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Osteoporosis guidelines from a rehabilitation perspective: systematic analysis and quality appraisal using AGREE II

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Abstract

Background. People affected by osteoporosis and fragility fractures often report disability and poor health-related quality of life. Albeit rehabilitation has a crucial role in older people, post-menopausal women and other subjects with high risk of fragility fractures, the rehabilitation perspective has been poorly investigated in the available guidelines for osteoporosis.

Aim. To systematically evaluate the quality of guidelines for osteoporosis from a rehabilitation perspective.

Design. Systematic analysis of guidelines.

Setting. Not applicable.

Population. Osteoporotic patients.

Methods. On May 2020, we performed a systematic search on medical literature of all guidelines published in the last 10 years on PubMed, PEDro, and international guideline databases. The study selection was based on key terms "exercise", "physical activity" or "rehabilitation". All authors independently assessed the methodological quality through the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument, consisting of six domains (scope, stakeholder involvement, rigor and development, clarity of presentation, applicability, editorial independence).

Results. Out of 331 documents retrieved, a total of 34 guidelines were selected after the screening phases. Twenty (58.8%) high quality guidelines were reported. According to AGREE II instrument, a mean score of $78.1 \pm 21.8\%$ was reported for "scope and purpose" domain; for stakeholder involvement, the mean score was $58.1 \pm 22.1\%$; the rigor of development was good (mean score of $61.3 \pm 27.3\%$); for clarity of presentation the mean score was $79.4 \pm 20.3\%$; the applicability was poor (mean score of $30.9 \pm 25.2\%$); for editorial independence the mean score was $75.1 \pm 24.6\%$. Rehabilitation recommendations for osteoporotic patients were reported in 21 (61.8%) of the selected guidelines.

Conclusions. This is the first systematic analysis evaluating quality of the guidelines for osteoporosis using AGREE II instrument. Starting from a state of the art of the currently available evidence, we could conclude that therapeutic exercise at moderate to high intensity is encouraged by several guidelines for the management of people with osteoporosis and fragility fractures. More than half of guidelines were of high-quality. However, most guidelines are lacking specific indications about exercise features.

Clinical Rehabilitation Impact. This study might support the implementation of a rehabilitation perspective in the guidelines for osteoporotic patients.

Keywords: Guideline; Osteoporosis; Rehabilitation; Osteoporotic Fractures; Exercise Therapy

Introduction

Osteoporosis is a progressive systemic skeletal disease, characterized by a reduction of bone mineral density (BMD) with impaired microarchitecture, resulting in increased susceptibility to fracture.¹

There are nearly 9 million osteoporotic fractures annually worldwide and the most common skeletal sites involved are spine, hip, wrist, and proximal humerus.² As consequence, patients affected by osteoporosis and fragility fractures often show disability, with a consequent low independence in activities of daily living, and a poor health-related quality of life.³⁻⁵

Albeit several pharmacological agents are effective in both primary and secondary prevention of fragility fractures, a considerable percentage of osteoporotic patients is still neglected and undertreated.^{1,6}

Physical and Rehabilitation Medicine (PRM) has a main role in the comprehensive management of osteoporosis and its consequences, considering the positive effects of therapeutic exercise not only in the functional recovery after fragility fractures,^{7,8} but also for prevention of falls, major determinants of fracture occurrence.⁹ Moreover, it has been showed how this intervention might also affect bone metabolism through mechanical loading with a consequent improvement of bone strength.¹⁰

However, any type of intervention, including rehabilitation approaches, should be addressed by clinical practice guidelines (CPGs), defined as “statements that include recommendations intended to optimize patient care that are informed by a systematic analysis of evidence and an assessment of the benefits and harms of alternative care options”.¹¹ CPGs have the role of translating evidence into clinical practice and are considered as mandatory for physicians to guarantee an adequate quality of care for their patients.¹²

Certainty of the evidence can be assessed with the Grading of Recommendations Assessment, Development Evaluation (GRADE)¹³ system, although we are still lacking a standardized procedure to evaluate the quality of CPGs. Appraisal of Guidelines for Research & Evaluation (AGREE) II

instrument was developed to define the essential components of a reliable guideline, improving the methodology and reporting quality of CPGs.¹⁴

To the best of our knowledge, in the available guidelines and related recommendations for the management of osteoporosis, the PRM perspective has been poorly investigated.

Therefore, aim of this systematic analysis was to summarize the state of CPGs for osteoporosis available in literature, appraising their quality using the AGREE II to provide information on the role of rehabilitation in osteoporotic patients and subjects at high risk of fragility fractures.

Methods

Search strategy

On May 2020, we systematically searched all CPGs published on PubMed/MEDLINE and Physiotherapy Evidence Database (PEDro), and on the following guidelines databases: Guidelines International Network (GIN), National Institute for Clinical Excellence (NICE), Australian National Health and Medical Research Council (NHMRC) guidelines, Scottish Intercollegiate Guidelines Network (SIGN), Canadian CPG InfoBase, New Zealand Guidelines Group (NZGG), eGuidelines, and International Osteoporosis Foundation (IOF) Guidelines. We used “Osteoporosis” as [MeSH] term and as filters “Guideline” for article type, “10 years” for publication date, “Humans” for species, and “English” for language. All duplicates were systematically identified and removed.

Study selection and data extraction

The study selection consisted of three phases: first, based on title and abstract evaluation; second, based on the critical assessment of the full texts; third, based on the presence of the key terms "exercise" or "physical activity" or "rehabilitation" in the text. The main question was: *“Does the paper evaluate exercises and/or rehabilitation treatment in patients affected by osteoporosis?”*.

Authors extracted from eligible documents through an Excel extraction form the following data: guidelines titles, authors, publication year, main key recommendations, and a synthesis of exercise recommendations.

Guidelines appraisal using the AGREE II

All guidelines were evaluated through the AGREE II instrument to ensure a systematic and standardized procedure to assess methodological quality and overall developing strategy of CPGs.¹⁴ AGREE II had six domains: 1) scope and purpose; 2) stakeholder involvement; 3) rigor and development; 4) clarity of presentation; 5) applicability; 6) editorial independence. This tool consists of 23 questions, scoring between 1 and 7, with a total score ranging from 23 to 161 (including items related to the methodological and reporting quality of CPGs). Four authors independently assessed the selected guidelines with the AGREE II instrument, evaluating the main text of the guideline, excluding additional data and documents. Each domain score was calculated through a standardized formula, as follow, by each appraiser independently, and then mean values were expressed as percentage: Scaled domain score = (Obtained Score – Minimum Score) ÷ (Maximum Score – Minimum Score).¹⁵

Guidelines are considered as high-quality ones in case of a score ≥ 60 in four or more domains (including “rigor of development”).¹⁶

Lastly, taking into account that AGREE II is a subjective instrumental tool, the degree of reviewer agreement was categorized according to Cicchetti¹⁷ into: poor in case of Intra-Class Correlation (ICC) <0.40 , moderate for ICC from 0.40 to 0.59, good for ICC from 0.60 to 0.74, and excellent for ICC from 0.75 to 1.00.

Quality of information on the role of rehabilitation

All guidelines were assessed in terms of quality of information on the role of rehabilitation for osteoporotic patients. In this context, we investigated four fundamental aspects that a PRM physician should take into consideration in CPGs for osteoporosis:

- How many studies with detailed information on rehabilitation are included in the CPGs?
- Is rehabilitation considered as an active intervention for osteoporosis by the CPGs?
- Is there a critical description of rehabilitation plan for osteoporosis (i.e. types of exercise, sessions, etc.) in the CPGs?
- Is the quality of rehabilitation component comparable to the pharmacological intervention component in the CPGs?

Results

Out of 331 documents retrieved, a total of 235 documents were assessed after the exclusion of duplicates; other 144 documents were considered as irrelevant after screening title and abstract and were excluded. After the full-text screening, out of 91 documents, 34 were not guidelines (e.g. consensus statements, summaries, research studies) and were excluded. Then, 57 guidelines were found eligible for the third screening phase that excluded all guidelines not including the key terms "exercise" or "physical activity" or "rehabilitation" in the text. Therefore, a final sample of 34 guidelines¹⁸⁻⁵¹ was obtained (Figure 1 depicts the PRISMA flow-diagram for guidelines selection).

The degree of reviewer agreement was excellent in 17 CPGs (50.0%), good in 14 CPGs (41.2%), and moderate in 3 CPGs (8.8%). As depicted in Table I, we reported the following results (means \pm standard deviations) for each domain according to AGREE II instrument: 1) scope and purpose, mean score of $78.1 \pm 21.8\%$, as most guidelines clearly delineated overall objectives; 2) stakeholder involvement, mean score of $58.1 \pm 22.1\%$, as most of the guidelines did not consider patients, public, and policy makers point of view in guideline development; 3) rigor of development, mean score of $61.3 \pm 27.3\%$, as we found a clear correlation among the recommendations and the supporting

evidence in literature; 4) clarity of presentation, mean score of $79.4 \pm 20.3\%$, considering that the majority of CPGs selected were specific and unambiguous, and key recommendations were easily identifiable; 5) applicability, mean score of $30.9 \pm 25.2\%$, because description of organizational barriers, costs implication of applying the CPGs, and auditing criteria were lacking; 6) editorial independence, mean score of $75.1 \pm 24.6\%$, suggesting an overall adequate funding and conflict of interest declarations of the CPGs.

We demonstrated the presence of 20 (58.8%) high-quality guidelines,^{18-31,33,35,36,38,39,41} considered as documents with 4 scores above 60% including rigor of development.

Taking into account the quality of information on rehabilitation from the selected CPGs for osteoporosis (see Table II for further details), we showed that rehabilitation had been considered as an active intervention for osteoporosis only by 19 CPGs (55.9%), thus reflecting that exercise is often wrongly considered only as protective factor or a recommended lifestyle. Moreover, only 17 CPGs (50.0%) provided an adequate critical description of rehabilitation plan for osteoporosis (i.e. types of exercise, sessions, etc.). These findings are in line with the gap existing between quality of CPGs component on pharmacological interventions and quality of CPGs component on rehabilitation, that resulted to be present in the 64.7% of cases.

Twenty-one CPGs (61.8%) had a dedicated paragraph for exercise and rehabilitation recommendations for osteoporotic patients, whereas the other CPGs enlisted key points into text.

Moreover, it was interesting to notice the differences in terms of study population included in the guidelines were: elderly patients (47.1%), post-menopausal women (32.3%), osteoporotic patients without fragility fractures (32.3%), osteoporotic patients with vertebral (8.8%) or hip (2.9%) fragility fractures, premenopausal women (5.9%), patients receiving glucocorticoids (5.9%), men with osteoporosis (2.9%) or at risk for low BMD (2.9%), cancer survivors with osteoporosis (2.9%), long-term care adults (2.9%), and general population (2.9%).

The guidelines for osteoporosis included in the present systematic analysis demonstrated that therapeutic exercise aimed at: preventing osteoporosis (70.6%), reducing fall risk (61.8%), reducing bone loss (47.1%), preventing vertebral fragility fractures (2.9%), and reducing the risk of main osteoporotic fractures (2.9%) (see Table III for further details).

Concerning the 20 high-quality CPGs, we resumed the evidence for the three main topics noticed in the present systematic analysis (osteoporosis prevention, fall risk prevention, reduction of bone loss) in Table IV.

Discussion

To the best of our knowledge, this is the first systematic analysis of CPGs for osteoporosis performed from a rehabilitation perspective. We identified and evaluated 34 osteoporosis guidelines published in the last 10 years through the AGREE II instrument, focusing on the rehabilitation interventions proposed. Osteoporosis is recognized as a disabling disease, considering activity limitation and participation restriction experienced by patients with major fragility fractures, requiring an individual rehabilitation plan from prevention to treatment.⁵² Patients with osteoporosis might also suffer from “kinesiofobia” (fear of movement),⁵³ making necessary an adequate education to understand benefits and safety of rehabilitation approaches, particularly therapeutic exercise, as well as physical activity in general, for a person with this specific health condition. Exercise training (weight bearing, progressive resistance exercise, strength training, balance training, and Tai-Chi) is encouraged by national and international recommendations⁵⁴ searched both for prevention and treatment of osteoporosis. It has been described that exercise might prevent bone loss, increase bone mineral density, and reduce fall risk.⁵⁵ More in detail, hip and trunk muscles, particularly back extensors, are main targets for strengthening to stimulate osteogenic effects for bone mass accrual of the proximal femur and spine, respectively, as well as to improve balance control.^{56,57}

In this systematic analysis, we found that CPGs recommend performing exercise at moderate to high intensity. Furthermore, we found some differences among the CPGs in terms of intensity of weight-bearing exercises to recommend, ranging from high (i.e. jogging) and moderate (i.e. stair climbing) to low (i.e. walking) impact exercises.⁵⁸ This discrepancy seems to reflect the knowledge advances, since more recent guidelines promote high impact exercise,^{22,42} that was discouraged in the past.⁵⁹ However, it should be underlined that most CPGs are lacking specific indications about exercise type, frequency, intensity, duration, progression, and contraindications, that should be investigated to improve quality of evidence about the application of this intervention in the management of patients with osteoporosis.

The mean AGREE II score broadly varies among different CPGs evaluated, with mean values ranging from 98.2 ± 3.4 to 22.9 ± 14.6 . Considering methodological strengths, most guidelines clearly defined objective and clinical questions. The different options for the management of osteoporosis were clearly presented in most cases and conflicts of interest of guideline development members were appropriately stated.

On the other hand, the evidence was often presented without grading, and the criteria used for the study selection were not properly described; moreover, external peer reviewers were lacking in most cases and planned updating procedure was not provided.

Furthermore, in the selected CPGs we noticed poor consideration of stakeholder's point of view and few data on resource implication, as well as limited real practice applicability and unavailability of auditing criteria.

In comparison with our findings, other methodological reviews of CPGs on osteoporosis management and on physical activities recommendation in osteoporosis reported a wider variability in terms of quality of guidelines, with clinical applicability and editorial independence as lowest ranked AGREE II domains.^{16,60}

Even in others medical conditions⁶¹⁻⁶⁴ the applicability seems to be one of the lower scores among AGREE II domains, suggesting that developing guidelines considering the knowledge translation from research to practice remains a challenging issue.

Moreover, the rigour of development of a guideline is one of most important domains, since it evaluates methodological quality in evidence search, selection and interpretation, as well as recommendation development process and potential external review and updating procedure. Almost 60% of CPGs could be defined as high quality guidelines, taking into account 4 scores, more than 60% including rigor of development. However, we found in some CPGs a lack of external review by field experts and a lack of dates of future updating processes. Most guidelines seem to follow an evidence-based methodology in developing recommendations, albeit they did not adequately describe the process in the text.⁶⁵

We are aware that this review presents some limitations: first, the AGREE II instrument is a subjective judgment that can be user-dependent in evaluating the validity of the CPGs, giving a score according to the study methodology;⁶⁶ second, all the CPGs assessed by the present work were not “a priori” structured in order to consider as main objective the role of physical exercise and/or rehabilitation in osteoporotic patients, albeit more than 60% had a dedicated paragraph; third, the CPGs with a high-quality appraisal by AGREE II might not provide the best recommendations for osteoporosis from a PRM perspective.

Conclusions

Taken together, our findings showed that therapeutic exercise at moderate to high intensity is encouraged by several guidelines for osteoporosis. By the present systematic analysis, the quality of CPGs for osteoporosis was firstly appraised using AGREE II instrument, summarizing the evidence on rehabilitation approach for older people and post-menopausal women. We might conclude that rehabilitation is mandatory in the interdisciplinary and multimodal approach to people with

osteoporosis with or without fragility fractures, thus suggesting that future CPGs on this topic should be developed considering the methodological pitfalls emerging from this research.

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None.

Authors' contribution

Study design and conceptualization: GI; Databases searching: AdS, CC, MP, AM; Data screening: AdS, CC, MP, AM; Data extraction: AdS, CC, MP, AM; Data synthesis and interpretation: AdS, CC, MP, AM; Manuscript drafting: GI, AdS; Critical revision: SL, DC, FG, AM; Study supervision: GI; Study submission: AdS. All authors read and approved the final version of the manuscript.

Ethics statement

All procedures performed in this study were in accordance with ethical standard and respecting the 1964 Helsinki Declaration and its later amendments.

Disclosure statement and funding

All authors declare no conflict of interests, funding sources or consultant relationships with any organizations involved in this research.

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Table 1. Systematic evaluation of the Guidelines for Osteoporosis using AGREE II instrument reporting all the percentage scores for different domains, the average judgement, and the Intra-Class Correlation.

N.	Guidel.		COPYRIGHT© EDIZIONI MINERVA MEDICA				e	average judgement	ICC	
			purpose	involvement	development	presentation				
1	2015 - SIGN n. 142 Management of osteoporosis and the prevention ¹⁸	Diagnosis and management	100.0	100.0	91.7	97.2	100.0	100.0	98.2±3.4	0.94
2	2010 - RACGP Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older me ¹⁹	Diagnosis and management	100.0	100.0	97.9	100.0	81.3	87.5	94.5±8.1	0.92
3	2017 - NOGG Guideline 2017 for the prevention and treatment of osteoporosis ²⁰	Diagnosis and management	100.0	100.0	90.6	97.2	60.4	75.0	87.2±16.2	0.89
4	2012 - Malaysia Clinical Guidance on Management of Osteoporosis ²¹	Diagnosis and management	100.0	75.0	93.8	94.4	66.7	91.7	86.9±13.0	0.78
5	2017 - SIOT - Clinical guidelines for the prevention and treatment of osteoporosis ²²	Diagnosis and management	100.0	83.3	74.0	100.0	62.5	100.0	86.6±16.1	0.93
6	2011 - AAOS - The Treatment of Osteoporotic Spinal Compression Fractures ²³	Osteoporosis fracture management	100.0	80.6	99.0	91.7	35.4	95.8	83.8±24.7	0.87
7	2019 - Management of Osteoporosis in Survivors of Adult Cancers with Nonmetastatic Disease ASCO Clinical Practice Guideline ²⁴	Cancer-related osteoporosis management	100.0	61.1	85.4	83.3	70.8	83.3	80.7±13.3	0.75
8	2010 - NOFSA Osteoporosis Guideline ²⁵	Diagnosis and management	100.0	86.1	80.2	97.2	31.3	83.3	79.7±25.0	0.77
9	2016 - EULAR-EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures ²⁶	Osteoporosis fracture management	83.3	77.8	82.3	100.0	35.4	83.3	77.0±21.8	0.74
10	2017 - RACGP - Osteoporosis prevention diagnosis and management in postmenopausal women and men over 50 years of age ²⁷	Diagnosis and management	100.0	63.9	71.9	100.0	47.9	70.8	75.8±20.6	0.88
11	2019 - Indian Menopause Society Update Guidelines Postmenopausal Osteoporosis ²⁸	Diagnosis and management	88.9	50.0	79.2	83.3	54.2	83.3	73.2±16.6	0.68
12	2017 - ACP - Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women A Clinical Practice Guideline Update ²⁹	Diagnosis and management	72.2	55.6	89.6	100.0	37.5	75.0	71.7±22.6	0.88
13	2011 - Taiwan Osteoporosis practice guideline ³⁰	Diagnosis and management	100.0	83.3	88.5	88.9	0.0	66.7	71.2±36.5	0.87
14	2016 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ³¹	Diagnosis and management	91.7	55.6	70.8	100.0	29.2	75.0	70.4±25.6	0.77
15	2018 - Portuguese recommendations for the prevention diagnosis and management of primary osteoporosis ³²	Diagnosis and management	88.9	50.0	52.1	88.9	31.3	100.0	68.5±27.6	0.59
16	2011 - Consensus statements on osteoporosis diagnosis prevention and management in the Philippines ³³	Diagnosis and management	80.6	41.7	77.1	100.0	16.7	91.7	68.0±32.1	0.76
17	2010 - AACE medical guidelines for clinical practice for the diagnosis and treatment of postmenopausal osteoporosis ³⁴	Diagnosis and management	77.8	66.7	59.4	91.7	22.9	87.5	67.7±25.1	0.89
18	2015 - Osteoporosis Canada - Recommendations for preventing fracture in long-term care ³⁵	Assessment of risk of fracture	83.3	41.7	69.8	86.1	20.8	87.5	64.9±27.6	0.78
19	2010 - Clinical practice guidelines for the diagnosis and management of osteoporosis	Diagnosis and	77.8	75.0	69.8	72.2	12.5	75.0	63.7±25.2	0.68

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20	2015 - Guidelines for Osteoporosis in Saudi Arabia Recommendations from the Saudi Osteoporosis Society ³⁷	Diagnosis and management	66.7	58.3	56.3	77.8	27.1	87.5	62.3±20.9	0.85
21	2017 - ACR Guideline for the Prevention and Treatment of GIO ³⁸	Management of GIO	83.3	47.2	60.4	83.3	0.0	83.3	59.6±32.8	0.77
22	2016 – SIOMMMS - Guidelines for the diagnosis prevention and management of osteoporosis ³⁹	Diagnosis and management	75.0	69.4	75.0	91.7	29.2	16.7	59.5±29.5	0.88
23	2012 - Japanese Guidelines for prevention and treatment of osteoporosis ⁴⁰	Diagnosis and management	69.4	50.0	57.3	66.7	20.8	87.5	58.6±22.5	0.79
24	2012 - Osteoporosis in Men: An Endocrine Society Clinical Practice Guideline ⁴¹	Diagnosis and management	69.4	47.2	66.7	72.2	6.3	79.2	56.8±27.0	0.76
25	2019 - SIE, SIGG, SIMFER, SIMG, SIMI, SIOMMMS, SIR, and SIOT - Guidelines for the management of osteoporosis and fragility fractures ⁴²	Diagnosis and management for male osteoporosis	66.7	33.3	22.9	66.7	33.3	100.0	53.8±29.2	0.85
26	2020 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ⁴³	Diagnosis and management	88.9	44.4	45.8	55.6	45.8	41.7	53.7±17.9	0.78
27	2012 - Joint IOF-ECTS GIO Guidelines Working Group - A framework for the development of guidelines for the management of GIO ⁴⁴	Management of GIO	80.6	27.8	42.7	75.0	0.0	95.8	53.7±36.4	0.87
28	2014 - Expert committee of the National Osteoporosis Foundation - Clinician's Guide to Prevention and Treatment of Osteoporosis ⁴⁵	Diagnosis and management	61.1	36.1	26.0	41.7	25.0	83.3	45.5±22.7	0.87
29	2013 - OSHK Guideline for Clinical Management of Postmenopausal Osteoporosis ⁴⁶	Diagnosis and management	72.2	52.8	20.8	69.4	4.2	54.2	45.6±27.3	0.57
30	2016 - Royal College of Orthopaedic Surgeons of Thailand and Thai Osteoporosis Foundation: Clinical practice guideline for osteoporosis 2016 ⁴⁷	Diagnosis and management	41.7	41.7	19.8	44.4	16.7	83.3	41.3±23.8	0.87
31	2013 - Up-date of the consensus statement of the Spanish Menopause Society on postmenopausal osteoporosis ⁴⁸	Diagnosis and management	16.7	33.3	11.5	38.9	4.2	75.0	29.9±25.7	0.58
32	2013 - Taiwanese Guidelines for the Prevention and Treatment of Osteoporosis ⁴⁹	Diagnosis and management	41.7	44.4	13.5	41.7	10.4	20.8	28.8±15.6	0.86
33	2018 - EAA clinical guideline on management of bone health in the andrological outpatient clinic ⁵⁰	Management for male osteoporosis	38.9	16.7	21.9	63.9	8.3	20.8	28.4±20.1	0.76
34	2012 – Brazilian Guidelines for the prevention and treatment of GIO ⁵¹	Management of GIO	38.9	25.0	19.8	38.9	2.1	12.5	22.9±14.6	0.81
Average judgment from AGREE II			78.1 ± 21.8	58.1 ± 22.1	61.3 ± 27.3	79.4 ± 20.3	30.9 ± 25.2	75.1 ± 24.6	63.8±18.4	

All Guidelines for Osteoporosis are ordered according to the average judgement by AGREE-II instrument. All data of the AGREE-II domains are expressed as percentages; overall judgement by AGREE-II is expressed as means ± standard deviations. Abbreviations: AGREE II =Appraisal of Guidelines for Research and Evaluation II; ICC = Intra-Class Correlation; SIGN=Scottish Intercollegiate Guidelines Network; RACGP = Royal Australian College of General Practitioners; NOGG = National Osteoporosis Guideline Group; SIOT = Italian Society for Orthopaedics and Traumatology; AAOS = American Academy of Orthopaedic Surgeons; ASCO = American Society of Clinical Oncology; NOFSA = National Osteoporosis Foundation of South Africa; EULAR = European League Against Rheumatism; EFFORT = European Federation of National Associations of Orthopaedics and Traumatology; ACP = American College of Physicians; AAACE = American Association of Clinical Endocrinologists; ACE = American College of Endocrinology; ACR = American College of

Gerontology and Geriatrics, SIMFER = Italian Society of Physical Medicine and Rehabilitation, SIMG = Italian Society of the General Medicine, SIMI = Italian Society of Internal Medicine, SIR = Italian Society of Rheumatology; IOF = International Osteoporosis Foundation; IOP = Italian Osteoporosis Society; OSHK = Orthopaedic Society of Hong Kong; AA = American Academy of Orthopaedic Surgeons. This document is protected by international copyright laws. No additional reproduction is authorized. It is permitted for personal use to download and save only one file and print only one copy of this Article. It is not permitted to make additional copies (either sporadically or systematically, either printed or electronic) of the Article for any purpose. It is not permitted to distribute the Article electronically or to include the Article in any retrieval system, electronic or mechanical, or in any information storage or retrieval system, or to use any part of the Article for any Commercial Use is not permitted. The creation of derivative works from the Article is not permitted. The production of reprints for personal or commercial use is not permitted. It is not permitted to remove, cover, overlay, obscure, block, or change any copyright notices or terms of use which the Publisher may post on the Article. It is not permitted to frame or use framing techniques to enclose any trademark, logo, or other proprietary information of the Publisher.

Table II. Quality of information on the role of rehabilitation in the selected Guidelines for Osteoporosis.

N.	Guideline	Studies with detailed included in the guideline	Consideration of rehabilitation as an active osteoporosis in the guideline	Critical description of rehabilitation plan for exercise, sessions, etc.) in the guideline	Quality of guideline component on rehabilitation to the component on pharmacological intervention
1	2015 - SIGN n. 142 Management of osteoporosis and the prevention ¹⁸	13 systematic reviews 2 observational studies	Yes	Yes	Yes
2	2010 - RACGP Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older me ¹⁹	2 systematic reviews 4 observational studies	Yes	Yes	Yes
3	2017 - NOGG Guideline 2017 for the prevention and treatment of osteoporosis ²⁰	4 systematic reviews	Yes	Yes	No
4	2012 - Malaysia Clinical Guidance on Management of Osteoporosis ²¹	1 observational study	No	No	No
5	2017 – SIOT - Clinical guidelines for the prevention and treatment of osteoporosis ²²	9 systematic reviews 5 observational studies	Yes	Yes	Yes
6	2011 – AAOS - The Treatment of Osteoporotic Spinal Compression Fractures ²³	1 observational study	Yes	No	No
7	2019 – Management of Osteoporosis in Survivors of Adult Cancers with Nonmetastatic Disease ASCO Clinical Practice Guideline ²⁴	6 systematic reviews 2 observational studies	Yes	Yes	Yes
8	2010 - NOFSA Osteoporosis Guideline ²⁵	3 systematic reviews 2 observational studies	Yes	Yes	Yes
9	2016 - EULAR-EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures ²⁶	2 systematic reviews 7 observational studies	Yes	No	Yes
10	2017 – RACGP - Osteoporosis prevention diagnosis and management in postmenopausal women and men over 50 years of age ²⁷	13 systematic reviews 3 observational studies	Yes	Yes	Yes
11	2019 - Indian Menopause Society Update Guidelines Postmenopausal Osteoporosis ²⁸	3 observational studies	No	No	No
12	2017 - ACP - Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women A Clinical Practice Guideline Update ²⁹	1 systematic review 8 observational studies	Yes	No	No
13	2011 - Taiwan Osteoporosis practice guideline ³⁰	8 systematic reviews 31 observational studies	No	Yes	Yes
14	2016 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ³¹	7 systematic reviews 2 observational studies	No	No	No
15	2018 - Portuguese recommendations for the prevention diagnosis and management of primary osteoporosis ³²	3 systematic reviews 2 observational studies	No	No	No
16	2011 - Consensus statements on osteoporosis diagnosis prevention and management in the Philippines ³³	4 systematic reviews 3 observational studies	Yes	Yes	No
17	2010 - AACE medical guidelines for clinical practice for the diagnosis and treatment of postmenopausal osteoporosis ³⁴	3 systematic reviews 3 observational studies	No	No	No
18	2015 - Osteoporosis Canada - Recommendations for preventing fracture in long-term care ³⁵	1 systematic review	No	No	No

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20	2015 - Guidelines for Osteoporosis in Saudi Arabia Recommendations from the Saudi Osteoporosis Society ³⁷	5 observational studies	No	No	No
21	2017 - ACR Guideline for the Prevention and Treatment of GIO ³⁸	1 observational study	No	No	No
22	2016 – SIOMMMS - Guidelines for the diagnosis prevention and management of osteoporosis ³⁹	Not specified	Yes	Yes	No
23	2012 - Japanese Guidelines for prevention and treatment of osteoporosis ⁴⁰	1 observational study	Yes	Yes	No
24	2012 - Osteoporosis in Men: An Endocrine Society Clinical Practice Guideline ⁴¹	1 systematic review 4 observational studies	No	No	No
25	2019 - SIE, SIGG, SIMFER, SIMG, SIMI, SIOMMMS, SIR, and SIOT - Guidelines for the management of osteoporosis and fragility fractures ⁴²	6 systematic reviews 3 observational studies	Yes	Yes	Yes
26	2020 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ⁴³	8 systematic reviews 1 observational study	Yes	Yes	Yes
27	2012 - Joint IOF-ECTS GIO Guidelines Working Group - A framework for the development of guidelines for the management of GIO ⁴⁴	Not specified	No	No	No
28	2014 - Expert committee of the National Osteoporosis Foundation - Clinician's Guide to Prevention and Treatment of Osteoporosis ⁴⁵	4 systematic reviews	No	No	No
29	2013 - OSHK Guideline for Clinical Management of Postmenopausal Osteoporosis ⁴⁶	1 systematic review 11 observational studies	Yes	Yes	Yes
30	2016 - Royal College of Orthopaedic Surgeons of Thailand and Thai Osteoporosis Foundation: Clinical practice guideline for osteoporosis 2016 ⁴⁷	6 systematic reviews 11 observational studies	Yes	Yes	Yes
31	2013 - Up-date of the consensus statement of the Spanish Menopause Society on postmenopausal osteoporosis ⁴⁸	1 systematic review	No	No	No
32	2013 - Taiwanese Guidelines for the Prevention and Treatment of Osteoporosis ⁴⁹	Not specified	No	Yes	No
33	2018 - EAA clinical guideline on management of bone health in the andrological outpatient clinic ⁵⁰	Not specified	No	No	No
34	2012 – Brazilian Guidelines for the prevention and treatment of GIO ⁵¹	1 systematic review 6 observational studies	Yes	Yes	No

Abbreviations: SIGN=Scottish Intercollegiate Guidelines Network; RACGP = Royal Australian College of General Practitioners; NOGG = National Osteoporosis Guideline Group; SIOT = Italian Society for Orthopaedics and Traumatology; AAOS = American Academy of Orthopaedic Surgeons; ASCO = American Society of Clinical Oncology; NOFSA = National Osteoporosis Foundation of South Africa; EULAR = European League Against Rheumatism; EFFORT = European Federation of National Associations of Orthopaedics and Traumatology; ACP = American College of Physicians; AACE = American Association of Clinical Endocrinologists; ACE = American College of Endocrinology; ACR = American College of Rheumatology; SIOMMMS = Italian Society for Osteoporosis, Mineral Metabolism and Bone Diseases; SIE = Italian Society of Endocrinology; SIGG = Italian Society of Gerontology and Geriatrics; SIMFER = Italian Society of Physical Medicine and Rehabilitation; SIMG: Italian Society of the General Medicine; SIMI = Italian Society of Internal Medicine; SIR = Italian Society of Rheumatology; IOF = International Osteoporosis Foundation; ECTS = European Calcified Tissue Society; GIO =

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Table III. Summary of the rehabilitative recommendations from the selected Guidelines for Osteoporosis.

N.	Guide ¹⁸		women
1	2015 - SIGN n. 142 Management of osteoporosis and the prevention ¹⁸	Premenopausal and postmenopausal women	<ul style="list-style-type: none"> Weight-bearing exercise, progressive resistance strength training exercise, walking and Tai Chi should be considered to slow decline of lumbar spine and femoral neck BMD in postmenopausal women High-impact exercise with progressive-resistance strength training should be considered to slow decline of lumbar spine and femoral neck BMD in premenopausal women
2	2010 - RACGP Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older me ¹⁹	Postmenopausal women and older men	<ul style="list-style-type: none"> Regular, high intensity weight bearing exercise is recommended for preventing osteoporotic bone loss in postmenopausal women and older men There is no evidence of long-term effects of exercise in terms of fracture risk reduction
3	2017 - NOGG Guideline 2017 for the prevention and treatment of osteoporosis ²⁰	Postmenopausal women and older men	<ul style="list-style-type: none"> Regular weight-bearing patient-tailored exercise should be advised in postmenopausal women and older men
4	2012 - Malaysia Clinical Guidance on Management of Osteoporosis ²¹	Postmenopausal women and older men	<ul style="list-style-type: none"> Regular physical activity, weight-bearing exercise must be encouraged to decrease bone loss, and avoid falls in postmenopausal women and older men
5	2017 – SIOT - Clinical guidelines for the prevention and treatment of osteoporosis ²²	General population, postmenopausal women and older people	<ul style="list-style-type: none"> Resistance, aerobic, high impact and/or weight bearing exercise might prevent age-related bone loss in the general population Walking is not effective in osteoporosis prevention Mixed moderate intensity exercise (aerobic and resistance training) might reduce the risk of falls Weight-bearing exercise with moderate/high intensity and slow progressive strength exercises should be encouraged in postmenopausal women and in older people
6	2011 – AAOS - The Treatment of Osteoporotic Spinal Compression Fractures ²³	Osteoporotic patients with vertebral fragility fractures	<ul style="list-style-type: none"> Unable to recommend for or against a supervised or unsupervised exercise program for patients with osteoporotic spinal compression fractures neurologically intact
7	2019 – Management of Osteoporosis in Survivors of Adult Cancers with Nonmetastatic Disease ASCO Clinical Practice Guideline ²⁴	Cancer survivor osteoporotic patients	<ul style="list-style-type: none"> Physical exercise (including balance training, flexibility or stretching exercises, endurance exercise, and resistance and/or progressive strengthening exercises) should be encouraged to reduce the risk of fractures caused by falls Exercise might not be enough to improve bone health but potentially reduces risk of falls in cancer survivor patients
8	2010 - NOFSA Osteoporosis Guideline ²⁵	Osteoporotic patients	<ul style="list-style-type: none"> Walking programs (5 km/day, 4 days/week) at brisk pace might improve hip BMD Specific resistance exercises for the lower back have been shown to improve vertebral BMD Exercise must be implemented in falls prevention programs
9	2016 - EULAR-EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures ²⁶	Osteoporotic patients with vertebral fragility fractures	<ul style="list-style-type: none"> Exercise is recommended for increasing in BMD and reducing the frequency of falls in osteoporotic patients with vertebral fragility fractures Evidence for vertebral fragility fracture prevention by exercise is limited
10	2017 – RACGP - Osteoporosis prevention diagnosis and management in postmenopausal women and men over 50 years of age ²⁷	General population over 50 years old and osteoporotic patients	<ul style="list-style-type: none"> Resistance moderate–vigorous, progressive and varied exercise should be performed by general population over 50 years old for 2–3 days per week to influence BMD and reduce fall and fracture risk High-intensity progressive resistance and balance training in older adults with osteoporosis might prevent further bone loss and decrease falls and fracture risk Resistance and balance training, after hip fracture might improve mobility, strength and physical performance in people aged more than 50 years
11	2019 - Indian Menopause Society Update Guidelines Postmenopausal Osteoporosis ²⁸	Postmenopausal women and osteoporotic patients	<ul style="list-style-type: none"> Resistance, weight bearing aerobic and core stabilizing exercise might maintain bone health Balance exercises might prevent falls Patients with severe osteoporosis should avoid forward flexion exercises, side bending, and heavy weights lift to prevent vertebral fractures
12	2017 - ACP - Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women A Clinical Practice Guideline Update ²⁹	Osteoporotic patients	<ul style="list-style-type: none"> Insufficient evidence shows effects of physical activity on fracture risk
13	2011 - Taiwan Osteoporosis practice guideline ³⁰	Postmenopausal women	<ul style="list-style-type: none"> Mixed resistive exercise/weight training might enhance in lumbar spine and femoral neck BMD in postmenopausal women
14	2016 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ³¹	Postmenopausal women	<ul style="list-style-type: none"> Strength training might produce significant changes in BMD in postmenopausal women Exercise is recommended in fall risk management in postmenopausal women

16	2011 - Consensus statements on osteoporosis diagnosis prevention and management in the Philippines ³³	Older people	<ul style="list-style-type: none"> Tai Chi might enhance balance and reduce risk of falling in elderly Aerobics, walking, resistance and weight bearing exercises, and walking must be regularly performed by older people to increase lumbar spine and femoral neck BMD
17	2010 - AACE medical guidelines for clinical practice for the diagnosis and treatment of postmenopausal osteoporosis ³⁴	Older people and osteoporotic patients	<ul style="list-style-type: none"> Exercise is recommended in reducing bone loss, improve balance, and reduce the risk of falls Severe osteoporosis patients should avoid forward flexion exercises, using heavy weights, or performing side-bending exercises, as compressive forces on the spine might lead to fracture
18	2015 - Osteoporosis Canada - Recommendations for preventing fracture in long-term care ³⁵	Older people in long-term care	<ul style="list-style-type: none"> Balance exercises and strength training should be encouraged to prevent falls in older people in long-term care
19	2010 - Clinical practice guidelines for the diagnosis and management of osteoporosis in Canada ³⁶	Older people and osteoporotic patients	<ul style="list-style-type: none"> Resistance training and/or weightbearing aerobic exercises are recommended for older people at risk for osteoporosis and for osteoporotic patients Core stability exercises are recommended to compensate postural weakness in patients with vertebral fragility fractures Tai Chi, balance exercises, and gait training should be considered for patients at risk of falls
20	2015 - Guidelines for Osteoporosis in Saudi Arabia Recommendations from the Saudi Osteoporosis Society ³⁷	Older people	<ul style="list-style-type: none"> Exercise is recommended for maintaining muscle and bone strength in older people
21	2017 - ACR Guideline for the Prevention and Treatment of GIO ³⁸	Patients receiving glucocorticoids	<ul style="list-style-type: none"> Regular weight-bearing or resistance training exercise is recommended to prevent glucocorticoid-induced osteoporosis
22	2016 - SIOMMMS - Guidelines for the diagnosis prevention and management of osteoporosis ³⁹	Older people	<ul style="list-style-type: none"> Weight-bearing exercise should be encouraged to counteract the loss of bone and muscle in older people
23	2012 - Japanese Guidelines for prevention and treatment of osteoporosis ⁴⁰	Older people	<ul style="list-style-type: none"> Walking and weight-bearing exercise are effective to prevent bone loss in older people Strength and balance training are recommended to prevent falls in older people
24	2012 - Osteoporosis in Men: An Endocrine Society Clinical Practice Guideline ⁴¹	Male osteoporotic patients	<ul style="list-style-type: none"> Weight-bearing activities sessions of 30-40 minutes (3-4 times per week) are recommended in male osteoporotic patients
25	2019 - SIE, SIGG, SIMFER, SIMG, SIMI, SIOMMMS, SIR, and SIOT - Guidelines for the management of osteoporosis and fragility fractures ⁴²	Older people and osteoporotic patients	<ul style="list-style-type: none"> High-intensity and speed walking, jogging, climbing stairs, and stepping, might limit bone loss in postmenopausal women Multi-component training, including moderate-to-high impact exercises, muscle strengthening, and balance exercises, might have a positive effect on lumbar spine and femoral neck BMD Modest physical activity in osteoporotic patients might reduce the risk of falling A minimum of physical activity (walk more than 30 min a day outdoor, if possible) should be encouraged in osteoporotic patients
26	2020 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ⁴³	Older people and osteoporotic patients	<ul style="list-style-type: none"> Regular weight bearing exercises slow bone loss, improve balance and reduce the risk of falls in elderly Balance and trunk muscle exercises are recommended in falls prevention Individuals with severe osteoporosis should avoid forward spine flexion and rotation, lifting heavy weights and side bending of the trunk as they might increase the risk of fracture
27	2012 - Joint IOF-ECTS GIO Guidelines Working Group - A framework for the development of guidelines for the management of GIO ⁴⁴	Patients assuming glucocorticoids	<ul style="list-style-type: none"> Regular weight-bearing exercise should be advised Physical exercise should be encouraged
28	2014 - Expert committee of the National Osteoporosis Foundation - Clinician's Guide to Prevention and Treatment of Osteoporosis ⁴⁵	Older people and osteoporotic patients	<ul style="list-style-type: none"> Regular weight-bearing and muscle strengthening exercises are recommended to improve agility, strength, posture, and balance, and to maintain or improve bone strength in elderly Exercise also reduces the risk of falls and fractures in elderly Severe osteoporotic patients should avoid forward bending and twisting during exercise
29	2013 - OSHK Guideline for Clinical Management of Postmenopausal Osteoporosis ⁴⁶	Postmenopausal osteoporotic women	<ul style="list-style-type: none"> Weight-bearing, muscle strengthening, and balance-training exercises might improve agility, strength, posture, coordination and balance, and reduce the risk of fall in postmenopausal osteoporotic women Exercise programs for osteoporotic patients should target posture, balance, gait, coordination, and hip and trunk stabilization
30	2010 - Royal Society of Thailand and Thai Osteoporosis Foundation	osteoporotic patients	<ul style="list-style-type: none"> Weight-bearing exercise is recommended to reduce bone loss in postmenopausal women

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	Clinical practice guideline for osteoporosis 2016 ⁴⁷		<ul style="list-style-type: none"> • Back extensor exercises are recommended in patients with vertebral fragility fractures • Balance training and lower limb strengthening are recommended to prevent falls • Low-impact weight-bearing exercises (walking for 40 min daily or 30 min/day for 3 days/week) are recommended in osteopenic patients
31	2013 - Up-date of the consensus statement of the Spanish Menopause Society on postmenopausal osteoporosis ⁴⁸	Postmenopausal women	<ul style="list-style-type: none"> • Weight-bearing resistance exercises might improve body stability and compensates postural abnormalities in post-menopausal osteoporosis women • Balance exercise (e.g. Tai Chi) should be considered for postmenopausal women at risk of falls
32	2013 - Taiwanese Guidelines for the Prevention and Treatment of Osteoporosis ⁴⁹	Postmenopausal women	<ul style="list-style-type: none"> • Weight bearing aerobic exercise, hip loading exercise, and impact exercise might improve the lumbar spine BMD • Resistance exercise might increase femoral neck BMD • Aerobic exercise, resistance exercise, or combined aerobic/resistance exercises might decrease bone loss, improve physical function, and maintain independence in post-menopausal women
33	2018 - EAA clinical guideline on management of bone health in the andrological outpatient clinic ⁵⁰	Male osteoporotic patients	<ul style="list-style-type: none"> • Physical exercise and lifestyle changes are recommended as first-line therapy in male osteoporotic patients
34	2012 – Brazilian Guidelines for the prevention and treatment of GIO ⁵¹	Patients receiving glucocorticoids	<ul style="list-style-type: none"> • Resistance exercises and weightlifting are recommended for the prevention and treatment of glucocorticoid-induced osteoporosis • Balance exercises are also recommended for patients receiving glucocorticoids at risk of falling

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Table IV. Summary of the main rehabilitative recommendations from high-quality Guidelines for Osteoporosis, according to the AGREE II score.

Guideline			oporosis bone loss
2015 - SIGN n. 142 Management of osteoporosis and the prevention ¹⁸	Physically active lifestyle	Balance training, flexibility or stretching exercises, endurance exercises, strengthening exercises	Weight-bearing exercises, resistance and strength training exercises, walking
2010 - RACGP Clinical guideline for the prevention and treatment of osteoporosis in postmenopausal women and older men ¹⁹	Resistance and balance training exercises, 2–3 days/week, moderate–vigorous.	Home-based exercises, medium to high intensity, balance training	Resistance and balance training, high intensity
2017 - NOGG Guideline 2017 for the prevention and treatment of osteoporosis ²⁰	Physically active lifestyle	Home-based exercises, muscle strengthening and balance training, Tai-Chi	Regular weight-bearing exercises
2012 - Malaysia Clinical Guidance on Management of Osteoporosis ²¹	Physically active lifestyle	Community exercises programs, Tai-Chi	Regular weight-bearing exercises
2017 – SIOT - Clinical guidelines for the prevention and treatment of osteoporosis ²²	Weight-bearing exercises with moderate/high intensity, strength exercises	Moderate intensity aerobic exercise and resistance training	Resistance, aerobic, high impact and/or weight bearing exercise
2011 – AAOS - The Treatment of Osteoporotic Spinal Compression Fractures ²³	Not evaluated	Not evaluated	Not evaluated
2019 – Management of Osteoporosis in Survivors of Adult Cancers with Nonmetastatic Disease ASCO Clinical Practice Guideline ²⁴	Weight-bearing exercises	Balance training, flexibility or stretching exercises, endurance exercises, strengthening exercises	Combination exercise programs
2010 - NOFSA Osteoporosis Guideline ²⁵	Walking programs (5 km/day, 4 days/week) at brisk pace	Exercise must be implemented in falls prevention programs	Squat and dead-lift exercises, 10 minutes/day, 2 days/week, resistance exercises
2016 - EULAR-EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures ²⁶	Physically active lifestyle	Not specified exercise program	Not specified exercise program
2017 – RACGP - Osteoporosis prevention diagnosis and management in postmenopausal women and men over 50 years of age ²⁷	Resistance moderate-vigorous and balance exercises (2–3 days/week)	Home-based exercise, or community-based exercise with resistance and balance training (2–3 days per week)	Weight-bearing aerobic exercises with moderate-to-high impact (i.e. jogging, tennis, volleyball, stair climbing and step aerobics)
2019 - Indian Menopause Society Update Guidelines Postmenopausal Osteoporosis ²⁸	Resistance, weight bearing, aerobic and core stabilizing exercise	Balance exercises	Resistance, weight bearing, aerobic and core stabilizing exercise
2017 - ACP - Treatment of Low Bone Density or Osteoporosis to Prevent Fractures in Men and Women A Clinical Practice Guideline Update ²⁹	Not evaluated	Not evaluated	Not evaluated
2011 - Taiwan Osteoporosis practice guideline ³⁰	Physically active lifestyle	Tai-Chi	Mixed resistive exercise/weight training
2016 - AACE/ACE clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis ³¹	Active lifestyle, weight-bearing, balance, and resistance exercises	Not specified exercise type	Strength training exercises
2011 - Consensus statements on osteoporosis diagnosis prevention and management in the Philippines ³³	Aerobics, walking, weight bearing exercises	Tai-Chi 3/week per 6 months	Supervised high intensity resistance exercise, strength training, with sets of 8–12 repetitions 2–3 days/week
2015 - Osteoporosis Canada - Recommendations for preventing fracture in long-term care ³⁵	Not evaluated	Balance exercises and strength training	Not evaluated

2010 - Clinical practice guidelines for the diagnosis and

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Resistance training and/or weight bearing

management of osteoporosis in Canada ³⁶			aerobic exercises
2017 - ACR Guideline for the Prevention and Treatment of GIO ³⁸	Regular weight-bearing or resistance training exercise	Not evaluated	Not evaluated
2016 – SIOMMMS - Guidelines for the diagnosis prevention and management of osteoporosis ³⁹	Weight-bearing exercise	Physical activity, even modest, walking for more than 30 minutes/day	Weight-bearing exercise
2012 - Osteoporosis in Men: An Endocrine Society Clinical Practice Guideline ⁴¹	Physically active lifestyle	Weight-bearing activities sessions of 30-40 minutes (3-4 times/week)	Weight-bearing activities sessions of 30-40 minutes (3-4 times/week)

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Tables and Figures Legends

Table I. Systematic evaluation of the Guidelines for Osteoporosis using AGREE-II instrument reporting all the percentage scores for different domains and the average judgement.

Table II. Quality of information on rehabilitation from the selected Guidelines for Osteoporosis.

Table III. Summary of the rehabilitative recommendations from the selected Guidelines for Osteoporosis.

Table IV. Summary of the main rehabilitative recommendations from high-quality Guidelines for Osteoporosis, according to the AGREE II score.

Figure 1. PRISMA flow-diagram for guidelines selection.

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