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CONSENSUS STATEMENT

Asia–Pacific consensus for the management of osteoporosis in men

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Abstract

Summary Osteoporosis in men is an underdiagnosed and undertreated condition that leads to significant morbidity and mortality, particularly in the aging population. This consensus report provides tailored guidelines for diagnosing, preventing, and treating male osteoporosis in the Asia–Pacific region by integrating global best practices with regional adaptations.

Purpose To establish evidence-based, region-specific guidelines for the management of male osteoporosis in the Asia–Pacific region, addressing demographic and lifestyle factors.

Methods Expert feedback was gathered through premeeting reviews, consensus conferences, and collaborative discussions. A life-course approach was employed to align international best practices with Asia–Pacific-specific needs, emphasizing continuous monitoring and intervention from middle age onward.

Results The 12 consensus strategies systematically approach male osteoporosis management, addressing screening, diagnosis, treatment, and long-term follow-up. Recommendations include the assessment of fracture risk for men aged 50 years and above, use of dual-energy X-ray absorptiometry (DXA) testing for men aged 70 years and above, lifestyle modifications, and pharmacological interventions such as bisphosphonates, denosumab, and anabolic agents for high-risk patients. Secondary causes of osteoporosis were highlighted, along with the establishment of fracture liaison services (FLSs) to improve long-term care. A life-course approach was proposed to optimize bone health throughout men's lives.

Conclusion This consensus provides a comprehensive framework tailored to the Asia–Pacific region for diagnosing, preventing, and managing osteoporosis in men. By addressing region-specific challenges and promoting evidence-based interventions, the latest guidelines incorporating the consensus may depict the conceptual direction in reducing fracture risk and improving long-term bone health outcomes for osteoporosis in men.

Keywords Asia–Pacific region · consensus · fractures · Men · osteoporosis

Introduction

Osteoporosis in men has long been underdiagnosed and undertreated, leading to higher fracture-related morbidity and mortality rates than those in women [1–3]. Although often underrecognized, the condition remains clinically significant, with prevalence rates among men over 50 ranging from 1.3% in Taiwan to 8.8% in South Korea. In the

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Asia–Pacific region, the incidence of hip fractures in men is rising more rapidly than in women, and men now account for approximately 30% of all global hip fractures, with notably higher post-fracture mortality rates. Furthermore, substantial regional differences in female-to-male hip fracture ratios—ranging from 1.4–1.7 in China to 3.1 in Japan—underscore the urgent need for gender- and region-specific osteoporosis prevention strategies [4]. This consensus provides insights from regional and international experts to establish guidelines tailored to the Asia–Pacific population for diagnosing, preventing, and treating male osteoporosis. These recommendations integrate international best practices, such as International Osteoporosis Foundation (IOF), with adaptations that consider the demographic, environmental, and lifestyle factors relevant to the Asia–Pacific region.

Methods

This study was developed through extensive collaboration, with feedback collected from experts across the region. This expert feedback was synthesized to create a comprehensive guideline for shaping the final consensus that aligns with the region's needs and challenges. Each expert contributed by reviewing the premeeting draft recommendation, attending the consensus conference, and/or providing insightful comments based on their clinical experience and the latest research. The consensus integrates both global best practices and Asia–Pacific contextual adaptations, with evidence sourced from peer-reviewed publications, clinical guidelines, and registry data.

The consensus recommendations were structured to reflect a life-course approach, which emphasizes continuous monitoring and intervention from middle age onward. This strategy, while consistent with worldwide best practices, incorporates adjustments tailored to the demographic and lifestyle profiles of men in the Asia–Pacific area.

Results

We developed a consensus on male osteoporosis management in the Asia–Pacific region, incorporating extensive recommendations from global experts, with particular emphasis on insights specific to the Asia–Pacific context. The 12 consensus strategies present a comprehensive approach to male osteoporosis management, systematically addressing key areas from prevention and diagnosis to treatment and long-term follow-up. The recommendations cover screening strategies, diagnostic approaches, and evidence-based interventions appropriate for men to stop fracture in the Asia–Pacific region (Table 1). Comprehensive strategies include alertness of osteoporotic fracture risk for men aged 50 years and above, with additional bone density assessment via dual-energy X-ray absorptiometry (DXA) for those over 70 years. The consensus underscores lifestyle modifications—such as smoking cessation, reduced alcohol intake, regular exercise, and adequate protein and vitamin D intake—to support bone health. For treatment, antiresorptive medications, such as bisphosphonates or denosumab, are recommended as first-line options, with anabolic agents prioritized for high-risk patients. Furthermore, it advocates establishing fracture liaison services (FLSs) to enhance long-term osteoporosis care and ensure effective resource allocation and healthcare system integration.

1. Implement targeted screening in men aged 50 years and above, using international and Asia–Pacific-developed tools[1] to assess osteoporosis or fracture risk and perform DXA in those aged 70 years and older for intervention decisions.

   Bone turnover markers are used to monitor treatment effects and enhance compliance, recognizing the limitations due to cost, interassay variability, intrasubject physiological fluctuations, and lack of consistent norms.Testing in men over the age of 50 years is crucial owing to the growing recognition of male osteoporosis and its associated risks. For fracture risk assessment, it is suggested to use internationally recognized techniques such as FRAX, which has received substantial global validation. While regionally produced instruments like MOSTAi (which requires additional external validation) and COSA are available for their own local population, FRAX remains the most completely validated instrument for predicting fracture risk across the Asia–Pacific regions and international populations [5–7]. BONEcheck™ is the first tool that incorporates the polygenic risk score PRS to predict 5-year fracture risk [8]. The Bone Health and Osteoporosis Foundation (BHOF), formerly the National Osteoporosis Foundation, specifically recommends DXA scans for men aged 70 and older to guide clinical interventions. Current data support DXA screening in older men as it enables earlier diagnosis, which is essential for preventing major fractures [9].
2. Conduct DXA scans via the international standard Caucasian female reference for men. Develop and validate male-specific reference databases tailored to Asian populations as needed.

[1] FRAX (Fracture Risk Assessment Tool), MORES (Male Osteoporosis Risk Estimation Score), Asia–Pacific-developed tools (such as MOSTAi (Male Osteoporosis Self-Assessment Tool for Taiwan), COSA (Chinese Osteoporosis Screening Algorithm), Garvan (Garvan Fracture Risk Calculator and/or BONEcheck™)).

Table 1 Consensus of 12 strategies for managing osteoporosis in men in the Asia–Pacific region

Actions	Objectives
1. Screen men aged 50 and above	Early detection of osteoporosis risk
2. Use NHANES III database for DXA scan	More sensitive bone density assessment for men
3. Evaluate risk factors for diagnosis	Comprehensive risk assessment
4. Monitor bone turnover	Track bone metabolism and adjust treatment
5. Ensure vitamin D and calcium intake	Provide essential nutrients for bone health
6. Recommend lifestyle changes	Increase activity, reduce fall and fracture risk
7. Use antiresorptive drugs (e.g., denosumab)	Reduce fracture incidence
8. Consider anabolic agents for high-risk cases	Improve bone strength and density
9. Treat hypogonadism with testosterone	Support bone and muscle health in men
10. Implement fracture liaison services (FLS)	Prevent secondary fractures and improve care coordination
11. Reinforce adherence and follow-up	Ensure long-term treatment success
12. Promote lifelong bone health	Emphasize prevention and care throughout the lifespan

DXA dual-energy X-ray absorptiometry, *NHANES* National Health and Nutrition Examination Survey

DXA scans typically use a reference database of bone mineral density (BMD) from a young, healthy population to calculate T-scores. The International Society for Clinical Densitometry (ISCD) recommends the use of a uniform Caucasian (nonrace-adjusted) female reference database for calculating T-scores in both men and women across all ethnic groups. Although the necessity for male-specific reference databases would be an issue in Asian populations due to their fragile fracture epidemiology, current international consensus favors continued application of the NHANES III Caucasian female reference database for DXA interpretation in men. The emphasis should be on accurately estimating fracture risk rather than creating sex- or region-specific reference databases, which may not necessarily improve clinical outcomes or diagnostic value [10].

3. Systematically assess secondary factors associated with increased fracture risk—such as hypogonadism, glucocorticoid use, and vitamin D deficiency—and incorporate findings into individualized diagnostic and treatment plans.

The diagnosis and management of osteoporosis in men must include a thorough evaluation of secondary causes that contribute to bone loss. Conditions such as hypogonadism, diabetes, and glucocorticoid use, along with lifestyle factors such as smoking and alcohol consumption, significantly influence osteoporosis risk [11]. Moreover, the impact of E-cigarettes on bone health remains uncertain, as limited research suggests potential risks but provides no definitive evidence [12]. Addressing these secondary factors in diagnosis and treatment plans ensures that all underlying contributors to osteoporosis are considered and managed to increase the effectiveness of treatment. Hypogonadism, in particular, is strongly associated with decreased BMD in men, and its treatment is an integral part of managing male osteoporosis [13].

4. Bone turnover markers are used to monitor treatment effects and enhance compliance, recognizing the limitations due to cost, interassay variability, intrasubject physiological fluctuations, and lack of consistent norms.

Bone turnover markers (BTMs), such as P1 NP (type 1 procollagen amino-terminal propeptide) and CTX (C-terminal telopeptide of type I collagen), are useful for monitoring treatment effectiveness [14]. They can indicate changes in bone formation and resorption, helping clinicians adjust therapies. However, the variability in these markers and the lack of standardized reference ranges make them less reliable as standalone tools. Despite these limitations, BTMs have the potential to improve patient compliance by providing a clear, measurable indicator of treatment efficacy, which helps patients stay engaged in their therapy [15].

5. Ensure sufficient vitamin D (≥ 800 IU/day) and calcium intake (1000–1200 mg/day) through diet and/or supplementation while avoiding overdose.

Adequate intake of vitamin D and calcium is essential for maintaining bone health. Vitamin D facilitates calcium absorption, and together, these nutrients help maintain bone mineralization and reduce fracture risk. Clinical studies recommend a daily intake of at least 800 IU of vitamin D and 1000–1200 mg of calcium for men with osteoporosis [16]. However, caution is advised to avoid overdosing, which can lead to complications such as hypercalcemia [17]. Proper nutritional counseling and monitoring can help ensure that men receive adequate but safe levels of these nutrients.

6. Lifestyle modifications, including smoking cessation, reduced alcohol consumption, regular exercise,

and sufficient protein intake, should be encouraged to improve musculoskeletal health and prevent fractures.

Lifestyle modifications play a pivotal role in preventing osteoporosis and related fractures in men. Smoking and excessive alcohol consumption have both been linked to accelerated bone loss and increased fracture risk [18]. Though research directly on e-cigarettes and bone health is relatively limited, existing evidence suggests they may have a negative impact on bone metabolism. Until more definitive data becomes available, caution is advised, and both traditional and e-cigarettes should be avoided as part of bone healthcare [12]. Regular exercise, particularly weight-bearing and resistance exercises, has been shown to increase bone density and improve musculoskeletal health, reducing the likelihood of fractures. Additionally, sufficient protein intake is necessary for bone matrix formation and maintaining muscle strength, which can help prevent falls [19]. Clinical research confirms that these lifestyle changes are essential for long-term bone health.

7. Prioritize bisphosphonates (e.g., alendronate, risedronate, zoledronate) or denosumab as first-line therapies for most men with osteoporosis.

   Bisphosphonates, such as alendronate, risedronate, and zoledronate, are considered first-line treatments for osteoporosis because of their ability to increase bone mineral density and reduce fracture risk. Denosumab, a monoclonal antibody, is also effective at increasing the BMD and reducing fractures, making it an important alternative for patients who cannot tolerate bisphosphonates; nevertheless, discontinuation of this agent can result in rapid bone loss. Although limited in number, validated clinical trials support the use of these medications in men, providing evidence of a significant reduction in the risk of vertebral and nonvertebral fractures [20].

8. For patients with imminent or very high fracture risk, anabolic agents are preferred as first-line agents, and they should be sequentially followed by antiresorptive therapy.

   In cases where men are at very high risk for fractures (> 30% 10-year major osteoporotic fracture risk or > 4.5% 10-year hip fracture risk), anabolic agents such as teriparatide, abaloparatide, and romosozumab should be prioritized [21]. These agents work by stimulating bone formation, leading to significant increases in bone density and reductions in fracture risk. After an initial course of anabolic therapy, antiresorptive treatments such as bisphosphonates or denosumab can be used to maintain improvements in bone density. Studies confirm that this sequential approach is particularly effective in men with severe osteoporosis [22].

9. Testosterone therapy should be reserved for men with symptomatic hypogonadism. Its effect on fracture risk reduction has not been established.

   Testosterone replacement therapy (TRT) has been shown to improve bone density in men with hypogonadism. Clinical trials indicate that TRT can help increase BMD, particularly in the spine, but its effect on fracture risk reduction remains inconclusive, and some studies have noted an increased fracture incidence among treated individuals. While TRT may improve BMD in men with symptomatic hypogonadism, standard osteoporosis treatments (such as bisphosphonates or other approved therapies) continue to be the primary interventions for managing bone health in these patients, with testosterone therapy serving as an adjunctive approach when clinically indicated for hypogonadal symptoms [23, 24].

10. Implement FLSs as standardized care pathways to optimize fracture prevention, improve musculoskeletal outcomes, and ensure cost-effective healthcare integration.

    FLSs are multidisciplinary programs that ensure that patients who have suffered osteoporotic fractures receive appropriate follow-up care to prevent future fractures. To ensure quality and consistency in FLS implementations, programs should compare their results to national clinical standards and worldwide best practice frameworks. The IOF Capture the Fracture® Best Practice Framework establishes a comprehensive global standard that includes critical performance factors such as fracture identification rate, time to DXA, treatment initiation rate, and long-term adherence. The development of national FLS registries enables real-time feedback and benchmarking among institutions. These programs have been highly successful in reducing the incidence of secondary fractures by improving diagnosis, treatment, and patient education. Clinical research shows that integrating FLSs into healthcare systems is both cost-effective and beneficial for long-term patient outcomes [25].

11. Emphasize long-term adherence with regular follow-ups every 6–12 months to monitor treatment effects, prevent adverse events, and make necessary adjustments.

    Long-term adherence to osteoporosis treatments is essential for reducing fracture risk and maintaining bone density. Regular follow-up visits every 6–12 months allow healthcare providers to monitor treatment progress, assess for any side effects, and adjust treatment plans as needed. Studies indicate that treatment adherence is one of the most significant challenges in managing osteoporosis, with many patients discontinuing their medications within a year [26]. Regular follow-up and patient education are critical to improving adherence and ensuring effective long-term management.

    A life-course approach to osteoporosis management involves addressing bone health at all stages of life, from youth through old age [27]. This approach emphasizes

prevention, early detection, and continuous management to reduce fracture risk and improve bone health outcomes over time. For men in Asia–Pacific, this involves using screening tools (e.g., FRAX) at the age of 50 years, maintaining proper nutrition and physical activity, and applying appropriate medical interventions as necessary. Research suggests that adopting a long-term perspective on bone health may contribute to improved patient outcomes, potentially reducing fracture incidence and enhancing quality of life [28]. By recognizing bone health as a lifelong concern, healthcare providers can help men maintain stronger bones and avoid osteoporosis-related complications throughout their lives.

Discussion

Osteoporosis in men is an emerging public health issue that has gained increasing recognition in recent years. Historically, osteoporosis was considered primarily a woman's disease, leading to a lack of awareness and underdiagnosis in men. However, current research demonstrates that men are at substantial risk for osteoporotic fractures, especially as they age. The strategy of implementing a comprehensive framework focuses on comprehensive recommendations for men's osteoporosis screening, diagnosis, treatment, and long-term management, with the goal of significantly reducing fracture risk and burden. It stresses the integration of worldwide best practices with region-specific considerations, recognizing the environmental and lifestyle factors that influence male osteoporosis in this region. Table 2 offers a comparative overview of recent guidelines and reviews that have been published on osteoporosis in men. These guidelines refine the current frameworks by customizing recommendations to the Asia–Pacific region's distinct demographic and lifestyle considerations.

One of the key findings of recent research is that men tend to lose bone mass more rapidly after the age of 50 years, particularly if they have underlying conditions such as hypogonadism or if they use glucocorticoids. This makes early screening and intervention critical for preventing fractures and maintaining bone health in men. The consensus recommendations highlight the importance of fracture risk assessment in men with clinical risk factors for osteoporosis. The incorporation of region-specific tools guarantees that the recommendations are tailored to the specific needs of the Asia–Pacific male population, even if FRAX remains the world's most widely used survey tool.

In addition to screening, addressing secondary causes of bone loss is essential for improving treatment outcomes. Conditions such as hypogonadism and diabetes, along with lifestyle factors such as smoking and alcohol consumption, have a profound impact on bone health. The consensus stresses the importance of evaluating these secondary causes and incorporating them into diagnosis and treatment plans. For example, testosterone therapy is recommended for men with symptomatic hypogonadism, although its use should be closely monitored.

Pharmacological treatment plays a central role in managing male osteoporosis. Bisphosphonates and denosumab are well-established therapies that have been shown to reduce fracture risk in men. For high-risk patients, anabolic agents offer an additional treatment option, followed by antiresorptive therapies to maintain bone density gains [29, 30]. The consensus advocates for a personalized approach to treatment, ensuring that medications are tailored to the individual's risk profile and response to therapy.

Lifestyle modifications are also crucial in preventing and managing osteoporosis in men [31]. Smoking cessation, alcohol reduction, regular exercise, and adequate nutrition are fundamental strategies for improving bone density and reducing the risk of falls and fractures. These modifications not only enhance bone health but also contribute to overall well-being and longevity.

Finally, the consensus suggests the value of considering bone health as a long-term priority, proposing that appropriate assessment and intervention at different life stages may help optimize skeletal health in men. This perspective encourages clinicians to view osteoporosis management as part of a broader approach to musculoskeletal health across the lifespan. This perspective ensures that bone health is addressed early and maintained through preventive measures and timely treatments as needed.

Conclusion

The Asia–Pacific consensus on male osteoporosis management provides a comprehensive framework for diagnosing, treating, and preventing osteoporosis in men. By incorporating both global best practices and region-specific considerations, the recent guidelines provide a roadmap that healthcare providers can use to enhance the management of male osteoporosis. Early screening, lifestyle modifications, and pharmacological interventions such as bisphosphonates, denosumab, and anabolic agents are essential for reducing fracture risk and improving bone health outcomes. The integration of FLSs and a life-course approach further strengthens the long-term management of male osteoporosis in the Asia–Pacific region.

By combining evidence-based interventions with tailored approaches for the Asia–Pacific male population, this consensus represents a significant step forward in improving the care and management of osteoporosis in men. As the burden of osteoporosis continues to increase with increasing age, these guidelines offer a roadmap for healthcare providers to provide optimal care and enhance the quality of life for men at risk of or suffering from osteoporosis.

Table 2 Recent guidelines and reviews on osteoporosis in men

Authors	Title	Highlights	Source
Bandeira et al	Male osteoporosis	Male osteoporosis screening and treatment focus on early detection through bone mineral density measurement and fracture risk assessment, alongside personalized interventions including pharmacologic treatments and lifestyle modifications to reduce fracture risk and improve bone health	Arch Endocrinol Metab. 2022;66:739–747
Beaudart C et al	Efficacy of osteoporosis pharmacological treatments in men	Systematic review and meta-analysis of pharmacological treatment effectiveness in male osteoporosis	Aging Clin Exp Res 2023;35:1789–1806
Björnsdottir S et al	Male osteoporosis-what are the causes, diagnostic challenges, and management	Screening and treatment for male osteoporosis emphasize the use of fracture risk assessment tools and bone density measurements, alongside individualized pharmacologic and nonpharmacologic interventions, to effectively reduce fracture risks and improve overall bone health in men	Best Pract Res Clin Rheumatol. 2022;36:101,766
Black DM et al	Treatment-related changes in bone mineral density as a surrogate biomarker for fracture risk reduction	Analysis of treatment efficacy markers in male osteoporosis, providing guidance for clinical decision-making	Lancet Diabetes Endocrinol 2020;8:672–682
Bouvard B et al	French recommendations for the management and treatment of male osteoporosis	Details French national guidelines for screening, diagnosis, and treatment of male osteoporosis, with focus on risk stratification and treatment selection	Rheum Rev 2021;88:173–182
Bruhn R et al	Epidemiology of male osteoporosis in Denmark (1996–2018)	Osteoporosis in men, often underdiagnosed and undertreated, affects nearly one in four men over 50, with increasing prevalence and treatment initiation rates, highlighting the need for improved fracture risk assessment, early diagnosis, and comprehensive management strategies	Osteoporos Int. 2023;34:935–942
Chandran M et al	The health and economic burden of osteoporotic fractures in Singapore	Analysis of osteoporosis burden and treatment strategies in Asian men, with recommendations for management approaches	Arch Osteoporos 2019;14:114
Fuggle NR et al	Evidence-based guideline for the management of osteoporosis in men	Comprehensive guideline addressing screening, diagnosis, and treatment approaches specific to male osteoporosis. Emphasizes the importance of risk assessment and individualized treatment plans	Nat Rev Rheumatol.2024;20:241–251
Gates M et al	Screening for the primary prevention of fragility fractures among adults aged 40 years and older in primary care: systematic reviews of the effects and acceptability of screening and treatment, and the accuracy of risk prediction tools	Male osteoporosis screening and treatment emphasize early risk assessment, utilizing tools like bone mineral density and fracture risk evaluation, alongside pharmacologic and lifestyle interventions, to effectively prevent fractures and improve skeletal health	Syst Rev. 2023;12:51
Gregson CL et al	UK clinical guideline for the prevention and treatment of osteoporosis	For male osteoporosis, the guidelines emphasize fracture risk assessment and intervention thresholds, focusing on men aged 50 and older, and recommend treatments such as antiresorptive and anabolic agents to provide a comprehensive approach to fracture prevention and management	Arch Osteoporos. 2022;17:58

Table 2 (continued)

Authors	Title	Highlights	Source
Kanis JA et al	Algorithm for the management of patients at low, high and very high risk of osteoporotic fractures	Risk-stratified approach to osteoporosis management, including specific considerations for male patients	Osteoporos Int 2020;31:1–12
Keaveny TM et al	Osteoporosis treatment prevents hip fracture similarly in both sexes: the FOCUS observational study	For male osteoporosis, the guidelines emphasize fracture risk assessment and personalized treatment, demonstrating that osteoporosis treatments are equally effective in preventing fractures in both sexes and underscoring the need for increased focus on screening and management for men	J Bone Miner Res. 2024;39:1424–1433
Morin SN et al	Clinical practice guideline for management of osteoporosis and fracture prevention in Canada: 2023 update	For male osteoporosis, the focus is on fracture risk assessment and the implementation of both pharmacologic and nonpharmacologic interventions, with an emphasis on early detection and personalized treatment to prevent fractures and support skeletal health in men aged 50 and older	CMAJ. 2023;195:E1333-E1348
Narla RR et al	Rationale for osteoporosis screening in men	Targeted screening for male osteoporosis, particularly in high-risk groups, identifies men at fracture risk and enables timely interventions to reduce fractures and associated complications	Osteoporos Int. 2024 (In Press) 10.1007/s00198-024–07337-5
Sng GGR et al	Osteoporosis in men—east and west: can the twain meet? A perspective from Asia	Discusses the underdiagnosis and undertreatment of osteoporosis in men, highlighting disparities in BMD and treatment between Asian and Western populations. Evaluates the efficacy of screening tools and pharmacological treatments tailored for Asian men	Osteoporosis and Sarcopenia, 2024;10:131–144
Vilaca T et al	Osteoporosis in men	Osteoporosis in men, often overlooked, is diagnosed using the same criteria as in women, with management focusing on addressing secondary causes, lifestyle modifications, adequate calcium and vitamin D, exercise, and pharmacological treatments like bisphosphonates, denosumab, and teriparatide to increase bone mineral density and reduce fracture risks	Lancet Diabetes Endocrinol. 2022;10:273–283
Yu F et al	The epidemiology of osteoporosis, associated fragility fractures, and management gap in China	For Chinese men, osteoporosis screening and treatment emphasize early fracture risk assessment using tools such as bone mineral density measurement and individualized interventions, addressing the underdiagnosis and treatment gaps to prevent fractures and improve bone health	Arch Osteoporos. 2019;14:32

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Data availability Data are available on reasonable request from the corresponding author.

Declarations

Conflicts of interest None.

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