score corresponded to an increase in fracture risk of 4% (HR=1.04; 95%CI: 1.008-1.07) Higher MPI values were also associated with a higher risk of non-vertebral clinical fractures

hypokinetic syndrome, delirium, malnutrition) and the presence and severity of neuropsychiatric symptoms.[22] Moreover, the use of CGA-tool, such as MPI, can better identify older people affected by dementia having advantages with the treatment of specific medications:[23] in fact, these medications can reduce mortality only in robust and pre-frail patients affected by dementia, whilst in frailer subjects no significant changes in mortality was observed, overall indicating the importance of CGA in clinical-decision making.[23] CGA seems to be useful in other chronic conditions typical of older people, such as cancer. In this kind of patients, CGA could be used to assess functional, nutritional, cognitive, emotional, and social status issues as well as comorbidities.[24] CGA, in fact, permits to detect numerous unrecognized health problems existing in parallel with the cancer,[25] implement tailored and individualized geriatric interventions effective for health problems that may be reversible,[26] and that can help in identifying prognostic factors in terms of treatment feasibility and toxicity risk, for example due to chemotherapy.[27] Again, MPI could be useful for the clinical-decision making in patients with cancer, having an excellent calibration.[28]

We can hypothesize that CGA can be useful in people having knee OA for several reasons. First, as reported in our systematic review, MPI significantly predicts the onset of several common conditions typical of this condition, such as fractures, falls and cardiovascular diseases that further accelerates the transition to disability. Moreover, CGA is an important step for clinical decision making and, in the case of knee OA, could be used for better tailoring pharmacological therapies. Knee OA is a condition predominantly affecting the older population, who is traditionally at higher risk of experiencing the side effects of the prolonged use of some medications, such as non-steroidal anti-inflammatory drugs, due to either underlying medical conditions or polypharmacy potentiating this effect.[29,30] We believe that in people with knee OA that can use several modalities not only for controlling pain, but also for the other comorbidities present, CGA can better personalize the correct pharmacological and non-pharmacological approach.[31] Future studies are needed to confirm these findings derived from conditions other than knee OA. Finally, some preliminary findings reported that prognostic tools can be used for predicting the onset of pain and therefore for the screening of people that will develop symptoms of knee OA.[32] Future studies using CGA derived tools are needed for confirming this last hypothesis.

The findings of this systematic review should be interpreted in the context of its limitations. First, we were not able to summarize the data using a meta-analytic approach due to the limited data for each outcome. Second, the data of this systematic review derived from the same study, *i.e.*, the OAI study, possibly introducing a selection bias. Finally, we were able to find only observational studies that have inherent limitations: we believe that future intervention studies assessing the role of CGA in older people are urgently needed.

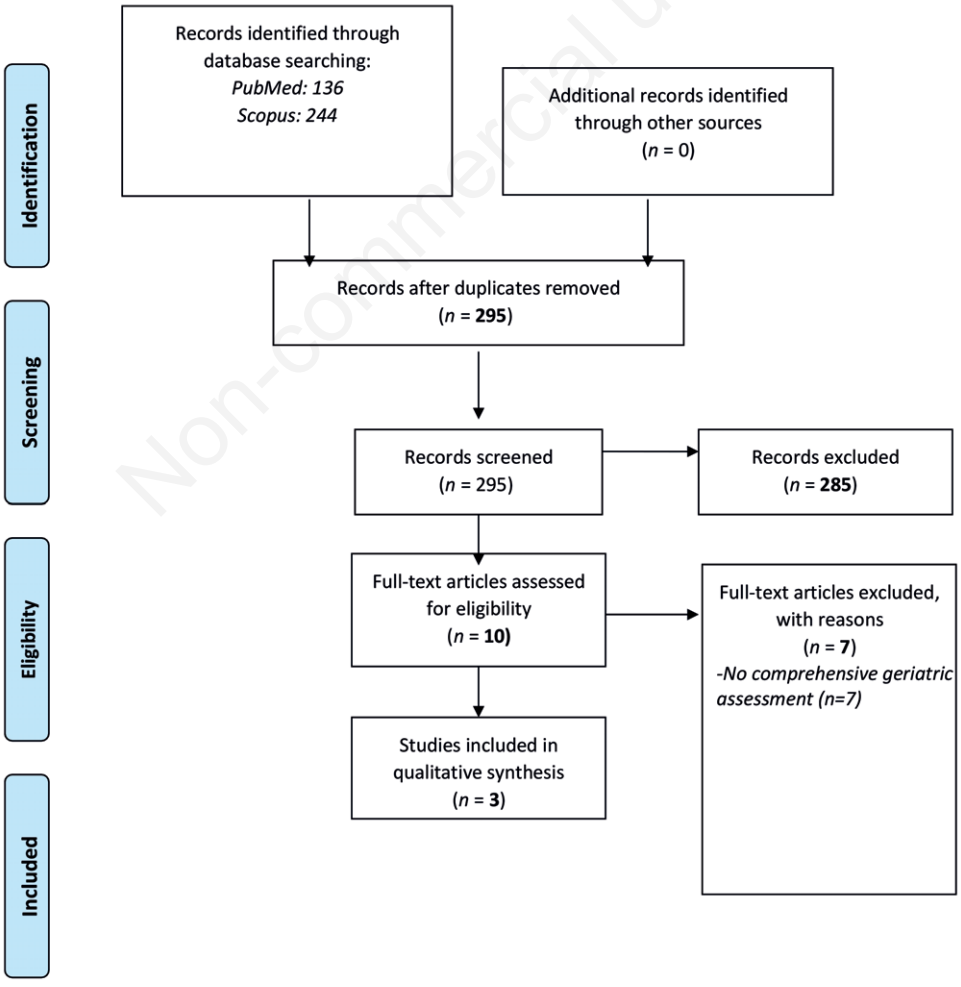

Figure 1. PRISMA flow-chart.

In conclusion, in this systematic review we summarized the current evidence of CGA in knee OA, finding that the MPI, a CGA derived tool, could be useful to early find people at higher risk of conditions that are associated with knee OA and therefore that can be the target of personalized interventions for preventing these conditions. Since CGA is useful in other chronic and acute conditions, future studies are needed for specifically understanding its use in knee OA.

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